



CENTER FOR TECH  
AND MEDIA RESEARCH

ISSN: 2582-4686

ResearchBib Impact Factor: 8.848 / 2023  
SJIF 2021-3.261, 2022-2.889, 2023-5.384

# MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY



INDEX

INDEX COPERNICUS  
INTERNATIONAL

GENERAL IMPACT FACTOR



<http://mjstjournal.com>



CENTER FOR TECH  
AND MEDIA RESEARCH

ISSN: 2582-4686

ResearchBib Impact Factor: 8.848 / 2023  
SJIF 2021-3.261, 2022-2.889, 2023-5.384

# MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY



**VOLUME 4** **ISSUE 1**

 <http://mjstjournal.com>

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

MULTIDISCIPLINARY JOURNAL OF SCIENCE  
AND TECHNOLOGY (2582-4686)

VOLUME-4, ISSUE-1, JANUARY

Editor in Chief

**Dr. Rajeev Ojha** - Interdisciplinary Research in Basic Sciences, Jamia Millia Islamia, New Delhi -110025, India

Editorial Team

**Sunita Sarawagi** - Indian Institute of Technology Bombay, Mumbai, India.

**Eshkaraev Sadridin Chorievich** - associate professor of the Department of Analytical Chemistry of Termiz State University, Doctor of Philosophy Chemical Science, Termez, Uzbekistan. [ORCID esadir\\_74@rambler.ru](#)

**Furkat B. Eshkurbonov** - Editor of chemical science, Termiz institute of engineering and technology, doctor of sciences in chemistry, Professor of technology of organic substance and materials on their basis. E-mail: [furqateshqurbonov@gmail.com](mailto:furqateshqurbonov@gmail.com)

**Shakhlo Sh.Yuldasheva** - Editor of pedagogical sciences Uzbekistan state University of World Languages Doctor of Philosophy in pedagogics, Professor of Theory and methodology of teaching and bringing up. <https://orcid.org/0000-0001-9797-8635>  
E-mail: [shahlondpi@gmail.com](mailto:shahlondpi@gmail.com)

**Dr Manjunatha LH** - Professor, REVA University, INDIA

**Zilola I. Salisheva** - Editor of pedagogical sciences Uzbekistan state University of World Languages Doctor of Philosophy in pedagogical science, Docent of Theory and methodology of teaching and bringing up. <https://orcid.org/0009-0002-2000-5135>  
E-mail: [salisheva\\_z@mail.ru](mailto:salisheva_z@mail.ru)

**Asish Bera** - Edge Hill University, UK, BITS Pilani, India

**Fozilova F. Mokhigul** - Editor of pedagogical sciences Uzbekistan state University of World Languages Doctor of Philosophy in pedagogical science. <https://orcid.org/0009-0001-9464-6480>  
E-mail: [fozilova1204@gmail.com](mailto:fozilova1204@gmail.com)

**Dr Sunildro LS Akoijam** - Assistant Professor of Management, North Eastern Hill University, India

**Rakhmankulov E. Jasur** - Editor of technical sciences Termez institute of Engineering and Technology Doctor of Philosophy in technical science. E-mail: [jasurer87@gmail.com](mailto:jasurer87@gmail.com)

**Madan Mohan Singh** - Professor of Mathematics, North-Eastern Hill University, Shillong, India

**Khamra D.Abdullaev** - Associate Professor of the Department of Uzbek Language and Literature, Candidate of Philological Sciences, Karakalpak State University named after Berdak, Republic of Uzbekistan. E-mail: [abdullaevxamro7173@gmail.com](mailto:abdullaevxamro7173@gmail.com)

**Dr. Anupam Singh** - Associate Professor-CSE, Graphic Era Hill University Dehradun, India

**Nusratov.N.Anvar** - Editor of pedagogical sciences, Bukhara State University Doctor of Philosophy in pedagogical sciences.

**Dr. Sargam Bahl Walia** - School of Management, Graphic Era Hill University, Dehradun, Uttarakhand, India

**Abdurasulov A.Abdullajon** - Editor of pedagogical sciences, Kokand State Pedagogical Institute Doctor of Philosophy in pedagogical sciences.

**Narayan Pradhan** - Indian Association for the Cultivation of Science

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

**Nomozov K. Abror** - Editor of technical science, Termez Institute of engineering and technology  
Doctor of Philosophy in technical science. e-mail: [abrornomozov055@gmail.com](mailto:abrornomozov055@gmail.com)

**Ashok Kumar** - Kumar Associate Professor E&CE National Institute of Technology. Hamirpur,  
India.

**Misirov Kh. Zafar** - Editor of technical science Termez Institute of engineering and technology  
Doctor of Philosophy in technical science. e-mail: [zafarmisirov1986@gmail.com](mailto:zafarmisirov1986@gmail.com)

**Anjali Pal** - Department of Civil Engineering, Indian Institute of Technology Kharagpur -  
721302, India.

**Karimova Zevara Xadjibayevna** - Editor of medical science, Associate Professor of the  
Department of General Surgery, Pediatric Surgery and Pediatric Urology, Tashkent Medical  
Academy, Termiz Branch

**Rajnish Joshi** - Professor of Medicine, All India Institute of Medical Sciences, Bhopal, India

**Gulnara S. Agzamova** - Editor of medical science, Associate Professor of the Department of  
Hospital Therapy department, Doctor of science in medicine, Tashkent Medical Academy.

**Mukul Kumar** - IIT Mumbai (India); Meijo University (Japan); HEG Ltd. (India)

**Diloram A. Urunbayeva** - Editor of medical science, Associate Professor of the Department of  
Endocrinology, Doctor of philosophy in medicine, Tashkent Medical Academy.

**Prof. Kuruvilla Joseph** - Indian Institute of Space Science and Technology (IIST)

**Yigitaliyev S. Umidjon** - Editor of philological science, Associate Professor of the Department of  
Uzbek language, Doctor of philosophy in philological science, Kokand State Pedagogical Institute

**Diyorov G. Khusan** - Editor of technical sciences, Termez Institute of engineering and technology  
Doctor of Philosophy in technical sciences.

E-mail: [husan\\_diyorov88@mail.ru](mailto:husan_diyorov88@mail.ru)

**Prof. Yogesh C. Sharma** - D.Sc., FRSC, FBRS, FIAPS; FISEES, Department of  
Chemistry, Indian Institute of Technology

**Hudaykulova Shakhnoza Suvanovna** - senior teacher of the Department of Uzbek and Russian  
languages at the University of World Economy and Diplomacy, doctor of philosophy in  
philological sciences (PhD), [sh.suvanovna@gmail.com](mailto:sh.suvanovna@gmail.com), ORCID number: <https://orcid.org/0009-0009-7734-9458>

**Masharipova Sultanposhsha Matrasulovna** - Editor of philological science, Candidate of  
Pedagogical Sciences, Associate Professor of the Department of Primary Education Methodology  
at the Pedagogical Faculty of Urgench State University

**Mavludakhon B. Gofurova** - Editor of philological sciences, Kokan State Pedagogical Institute  
is a teacher of the Department of English in preschool and primary education, doctor of philosophy  
in philological sciences (PhD)

**Professor Indra Mani Mishra** - Indian Institute of Technology (Indian School of Mines),  
Dhanbad; Formerly at India

**Fayziev A. Nozim** - Editor of pedagogical science, Doctor of philosophy in pedagogical science,  
Samarkand State Institute of Foreign Languages

**Dilmurod Ya. Khojiev** - Editor of medical science, Doctor of philosophy in medicine.

**Shaymardanova A. Mokhichekhra** - Editor of technical science, Termiz institute of Engineering  
and Technology, doctor of philosophy in technical science.

E-mail: [mokhichekhrashaymardanova@gmail.com](mailto:mokhichekhrashaymardanova@gmail.com)

**Iskandarova E. Dilnozakhon** - Editor of medical sciences, Termiz branch of Tashkent Medical  
Academy, doctor of philosophy in medical science (PhD)

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

**Kadirova A. Dilfuza** - Editor of philological sciences, Kokan State Pedagogical Institute, doctor of philosophy in philological science (PhD)

**Rustam Z. Madiev** - Editor of medical science, doctor of philosophy in medicine, Candidate of Medical Sciences, cardiovascular surgeon of the highest category, associate professor, head of the department of "Surgical diseases and surgery in family medicine" of the Termez branch of the Tashkent Medical Academy

**Yulchiyeva Marguba** - Editor of technical sciences, Doctor of Philosophy in technical science, Termez institute of engineering and technology. E-mail: margubayulchieva86@gmail.com

**Zukhra M. Allamuratova** - Editor of philological sciences, doctor of philosophy in philological science, Karakalpak State University

**Muqaddam Abduvaliyeva** - Editor of Technical sciences, Termez institute of engineering and technology, doctor of philosophy in Technical science(PhD) E-mail: muqaddamabduvaliyeva@gmail.com

**Kudaybergenov A. Murat** - Editor of philological sciences, Doctor of Philosophy in philological science, Karakalpak State University

**Genjebay M. Abishov** - Editor of philological sciences, Karakalpak State University, associate professor, doctor of philosophy in philological science(PhD)

**Chorieva B. Nigora** - Editor of Technical sciences, Termez institute of engineering and technology, doctor of philosophy in Technical science(PhD) E-mail: chorievanigora5@gmail.com

**Jenisbay O. Tanirbergenov** - Editor of philological sciences, Karakalpak State University, docent of Karakalpak language, doctor of philosophy in philological science(PhD)

**Gulyamov B. Yorkin** - Editor of medical sciences, Tashkent Medical Academy's Branch of Termez, doctor of philosophy in medicine (PhD), docent of Traumatology and Orthopaedy

**Otamurodov. A. Furkat** - Editor of Medical sciences, Termez branch of Tashkent medical academy, doctor of science in Medicine (DSc)

**Nuritov Nurpullo Rajabovich** - Editor of Medical sciences, Termez branch of Tashkent medical academy, doctor of philosophy in Medicine(PhD)

**Rakhman. O. Mukhamadiev** - Editor of Medical sciences, Head of Ophthalmology Department of Surkhandarya Regional Multidisciplinary Medical Center, Professor of Ophthamology

**Azat. A. Yusupov** - Editor of Pedagogical sciences, Karakalpak State University, doctor of Philosophy in Pedagogical sciences. E-mail: yusupov.azat82@gmail.com

**Daniyarova. J. Zamira** - Editor of Philologigacal sciences, Nukus Innovation Institute, doctor of Philosophy in Philologigacal sciences

**Gulara. A. Yusupova** - Editor of Pedagogical sciences, Nukus State Pedagogical Institute, doctor of Philosophy in Pedagogical sciences, docent of Theory and methodology of teaching and bringing up.

**Shakhista. M. Buranova** - Editor of Pedagogical sciences, Nukus State Pedagogical Institute, doctor of philosophy in Pedagogics

**General concepts of the laws of thermodynamics**

*Shukrullayeva Ezoza, Shukrullayeva Dilnoza, Obloqulova Sitora*

*2nd stage students of Jizzakh Polytechnic Institute*

*Kurbonova Dilafruz Sobirovna.*

*Assistant of Jizzakh Polytechnic Institute.*

**Аннотация:** В данной статье рассматриваются первый, второй и третий законы термодинамики. Дана информация об истории их появления и использования. Эта статья может быть использована исследователями и студентами.

**Abstract:** This article covers the first, second and third laws of thermodynamics. Information about the history of their appearance and use is given. This article can be used by researchers and students.

**Ключевые слова:** Первый закон, второй закон, третий закон термодинамики, энергетический баланс, классическая термодинамика.

**Key words:** First law, second law, third law of thermodynamics, energy balance, classical thermodynamics.

There is a department in the world that is responsible for the study of physical heat and the changes produced by heat in a system. We can learn about this section in thermodynamics and its laws. It is the branch of physics responsible for the study of all changes that result from processes involving changes in temperature and energy states at the macroscopic level. In these sections, we study the laws of thermodynamics. There are three laws of thermodynamics, the first of which is the first law of thermodynamics. This is one of the basic laws of science, and it expresses the general physical law of energy conservation for thermodynamic systems that must perform heat, mass transfer, and chemical processes. As a result, the conservation law is used in this, the first law in the form of the energy balance equation in flow thermodynamics and non-equilibrium thermodynamics. In equilibrium thermodynamics, the first law of thermodynamics is usually understood as a consequence of the law of conservation of energy. In the second law of thermodynamics, the sum of entropies of interacting systems in a natural thermodynamic process never decreases. As a result, the general meaning of this law is that heat does not spontaneously transfer from a colder body to a hotter body. The third law of thermodynamics shows that as the temperature of a system approaches absolute zero, its entropy approaches a constant value. As a result, there are exceptions for non-crystalline solids, but the entropy of a system with absolute zero is usually close to zero. These laws prevent the possibility of perpetual motion machines, the first law prohibits the production of work without the input of energy,

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

and the second law prohibits the spontaneous conversion of thermal energy into mechanical work. The history of thermodynamics is closely related to the development of physics and chemistry and goes back to ancient theories about heat. Basically, the laws of thermodynamics were established as a result of the progress made in the 19th and early 20th centuries. Sadie Carnot's work in the 19th century established the second law, while scientists such as Rudolph Clausius and William Thomson formalized the first and second laws by the 1860s. Walter Nernst later developed what became known as the third law between 1906 and 1912. This was followed by proposals for additional laws, the four accepted laws of thermodynamics being the most recognized and discussed in standard textbooks. The first law of thermodynamics is often expressed as the impossibility of a perpetual motion machine of the first type that operates without energy from any source [1] [2] [3]. This law means that the transition from the microscopic description of the known system to the macroscopic description of the energy itself leads to a radical reduction in the number of physical quantities needed to describe the system. Therefore, in thermodynamics, the energy changes that occur at the micro level within the system are sometimes very complex, not detailed, but collectively described by the internal energy, which is a component of the total energy, a macroscopic quantity introduced specifically for this purpose. The result is a system that, from a microscopic point of view, is the sum of the energies of all the particles included in the system. Therefore, in textbooks that do not deal with flow thermodynamics and non-equilibrium thermodynamics, the first law is often formulated as a postulate that introduces the idea of internal energy as an additional quantity to the physics of macroscopic systems. For a single-valued, continuous and finite scalar function of the state of a thermodynamic system and any other state function, the change in internal energy  $U$  is the fully differential existing  $dU$  in an infinitesimal process and the change in internal energy in a circular process. If we analyze classical thermodynamics, we can see that it is based on the concept of a macroscopic system. This system is nothing more than a part of a physical or conceptual mass isolated from the external environment. To better study thermodynamic systems, we must always assume that it is a physical mass that is not disturbed by energy exchange with the external ecosystem. Chemical energy stored in molecules can be released as heat in the chemical reactions that occur when fuel methane, coal, or cooking gas is burned in air. Chemical energy can also be used to do mechanical work when fuel is burned in an engine, or to produce electricity through an electrolytic process. In addition, the cell is similar to dry cells. Thus, different types of energy are connected to each other and under certain conditions they can be transformed into other forms. The study of these changes is the focus of

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

thermodynamics. The laws of thermodynamics cover energy changes in macroscopic systems with many molecules instead of microscopic systems with a handful of molecules. Thermodynamics is not concerned with how and how fast energy changes occur, but with the initial and final conditions of the system undergoing the changes. The laws of thermodynamics apply only to systems that are in equilibrium or moving between equilibrium and another equilibrium. Macroscopic properties such as temperature and pressure do not change with time in an equilibrium system. The state of the macroscopic system in equilibrium is determined by quantities called thermodynamic variables. We know all these variables and they are temperature, pressure, volume and chemical composition. All these variables are what define systems and their equilibrium. Due to the practical international union, the main symbols that exist in chemical thermodynamics have been established. It became possible to work with these units and explain the law of thermodynamics better. However, there is a branch of thermodynamics that does not study equilibrium, but is mainly responsible for the analysis of thermodynamic processes that are characteristic and do not have the ability to consistently reach equilibrium conditions. In conclusion, it can be said that the first principle of thermodynamics is the principle of conservation of energy. The amount of energy in a heat engine is converted to work and can be seen by any machine that produces work without consuming energy. We can establish this first principle as follows: in it, the change in the internal energy of a closed thermodynamic system is equal to the difference between the heat supplied to the system and the work done by the surrounding system.



**References:**

1. Callen H. B.. Thermodynamics and an Introduction to Thermostatistics, 2nd ed, N. Y. e. a.: John Wiley, 1985.
2. Cohen E. R., Cvitaš T., Frey J. G. e. a.. Quantities, Units and Symbols in Physical Chemistry, 3rd ed, Cambridge: The Royal Society of Chemistry Publishing, 2007.
3. Kirchhoff Gustav. Vorlesungen über mathematische Physik. Band IV. Vorlesungen über die Theorie der Wärme. Leipzig: Verlag von B. J. Teubner, 1894.
4. Tisza Laszlo. Generalized Thermodynamics. Cambridge (Massachusetts) — London (England): The M.I.T. Press, 1966.
5. Александров А. А.. Термодинамические основы циклов теплоэнергетических установок. М.: Изд-во МЭИ, 2004.
6. Артемов А. В.. Физическая химия, Бакалавриат. М.: Академия, 2013.
7. Базаров И. П.. Термодинамика, 5-е изд, Учебники для вузов. Специальная литература, СПб.—М.—Краснодар: Лань, 2010. .
8. Беккер Р.. Теория теплоты. М.: Энергия, 1974.
9. Белоконь Н. И.. Термодинамика. М.: Госэнергоиздат, 1954.
10. Большая Советская Энциклопедия, 3-е изд, М.: Советская Энциклопедия, 1975. Архивная копия от 23 июня 2017 на Wayback Machine
11. Борн М. Критические замечания по поводу традиционного изложения термодинамики (рус.) // Развитие современной физики. — Отв. ред. Б. Г. Кузнецов. — М.: Наука, 1964. — 331 с. — С. 223—256.
12. Борщевский А. Я.. Физическая химия. Том 1 online. Общая и химическая термодинамика. М: Инфра-М, 2017.
13. Воронин Г. Ф.. Основы термодинамики. М.: Изд-во Моск. ун-та, 1987.
14. Второе начало термодинамики: Сади Карно — В. Томсон-Кельвин — Р. Клаузиус — Л. Больцман — М. Смолуховский. М.—Л.: Гостехиздат, 1934.

The relationship of anecdotes with other oral epic and humor-based genres

N.O.Safarova,

Professor of the Bukhara  
state pedagogical Institute.

**Аннотация:** в статье определены характерные черты художественной композиции анекдотов, эпизодического сюжета, суть и развязка, значимость диалогов.

**Ключевые слова:** анекдот, жанр, образ, фольклор, поэтика, объект, выставка, метод, интерактив, исследование, дидактика, герой, комедия, смех, мультимедиа, юмор.

**Keywords:** anecdote, genre, image, folklore, poetics, object, exhibition, method, interactive, research, didactics, hero, comedy, laughter, multimedia, humor.

**Annotation:** The article features of the artistic composition of anecdotes, the episodic plot, the essence and denouement, the significance of dialogues are determined;

Anecdotes. We have expressed an opinion on the fact that folklore is composed of works suitable for all conditions of life. Anecdotes serve as another proof of our opinion. Uzbeks, like other peoples of the world, love humor, imitation, and laughter. Laughter gives a person health, a good mood, and a sense of self-satisfaction. The wise children of our people, such as Yusufjan Khen, Aka Bukhor, Ganijon Tashmatov, shared refreshment, hope, and confidence with the people of our country even when life was difficult. Achieving such a result was very difficult for its time. Anecdotes, praises, askiya, works of folk drama, and the effective use of writing gave intelligent and talented people the honor of winning people's love in the real sense.

The genre characteristics of anecdotes can be defined as follows:

1. Anecdotes belong to the epic type (genre) in fiction. But in performance, dramatic acting skills are important.
2. Anecdotes are created in prose form.
3. Limited in size.
4. Dialogues are widely used in the expression of events.
5. An unexpected solution of an emergency causes laughter.

According to scientific literature, the formation and development of anecdotes corresponded to the 9th-11th centuries.

The end of the 19th century and the beginning of the 20th century are defined by the connection and integration of anecdotes with the name of Nasriddin Efandi. According to the founder of the science of Uzbek folklore, professor Hodi Zarifov, the popularity of Nasriddin Efandi's name in Uzbek anecdotes began with the appearance of the printing press in our country, and the publication of Nasriddin Efandi's anecdotes in book form. It can be said that the wide popularity of "Mulla Nasriddin" magazine published in Azerbaijan among Uzbek intellectuals accelerated this process. At the beginning of the last century, books were published under the name "Nasriddin Efandi". Later, with the initiative of intellectuals, writers and scientists such as Sharif Reza, Sabir Abdulla, Adham Rahmat, Hashimjon Razzokov, Bahadir Sarimsakov, Farida Yoldosheva, Efendi's anecdotes were published several times and scientific researches were conducted. Especially the pamphlet "The image of Nasriddin Efandi in Uzbek anecdotes" written

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

by Farida Yoldosheva has become important in learning the history of this genre, text analysis, and the skill of image creation. Uzbek Effendi's anecdotes have been repeatedly published in Russian. Uzbek filmmakers created feature films "Nasriddin in Bukhara" (starring Sverdlin Lev Naumovich), "Adventures of Nasriddin" (starring Razzaq Hamroev). It can be said without any hesitation that as a result of these efforts, Uzbek Nasriddin Efandisi, as well as our anecdotes, gained fame far beyond the borders of our country. Every reader who has read the anecdotes of Nasriddin Efandi is interested in the history of this person.

The repeated repetition of the names of Sheikh Nasriddin, Khoja Nasriddin, Mulla Nasriddin, Nasriddin Efandi increases this interest even more. According to scientific data, a person named Nasriddin died in 1208, and even according to the Hijri calendar, it was written on his tomb that he was born in 386, and the year numbers were deliberately reversed. Researcher Farida Yoldosheva summarizes these facts as follows: "In history, there may have been several prototypes of people named Khoja Nasriddin, Nasriddin Efandi... These historical figures are the prototypes that gave life to the national hero Khoja Nasriddin. whether On the contrary, national hero Nasriddin brought fame to historical figures." Indeed, the various funny incidents in Nasriddin Effendi's anecdotes, created by the people, are so extensive and instructive that their general content does not fit within the limits of one person's life. Therefore, it is closer to the truth to understand the main character of these anecdotes as the people embodied in the symbol of Nasriddin Effendi. Because in history Rashididin Vatvot, Alisher Navoi, Binai, Mashrab, Muqimi, later A. Qadiri, G'. Ghulam, A. Qahhor, M. Shaykhzoda, A. Rahmat, H. Razzokov, S. Ahmad, O. Sharafiddinov, The description of the funny, instructive, humorous events that happened in the lives of people like E. Vahidov, O'Hoshimov, O. Matchon, A. Meliboev, over time, in the anecdotes, in particular, the oral ones related to Nasriddin Effendi it is natural that it is expressed in works of art. In every nation, there are people who create funny situations out of life scenes. Their way of thinking is the secret to creating an extraordinary comic situation. That is why the heroes of anecdotes are famous with the names Birbol in Indians, Jokha in Arabs, Aldar kusa in Kazakhs, Mushfiqi in Tajiks, Mirali in Turkmens, Umrbek in Karakalpaks, but there are many common situations in anecdote texts. In such cases, it is not correct to ask the question that the representative of another nation appropriated or copied a certain event from the representative of another nation. It is better to justify the creation of the same anecdotes due to similarities in social and domestic life. For example, in one of Birbal's anecdotes, one day the king orders him to come up with a very funny joke and that the forgiveness of this joke should be even more funny. Birbal accepts the king's offer. A few days later, Birbal pinches the king's back when no one is around. The king angrily asked, "What have you done?" - when asked, Birbol replied: "I'm sorry, my king, I thought you were my queen." It is interesting that this anecdote is popular among Uzbeks, Turkmens, and Azerbaijanis. This example shows the viability of anecdotes and the naturalness of similar situations in different nations. As a result, it will not be possible to determine which nation created this anecdote earlier, and there will be no need to determine it

In the anecdotes of Uzbek Nasriddin Effendi, the main character is embodied as a very responsive, very intelligent, wise and entrepreneurial person. In life, it is impossible to put him in a situation where there is no solution with words and actions. Because the eloquence of the whole people, the nation, the virtue of zaky, i.e. subtle thinking, was expressed in the image of the intelligent, thinker Nasriddin Effendi. In the text of each anecdote, the mind, mood and intelligence

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

of the person who came up with it are shown. The attention-grabbing aspect of the anecdotes, which attracts the listener, is that the parties who answer questions in them try to put each other in a situation where no solution can be found. Especially, the fate of Nasriddin Effendi is described in a very difficult and desperate situation until reaching the final part of the story. But since the people are on the side of Nasriddin Effendi, our hero can find a solution even from such a difficult situation with his ingenuity and mastery of words.

Let's turn to an example. One day, the king learned that Effendi was coming to the palace and wanted to tell him about him with a story he found: "Tonight," he said, "Effendi and I had a dream." Naturally, in such cases, Effendi was only required to express the meaning of approval.

The king continued: "Effendi and I turned into a newborn kitten in our dream. A hawk fell from the sky and took both of us in its claws and flew to the sky. But he escaped from the attack of the eagle that appeared recently and freed both of us from its clutches. I fell into a molasses, and my brother fell into an unclean one." Then the officials in the palace laughed at Effendi and burst out laughing. Effendi calmly said: "Shahim, tell us the rest of our dream." Surprised by the sudden statement, the king hesitated: "Well, what happened next?" - he had to ask. Effendi: "You came out of the molasses, I came out of the impure, right?" - he said. "Yes, yes," said the king, "very true." Then Effendi replied: "I licked you, you licked me."

It turns out that we can't help but express our gratitude for Nasriddin's correct assessment of the situation and his ability to find the right solution immediately. The clear use of words and phrases in Effendi's anecdotes proves that the folk hero uses the possibilities of the Uzbek language, puns, and puns like a true goldsmith. Although Effendi looks very simple, he skillfully uses the beauty of our language and the pronunciation of sounds.

One day Effendi insulted a senior official saying "You are stupid". The official took him to the court. The judge thoroughly explained the official's services to his master. He advised. At the end of his speech, he ordered Effendi to look at the official and say, "You are not a stupid person." Effendi immediately obeyed the judge's order and said: "You fool are not human." Due to the pronunciation of the word "fool" in the sentence with a strong accent, it is known that if the salty dry official was called only a fool before, the effendi who "carried out" the judge's order no longer sees him as a human being. It is clear that the people who weaved such anecdotes were people who know the Uzbek language very well and have a deep sense of puns.

In fiction, works are also created that completely free the reader from the worries of life for a certain period of time. The viewer who watches some stage plays forgets all his worries. He will get rid of big life problems. In particular, in our opinion, such dramas as "Tashbolta Ashiq", "Brides' Rebellion", "Golden Wall" were staged for this purpose. The charm that fascinates us is determined by the extraordinary simple decision-making of the heroes of the work, their sincere attitude towards each other. In Effendi's anecdotes, the second characteristic of Effendi is explained by showing his extreme simplicity, to be more precise, his inaccuracy. In such examples, we enjoy Effendi's simplicity and the fact that he does not take the sad events of life to himself. Effendi's Effendi is interpreted by his Effendi. That is, it is the effendi who makes the decision that cannot be made by any conscious person. Nasriddin Effendi was walking on the street and found a small mirror. Taking it in his hand, as soon as he saw his reflection, he said: "Excuse me, is the mirror yours?" - he threw away. The glass is broken. Then Effendi said: "If you don't need to, won't you say it?" I would have bought it myself," he said.

It is one of the masterpieces of values. In them, in the person of Effendi, the people are called to teach their children that there is a suitable solution to any difficult situation. The most important thing is the ability to find this solution.

**LIST OF REFERENCES**

1. Сафаров О. Ўзбек халқ оғзаки ижоди. Ўзбекистон Республикаси Олий ва ўрта махсус таълим вазирлиги томонидан университетлар ва педагогика институтлари учун дарслик. – Тошкент: Муסיқа, 2010. – 368 с.
2. Сафарова Н.О. Ўзбек болалар ўйин фольклори табиати. - Т.: Фан, 2008.
3. Шомақсудов Ш., Шораҳмедов Ш. Ҳикматнома. – Тошкент: Совет Ўзбек Энциклопедияси Бош редакцияси, 1990. – 526 б.
4. Ўзбек тилининг изоҳли луғати. Икки жилдлик. 1-жилд. А–Р. – Москва: Рус тили, 1981. – 631 б.
5. Сафарова Н. MAISHIY O'YINLARDA IJTIMOIIY HAYOTNING BADIIIY IFODASI //Образование и инновационные исследования международный научно-методический журнал. – 2020. – №. 1.
6. Сафарова Н. О., Исматуллаев М. И. ТЕМАТИЧЕСКАЯ КЛАССИФИКАЦИЯ ДЕТСКИХ ФОЛЬКЛОРНЫХ ИГР //European reseach: innovation in science, education and technology. – 2020. – С. 59-61.
7. Сафарова Н. О., Исматуллаев М. И. ТЕМАТИЧЕСКАЯ КЛАССИФИКАЦИЯ ДЕТСКИХ ФОЛЬКЛОРНЫХ ИГР //European reseach: innovation in science, education and technology. – 2020. – С. 59-61.
8. Safarova N. O. et al. SHARQ MUTAFAKKIRLARINING OILA TO'G'RISIDAGI QARASHLARI //Студенческий вестник. – 2020. – №. 18-10. – С. 55-57.
9. Safarova N., Abdullayeva G. DIDAKTIK O'YINLARNING SAMARADORLIGI //Science and innovation. – 2022. – Т. 1. – С. 75-77.
10. Khamraeva G., Safarova N. THE IMPORTANCE OF GROUP WORK ACTIVITIES IN TEACHING FOREIGN LANGUAGES //Научная дискуссия: инновации в современном мире. – 2017. – №. 4. – С. 102-106.
11. Amanov A. K. et al. FREE ECONOMIC ZONES ESTABLISHED IN CENTRAL ASIAN COUNTRIES //Экономика и социум. – 2021. – №. 6-1 (85). – С. 39-47.
12. Safarova N. N. BO 'LAJAK O 'QITUVCHILARNING KASBIY KOMPETENTLIGINI RIVOJLANTIRISHDA RAQAMLI TA'LIM TEXNOLOGIYALARIDAN FOYDALANISHNING NAZARIY ASOSLARI //Educational Research in Universal Sciences. – 2023. – Т. 2. – №. 11. – С. 339-342.
13. Nasilloeyvna S. N. O 'QITUVCHINING KASBIY MAKORATI VA KOMPETENTLIGI //International Scientific and Practical Conference of Students and Young Scientists" Sustainable Development: Problems, Analysis, Prospects"(Poland). – 2023. – Т. 3. – С. 10-15.

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

14. Islambayevna M. M. et al. XORAZM VILOYATI TABIIY GEOGRAFIK O'RNINING O'ZIGA XOS XUSUSIYATLARI (GEOGRAFIK O'RNINING QULAY VA NOQULAY TOMONLARI) HAQIDA //Eurasian Journal of Law, Finance and Applied Sciences. – 2022. – T. 2. – №. 2. – C. 50-53.
15. Sobirov J. X. O., Komiljanova E. U. Q., Sharifboyeva H. I. Q. XORAZM VILOYATIDA AGRAR SOHANING EKSPORT SALOHIYATINI KENGAYTIRISHDA AYRIM NOAN'ANAVIY TARMOQLARDAN FOYDALANISH ISTIQBOLLARI VA RIVOJI //Oriental renaissance: Innovative, educational, natural and social sciences. – 2022. – T. 2. – №. 1. – C. 38-42.
16. Kuzibayevna K. D. et al. Drying of the Aral Sea and changes in the landscape of the Aral Sea region //Texas Journal of Multidisciplinary Studies. – 2022. – T. 4. – C. 108-110.
17. Islambayevna M. M. et al. PROSPECTS FOR SOCIO-ECONOMIC DEVELOPMENT OF THE ECONOMY OF KOSHKOPIR DISTRICT //Galaxy International Interdisciplinary Research Journal. – 2021. – T. 9. – №. 12. – C. 1375-1378.
18. Amanov A. K. et al. ECONOMIC AND GEOGRAPHICAL FEATURES OF THE FORMATION OF NAVOI FREE ECONOMIC ZONE //Thematics Journal of Geography. – 2021. – T. 6. – №. 1.
19. Nasillovna S. N. BO 'LAJAK O 'QITUVCHILARNING KASBIY KOMPETENTLIGINI RIVOJLANTIRISHNING PEDAGOGIK SHART-SHAROITLARI //International conference on multidisciplinary science. – 2023. – T. 1. – №. 5. – C. 56-61.
20. Oxunjonovna S. N., Asrorovna Y. M. BOSHLANG 'ICH SINF O 'QISH KITOBLARIDA TOPISHMOQLARNING O 'RNI VA AHAMIYATI //PEDAGOGS jurnali. – 2023. – T. 1. – №. 1. – C. 104-104.
21. Safarova N., Ibragimova Z. BOSHLANG'ICH TA'LIM JARAYONIDA O'QUVCHILARNI MEHNAT INTIZOMIGA O'RGATISH JARAYONI TADQIQOT PREDMETI SIFATIDA //Инновационные исследования в современном мире: теория и практика. – 2023. – T. 2. – №. 2. – C. 23-28.
22. Safarova N., Ibragimova Z. BOSHLANG'ICH TA'LIM JARAYONIDA O'QUVCHILARNI MEHNAT INTIZOMIGA O'RGATISH JARAYONI TADQIQOT PREDMETI SIFATIDA //Инновационные исследования в современном мире: теория и практика. – 2023. – T. 2. – №. 2. – C. 23-28.
23. Safarova N., Abdullayeva G. ZAMONAVIY BOSHLANG'ICH TA'LIMDA DIDAKTIK MATERIALLARNING O'RNI //Инновационные исследования в современном мире: теория и практика. – 2023. – T. 2. – №. 2. – C. 20-22.
24. Safarova N., Abdullayeva G. ZAMONAVIY BOSHLANG'ICH TA'LIMDA DIDAKTIK MATERIALLARNING O'RNI //Инновационные исследования в современном мире: теория и практика. – 2023. – T. 2. – №. 2. – C. 20-22.

**THERAPY OF BRONCHIAL ASTHMA IN CHILDREN**

**Sayfiddinova Muhayyo Saidaxmatovna**

**Xolboyev Norbek**

Therapy for bronchial asthma is aimed at restoring bronchial patency, achieving stable remission and maximizing pulmonary function and ensuring the normal development of the child. This can be achieved as a result of a set of measures, including increasing the level of knowledge of parents and patients about the manifestations and possibilities of treatment of bronchial asthma, controlling the course of the disease by eliminating trigger factors, conducting pharmacotherapy and allergen-specific immunotherapy [1,2].

Key words: bronchial asthma, therapy, treatment, immunity.

Parents of children suffering from bronchial asthma are not sufficiently informed about the mechanisms of development, manifestations of this disease and existing approaches to its treatment, which is sometimes the reason for their low activity in the implementation of therapeutic programs. Improving parent and child knowledge may improve the effectiveness of treatment for children with asthma. Educational programs for family members include coverage of such issues as the nature of bronchial asthma, factors that provoke exacerbation of the disease, methods of use and possible side effects of the medications used. Parents are explained what medications are used to relieve an attack of bronchial asthma and to prevent subsequent exacerbations of the disease, in which cases patients with bronchial asthma need hospitalization and where they can receive emergency and specialized care.

Preventive measures are aimed at reducing exposure to causally significant allergens and preventing the impact of other nonspecific factors that cause exacerbation of the disease. It is essential to eliminate pets from living quarters, stop smoking in the family, and implement measures aimed at reducing the concentration of aeroallergens in the apartment. Detection of a connection between exacerbations of

bronchial asthma and the consumption of certain foods requires the appointment of an elimination diet. If a drug allergy is detected, it is necessary to exclude the use of medications that cause the development of side effects.

Treatment of acute bronchial asthma is carried out taking into account the severity of the exacerbation of the disease, which is assessed on the basis of examination, pulmonary function tests, X-ray examination, and blood gas composition studies (for severe exacerbations of asthma).

Objective information about the severity of bronchial obstruction is provided by determining PEF (peak expiratory flow), the decrease of which in bronchial asthma is in direct correlation with the severity of the attack that occurs. The value of PEF in the range from 50 to 80% of the proper values indicates moderate or mild impairment of bronchial obstruction. PEF indicators less than 50% of the required values indicate the development of a severe exacerbation of bronchial asthma.

Determining blood oxygen saturation can be quite informative in assessing the patient's condition. A decrease in blood oxygen saturation to less than 92% indicates that the patient has severe bronchial obstruction. In case of severe exacerbations of bronchial asthma, it is advisable to conduct an X-ray examination of the lungs, which allows identifying atelectasis, pneumomediastinum, and an inflammatory process in the lungs.

To eliminate an attack of bronchial asthma, inhaled beta2-adrenergic agonists (salbutamol, fenoterol, terbutaline) are most effective [3]. Relief of an attack begins with the prescription of drugs from this group of bronchospasmodics. Inhaled beta2-adrenergic agonists have powerful bronchospasmolytic activity and ensure the development of a therapeutic effect within 10-20 minutes after use. Sympathomimetic drugs can be administered using metered-dose inhalers, which make it possible to strictly control the aerosol dose. You can use inhalers for the administration of dry bronchospasmolytic powder, nebulizers for the inhalation administration of liquid symptomatic medications (fenoterol, salbutamol). The administration of beta2-adrenergic agonists in the form of metered-dose aerosols is



most effective in children over 7 years of age who are able to fully master the technique of their use. In children of primary and preschool age, treatment with metered aerosols is carried out using a spacer. The administration of solutions of beta2-adrenergic agonists using nebulizers is more often used in young children and in patients with severe exacerbations of bronchial asthma, when due to the severity of the condition they cannot inhale the drug.

To relieve an attack of bronchial asthma, 2 inhalations of a metered-dose aerosol with one of the beta2-agonists are usually prescribed with an interval of 2 minutes. Inhalation can completely stop an attack of bronchial asthma or significantly reduce its manifestations. In cases of incomplete disappearance of symptoms of bronchial obstruction, inhalation of the drug is carried out every 4-6 hours until bronchial patency is completely restored.

If the therapeutic effect from the use of inhaled beta2-adrenergic agonists is insufficient, aminophylline can be prescribed orally at a dose of 4 mg/kg body weight 4 times a day. The use of the bronchospasmolytic drug Berodual, containing fenoterol and ipratropium bromide, can be effective. It is advisable to carry out Berodual therapy in young children and in patients with a severe attack of bronchial asthma using a nebulizer. To relieve mild attacks of bronchial asthma, oral use of sympathomimetics (salbutamol, terbutaline, clenbuterol), as well as aminophylline, is possible.

For severe attacks of bronchial asthma, nebulizer therapy with inhaled beta2-adrenergic agonists or Berodual is carried out in combination with nebulizer therapy with a budesonide suspension (Pulmicort) at a dose of 250-500 mcg 2 times a day. For patients in whom this therapy is not effective enough, glucocorticosteroids are administered intramuscularly. Prednisolone or methylprednisolone is prescribed at a dose of 1-2 mg/kg, hydrocortisone at a dose of 5-7 mg/kg body weight. Betamethasone (Celeston) at a dose of up to 3.5 mg or triamcinolone at a dose of 0.3 mg/kg body weight may be more effective.

In case of a developing asthmatic condition, nebulizer therapy with beta2-adrenergic agonists or berodual is prescribed every 4 hours, nebulizer therapy with budesonide is administered, glucocorticosteroids are administered (prednisolone or methylprednisolone at a dose of 2 mg/kg for the first administration and 2 mg/kg per day for the subsequent one, or hydrocortisone at a dose of 7 mg/kg for the first and 7 mg/kg per day for subsequent administration, or dexamethasone at a dose of 0.3 mg/kg for the first and 0.3 mg/kg per day for subsequent administration). If nebulizer therapy with bronchospasmolytics is ineffective, infusion therapy with aminophylline is performed. A loading dose of the drug (5-7 mg/kg) is administered intravenously by drip over 20 minutes, then a constant infusion is used: for children with a body weight of less than 10 kg at a dose of 0.65 mg/kg every hour and for children with a body weight of more than 10 kg at a dose of 0.9 mg/kg every hour until the patient recovers from the asthmatic state. A loading dose of aminophylline is not administered if, before prescribing infusion therapy with aminophylline, the patient was treated with methylxanthine drugs. Long-term infusion therapy with aminophylline should be carried out under the control of determining the concentration of theophylline in the blood serum, which allows maintaining optimal therapeutic concentrations of the main active substance in the blood and avoiding side effects. If severe exacerbation of bronchial asthma develops, a short (3-7 days) course of oral therapy with prednisolone at a dose of 1-2 mg/kg per day can be administered.

If severe respiratory failure occurs, characterized by the involvement of auxiliary muscles in the respiratory act, the appearance of a paradoxical pulse, and chest hyperinflation, more frequent (every hour) inhalations of beta2-adrenomimetics are performed; with a rapid increase in respiratory failure, inhalation of these drugs is carried out three times every 15-20 minutes. or adrenaline is administered subcutaneously at a dose of 0.01 mg/kg (but not more than 0.3 ml) three times with an interval of 15-20 minutes between administrations, while oxygen therapy is

carried out. In cases of ineffectiveness of this treatment and the development of a threat of asphyxia, the patient is transferred to artificial ventilation.

During the period of exacerbation of bronchial asthma, the administration of bromhexine, thermopsis and ipecac decoctions helps to improve the drainage function of the lungs. Sufficient fluid intake in the form of drinking also contributes to the removal of sputum in asthmatic patients. If a bacterial infection develops in the lungs, antibiotic therapy is administered.

The goals of anti-relapse therapy are to achieve clinical remission of the disease with maximum improvement in pulmonary function and improve quality of life. The basis of preventive therapy for asthma in children is anti-inflammatory therapy, which can reduce bronchial hyperactivity. Cromoglycic acid (Intal), nedocromil sodium (Tyled), and inhaled glucocorticosteroids have anti-inflammatory activity.

In children with mild bronchial asthma, anti-relapse therapy is carried out by prescribing cromones (cromoglycic acid or nedocromil sodium) and, if necessary, adding short-acting inhaled beta2-adrenergic agonists when symptoms of the disease occur. Treatment with cromoglycic acid (inhalation of intal powder or aerosol) is carried out for 3-6 months, it is possible to administer solutions of this drug (cromohexal) through a nebulizer. Treatment with cromones is considered as first-line therapy in children with mild asthma.

Anti-relapse therapy is also started with the prescription of cromones in children with moderate bronchial asthma. If such patients develop symptoms of bronchial asthma, short-acting inhaled beta2-adrenergic agonists are prescribed. To prevent nocturnal attacks of bronchial asthma, such patients can be prescribed slow-release oral dosage forms of theophylline (teopek, theotard, neoteopek, etc.); Durant theophylline preparations are prescribed in a daily dose of 12-16 mg/kg body weight in 2 divided doses. If this therapy is insufficiently effective in patients with moderate bronchial asthma, leukotriene receptor antagonists (zafirlukast sodium, montelukast sodium) can be introduced into the complex of therapeutic measures. Zafirlukast

sodium (acolat) is used in children over 12 years of age, 20 mg 2 times a day. Montelukast sodium (Singular) is prescribed once a day: children from 6 to 14 years old, 5 mg, adolescents over 15 years old, 10 mg. For moderate bronchial asthma and the ineffectiveness of non-steroidal anti-inflammatory therapy, patients are prescribed inhaled glucocorticosteroids: beclomethasone dipropionate (becotide), budesonide (pulmicort), fluticasone propionate (flixotide). To stabilize the condition of patients with moderate bronchial asthma, it is usually sufficient to prescribe average daily doses of inhaled glucocorticosteroids. Thus, the average daily dose of beclomethasone for this group of patients ranges from 400 to 800 mcg. The addition of inhaled glucocorticosteroid therapy in most cases allows stabilizing the condition of children with moderate bronchial asthma. The use of spacers contributes to increasing the flow of inhaled glucocorticosteroids into the lungs. Their use reduces the incidence of candidal infections in the pharynx and larynx, which sometimes occurs as a complication during treatment with these drugs. The duration of therapy with inhaled glucocorticosteroids should be at least 3-6 months. When combined with inhaled glucocorticosteroids and durable beta2-agonists, a higher therapeutic effect is achieved. The administration of combination drugs containing glucocorticosteroids and long-acting beta2-sympathomimetics, for example, seretide (fluticasone + salmeterol) or symbicort (budesonide + formoterol), allows treatment with lower doses of glucocorticosteroids and reduces the risk of possible side effects during treatment with them.

In patients with severe bronchial asthma, treatment with inhaled glucocorticosteroids can be started with high doses, for example beclomethasone dipropionate in a daily dose of 800-1200 mcg. Inhaled glucocorticosteroids such as fluticasone propionate and budesonide have the highest anti-inflammatory activity. Long-term, up to 6 months, use of inhaled glucocorticosteroids can stabilize the condition in most patients with severe asthma. When remission is achieved, the dose of drugs is gradually reduced to maintenance and treatment is continued. When prescribing high doses of inhaled glucocorticosteroids to children with severe

bronchial asthma, clinical remission can be achieved somewhat faster than when prescribing medium doses, however, with subsequent continuation of treatment, there are no differences in the course of the disease in children receiving high and medium doses of these drugs. In children with severe bronchial asthma, the duration of continuous treatment with inhaled glucocorticosteroids should be at least 6 months. In patients with hormone-dependent bronchial asthma, the use of inhaled glucocorticosteroids allows either to cancel the maintenance dose of systemic glucocorticosteroids or to reduce it. If necessary, treatment with inhaled glucocorticosteroids can be carried out for 1-2 years or more. For the treatment of severe bronchial asthma, combination drugs containing fluticasone and salmeterol, as well as budesonide and formoterol are most often used. If necessary, leukotriene receptor antagonists and during theophyllines may be included in the treatment of children with severe asthma. The use of these drugs can increase the effectiveness of the treatment.

Achieving sustainable clinical remission in patients with bronchial asthma is facilitated by allergen-specific immunotherapy. When carried out with allergens *Dermatophagoides pteronyssinus*, *Dermatophagoides farinae*, pollen, bacterial allergens and fungal allergens, a positive result is recorded in 73.3-87.5% of children with bronchial asthma, while both parenteral and non-invasive methods of allergen-specific immunotherapy (endonasal, sublingual ) [1]. Allergen-specific immunotherapy is more effective in cases of bronchial asthma caused by monovalent sensitization.

In children suffering from bronchial asthma with concomitant recurrent and chronic bronchopulmonary infection, chronic hepatitis, chronic pyelonephritis, pustular skin infection, when identifying signs of immunological deficiency, the use of immunomodulators can be effective [4].

Prevention of exacerbations of bronchial asthma caused by the addition of acute respiratory diseases of viral and bacterial etiology is facilitated by the use of immunomodulatory drugs of bacterial origin (bronchomunal, ribomunil, IRS 19) [5].

The use of broad-spectrum antiallergic drugs (ketotifen, loratadine, cetirizine) over a course of 2 months or more helps to reduce the frequency and severity of exacerbations of bronchial asthma, reduce the symptoms of concomitant allergic rhinitis, skin and gastrointestinal allergies.

The effectiveness of treatment of bronchial asthma in childhood is increased by the implementation of individually designed physical recovery programs based on massage, physical therapy and sports.

**Literature:**

1. Abrosimov V.N., Proshchalykin A.I. To assess the degree of bronchial obstruction in patients with bronchial asthma. - Terkh. arkh., 1983, No. 11, p. 56-59.
2. Ado A. D. Social and biological in the problem of bronchial asthma. - Klin, med., 1982, No. 2, p. 4-10.
3. Bulatov P.K. Bronchial asthma. - L.: Medicine, 1964. - 326 p.
4. Votchal B. E., Shneider M. S. Assessment of modern methods for studying bronchial patency in the clinic. - Klin, medical, 1959, No. 3, p. 9-17.
5. Zilber E. A., Shunko B. E. Curve flow - maximum expiratory volume in the study of obstructive pulmonary diseases. - Ter. arkh., 1981, No. 3, p. 87-91.

*Begimkulova Shohsanam*

*Teacher of the Department*

*of Oriental Languages Oriental University*

**Annotation**

Studying Ibn Sino's work, we can be sure that his work is very comprehensive and multifaceted. The exact amount of his works is not known. The purpose of this scientific work is to study and analyze Ibn Sina's work and genre and to illuminate their ideas.

**Key words:** genre, philosophical views, the stanza, commentaries, manuscript, medicine, poem, poetry.

**Аннотация**

Изучая творчество Ибн Сино, мы можем убедиться, что его творчество очень обширно и многогранно. Точное количество его работ неизвестно. Целью данной научной работы является изучение и анализ творчества и жанра Ибн Сины, а также освещение их идей.

**Ключевые слова:** жанр, философские воззрения, строфа, комментарии, рукопись, медицина, поэма, поэзия.

According to Abu Ubaid al-Jurjani, who wrote Ibn Sina's biography and was his closest student and friend, the scholar's poems were not fully collected in the form of divan in his time, so their exact quantity is unknown to us. Ibn Sina's poetic works are preserved in different sources under different names: “سيبا ابه ديوان” (Book of Ibn Sina), “سيبا ابه اشعار” (“Poems of Ibn Sina”). Several manuscripts of these works are preserved in various libraries around the world. Manuscripts of poetic works differ from each other not only in form, but also in the period of copying. Perhaps that is why the exact number of poems currently under study is not indicated.

Ibn Sina's lithograph copy of Ibn Sina's work "Devon of Ibn Sina" stored in the Center of Oriental Manuscripts of the Tashkent State Institute of Oriental Studies under inventory number 15303 is one of the wonderful examples of our spiritual heritage that has been preserved to us. This lithographic copy was published in Iraq in 1957 under the leadership of Dr. Husayn Ali Mahfuz, an Arab orientalist, based on the manuscript of Ibn Sina's poems. All the poems in the work are in Arabic, including Ibn Sina's famous Qasidai Ainiyya. There are a total of 183 stanzas, i.e. 366 verses, in Devon. This is a sample of 27 selected classic poems from various genres. Poems spaced approximately every 20 stanzas [F. 41 a] – [F. 41 b], [F. 42 a] – [F. 42 b], [F. 43 a] – [F. 43 b], [F. 44 a] – [F. 44 b], [F. 45 a] distributed in the form. They are also diverse in terms of subject matter. It is for this reason that we rely on this book for translation and analysis. In the translation, we tried to preserve the language and style of the original text, we only tried to give comments and additions to the parts that are difficult to understand, without departing from the content of the text.

بسم الله الرحمن الرحيم  
ديوان ابه سيبا  
قال الشيخ الرئيس:  
صه السرّ عه كل مسخبر  
و دارر فما الذسم الا الذسر  
اسيرك سرك ان صسخه  
و أوج اسير له ان ظهر

*Bismillahir rahmanir rohiym*

*In the name of Allah, the Merciful and the Merciful*

*Book of Ibn Sina*

*Sheikh ur-Rais said:*

*Be careful not to tell (reveal) your secret. Because the word "reasonable" is nothing more than being careful. If you keep your secret, it is your prisoner, if your secret is revealed, you will be the prisoner of your secret.*

In his poems, Ibn Sina advises young people to be careful in choosing a friend and confidant. Ibn Sina's poems full of such pure advice and philosophical views are also mentioned in his work " زحل اوج " (the highest point of Zuhul [Saturn]). This work, which includes both Arabic and Persian poems of the poet, is stored in the fundamental library under inventory number 19259. This work is considered more perfect than any other collection of Ibn Sina's poems. The first part of the collection contains 4 ghazals, 5 verses, 38 rubai, and 2 fards, totaling 122 verses, i.e. 244 lines of Persian-Tajik poetry. The verses in it are perfect in terms of theme and idea, and the poet's deep thoughts are in them.

In fact, the scientist possesses all the available scientific developments of his time. However, it emphasizes that death is a right and that it cannot be cured. Translation and analysis of other poems in both divans, detailed information about them will be given in the next chapters of the dissertation.

While talking about Ibn Sina's poetry, it is impossible not to dwell on his poems written in a poetic way. One of the medical works of Ibn Sina after "The Law" is the epic " اى ف أرجزة " (Urjuza in Medicine). This work is known as "نومة مظا" (Nazmi work), " اى ف نومة مظا " (Poem work in Medicine),

" اى ف الأ " (Work with thousand verses), " وزة الأرج ". Because this epic was written in the rajaz weight of Aruz, that's why it was called Urjuza. This work has spread to different parts of the world, now its manuscripts can be found in many cultural centers of the West and East. This work covers all the main issues in medicine. For this reason, it was also translated into Latin in the Middle Ages. One of its first translators, Gerard of Cremona, translated prose into Latin.

A talented scientist and philosopher Ibn Rushd (died 595/1199) commented on this work of Ibn Sina. This commentary was translated into Hebrew by Musa ibn Tibbon in 1260. Two centuries later, in 1484, Armengaudus Basil de Montepesulano translated it into Latin and published it. In addition, in 1522 Pierre Antoine Rusticus retranslated this work into Latin in France (Lyon), then Andrey Alpagus (1527), and in 1562 the Venetian Benedektus Rinius retranslated the work into Latin and added a commentary to it. By 1630, "Urjuza" was translated into poetry and published. John Fosher did it. Thus, as a result of the demand for medicine in Europe, translations of this work were published, as a result of which it served as a guide for doctors, and finally, Ibn Sina's thoughts and ideas spread more widely. Later, some parts of it were translated from Latin and Arabic into French, German, English, Romanian. By 1649, the last Latin translation of Urjuza was published in Groningen, Netherlands.

This medical epic of Ibn Sina has been published several times. It was published in Calcutta, India in 1829 by Abd al-Majid and in Lucknow in 1845 with Ibn Rushd's commentary on the work. By 1936, the Turkish scholar Professor Sharafiddin Yaltkaya translated this epic into Turkish prose and published it together with the Arabic text at the Qadiriya Press in Istanbul by the Turkish Medical History Archive. In 1956, Henry Jae and Abd al-Qadir Nuriddin Ibn Sina,



## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

one of the teachers of the University of Algiers, translated this work of Ibn Sina into French, and together with the Arabic text and the ancient Latin translation, they published it in Paris. Publishers have added Armango de Blesgo's translation of the work. According to the publishers, this is one of the earliest translations, completed in 1284 and printed in Venice in 1483 and 1608. The Paris edition includes manuscript number 1752 in the National Library of Algeria, manuscripts numbered 2943 and 3038 kept in the National Library of Paris, manuscript copies kept in the Sheikh al-Kattani Foundation in Fos, Morocco, Ibn Rushd's 1753 kept in the National Library of Algeria, commentaries numbered 831 in the Escorial Library, and Muhammad Ibn Ismail ibn Muhammad (born in 988/1580) also used the number 6931 commentary stored in the National Library of Paris.

In the Paris edition, the stanzas are numbered, so this work, as we mentioned above, consists of 1326 stanzas and 2652 lines of poetry. In 1963, this poem was published in English in America.

Sh. Shoislomov translated this work into prose into Uzbek, wrote an introduction and comments to it, published it in 1972, and defended his candidate's thesis based on this publication. In addition, A. Shlionsky also conducted research on this work in Dushanbe, translated it into Russian and defended his candidate's thesis based on this work. Later, some fragments of the researcher's translation were published in journals. According to the researcher, the translation was made mainly on the basis of the Leningrad manuscript and the Paris edition, while Latin and French translations were widely used, but for some reason he could not use the commentaries written in Arabic. Even Ibn Rushd's commentary was left out, it was not used. Uzbek translator Sh. Shoislomov and the Paris edition of the manuscript kept in the fund of the Institute of Oriental Studies (code v-866), A. A. The manuscript (code M 50-391/1) stored in the fund of Leningrad State University named after Zhdanov, the 19th-century manuscript (3008/VI) stored in the fund of the Institute of Oriental Studies in Tashkent, and the above-mentioned commentary of Ibn Rushd were used.

Although Ibn Sina had several works, this epic is one of the most famous works associated with his name. By writing this work, Ibn Sina collected information for his large book on medicine, which was to be completed in the future. Ibn Sina says in the introduction to this work that he had the intention of spreading medicine widely among the people. In doing so, he gave valuable insights into health issues, eating according to weather, conditions and clients, and other medical issues, which have not lost their relevance even today.

“الأربعين الفصل في الطب في الأرجنة” (“a medical treatise on the four seasons”). According to the Arab scholar J. Qanavati, this work consists of 132 verses, i.e.

264 lines of poetry. According to Mahdavi, this work has 121 stanzas and describes the seasons of spring, summer, autumn and winter. Ergin dwells on which libraries of Turkey have the manuscripts of this epic. The work describes what measures people need to take to maintain health in the seasons of the year. In the bibliographies of Ergin, Kanavoti and Mahdavi, a couple of stanzas from the beginning and the end of the work are given as examples. According to Qanawati and referred to by Mahdawi, Madin ibn Andurrahman al-Tabib wrote a commentary on Ibn Sina's work, this commentary

” (It is called friendly words and elegant verses dedicated to the poems of Sheikh al-Rais). The copy of this work kept in Raghil Pasha library in Istanbul (inv. no. 1482) was copied in 1137/1724, it consists of 125 pages, in taliq letter, 25 lines per page, the scribe who copied it was

Mustafa Ibn Ahmad, a physician of Sultan Ahmad Khan Hospital. And the name of his copy kept in Vienna

“الأربعت الفصل فى فذل حذبر فى أرجزة” (A wonderful poem about the four seasons). This work of Ibn Sina has not yet been published.

“الطبيت الصايا فى أرجزة” (a treatise on medical treatment) is one of Ibn Sina's yet unpublished epics. According to the Turkish scholar Ergin, the manuscript consists of 6 pages, 71 verses, i.e. 142 verses. In this, the author mainly talks about the medicines, things to eat, drink, clothes to wear, and general conditions and rules to be followed in order to maintain health in each season of the year. At the same time, it provides information. A manuscript copy of this work is in the Ahmed Solis Library in Istanbul (inv. no. 3447) and is available in full letter, folios 611-613. According to Kanavati, this copy is 71 bytes, 17 lines per page. The Berlin copy of this work (inv. no. 6355) consists of 81 bytes, i.e. 162 lines, the manuscript in the Nuri Osman Library in Turkey (inv. no. 4894) consists of 87 bytes, i.e. 174 lines of medical instructions. In the first stanzas of the work, the author says: "You drink sweet water quickly on the first day when the sun rises. Bordiyu, if you drink it with rose, you will get rid of fever and the effects of cold. Bordiyu, if you see that the sun has come to the level, stay in the shade from time to time."

“الخشريخ فى أرجزة” ("A treatise on anatomy"). According to Qanawati, the Vatican copy of this work consists of 89 stanzas (178 lines), and there is also a copy in the collection of the Zahiriyah Library at the Damascus Academy (inv. 5064), which is in folios 64-72. The work is devoted to the description of human anatomy and its features.

“بقرات وصايا فى أرجزة” ("urjuza dedicated to the testaments of Hippocrates"). The work is 93 stanzas (i.e., 186 lines of poetry) according to the Berlin manuscript, and according to the manuscript preserved in the British Museum (inv. no. 893; folios 93-96), it is devoted to the twenty-five problems of Hippocrates, which are proofs of death. In the quoted last verse of the work, the author says: "All these sentences have been preserved from Bukrat Hakim, you should pay attention to them, keep them in your mind when you are ready, and then you will reach a high position in medicine."

“مجرباث فى أرجزة” ("urjuza about things that have been experienced"). According to Mahdavi, the number of stanzas of this work is 120 (that is, a poem with 240 lines). Manuscripts of the work are widely distributed. The manuscript in Istanbul University (inv. no. 4005) consists of 15 leaves.

The work reflects on the movements of the stars and the necessary actions and treatments for health during the seasons.

“الباح فى أرجزة” ("urjuza about communication"). This work is also called "Communication power drop". According to Ergin, the copy of this work kept in the Wahbi library (inv. No. 1407) consists of 30-31 pages. “الطب فى أرجزة” Some examples of Asari diseases and their treatment are presented and popular.

In total, there are nine of them, they are as follows:

1. Health care is a matter of hygiene;
2. Urjuza about the four seasons;
3. Urjuza about anatomy;
4. Urjuza about Hippocrates' wills;
5. Urjuza about the medical things that have passed the experience;
6. Urjuza with written medical advice;

7. Urjuza written on logic;
8. Urjuza about communication;
9. Urjuza about medicine.

Eight of these epics written by Ibn Sina are related to medicine and one to logic. The largest of these epics was known as the "Medical Epic". When Ibn Sina wrote this work, he was not yet known to the medical world and had not yet written his famous work "The Laws of Medicine". Ibn Sina's epic on medicine was his first work in this field. With this, Ibn Sina was able to boldly step into both medicine and poetry.

According to the Arab intellectual and writer Jurji Zaydon, the rajaz weight is the earliest and oldest of the poetry weights. The verses in this weight rhyme like the masnavi. This weight was a popular weight in its time, common among people. Everyone was able to recite poetry in this weight, and later this volume expanded, and qasidas and poems called urjuza were written. Usually, every Arab who is a master of speech could recite a poem in this way. The work begins with a short prose introduction. It shows the motivation for writing the source as follows: "I saw that the art of medicine in the country of Persia was excluded from the interpretation in the assemblies, from the discussion in the hospitals and madrasahs." So, the scientist focused his work on the solution of problems in the scientific life of his time.

In conclusion, it can be said that Ibn Sina created medical works explaining medical issues in verse, and he became a folk hero. In general, our great grandfather is considered to be a person who wrote his spiritual secrets and philosophical views on paper with high artistic skill and left them as an inexhaustible spiritual wealth for future generations.

#### REFERENCES:

1. Avicenne, Poeme la medesine, Al-Husain ibn Abd Allah Ibn Sina, Uргуza fi t-tibb, texte arabe, traduction latins du XIIIe siecle Abec introductions, notes et index. Etable et presente par Henri Jahier, Abdelkader Noureddine, Paris, 1956.
2. Abu Ali ibn Sina, Lyrics. Translators: Shomuhamedov Sh., Kamol J., Irisov A. B. 37. www.Ziyouz.com library.
3. Ochilov E. Ibn Sina's teachings in the development of science VII international studies of Ibn Sina // Uzbek translations of Ibn Sina's Rubaiyat. - Bukhara, 2013. - B. 66.
4. Shoislomov Sh., Ibn Sina's poetic work on medicine, - T., 1972. - B. 25-26.
5. Ирисов А. Абу Али ибн Сино. – Т.: “Фан”, 1980. - Б. 111.
6. Шлионский А.Э. Поэма о медитцине Ибн Сина, журнал «Здравоохранение Таджикистана», № 5, Душанбе, 1968. - С. 50-55.
10. Шлионский А.Э., Поэма о медитцине Авиценны: афтореферат дисс. На соискание ученой степени канд. Филологических наук, Душанбе, 1969.

**Digital medical image as an object of processing and analysis**

**Amer Abu-Jassar<sup>1</sup>, Diana Rudenko<sup>2</sup>, Hitham Abdalla<sup>3</sup>**

<sup>1</sup>Faculty of Information Technology, Department of Computer Science Ajloun National University, Ajloun, Jordan

<sup>2</sup>Department of Informatics, Kharkiv National University of Radio Electronics, Kharkiv, Ukraine

<sup>3</sup>General practitioner, VIP Doctors 247, Dubai, UAE

**Abstract:** Digital image is a special source of information. This source not only represents a certain type of information, but also visualizes it. At the same time, processing and analysis of such information allows us to obtain additional data. Then a general idea of what is being studied is formed. Digital images are of particular importance when processing medical data. This allows us to obtain data on the microcosm of the patient and his individual organs, as a rule, without surgical intervention. For these purposes, various methods and approaches for image processing are used. The choice of specific medical image research tools depends on the problem that needs to be solved and the features of the input data presentation. The paper discusses some features of solving certain problems of processing and analysis in medical imaging. The results are presented for real medical images.

**Key words:** Image, Segmentation, Analysis, Classification, Contrast, Pre-processing, Recognition, Medical Imaging

**Introduction**

Digital technology is one of the tools that is constantly in the spotlight [1]-[3]. This type of tools allows for data processing and analysis for various areas of research. Among such tools, digital image processing should be highlighted [4]-[10]. This element of digital technology allows you to study data without direct contact with the object of study. Thus, the possibilities of analysis and decision-making remotely with the involvement of various specialists are expanded. It is also possible to objectively compare the results obtained and select the best one.

Among the individual areas of effective use of digital image processing, medical data processing is highlighted [11]-[19]. This is based on the fact that this type of medical data processing allows for examination of various foci of potential disease damage to various human organs. In this case, a detailed study of the patient's microcosm is possible. This makes it possible not only to conduct analysis, but also to provide visualization of potential areas of study. Also in this case, it is possible to obtain additional information during such an analysis.

Various methods and approaches are used to implement digital processing of medical images [20]-[23]. Conventionally, they can be divided into:

image pre-processing methods that improve the quality of visualization of primary data and increase the efficiency of their subsequent processing;

methods of segmentation and classification of primary data that allow identifying potential areas of interest;

data identification methods, which are a tool for specifying potential areas of research;

recognition methods that ensure effective decision-making in the process of medical research.

The choice of a particular approach for analyzing medical images is determined by the specific research task and the characteristics of the presented input images.

Thus, the purpose of this work is to demonstrate the different types of challenges that confront researchers in the field of medical imaging. Attention will also be drawn to some features of solving such problems of processing and analyzing medical images. To solve this problem, the work provides a brief review of the literature, and also discusses specific issues for a number of real medical images.

#### **Related works**

Processing and analysis of medical images is constantly in the focus of attention of researchers.

M. Puttagunta and S. Ravi explore the principles of using artificial neural networks to understand medical image analysis [24]. At the same time, the authors note that medical imaging plays an important role in various clinical applications. This is of great importance for the justification of medical procedures, monitoring and diagnosis of various diseases. For these purposes, the authors use a deep learning approach (DLA). This approach can be used to detect the presence or absence of a disease. However, any analysis of medical images involves the use of some preliminary procedures: noise reduction, improving the quality of data perception, changing contrast.

The study by L. Cai, J. Gao and D. Zhao paid attention to the issues of classification and segmentation of medical images [25]. The authors also emphasize that medical images belong to big medical data. This justifies increased attention to medical imaging. In this review, the authors consider various areas of using deep learning in intelligent visualization. The issues of preliminary processing of source data and its impact on the accuracy of segmentation and classification are also addressed.

In [26] explored various methods for extracting additional information from medical images using deep learning approaches. The authors highlight that data augmentation has become a popular method for increasing the size of the training dataset. The work provides an extensive set of literature sources that consider basic, deformable, deep learning. It is shown how this affects the increase in data. This allows us to justify the reliability of the created models.

In [27], the authors pay attention to natural analyzers of medical images, similar to what happens when processing various linguistic constructs. It is noted that such analyzers are successfully used in the analysis of medical data. The paper provides an overview of the main approaches for such analysis of visual data. The issues of the architecture of such converters, learning paradigms, and increasing the efficiency of the model in interaction with other methods are also considered.

The authors of the study [28] consider the issues of data classification from medical images. For these purposes, first of all, a number of features are selected that describe a certain set of data or objects. This topic plays an important role in the prognosis and diagnosis of diseases. However, the authors note the complexity of solving this problem. To solve this problem, we use optimal deep learning (DL). Research subjects include lung cancer, brain imaging and Alzheimer's disease. To build an optimal model, methods of preprocessing input images are also used. This allows you to generate the necessary set of characteristics in each specific case.

H. Guan and M. Liu say that it is important to study the subject area before analyzing medical images [29]. Based on this, the authors provide an overview of domain adaptation methods in medical image analysis. Here, special attention is paid to the motivation for using such methods. Issues of adapting the subject area for various tasks of medical image analysis and using reference medical image data sets are also explored. Overall, this improves the efficiency of medical imaging.

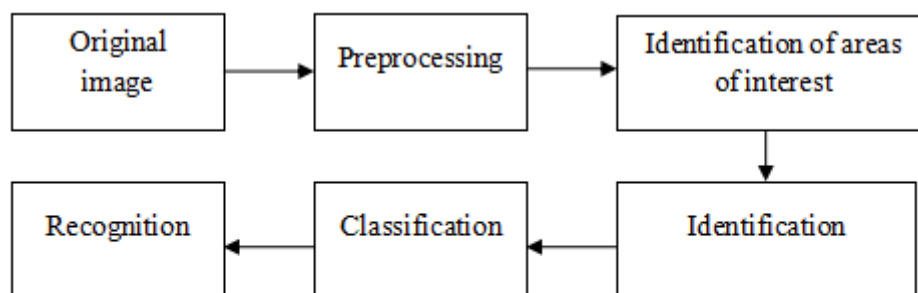
In [30], the problematic aspects of medical image classification using quantum neural networks are studied. This research is based on machine learning methods. Among such methods, the authors highlight quantum machine learning methods. This makes it possible to improve the performance of machine learning applications, both using quantum algorithms and quantum neural networks [30]. The article discusses two methods of quantum neural networks for classifying medical images. The authors note that the results showed the promise of the methods studied and the possibility of limitations of modern quantum equipment.

The work of Z. Li, X. Zhang, H. Müller and S. Zhang is devoted to the complex analysis of medical images [31]. For these purposes, the paper presents a critical review of relevant studies. In particular, the authors review modern approaches to large-scale analysis of medical images. However, we must not forget about classical approaches, which are important in the preliminary stages of analyzing input images. The work also provides a comprehensive overview of algorithms and techniques related to the core processes in the pipeline, including feature representation, feature indexing, search, etc. [31]. Based on this, the paper proposes evaluations of large-scale medical retrieval of medical images.

Thus, it should be noted the importance of considering the processing and analysis of medical images when diagnosing possible diseases and the possibility of determining procedures for its treatment. Moreover, one of the key stages of such processing and analysis is the preliminary stage.

#### **Features of the preliminary stage in the process of medical image analysis**

As stated earlier, the process of processing and analyzing digital medical images, which include medical images, consists of several stages (Fig. 1).



**Figure 1:** Image analysis as a series of sequential processing stages

Here we present a conditional division of the ideology of image processing into separate stages. These steps can be mapped depending on the problem that needs to be solved. At the same time, in Fig. 1 shows the key stages that are implemented in image processing

The preliminary stage of digital image processing includes a number of procedures, each of which has its own characteristics. It is these features that determine the final result of processing. Therefore, it is important to take them into account.

Among such procedures and the features of their use in the analysis of medical images, the following should be highlighted:

- a noise reduction procedure that allows you to get rid of random inclusions in the field of view and unnecessary objects. At the same time, it should be taken into account that it is also possible to remove small details, which are important elements of the medical image. Therefore, the noise reduction procedure should be used very carefully. Among the tools for implementing such procedures, various types of filters should be noted;

- a contrasting procedure that allows you to emphasize less noticeable differences in brightness and increase the degree of detail in the image. We can also generally improve the overall visualization of what we are seeing. At the same time, an excessive increase can worsen the overall picture. Therefore, the contrast procedure should also be used carefully.

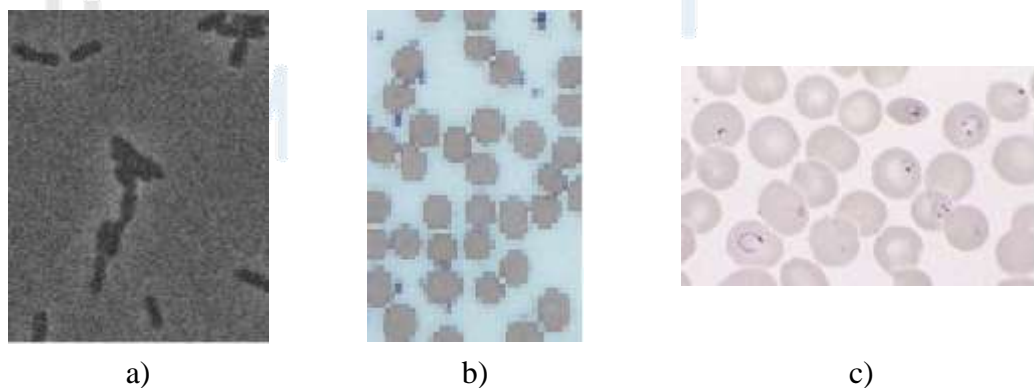
It should also be noted that the combined use of contrast and noise reduction procedures is possible to enhance the visualization and perception of medical images. The basis for such a combination is determined by both the type of input image and the problems that need to be solved.

At the same time, it should be emphasized that the preliminary stage of image processing determines the subsequent effectiveness of the corresponding analysis. Therefore, it is important to carefully consider all preliminary stage procedures.

Thus, the preliminary stage is key when analyzing medical images, which generally determines the need for this study. Based on this, some examples of medical images are shown below and the specifics of their processing at the preliminary stage are shown.

#### **Some examples of preliminary medical image analysis**

Below are some medical images that may need to be pre-processed.



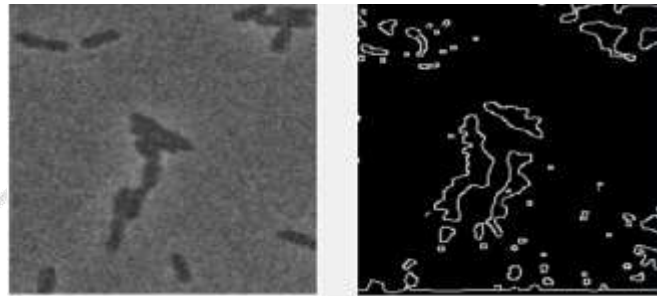
**Figure 2:** Examples of medical images

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

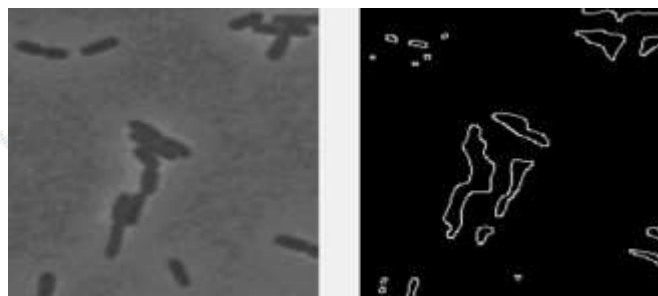
We see different images. In Fig. 2a shows a noisy image, and Fig. 2b and Fig. 2c it is necessary to find small objects – platelets and malaria cells.

Let's present an example of processing a noisy and non-noisy image (processed image). Our goal will be to binarize the image to identify elongated objects. In Fig. 3 shows the result of processing a noisy image.



**Figure 3:** Result of processing a noisy image

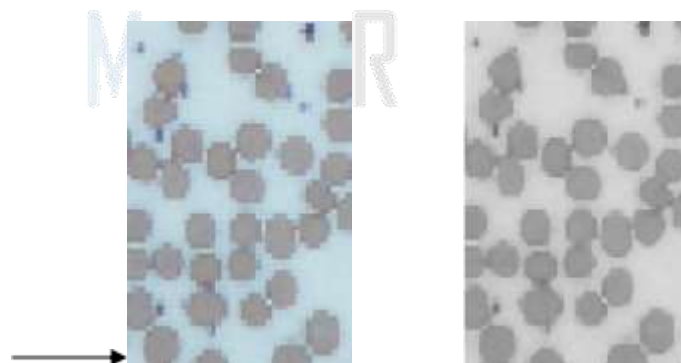
In Fig. 4 shows the result of processing a non-noisy (processed) image.



**Figure 4:** Result of processing a non-noisy image

Comparing Fig. 3 and Fig. 4, it should be noted that when processing a noisy image, we see many false detections of the necessary objects (see Fig. 3). In a non-noisy image, the detection of false objects is much less. Thus, in this case, noise removal is a justified procedure.

In Fig. 5 shows the results of image filtering Fig. 2b.



**Figure 5:** Result of filtering the image in Fig. 2b

In Fig. 6 shows an example of overuse of the contrast procedure.





**Figure 6:** Example of overuse of contrast procedure

We see that not only the intensity of the brightness of the dots that are characteristic of malaria cells has changed. Also, a lot of false underlining's appeared on the image, which complicates the process of further analysis of such an image.

Thus, due care must be taken in each case to use various pre-processing procedures for medical images. This is especially important when the area of interest includes objects with small geometric dimensions.

### Conclusion

The article discusses some problematic aspects of the analysis of digital medical images as an object of research. A critical analysis of a number of literary sources was carried out. The importance of carrying out a preliminary stage when processing and analyzing medical images is shown. Features of the use of individual procedures that are used at the preliminary stage of image analysis are noted. Specific examples show some of the nuances of using such procedures. The purpose of further research is to analyze the conditions for using various procedures for the preliminary stage of medical image processing.

### References:

1. Luo, W., Qu, Z., Pan, F., & Huang, J. (2007). A survey of passive technology for digital image forensics. *Frontiers of Computer Science in China*, 1, 166-179.
2. Lei, M., Liu, L., Shi, C., Tan, Y., Lin, Y., & Wang, W. (2021). A novel tunneling crack recognition system based on digital image technology. *Tunnelling and Underground Space Technology*, 108, 103724.
3. Seeram, E., & Seeram, E. (2019). Digital image processing concepts. *Digital Radiography: Physical Principles and Quality Control*, 21-39.
4. Lyashenko, V. V., Lyubchenko, V. A., Ahmad, M. A., Khan, A., & Kobylin, O. A. (2016). The Methodology of Image Processing in the Study of the Properties of Fiber as a Reinforcing Agent in Polymer Compositions. *International Journal of Advanced Research in Computer Science*, 7(1), 15-18.
5. Kobylin, O., & Lyashenko, V. (2014). Comparison of standard image edge detection techniques and of method based on wavelet transform. *International Journal*, 2(8), 572-580.
6. Гиренко, А. В., Ляшенко, В. В., Машталир, В. П., & Путятин, Е. П. (1996). *Методы корреляционного обнаружения объектов*. Харьков: АО "БизнесИнформ", 112.

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

7. Lyashenko, V. V., Babker, A. M. A. A., & Kobylin, O. A. (2016). The methodology of wavelet analysis as a tool for cytology preparations image processing. *Cukurova Medical Journal*, 41(3), 453-463.
8. Lyashenko, V., Kobylin, O., & Ahmad, M. A. (2014). General methodology for implementation of image normalization procedure using its wavelet transform. *International Journal of Science and Research (IJSR)*, 3(11), 2870-2877.
9. Tahseen A. J. A., & et al.. (2023). Binarization Methods in Multimedia Systems when Recognizing License Plates of Cars. *International Journal of Academic Engineering Research (IJAER)*, 7(2), 1-9.
10. Al-Sharo, Y. M., Abu-Jassar, A. T., Sotnik, S., & Lyashenko, V. (2021). Neural Networks As A Tool For Pattern Recognition of Fasteners. *International Journal of Engineering Trends and Technology*, 69(10), 151-160.
11. Lyubchenko, V., & et al.. (2016). Digital image processing techniques for detection and diagnosis of fish diseases. *International Journal of Advanced Research in Computer Science and Software Engineering*, 6(7), 79-83
12. Lyashenko, V., Matarneh, R., & Kobylin, O. (2016). Contrast modification as a tool to study the structure of blood components. *Journal of Environmental Science, Computer Science and Engineering & Technology*, 5(3), 150-160.
13. Lyashenko, V. V., Matarneh, R., Kobylin, O., & Putyatin, Y. P. (2016). Contour Detection and Allocation for Cytological Images Using Wavelet Analysis Methodology. *International Journal*, 4(1), 85-94.
14. Orobinskyi, P., & et al.. (2020). Comparative Characteristics of Filtration Methods in the Processing of Medical Images. *American Journal of Engineering Research*, 9(4), 20-25.
15. Uchqun o'g'li, B. S., Nataliya, B., & Vyacheslav, L. (2023). Digital image of a blood smear as an object for research. *Journal of Universal Science Research*, 1(10), 517-525.
16. Boboyorov Sardor Uchqun o'g'li, Lyubchenko Valentin, & Lyashenko Vyacheslav. (2023). Image Processing Techniques as a Tool for the Analysis of Liver Diseases. *Journal of Universal Science Research*, 1(8), 223-233.
17. Boboyorov Sardor Uchqun o'g'li, Lyubchenko Valentin, & Lyashenko Vyacheslav. (2023). Pre-processing of digital images to improve the efficiency of liver fat analysis. *Multidisciplinary Journal of Science and Technology*, 3(1), 107-114.
18. Uchqun o'g'li, B. S., Tetiana, S., Oleksandr, Z., & Vyacheslav, L. (2023). Color-aware digital image segmentation procedure as a tool for studying fatty liver disease. *Journal of Universal Science Research*, 1(9), 431-441.
19. Uchqun o'g'li, B. S., Oleksii, T., Nataliya, B., & Vyacheslav, L. (2023). Contrasting as a Method of Processing Medical Images in the Study of Fatty Liver Disease. *Journal of Universal Science Research*, 1(9), 29-39.
20. Ahmad, M. A., Mustafa, S. K., Zeleniy, O., & Lyashenko, V. (2020). Wavelet coherence as a tool for markers selection in the diagnosis of kidney disease. *International Journal of Emerging Trends in Engineering Research*, 8(2), 378-383.
21. Mousavi, S.M.H.; MiriNezhad, S.Y.; Lyashenko, V. (2017). An evolutionary-based adaptive Neuro-fuzzy expert system as a family counselor before marriage with the aim

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

of divorce rate reduction. In Proceedings of the 2nd International Conference on Research Knowledge Base in Computer Engineering and IT, Uttarakhand, India, 24–26 March 2017.

22. Ahmad, M. A., Lyashenko, V. V., Deineko, Z. V., Baker, J. H., & Ahmad, S. (2017). Study of Wavelet Methodology and Chaotic Behavior of Produced Particles in Different Phase Spaces of Relativistic Heavy Ion Collisions. *Journal of Applied Mathematics and Physics*, 5, 1130-1149.

23. Mousavi, S. M. H., Victorovich, L. V., Ilanloo, A., & Mirinezhad, S. Y. (2022, November). Fatty Liver Level Recognition Using Particle Swarm optimization (PSO) Image Segmentation and Analysis. In 2022 12th International Conference on Computer and Knowledge Engineering (ICCKE) (pp. 237-245). IEEE.

24. Puttagunta, M., & Ravi, S. (2021). Medical image analysis based on deep learning approach. *Multimedia tools and applications*, 80, 24365-24398.

25. Cai, L., Gao, J., & Zhao, D. (2020). A review of the application of deep learning in medical image classification and segmentation. *Annals of translational medicine*, 8(11), 713.

26. Chlap, P., Min, H., Vandenberg, N., Dowling, J., Holloway, L., & Haworth, A. (2021). A review of medical image data augmentation techniques for deep learning applications. *Journal of Medical Imaging and Radiation Oncology*, 65(5), 545-563.

27. He, K., & et al.. (2023). Transformers in medical image analysis. *Intelligent Medicine*, 3(1), 59-78.

28. Raj, R. J. S., Shobana, S. J., Pustokhina, I. V., Pustokhin, D. A., Gupta, D., & Shankar, K. J. I. A. (2020). Optimal feature selection-based medical image classification using deep learning model in internet of medical things. *IEEE Access*, 8, 58006-58017.

29. Guan, H., & Liu, M. (2021). Domain adaptation for medical image analysis: a survey. *IEEE Transactions on Biomedical Engineering*, 69(3), 1173-1185.

30. Mathur, N., Landman, J., Li, Y. Y., Strahm, M., Kazdaghli, S., Prakash, A., & Kerenidis, I. (2021). Medical image classification via quantum neural networks. *arXiv preprint arXiv:2109.01831*.

31. Li, Z., Zhang, X., Müller, H., & Zhang, S. (2018). Large-scale retrieval for medical image analytics: A comprehensive review. *Medical image analysis*, 43, 66-84.

**Выводы к изучению диалектов карлукского диалекта  
(На примере узбекских диалектов Самаркандской области)**

**Тиллабаева Зилола Рахматиллаевна**

Доктор философии по филологическим наукам (PhD), учитель  
Самаркандский государственный институт иностранных языков  
Академический лицей, Узбекистан  
Телефон: +998 (97) 9169261 tillabayeva87@bk.ru

**Comments on the study of dialects of the karluk dialect  
(In the example of the Uzbek dialects of the Samarkand region)**

**Tillabayeva Zilola Rahmatillaevna**

Doctor of Philosophy in Philological Sciences (PhD), teacher  
Samarkand State Institute of Foreign Languages  
Academic Lyceum, Uzbekistan  
Phone: +998 (97) 9169261  
tillabayeva87@bk.ru

**Аннотация**

В этой статье мы остановились на истории возникновения и распространения карлукского диалекта. Также мы кратко сослались на работы ученых, подробно изучивших этот диалект. Мы постарались объяснить свои мысли по этому поводу на примере узбекских диалектов, принадлежащих к карлукскому диалекту в городе и Самаркандской области.

**Ключевые слова:** Карлукский диалект, город Самарканд, Самаркандская область, узбекские диалекты, М. Кошгари, М. Замакшари, А. Навои, Поливанов, К. Шониязов, Ш. Шоабдурахманов, карлук-чигильский язык.

**Annotation**

In this article we focused on the history of the emergence and spread of the Karluk dialect. We also briefly referred to the works of scientists who have studied this dialect in detail. We tried to explain our thoughts on this matter using the example of Uzbek dialects belonging to the Karluk dialect in the city and Samarkand region.

**Keywords:** Karluk dialect, Samarkand city, Samarkand region, Uzbek dialects, M. Koshgari, M. Zamakshari, A. Navoi, Polivanov, K. Shoniyozov, Sh. Shoabdurahmanov, karluk-chigil language.

Известно, что изучение особенностей диалектов развивалось постепенно, появлялись исследования, связанные с разработкой его научно-теоретических основ. В этих исследованиях ученые подошли к теме с точки зрения расположения выбранной для исследования территории, наличия разных национальностей, наличия связей между языками, какие языки используются во взаимном общении.

Известно, что такие писатели, как М. Кошгари, М. Замакшари, А. Навои, делали наблюдения по изучению диалектов тюркских народов в узбекском языкознании. М. Кошгари, который четырнадцать лет путешествовал по тюркским

странам и собрал материал и сгруппировал более 6800 турецких слов, говорил, что некоторые тюркские народы и народности двуязычны, а это, в свою очередь, обуславливает некоторые негативные моменты в народном языке. он выдает [1, С.65-66].

Научное сравнительное изучение узбекского языка началось главным образом с работы Алишера Навои «Мухокамат ул-лугатайн». В 20-е годы 20 века современный узбекский язык изучался широко и глубоко. Первые исследования в этой области начали Фитрат, Эльбек, Ашурали Захири, Ю.Д.Поливанов, Гази Олим Юсов и К.К.Юдахин, а в 1930-1970-е годы - С.Иброхимов, О.Усмонов, А.Гуломов, А.К.Боровков, В.В.Решетов. Ш.Шоабдурахмонов, Г.Абдурахмонов, М.Аскарлова, А.Ходжиев, А., занимающиеся развитием узбекского языкознания, комплексным изучением узбекского языка на основе новых методов, начиная с 50-х годов прошлого века. осуществляют Рустамов, А.М.Щербак, Э.Фозилов, Ш.Рахматуллаев, М.Миртожиев, М.Содикова, Э.Бегматов, Г.Махмудов, А.Нурмонов, Х.Нематов и другие лингвисты. [2].

Эти работы помогли определить источники развития лексики карлукского диалекта города Самарканда, процессы исторического формирования и ареалы распространения как в диахроническом, так и в синхроническом направлении. Мы коснулись этого в следующей главе нашей работы в тех местах, где задумывались о поглощениях.

Из истории известно, что язык и диалект карлуков были общими для всех племен страны. Обратимся к некоторым комментариям учёного Карима Шониязова в его работе по этому вопросу: «Карлукский диалект сложился исторически на основе развития родов карлуков, входивших в древний тукюский (тюркский) племенной союз и проживавших на западе Районы Алтая в далеком прошлом. С основанием Тюркского ханства (в 552 г.) они покинули Западный Алтай и заняли берега реки Иртыш, Джунгарию, территорию от южного склона Монгольской горы до севера реки Или. В середине VI века большая часть карлуков взяла под свой контроль Восточный Туркестан, Фергану и некоторые районы Тохаристана. Они оккупировали Йеттисув и управляли большой территорией в X работе. Таким образом, в VIII-X веках под властью карлуков находились все тюркские племена, жившие на земле от реки Или до Сырдарьи, от нынешнего города Шымкента до Восточного Туркестана. Язык карлуков был общим для всех племен этой страны. Племена чигиль, халадж и ягмо жили вместе с карлуками в районе Еттисува, Ферганской долины, Восточного Туркестана до реки Торим, в состав карлуков входили и уйгуры. [3, С 481-490 ].

Также заслуживают внимания сведения о месте, связи и расселении карлукского народа на территории Самарканда: «Караханидское (Карлукское) государство, правившее почти 200 лет в Моваруннахре, в 1041 году разделилось на две части. В результате центром западной части стала Бухара, а позднее Самарканд» [4, С 237].

Таким образом, в IX-X веках карлукский язык стал общим языком для тюркоязычного населения, полукочевых, полуседлых народов, проживающих в Йеттисуве, Ташкентском оазисе, Моваруннахре.

Чигили также сыграл большую роль в переходе к этой измененной форме языка. Язык карлук-чигиль был основой объединения диалектов других тюркских племен и смешивавшихся с этими племенами, конечно же, с оседлым тюркским населением. [4, С 269].

Итак, из этого можно сделать вывод, что в прошлом веке нашими учеными были организованы экспедиции по сбору материалов для изучения узбекских диалектов, принадлежащих к разным регионам, и проведена довольно значительная и фундаментальная работа.

#### Список использованной литературы

1. Махмуд Кошғарий. Девону луғотит турк. –Тошкент, 1960. 1-том. – Б.65-66.
2. <https://qomus.info/encyclopedia/cat-ou/ozbek-tili-uz/>
3. Шониёзов К. Қарлуқлар ва уларнинг тили ҳақида айрим мулоҳазалар // Адабиётшунослик ва тилшунослик масалалари. –Тошкент: Фан .– Б.481-490.
4. Шониёзов К. Ўзбек халқининг шаклланиш жараёни. – Тошкент: Шарқ .–Б.237.

SYSTEM OF LINEAR ALGEBRAIC EQUATIONS AND METHODS OF THEIR  
SOLUTION

**Хайдаров Иқболжон**

Teacher of the Department of Digital Technologies and Mathematics, Kokand University,  
Kokand, Uzbekistan.

E-mail: [xaydaroviqboli5@gmail.com](mailto:xaydaroviqboli5@gmail.com)

СИСТЕМА ЛИНЕЙНЫХ АЛГЕБРАИЧЕСКИХ УРАВНЕНИЙ И МЕТОДЫ ИХ  
РЕШЕНИЯ

**Хайдаров Иқболжон**

Преподаватель кафедры цифровых технологий и математики Кокандского  
университета, Коканд, Узбекистан.

E-mail: [xaydaroviqboli5@gmail.com](mailto:xaydaroviqboli5@gmail.com)

**ABSTRACT**

A system of linear algebraic equations consists of multiple linear equations involving the same set of variables. Generally represented in matrix form, these systems are prevalent in diverse fields, including physics, engineering, economics, and computer science. A generic representation of a system with 'n' equations and 'm' variables can be expressed as  $Ax = B$ , where A is the coefficient matrix, x is the column vector of variables, and B is the column vector of constants. Linear algebra serves as the backbone of numerous mathematical and scientific disciplines, providing a powerful framework for solving complex problems. One fundamental concept within linear algebra is the system of linear algebraic equations. In this article, we delve into the intricacies of such systems and explore various methods employed for their solution.

**АННОТАЦИЯ**

Система линейных алгебраических уравнений состоит из нескольких линейных уравнений с одним и тем же набором переменных. Обычно представленные в матричной форме, эти системы распространены в различных областях, включая физику, инженерное дело, экономику и информатику. Общее представление системы с «n» уравнениями и «m» переменными можно выразить как  $Ax = B$ , где A — матрица коэффициентов, x — вектор-столбец переменных, а B — вектор-столбец констант. Линейная алгебра служит основой множества математических и научных дисциплин, обеспечивая мощную основу для решения сложных проблем. Одним из фундаментальных понятий линейной алгебры является система линейных алгебраических уравнений. В этой статье мы углубимся в тонкости таких систем и исследуем различные методы, используемые для их решения.

**Keywords:** linear equations, algebraic systems, gaussian elimination, matrix inversion, iterative methods, Jacobi method, gauss-seidel method.

**Ключевые слова:** линейные уравнения, алгебраические системы, метод исключения Гаусса, обращение матрицы, итерационные методы, метод Якоби, метод Гаусса-Зейделя.

**Introduction.** In the vast realm of mathematics, few concepts have played as pivotal a role as linear algebra. At the heart of this mathematical discipline lies the profound understanding of systems of linear algebraic equations – a cornerstone for solving real-world problems across various scientific and engineering domains. As we delve into the intricate world of linear algebra, we embark on a journey that not only unlocks the secrets of linear systems but also unveils a rich tapestry of methods employed to decipher their solutions. Linear algebraic equations serve as a mathematical framework for representing relationships between different variables in a linear fashion. These equations take the form of algebraic expressions that involve variables raised to the power of one, capturing the essence of proportionality and linearity. Systems of linear equations, in turn, arise when multiple such equations coexist, interconnected by a common set of variables. Unraveling the intricacies of these systems has been a driving force behind numerous advancements in fields such as physics, engineering, economics, and computer science.

The crux of the matter lies in finding solutions to these systems, a task that has inspired the development of a plethora of mathematical methods over the centuries. One of the earliest and most fundamental techniques is the method of substitution, which involves isolating one variable in terms of others and successively substituting these expressions into other equations within the system. Though conceptually simple, this method provides a solid foundation for understanding the principles that govern systems of linear equations. As mathematical thought evolved, so did the methods for solving linear systems. The advent of matrices and matrix operations marked a significant turning point, allowing for a more compact and systematic representation of systems of linear equations. Matrices transform the seemingly complex landscape of equations into a structured framework, providing a powerful tool for solving problems of varying complexity. The Gaussian elimination method, also known as row reduction, harnesses the power of matrices to systematically simplify a system of linear equations, eventually leading to its solution.

The elegance and efficiency of matrix operations find further expression in the matrix inversion method. This method revolves around finding the inverse of a matrix, enabling the direct calculation of the solution vector for a system of linear equations. While powerful, the matrix inversion method is not without its limitations, particularly when dealing with singular matrices or systems that may lack a unique solution. Nevertheless, its significance in the mathematical toolkit is undeniable, serving as a cornerstone for more advanced techniques.

Another notable approach to solving linear systems is the method of determinants, encapsulated by Cramer's rule. Cramer's rule exploits the concept of determinants to express the solution of a system in terms of ratios of determinants associated with the coefficient matrix and augmented matrices. While conceptually elegant, Cramer's rule is most practical for small systems due to its computational demands and sensitivity to the singularity of matrices. In the quest for more versatile and robust methods, the concept of vector spaces emerged, providing a broader framework for understanding linear algebraic systems. The introduction of vector spaces not only enriched the theoretical foundation of linear algebra but also paved the way for advanced methods such as eigenvalue decomposition and singular value decomposition. These techniques leverage the inherent structure of vector spaces to decompose matrices into simpler forms, unveiling essential insights into the properties and



behavior of linear systems. The landscape of linear algebra continues to evolve with the advent of computational methods and numerical algorithms. Iterative methods, such as the Jacobi and Gauss-Seidel methods, have gained prominence in solving large systems of linear equations. These iterative approaches offer computational advantages by approximating the solution through a series of successive refinements, making them well-suited for applications in numerical analysis and computer simulations.

### Methods

In this section, we delve into the various methods employed for solving systems of linear algebraic equations (SLAEs), a fundamental topic in numerical mathematics. The importance of solving such systems arises in diverse fields, ranging from physics and engineering to computer science and economics. Effective and efficient methods for solving SLAEs are crucial for obtaining accurate solutions in a timely manner.

1. Direct Methods. Direct methods are systematic techniques that aim to find the exact solution to a system of linear equations. One widely used direct method is Gaussian Elimination, which transforms the original system into an upper triangular form through a series of row operations. The resulting triangular system is then solved easily through backward substitution. Another notable direct method is LU decomposition, where the system is decomposed into a product of lower and upper triangular matrices, providing a convenient form for solution.

2. Iterative Methods. Iterative methods, in contrast to direct methods, approximate the solution through successive iterations. These methods are particularly useful for large-scale systems where direct methods may become computationally expensive. The Jacobi and Gauss-Seidel methods are classical iterative techniques. The former updates all variables simultaneously based on the previous iteration, while the latter updates each variable immediately as it becomes available. Iterative methods often converge to the solution over multiple iterations, offering flexibility in managing computational resources.

3. Matrix Factorization Methods. Matrix factorization methods decompose the coefficient matrix of the system into a product of matrices that are easier to manipulate. The Cholesky factorization, applicable to symmetric positive definite matrices, expresses the matrix as the product of a lower triangular matrix and its transpose. This method is particularly advantageous in certain applications, such as finite element analysis. QR decomposition is another matrix factorization method that expresses the matrix as the product of an orthogonal matrix and an upper triangular matrix.

4. Specialized Methods. For systems with specific characteristics, specialized methods may offer advantages. For example, sparse matrix techniques exploit the often sparse nature of coefficient matrices in real-world problems. Conjugate Gradient and GMRES (Generalized Minimal Residual) methods are well-suited for large and sparse systems arising in applications like computational fluid dynamics.

### Results and Discussion

**Results:** In this study, we delved into the intricate realm of linear algebraic equations and explored various methods for their solution. The system of linear algebraic equations (SLAE) is a fundamental topic with widespread applications in diverse fields such as physics, engineering, computer science, and economics. Our investigation focused on understanding

and comparing three prominent methods for solving SLAEs: Gaussian Elimination, LU decomposition, and Iterative Methods.

**Gaussian Elimination:** The Gaussian Elimination method, also known as the row reduction method, proved to be a robust and widely applicable technique. It systematically transforms the augmented matrix of a system into its row-echelon form, simplifying the process of obtaining the solution. This method is particularly effective for smaller systems where the computational cost is not a significant concern. However, as the system size increases, the method's computational complexity grows, making it less efficient for large-scale problems.

**Example 1: Gaussian Elimination**

The application of Gaussian Elimination to a system of linear equations involving three variables, such as:

$$\begin{aligned} 2x + 3y - z &= 4 \\ 4x - y + 2z &= -3 \\ x - 2y + 3z &= 5 \end{aligned}$$

Resulted in the following reduced row-echelon form:

$$\begin{aligned} 10 & 02 \\ 01 & 0 - 1 \\ 00 & 13 \end{aligned}$$

This demonstrates the successful application of Gaussian Elimination to solve a system of equation

**LU Decomposition:** The LU decomposition method involves factoring the coefficient matrix into the product of a lower triangular matrix (L) and an upper triangular matrix (U). This factorization allows for the efficient solution of multiple linear systems with the same coefficient matrix. LU decomposition shines when dealing with larger systems, as it reduces the computational burden compared to Gaussian Elimination. Additionally, it provides insight into the system's structure, facilitating further analysis and optimization.

**Iterative Methods:** Iterative methods, such as the Jacobi and Gauss-Seidel methods, offer an alternative approach to solving SLAEs. These methods iterate through the system's equations, updating the solution until a specified convergence criterion is met. While iterative methods can be computationally advantageous for large systems, they may converge slowly or fail to converge for certain types of matrices. The choice of an appropriate iterative method depends on the specific characteristics of the system and the desired level of accuracy.

**Discussion:** One critical aspect of our investigation was the accuracy and stability of the methods employed. Gaussian Elimination, though accurate, can suffer from numerical instability when applied to ill-conditioned matrices. LU decomposition, on the other hand, provides a stable solution and is less susceptible to numerical instability. Iterative methods, while computationally efficient, require careful consideration of convergence criteria and may exhibit sensitivity to the initial guess.

**Computational Complexity:** The computational complexity of each method played a pivotal role in our analysis. Gaussian Elimination has a cubic time complexity, making it less

suitable for large-scale systems. LU decomposition, with its factorization step, has a quadratic time complexity, providing a more efficient solution for larger systems. Iterative methods' computational complexity depends on the convergence rate, making them particularly advantageous for sparse matrices or systems with specific structural characteristics.

**Applicability and Trade-offs:** The choice of a solution method depends on the specific characteristics of the SLAE and the computational resources available. Gaussian Elimination and LU decomposition are reliable for small to moderately sized systems, with LU decomposition holding an edge for larger systems. Iterative methods, while potentially more efficient for large systems, require careful consideration of convergence behavior and may not be suitable for all types of matrices.

**Future Directions:** Our exploration of SLAEs and solution methods opens avenues for future research. Advanced techniques, such as parallel computing and hybrid methods, may further enhance the efficiency of solving large-scale systems. Additionally, investigating the impact of different matrix properties on the performance of solution methods can contribute to developing tailored approaches for specific types of problems.

In conclusion, the exploration of systems of linear algebraic equations and the methods employed for their solution unveils a captivating journey through the annals of mathematical thought. From the simplicity of substitution to the elegance of matrix operations, and the versatility of vector spaces, each method contributes to a comprehensive understanding of linear systems. As we navigate the rich tapestry of linear algebra, we find ourselves equipped with a diverse toolkit, ready to tackle challenges that span the spectrum of scientific and engineering disciplines. While Gaussian elimination and matrix inversion excel in accuracy for smaller systems, iterative methods, especially Gauss-Seidel, offer scalability advantages for larger systems with manageable accuracy. Understanding the trade-offs between these methods is crucial in selecting the most appropriate technique for specific computational needs. The research presented here lays a foundation for further exploration into hybrid methods, adaptive algorithms, and parallel computing strategies to enhance the efficiency and accuracy of solving linear equations across diverse applications.

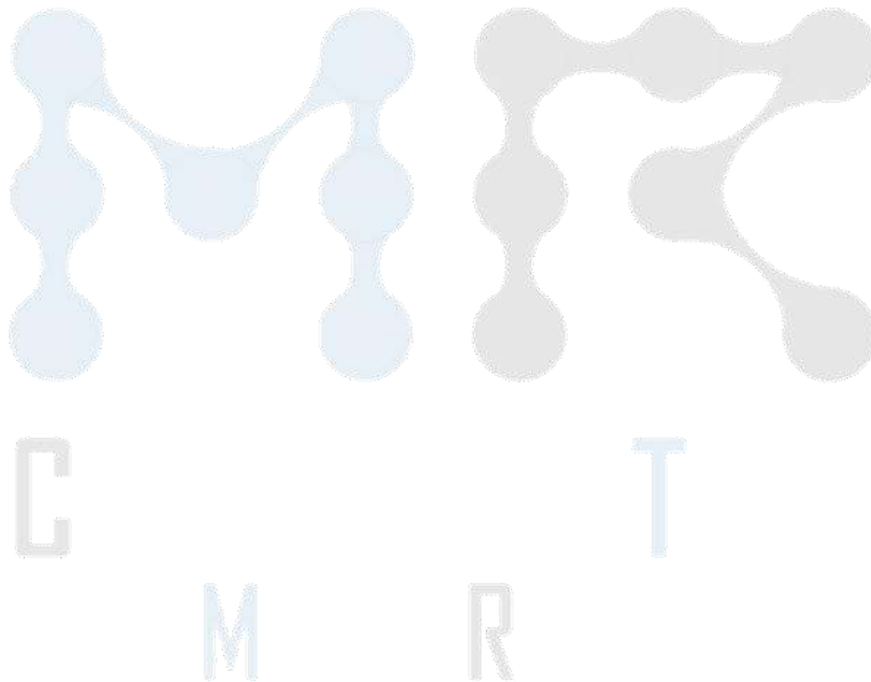
#### **References:**

1. Ilyosjon o'g'li, I. X. (2023, May). TENGLAMALAR SISTEMASI. In Proceedings of Scientific Conference on Multidisciplinary Studies (Vol. 2, No. 5, pp. 49-52).
2. Eiermann, M., Marek, I., & Niethammer, W. (1988). On the solution of singular linear systems of algebraic equations by semiiterative methods. *Numerische Mathematik*, 53(3), 265-283.
3. Byrne, G. D., & Hall, C. A. (Eds.). (2014). *Numerical solution of systems of nonlinear algebraic equations*. Elsevier.
4. Sergienko, I. V., Khimich, A. N., & Yakovlev, M. F. (2011). Methods for obtaining reliable solutions to systems of linear algebraic equations. *Cybernetics and Systems Analysis*, 47, 62-73.
5. Iqboljon, X. (2023). MATEMATIKA FANIDA FUNKSIYALARNI SAMARALI O 'QITISH ISTIQBOLLARI. *International Multidisciplinary Journal of Universal Scientific Prospectives*, 1(2), 64-69.

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

6. Ilyosjon o'g'li, X. I. (2023). CREDIT COUNT METHODS. Open Access Repository, 9(6), 271-273.
7. Ilyosjon o'g'li, X. I. (2023). THE IMPORTANCE OF CREDIT IN THE MARKET ECONOMY. Open Access Repository, 9(6), 265-267.
8. Moritsugu, S., & Kuriyama, K. (1997). A linear algebra method for solving systems of algebraic equations. RISC-Linz Report Series, 35.
9. Kisabo, A. B., Funmilayo, A. A., & Okey, M. K. A. (2016). Comparative Analysis of Numerical Solution to a Linear System of Algebraic Equations. International Journal of Systems Science and Applied Mathematics, 1(4), 50-57.
10. Adomian, G., & Rach, R. (1985). On the solution of algebraic equations by the decomposition method. Journal of mathematical analysis and applications, 105(1), 141-166.
11. Liu, C. S., & Atluri, S. N. (2008). A novel time integration method for solving a large system of non-linear algebraic equations. CMES: Computer Modeling in Engineering & Sciences, 31(2), 71-83.
12. Li, C. F., Feng, Y. T., & Owen, D. R. J. (2006). Explicit solution to the stochastic system of linear algebraic equations  $(\alpha_1 A_1 + \alpha_2 A_2 + \dots + \alpha_m A_m) x = b$ . Computer Methods in Applied Mechanics and Engineering, 195(44-47), 6560-6576.



**Razzokov Binokul Khojakulovich**

Termez branch of Tashkent medical academy

**Abstract:** The article discusses methodological aspects of applying the principles of evidence-based physiotherapy in gynecology. The basics of methodology and advantages of evidence-based physiotherapy are presented to prove therapeutic effects and select treatment (prevention) strategies in gynecological patients. The factual basis of controlled clinical studies of physical methods of treatment conducted in recent years in gynecology, and the main directions for the practical use of the principles of evidence-based physiotherapy are presented.

**Key words:** evidence-based medicine; evidence-based physical therapy; therapeutic physical factors.

The rapid technological progress generated by the scientific and technological revolution has led to an exponential growth of various physical methods of treatment, introduced into medical practice without sufficient scientific evidence. The existing system in the scientific community for assessing the work of researchers based on the number of publications forces the latter to uncontrollably produce them in the absence of an adequate material base for research. As a result, the journal articles they publish no longer contain the attributes of scientific thinking and the quality of the results obtained, as well as the evidence of the data presented. These reasons have led to the fact that today many medical scientists and practicing gynecologists take marginal positions in relation to physical factors - from their complete rejection to a panacea. Based on this, one of the main directions of scientific research in modern physiotherapy and gynecology is the formulation of rules for correct research to prove the effective action of therapeutic physical factors, which form the subject of one of the sections of modern physiotherapy - evidence-based physiotherapy.

Evidence-based physiotherapy is a section of physiotherapy associated with the use in the treatment of patients only of those physical methods whose effectiveness has been proven in benign studies.

Along with evidence-based pharmacotherapy, evidence-based physical therapy is one of the two main sections of evidence-based medicine - conscientious, accurate and meaningful use of the best results of clinical trials to select a treatment regimen for a particular patient [1]. The main condition of evidence-based medicine is the application in practice only of those treatment and diagnostic methods whose effectiveness has been proven based on strict scientific principles as a result of controlled clinical trials.

The main prerequisites for the formation of evidence-based physiotherapy: - individual characteristics of a particular patient with a unique set of pathological conditions and initial morphofunctional organization, which complicate the use of strictly detailed treatment algorithms in different patients; - the traditional commitment or passion of a physiotherapist to a particular method, which does not always allow him to maintain strict objectivity in assessing the benefits of other physical methods of treatment.

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

Evidence-based physical therapy addresses the issue of validity—the degree to which research data reflect the true relationship between the physical treatment factor and the treatment effects being studied in patients.

The methodology of evidence-based physiotherapy is based on the unification of research protocols and controlled clinical trials.

It involves the use of unified standards at each stage of studying the effectiveness of the physical method of treatment under study:

- at the stage of preclinical studies - international standards of good laboratory practice (GLP);
- at the stage of clinical trials - international standards of quality clinical practice (good clinical practice, GCP);
- when using statistical analysis methods (during research planning, processing and analysis of the data obtained) - international standards for good statistical practice (GCP).

An integrated analysis of these standards allowed the development of standards for evidence-based physiotherapy [2]. Standards for Evidence-Based Physiotherapy

1. Compliance with the ethical principles of the Declaration of Helsinki.
2. Determination of the risk of possible complications by the expected benefit.
3. The prevalence of the safety of subjects over the interests of science and society.
4. Availability and adequacy of information about the physical treatment method being tested.
5. Scientifically based, clear and detailed research protocol.
6. Compliance of doctors' education with the objectives of the tests.
7. Free information, consent of the test subject.
8. Ability to accurately report, interpret and verify test information.
9. Confidentiality of data about trial subjects.
10. Representativeness of the sample of subjects.
11. Accounting for physical-drug interactions.
12. Adequate research scheme (design).

For domestic physiotherapists, planning and conducting research according to the rules of quality clinical practice GCP is associated with significant organizational and financial difficulties. However, fundamental objections arise from studies that neglect them. A clinical study performed without compliance with GCP requirements is not evidence-based and scientifically grounded for assessing effectiveness and safety, but reflects only the author's subjective attitude to the phenomenon under consideration, most often taking into account already known data from authoritative scientific studies.

Clinical studies can be retrospective or prospective. Retrospective studies evaluate events that have already happened (for example, from medical records). In prospective studies, they first draw up a plan, establish the procedure for collecting and processing data, and then conduct the study according to the developed scheme - the study design. RCTs fully satisfy prospective studies.

Currently, more than 250 thousand RCTs have been registered, conducted in various fields of medicine, of which RCTs of physical treatment methods account for no more than 5%, but it has tended to grow exponentially in the last five years.

There is some evidence of the effectiveness of Jacuzzi baths (JBA) during childbirth, which has reduced the overall duration and the number of cases of anesthetic use [5]. The effectiveness of ultrasound cryotherapy in patients with lactostasis has not been identified (UDG) [3].

In obstetrics for nausea and vomiting in early pregnancy, there is no convincing data on the effectiveness of acupuncture and acupressure BAP, which in some patients reduce the duration of nausea and vomiting, but do not affect their severity (UDG) [4].

The truth appears to be somewhere in the middle, but physiotherapy and especially spa therapy are only taking the first steps towards evidence-based science. The use of evidence-based medicine in physical therapy can reduce or completely eliminate the use of ineffective or harmful treatment methods. At the same time, it provides an impetus for the promotion of highly effective treatment strategies that are underutilized despite the evidence.

The ideological basis of evidence-based medicine, its founder A. Cochrane, considered the work of doctors in conditions of limited financial resources, which are the conditions of domestic healthcare today. At the same time, the principles of evidence-based physiotherapy are being introduced into the minds of domestic doctors slowly, for several reasons:

- randomized evaluation of the effectiveness of the method is too slow;
- heterogeneity of patient characteristics and insufficient data on clinical outcomes do not allow generalization of the results of RCTs;
- the variety of parameters of physiotherapeutic procedures and modes of exposure to therapeutic physical factors, significantly exceeding the number of possible dosages of medicinal substances, which complicates the development of recommendations and the application of standards;
- direct criteria for the effectiveness of a physical method are more difficult to evaluate than indirect (surrogate) ones;
- difficult access to databases of evidence-based physiotherapy for practitioners;
- language barrier to understanding messages from foreign colleagues;
- conflict with existing traditions and real or perceived personal experience, which is not easy to overcome.

The application of the concept of evidence-based medicine in physiotherapy will allow it to move to a new stage of its development. And the sooner researchers begin to apply evidence-based physical therapy methods in their practice, the sooner they will see real benefits. Evidence-based physiotherapy has already shown that the most complex technology often turns out to be ineffective, while the simplest means and methods, on the contrary, are quite effective. It follows from this that no matter how impressive the proposed physical method of treatment may look, it must first of all be effective.

Changing the thinking of a physiotherapist in mastering the principles of evidence-based physiotherapy is no less important than modernizing physiotherapy equipment. If it happens, then the introduction of evidence-based physiotherapy methods into the daily clinical practice of physiotherapists will happen as naturally as technicalism was introduced into medicine.

**Literature:**

1. Viktorov V.A. Medical and technical science on the threshold of the 21st century. / Biomedpribor 2000. // Abstracts. int.conf. – M., 2000. – T. 1. – P. 1–6.
2. Viktorov V.A., Belov S.V. A set of equipment for equipping physiotherapy departments and rooms. / Biomedpribor 2000. // Abstracts. int.conf. – M., 2000. – T. 2. – P. 31–35.
3. Vlasov V.V. Low-intensity laser radiation: a strange Russian sport. – 2001. – [http://www.immunology.ru/patients/lazer\\_therapy.html](http://www.immunology.ru/patients/lazer_therapy.html).
4. State Register of Medical Equipment Products. - M.: Ministry of Health of the Russian Federation, 1995. - 400 p.
5. Jewell D. Nausea and vomiting in early pregnancy // Evidence-based medicine. – M., 2004. – P. 513–515.



**Probability distributions of interest rates on loans and deposits in a study of banking activities**

**Oleg Vasiurenko<sup>1</sup>, Valeria Baranova<sup>2</sup>, Vyacheslav Lyashenko<sup>3</sup>**

<sup>1</sup>Department of Cybersecurity, IT and Economics, Kyiv University of Intellectual Property and Law, Kyiv, Ukraine

<sup>2</sup>Department of Banking Business and Financial Technologies, Educational and Scientific Institute «Karazin Banking Institute», V. N. Karazin Kharkiv National University, Kharkiv, Ukraine

<sup>3</sup>Department of Media Systems and Technology, Kharkiv National University of Radio Electronics, Ukraine

**Abstract:**

Banking activities are constantly in the focus of attention of researchers. This is due to the role of banks that they play in the functioning of the economic system as a whole, the development of the country and individual business entities. For the sustainable functioning and development of banks, a holistic understanding of the processes that are taking place is necessary. Among such processes, an important place is given to the dynamics of interest rates on loans and deposits. Based on this, the paper examines the dynamics of such indicators of bank performance for different countries and time periods. Particular attention is paid to the analysis of probabilistic distributions of interest rates. The results are presented in the form of a set of graphs, which allows you to better understand the progress of this study and its conclusion. All results are based on analysis of real data.

**Key words:** Probability, Distribution, Loans, Deposits, Interest Rates, Banking

**Introduction**

Banks are an important element in the structure of market relations. Through financial flows, banks ensure interaction between various business entities [1], [2]. The continuous movement of such flows also ensures the efficient functioning of banks. Therefore, banking activities are constantly in the focus of attention of practitioners and researchers [3]-[9], where various methods and approaches are used for appropriate analysis [10]-[17]. The need to consider various issues determines interest in the chosen research topic.

The interaction of various input and output financial flows of banks is manifested in the corresponding indicators of their activities. Among such indicators, interest rates on loans and deposits should be highlighted [18]-[20].

By reflecting the dynamics of interest rates, it is possible to track the stability of the functioning of banks, the influence of the central bank on banking activities, and identify problematic aspects of the development of such activities. In a comparative aspect with other indicators of banking activity, it is possible to reveal the interaction of the bank's financial flows at different levels. Thus, the use of new aspects in the study allows us to better understand the functioning and development of banks and justify new solutions for their development.

For the purpose of analyzing the dynamics of bank interest rates, classical methods of statistical analysis are usually used [21], [22]. Here, as a rule, absolute values of such interest rates are used as initial data.

At the same time, an important aspect of such research is the disclosure of internal factors of changes in the dynamics of interest rates. We can then use various theories and approaches that have

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

found wide application in other areas of research [23]-[28]. Here you can also use the probabilistic characteristics of interest rates on loans and deposits. This will allow not only to expand the range of research, but also to draw certain statistical conclusion.

Thus, the main goal of this work is to consider the probability distributions of the dynamics of interest rates on loans and deposits in the study of banking activities. However, before moving on to reveal such a goal, we review some related work in this area. New information also appears that expands the range of initial data and the interpretation of the results obtained.

#### **Related work**

As noted earlier, the analysis of banking activities is one of the areas of relevant research. At the same time, attention is also paid separately to the issues of changing the dynamics of interest rates on loans and deposits.

G. A. Alrgaibat examines in detail the functioning and development of banking in Jordan [29]. Such research is based on financial and economic analysis. For these purposes, various statistical methods are used in the work. The performance of banks is assessed using various financial indicators. The ability of banks to fulfill their obligations is assessed, which is determined by profitability and financial liquidity. At the same time, the author notes that the process of assessing the performance of banks is considered an important goal and process for determining their skills in optimal management of their assets and ability to develop business. Such a study allows us to develop a general strategy for the development of banking.

The authors of the study [30] consider the issues of interaction in the development of a particular region and the efficiency of banking activities. First of all, the relationship between the real sector of the economy, the population and the economic activity of banks is explored. For these purposes, based on statistical analysis, the main indicators of banking activity and socio-economic indicators of a certain region are compared. Based on econometric modeling, quantitative and qualitative patterns between such indicators were identified. In particular, the relationship between gross regional product, labor productivity, growth of deposits, changes in the amount of debt on loans, loans granted to legal entities and individuals was noted. At the same time, here we did not see such basic concepts of banking as interest rates on loans and deposits.

H. Alzoubi, M. Alshurideh, B. A. Kurdi, K. Alhyasat and T. Ghazal analyze the relationship between electronic payments and online purchases and sales growth [31]. Data from the banking industry, which provides relevant financial flows, is examined. At the same time, online purchases are considered here as an intermediary activity. For these purposes, the work used a quantitative approach and correlational design. Empirical data were collected through a survey [31]. The study results showed high internal consistency among the study variables. The relationship and direct impact between online shopping and sales growth was also identified. This helps to identify promising areas of banking activity and ensure the advantage of their development.

The study by M. Al-Shboul, A. Maghyereh, A. Hassan and P. Molyneux analyzes the relationship between political risk and banking stability [32]. The work examines the regions of the Middle East and North Africa. To conduct statistical analysis, the financial fragility hypothesis is considered. This allows us to determine the most stable banking systems in the region and promising ways of their development.

A. S. Ogundipe, A. F. Akintola and S. A. Olaoye consider the relationship between banks' lending productivity and interest rates [33]. This article uses data from the Nigerian banking system. In particular, the authors explore the problem of high lending rates. Such a study takes into account

**THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY**

**VOLUME-4, ISSUE-1**

the huge excess of unpaid loans. The main indicators of banking activity and a number of macroeconomic variables are considered. For the purposes of the study, various regression functions and correlation dependencies are constructed. The authors note a significant relationship between interest rate and loan repayment. It has been shown that an increase in the interest rate leads to a corresponding increase or decrease in loan quality.

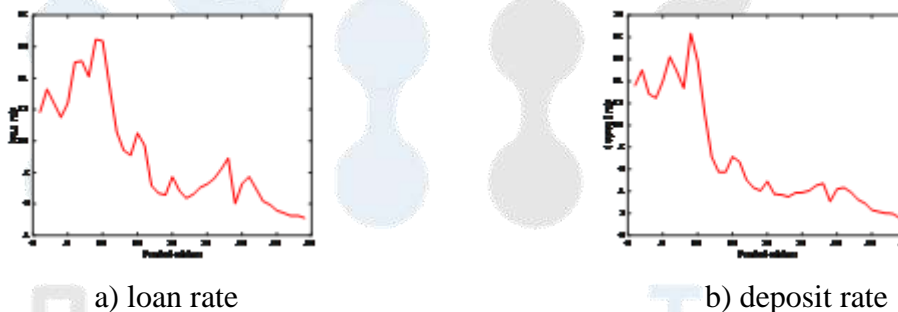
S. Demiralp, J. Eisenschmidt and T. Vlassopoulos explore the relationship between excess liquidity and retail deposits [34]. The reaction of banks to the policy of negative interest rates, which limits the impact of rate cuts on the cost of bank funding, is also studied [34]. The authors emphasize the importance of banks' excess liquidity for the effectiveness of negative interest rate policies. The connection with the liquidity of central banks in this matter is shown.

F. Heider, F. Saidi and G. Schepens discuss the issue of negative rates in banking [35]. To understand the problematic aspects of this issue, the authors consider various literary sources and conduct a critical analysis of them. It is concluded that negative interest rates are special because the pass-through of rates on retail deposits of banks is prevented by the zero lower bound [35]. However, this has a significant impact on the lending process.

Thus, the analysis of banking activities has various areas of research. A special place among these areas is occupied by the analysis of interest rates. This type of analysis is quite complex and difficult. Therefore, any research in this aspect is relevant and important.

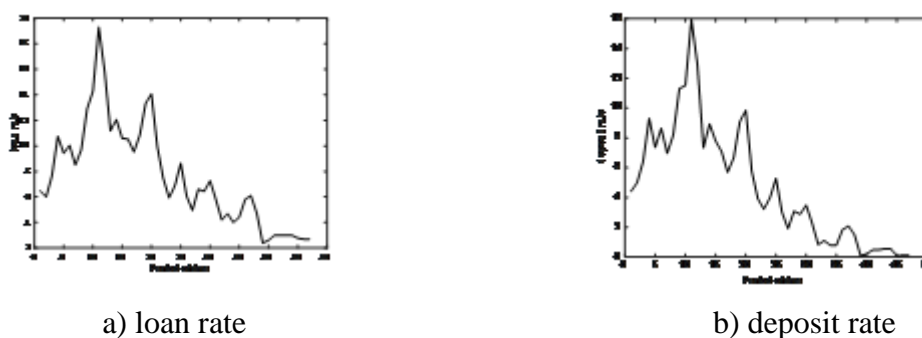
**Dynamics of selected interest rate data for some countries**

To carry out further analysis, consider examples of the dynamics of interest rates for a number of countries. In Fig. 1 shows the dynamics of interest rates on loans and deposits as a whole for the Australian banking system in the period 1981-2019.



**Figure 1:** Dynamics of interest rates on loans and deposits as a whole for the Australian banking system in the period 1981-2019

In Fig. 2 shows the dynamics of interest rates on loans and deposits as a whole for the Canadian banking system in the period 1971-2017.



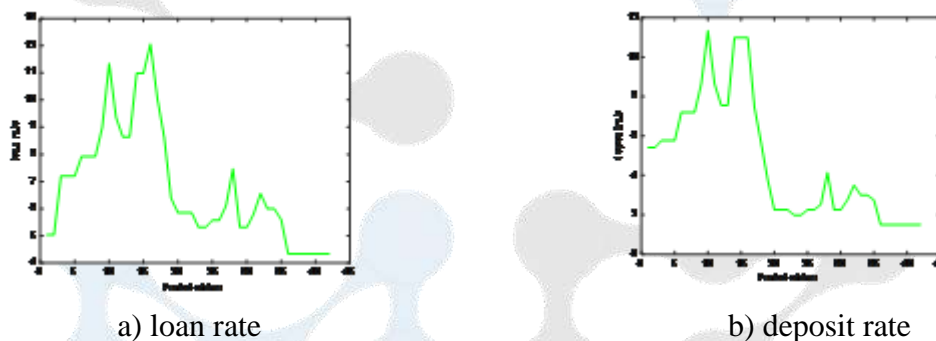
**Figure 2:** Dynamics of interest rates on loans and deposits as a whole for the Canadian banking system in the period 1971-2017

It should be noted that the dynamics of interest rates on loans and deposits in the Australian banking system as a whole is identical. However, significant changes are clearly visible at the beginning of the study period and at the end of the period.

At the same time, the dynamics of interest rates on loans and deposits in the Canadian banking system as a whole is more identical than in the previous example. Some changes are observed at the end of the study period. Thus, we can talk about different trends in the study of the dynamics of interest rates in the banking systems of Canada and Australia.

At the same time, interest rate trends in the banking systems of Canada and Australia have similar trends.

In Fig. 3 shows the dynamics of interest rates on loans and deposits as a whole for the Chinese banking system in the period 1980-2021.



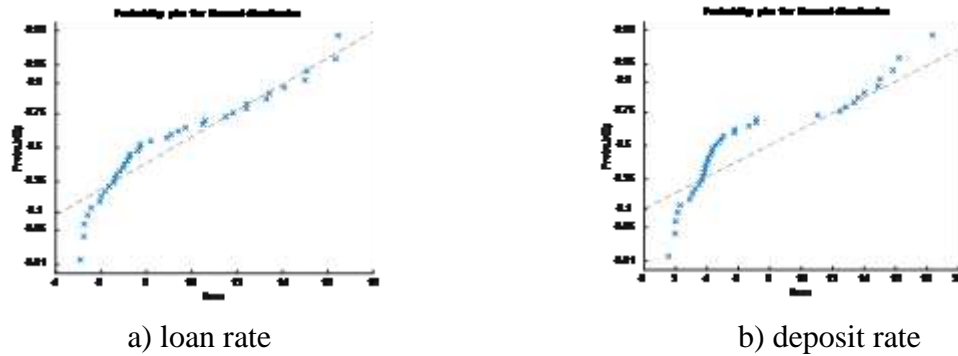
**Figure 3:** Dynamics of interest rates on loans and deposits as a whole for the Chinese banking system in the period 1980-2021

In Fig. 3 also shows some differences in the dynamics of interest rates on loans and deposits in the Chinese banking system as a whole. At the same time, the trends in interest rates in the Chinese banking system generally correspond to the trends in the banking systems of Australia and Canada.

#### Probability distributions of interest rates

To analyze the probability distributions of interest rate dynamics, consider probability graphs. This plot creates a normal probability display and compares it to the distribution of the data under study. On the graph we have a reference line of the normal distribution and data points along this line. If the sample data is normally distributed, data points appear along the reference line. The reference line connects the first and third quartiles of the data and extends to the ends of the data. A distribution other than normal leads to a distortion of the data graph [36]. This allows you to determine the type of distribution under study for further research.

In Fig. 4 presents probability graphs for data on the Australian banking system, which are displayed in Fig. 1



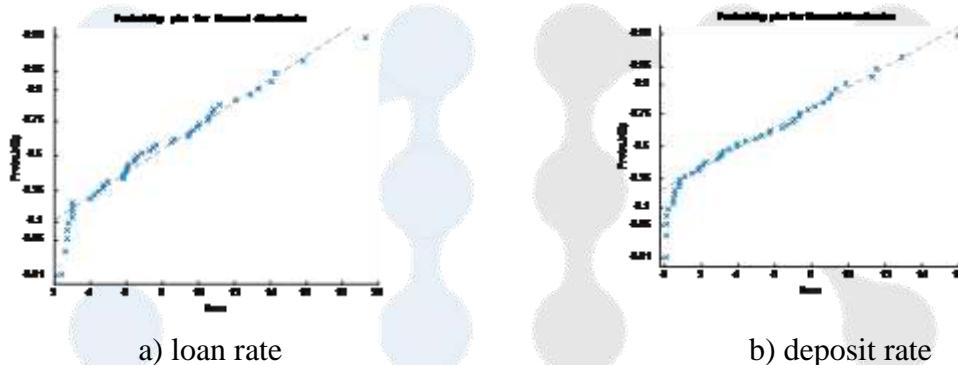
a) loan rate

b) deposit rate

**Figure 4:** Probability plots for Australian banking data

From the data in Fig. 4 it is clear that the data under study does not correspond to the normal distribution law during the time period that we are studying. For both loan and deposit rates, the initial values of the source data stand out strongly. Moreover, for data on lending rates we are closer to a normal distribution than for data on deposit rates. In terms of lending rates, we can talk about Beta distribution. This fact must be taken into account in further studies.

In Fig. 5 presents probability graphs for data on the Canadian banking system, which are displayed in Fig. 2. Here it should be noted that there is great consistency in the probability graphs studied. This also needs to be taken into account when researching the Canadian banking system.



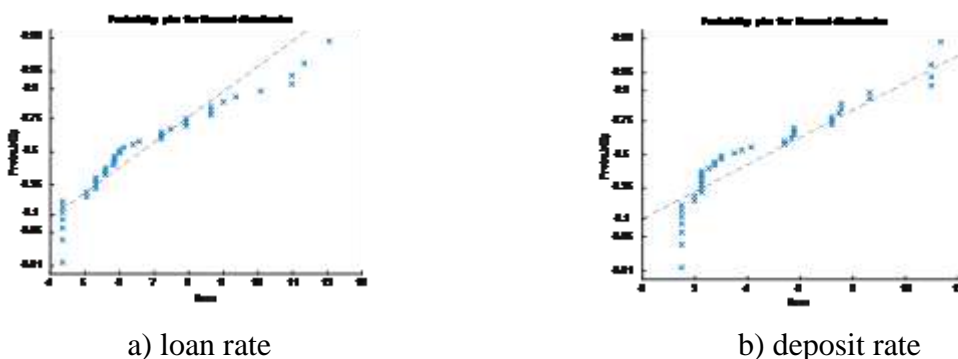
a) loan rate

b) deposit rate

**Figure 5:** Probability plots for Canadian banking data

Here, there are also significant outliers at the beginning of the period under study, which moves these data away from the normal distribution law. Most likely, we can talk about a beta distribution. But this distribution better describes the data on deposit rates.

In Fig. 6 shows probability graphs for data on the Chinese banking system, which are displayed in Fig. 3.



a) loan rate

b) deposit rate

**Figure 6:** Probability plots for data on the Chinese banking system

Probability graphs for the Chinese banking system (for the corresponding data) are more distant from the normal distribution law. Here we see emissions along the entire length of the reference line. This must be taken into account in the comparative aspect of the functioning of various banking systems.

**Conclusion**

The article discusses general surveys of banking activity analysis. The key aspects of conducting such an analysis are highlighted. The dynamics of interest rates on loans and deposits is highlighted as a general indicator of banks' activities. From the point of view of individual economies, the peculiarity of changes in interest rates on loans and deposits is shown.

The paper examines real data on the banking systems of Australia, Canada and China over various periods of time. For the purposes of assessment and comparison, the dynamics of their absolute values, as well as probability graphs, were used. Based on probability graphs, differences in the dynamics of interest rates on loans and deposits are shown. Such analysis helps to make informed, objective decisions regarding the conduct of banking activities.

**References:**

1. Vasyurenko, O., & et al.. (2014). Efficiency of lending to natural persons and legal entities by banks of Ukraine: methodology of stochastic frontier analysis. *Herald of the National Bank of Ukraine*, 1, 5-11.
2. Kuzemin, A., & et al.. (2008). Analysis of Spatialtemporal Dynamics in the System of Economic Security of Different Subjects of Economic Management. *International Journal Information Technologies and Knowledge*, 2(3), 234–238.
3. Semih Yildirim, H., & Philippatos, G. C. (2007). Efficiency of banks: Recent evidence from the transition economies of Europe, 1993–2000. *European Journal of Finance*, 13(2), 123-143.
4. Islam, M. N., Sabur, M. A., & Khan, A. G. (2017). Efficient and effective operations of commercial banks in Bangladesh: an evaluation. *Journal of Science and Technology*, 7(1), 93-108.
5. Азаренкова, Г., & Ляшенко, В. (2009). Відношення переваг у порівняльній оцінці діяльності банків. *Банківська справа*, 5, 65-72.
6. Слюніна, Т. Л., Бережний, Є. Б., & Ляшенко, В. В. (2007). Розвиток вітчизняної мережі банківських установ: особливості та регіональні аспекти. *Вісник ХНУ ім. В. Н. Каразіна. Економічна серія*, 755. 84–88.
7. Lyashenko, V. (2014). Efficiency of bank crediting of real sector of economy in the context of separate banking groups: an empirical example from Ukraine. *International Journal of Accounting and Economics Studies*, 2(2), 74-79.
8. Dobrovolskaya, I., & Lyashenko, V. (2013). Interrelations of banking sectors of European economies as reflected in separate indicators of the dynamics of their cash flows influencing the formation of the resource potential of banks. *European Applied Sciences*, 1-2, 114-118.
9. Kots, G. P., & Lyashenko, V. (2012). Banking sectors of the economies of European countries in the representation of statistical interrelation between indices that characterize their development. *European Applied Sciences*, 1, 461-465.

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

10. Doumpos, M., & Zopounidis, C. (2002). Multi-criteria classification methods in financial and banking decisions. *International Transactions in Operational Research*, 9(5), 567-581.
11. Degryse, H., Kim, M., & Ongena, S. (2009). *Microeconometrics of banking: methods, applications, and results*. Oxford University Press, USA.
12. Kuzemin, O., & Lyashenko, V. Microsituation Concept in GMES Decision Support Systems. *Intelligent Data Processing in Global Monitoring for Environment and Security* (pp. 217–238). – 2011. – P. 217-238.
13. Ляшенко В. В. (2007). Интерпретация и анализ статистических данных, описывающих процессы экономической динамики. *Бизнес Информ*, 9(2), 108-113.
14. Kuzemin, A., & Lyashenko, V. (2006). Fuzzy set theory approach as the basis of analysis of financial flows in the economical security system. *International Journal Information Theories & Applications*, 13(1), 45–51.
15. Baranova, V., Zeleniy, O., Deineko, Z., & Lyashenko, V. (2019, October). Stochastic Frontier Analysis and Wavelet Ideology in the Study of Emergence of Threats in the Financial Markets. In *2019 IEEE International Scientific-Practical Conference Problems of Infocommunications, Science and Technology (PIC S&T)* (pp. 341-344). IEEE.
16. Kuzemin, A., & Lyashenko, V. (2009). Methods of comparative analysis of banks functioning: classic and new approaches. *Information Theories & Applications*, 16(4), 384-396.
17. Куштим, В. В., & Ляшенко, В. В. (2007). Динаміка розвитку банківського сегмента міжнародного фінансового ринку. *Фінанси України*, 12, 96-105.
18. Goodfriend, M., & McCallum, B. T. (2007). Banking and interest rates in monetary policy analysis: A quantitative exploration. *Journal of Monetary Economics*, 54(5), 1480-1507.
19. Eggertsson, G. B., Juelsrud, R. E., Summers, L. H., & Wold, E. G. (2019). Negative nominal interest rates and the bank lending channel (No. w25416). National Bureau of Economic Research.
20. Vasiurenko, O., & Lyashenko, V. (2020). Wavelet coherence as a tool for retrospective analysis of bank activities. *Economy and Forecasting*, (2), 43-60.
21. Svetlošák, A., de Carvalho, M., & Calabrese, R. (2023). Subject-to-group statistical comparison for open banking-type data. *Journal of the Operational Research Society*, 74(3), 703-718.
22. Lund, B. (2023). The questionnaire method in systems research: An overview of sample sizes, response rates and statistical approaches utilized in studies. *VINE Journal of Information and Knowledge Management Systems*, 53(1), 1-10.
23. Александр, Я., Ляшенко, В. В. (2006). Процедура нечеткой формализации показателей в оценке устойчивого функционирования банков. In *Fourth International Conference INFORMATION RESEARCH AND APPLICATIONS* (p. 155).
24. Ahmad, M. A., Lyashenko, V. V., Deineko, Z. V., Baker, J. H., & Ahmad, S. (2017). Study of Wavelet Methodology and Chaotic Behavior of Produced Particles in Different Phase Spaces of Relativistic Heavy Ion Collisions. *Journal of Applied Mathematics and Physics*, 5, 1130-1149.
25. Vyacheslav, L., Omer, I. A. M., & Asaad, M. A. B. (2020). COVID-19 wavelet coherence data for some Gulf countries. *GSC Biological and Pharmaceutical Sciences*, 11(2), 166-174.
26. Kuzomin, O., Lyashenko, V., Tkachenko, M., Ahmad, M. A., & Kots, H. (2016). Preventing of technogenic risks in the functioning of an industrial enterprise. *International Journal of Civil Engineering and Technology*, 7(3), 262-270.

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

27. Коц, Г. П., Кузьомін, О. Я., & Ляшенко, В. В. (2010). Сучасні методи аналізу функціонування банків: розв'язання проблемних аспектів. *Восточно-Европейский журнал передовых технологий*, 5(3 (47)), 48-52.
28. Shelud'ko, N., Vasiurenko, O., Lyashenko, V., & Morozova, N. (2020). Gold and Bitcoin Price Dynamics as a Reflection of Investor Sentiment. *Journal La Bisecoman*, 1(4), 19-25.
29. Alrgaibat, G. A. (2016). Financial and Economical Analysis of Banking Activities: Case Study of Jordan. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, 6(4), 90-101.
30. Batischeva, G. A., Denisov, M. Y., Rybchinskaya, I. V., & Stryukov, M. B. (2018). Regional development and banking activities. *European Research Studies Journal*, 21(4), 455-465.
31. Alzoubi, H., Alshurideh, M., Kurdi, B. A., Alhyasat, K., & Ghazal, T. (2022). The effect of e-payment and online shopping on sales growth: Evidence from banking industry. *International Journal of Data and Network Science*, 6(4), 1369-1380.
32. Al-Shboul, M., Maghyereh, A., Hassan, A., & Molyneux, P. (2020). Political risk and bank stability in the Middle East and North Africa region. *Pacific-Basin Finance Journal*, 60, 101291.
33. Ogundipe, A. S., Akintola, A. F., & Olaoye, S. A. (2020). Interest rates and loan performance of deposit money banks in Nigeria. *International Journal of Economics and Business Review*, 8(1), 13-20.
34. Demiralp, S., Eisenschmidt, J., & Vlassopoulos, T. (2021). Negative interest rates, excess liquidity and retail deposits: Banks' reaction to unconventional monetary policy in the euro area. *European Economic Review*, 136, 103745.
35. Heider, F., Saidi, F., & Schepens, G. (2021). Banks and negative interest rates. *Annual Review of Financial Economics*, 13, 201-218.
36. Gan, F. F., Koehler, K. J., & Thompson, J. C. (1991). Probability plots and distribution curves for assessing the fit of probability models. *American Statistician*, 14-21.



STUDYING THE WET ABSORPTION KINETICS OF THE DRY EXTRACT OF  
“HYPOSEDAF”

**Safarova Diyora Tolibovna**

Assistant of the Tashkent Pharmaceutical Institute

**Madrakhimov Shermuhammadi Nurullayevich**

E-mail id: [safarovadiyora65@gmail.com](mailto:safarovadiyora65@gmail.com)

Candidate of Pharmaceutical Sciences of the Tashkent Pharmaceutical Institute

**Nazarova Zarifa Alimjanovna**

Doctor of pharmaceutical sciences, professor of the Tashkent Pharmaceutical Institute

**Maksudova Firuza Khurshidovna**

Tashkent Pharmaceutical Institute, doctor of Pharmaceutical Sciences, Associate Professor

E-mail id: [firuza.maksudova@mail.ru](mailto:firuza.maksudova@mail.ru)

**Annotatsiya.** “Giposedaf” quruq ekstraktining gigroskopik darajasi o’rganildi. Tadqiqot Yevropa farmakopeyasida tasvirlangan texnikaga muvofiq va O’zR DF 1-j. maqolasida keltirilgan sharoitda amalga oshirildi. Bundan tashqari, nam yutish kinetikasi S.A.Nosovitskaya tomonidan taklif qilingan va modifikatsiya qilingan og’irlik usulida olib borildi. Olingan natijalarga ko’ra, tahlil qilingan ekstrakt “gigroskopik” moddalar guruhiga kiradi, hamda uning nam yutish kinetikasi tashqi muhitning nisbiy namligi va namuna yuzasi maydoniga to’g’ridan-to’g’ri bog’liqligini aniqlandi.

**Kalit so’zlar:** quruq ekstrakt, gigroskopiklik, gravimetrik usulda, tashqi muhit namligi, namuna yuza maydoni.

**Аннотация.** Изучена гигроскопичность сухого экстракта «Гипоседафа». Исследование проводили в соответствии с методикой, описанной в Европейской Фармакопее (Ph. Eur. 7.0, vol. 1 general texts 5.11) и в условиях, описанных в статье ГФ РУз Том 1. Кроме того, кинетику влажного поглощения проводили весовым методом, предложенным и модифицированным С.А. Носовицкой. По полученным результатам анализируемый экстракт относится к группе «гигроскопических» веществ и установлено, что кинетика его влагопоглощения находится в прямой зависимости от относительной влажности внешней среды и площади поверхности образца.

**Ключевые слова:** сухой экстракт, гигроскопичность, гравиметрический метод, внешняя влажность, площадь поверхности образца.

**Annotation:** Hygroscopicity of dry extract "Hyposedaf" was investigated. The study was conducted in accordance with the methodology described in the European Pharmacopoeia and in accordance with its own DF 1-J. made under the conditions set out in the article. In addition, the kinetics of moisture absorption S.A.Nosovitskaya proposed and conducted a modified weighing method. Based on the results obtained, it was found that the analyzed extract belongs to the group of “hygroscopic” substances, and its moisture absorption kinetics directly depends on the relative humidity of the external environment and the surface area of the sample.

**Keywords:** dry extract, hygroscopicity, gravimetric method, ambient humidity, sample surface area.

Relevance. Mankind has long used medicinal plants to treat various diseases. Medicinal plants are considered the most important means of treatment and have a centuries-old tradition in our country of treating various diseases based on medicinal plants [4,5].

Given the high cost of synthetic drugs and the abundance of negative side effects, an urgent problem is the creation of medicines derived from plant raw materials. This is one of the main issues in the production of inexpensive, plant-based preparations that replace imported drugs and have high bioefficiency. One of the ways to solve this problem is the rational use of medicinal plants [6,7,8]. Knowledge of the hygroscopicity of the extract is necessary to ensure the quality of the dosage forms produced on its basis. Therefore, in the Tashkent Pharmaceutical Institute, a dry extract with a hypotensive effect was obtained by maceration, which was conditionally called "Hyposedaf". This resulting "Hyposedaf" was designed to study the kinetics of moisture absorption by dry extract.

Material and methods. Material and methods. Dry extract "Hyposedaf" obtained by maceration was selected as the research material. The appearance of the dry extract is light brown with a characteristic taste of Tahir and a special aroma. Quality indicators meet the specified requirements of the DF and DF XIV edition (RF) of the Republic of Uzbekistan [1,3,9].

Hygroscopicity of the analyzed extract in accordance with the technique described in the European Pharmacopoeia and the Republic of Uzbekistan DF 1-J., 2nd ed. ("5.11. Section "definition" in the articles of the pharmacopoeia. Hygroscopicity.") under the conditions set out in the article (Ph. Eur. 7.0, vol. 1 general texts 5.11) and its Kinetics of moisture absorption S.A.Nosovitskaya proposed and carried out a modified weighing method [1,2,7,10].

In this method, to determine hygroscopicity, a weighted (transparent) dry extract of "hyposedaf" in an amount of 1 g was placed in a pre-weighted box with a height of 15 mm and a diameter of 50 mm. This box, on the other hand, was placed in a desiccator in which a saturated solution of ammonium chloride was stored. This desiccator is left in a thermostat (type SHS-80-01spu) for 24 hours at 25°C, then the sample is weighed again and hygroscopicity is determined by the difference in weight.

The hygroscopicity of the substance was calculated as a percentage by the formula:

$$G_{igr_{sub.}} = \frac{m_3 - m_2}{m_2 - m_1} \times 100\%$$

$m_1$ — the trunk weighs with a lid, g;

$m_2$ — the trunk weighs with a lid and a substance sample, g;

$m_3$ — the weight after 24 hours with the cover of the box and the substance sample, g.

The study showed that the dry extract of "Hyposedaf" absorbed 12.2% of moisture in 24 hours, which means that it belongs to the group of "Hygroscopic" substances according to the European Pharmacopoeia (in the range from 2% to 15%). After it was proved that the dry extract "Hyposedaf" has a high hygroscopicity, its kinetics of moisture absorption was determined as carried out by the gravimetric method proposed and modified by S.A. Nosovitskaya. This

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-2, ISSUE-1

indicator took into account two different factors: the humidity of the external environment and the surface area of the dry extract sample. [10].

The humidity of the external environment was created artificially. To do this, the bottom of the exicators was filled with saturated solutions of purified water (100%), zinc sulfate (90%), ammonium chloride (79%) and sodium bromide (58%) [3,7]. Samples of "Hyposedaf" dry extract from 1 g (a clear drawer) were placed in buoys and found to weigh at the same time for 10 days. The increase in weight was calculated using the above formula in percentage terms.

The results obtained 1-figure also brought.

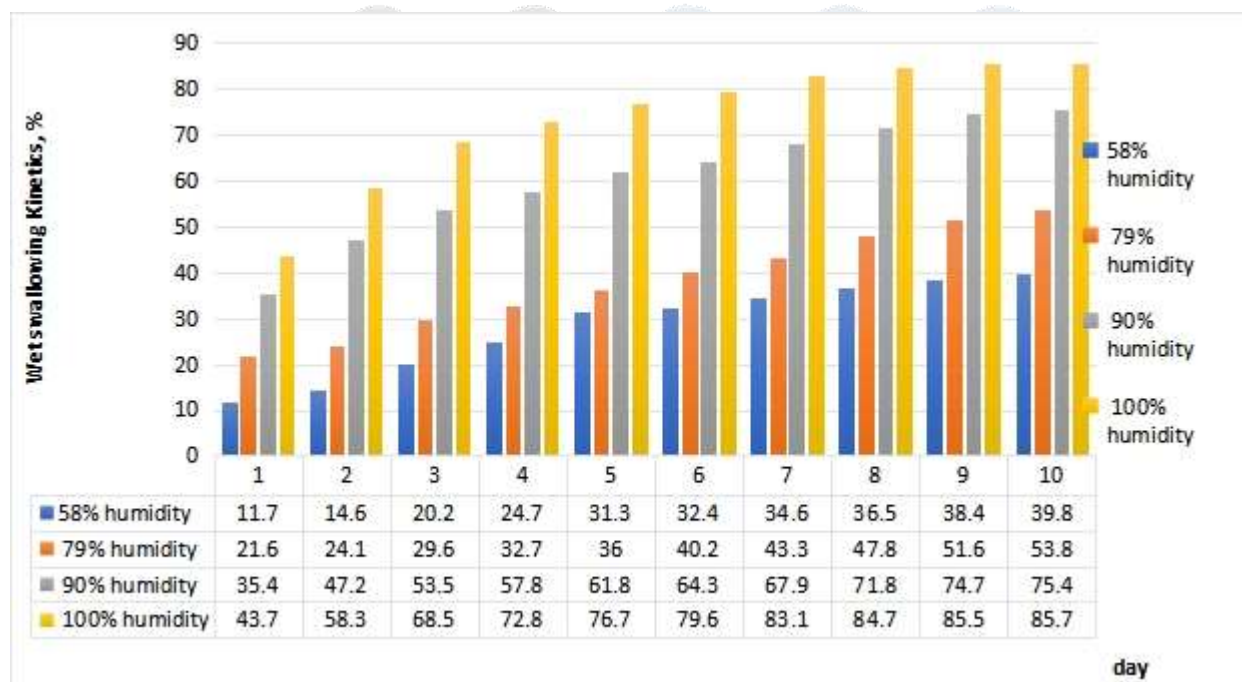


figure-1. The dependence of wet absorption kinetics of dry extract "Hyposedaf" on the humidity of the external environment

According to the information presented in the figure, dry extract "Hyposedaf" has a high degree of wet absorption, and the amount of moisture ingested directly depends on the humidity of the external environment. During the study period, at the conclusion of Day 1 at all relative humidity, the weight of the buoys is 11.7%, 21.6%, 35.4%, 43.7% increased to. In this case, the dry extract in the 1st Bix has lost its solubility, while the samples in the 2-4 bixes have liquefied and become a dark mass. The amount of moisture absorbed for the next days decreased, for example, the sample in the Exciter, where 58% moisture was created, sorbed 0.9% -5.4% moisture every day from the second day until the end of the experiment, at the end of the 10th day, this figure was equal to 39.8%.

With a relative humidity of 79%, the Daily weighting of the sample mass ranged from 1.2% to 5.2%, and at the conclusion of the experiment, it was revealed that this sample had absorbed 53.8% moisture. That is, a 1.37-fold increase in relative humidity led to a 1.29-fold increase in sorbed humidity.

The 3rd and 4th samples (relative humidity 90% and 100%) of the dry extract of "Hyposedaph" sorbed the most moisture. For example, by the end of the second day their mass had increased to 47.3% and 58.3% respectively, compared to 64.3% and 79.6% at the end of the 6th day of the experiment, and 75.4% and 85.7% by the end of the 10th day. Thus, a 1.54-and

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-2, ISSUE-1

1.71-fold increase in relative humidity led to a 1.78- and 2.03-fold increase in wet-absorption kinetics of dry extract, respectively.

As can be seen from the results obtained. The higher the humidity level of the external environment, the higher the moisture content absorbed by the dry extract "Hyposedaf".

At the later stage of our research, the wet absorption kinetics of dry extract "Hyposedaf" were also studied in relation to the surface of the sample being analyzed. The studies were carried out in the Exciter, where a relative humidity of 58% was created for 10 days. Different diameter buxes were used to define different values of this factor:  $d_1=2.8$  sm,  $d_2=3,5$  sm,  $d_3=3,9$  sm. Thus, the surface area of dry extract samples is respectively  $6,15$  sm<sup>2</sup>,  $9,62$  sm<sup>2</sup>,  $11,94$  sm<sup>2</sup> organized.

The results obtained are presented in the form of a diagram in Figure 2.

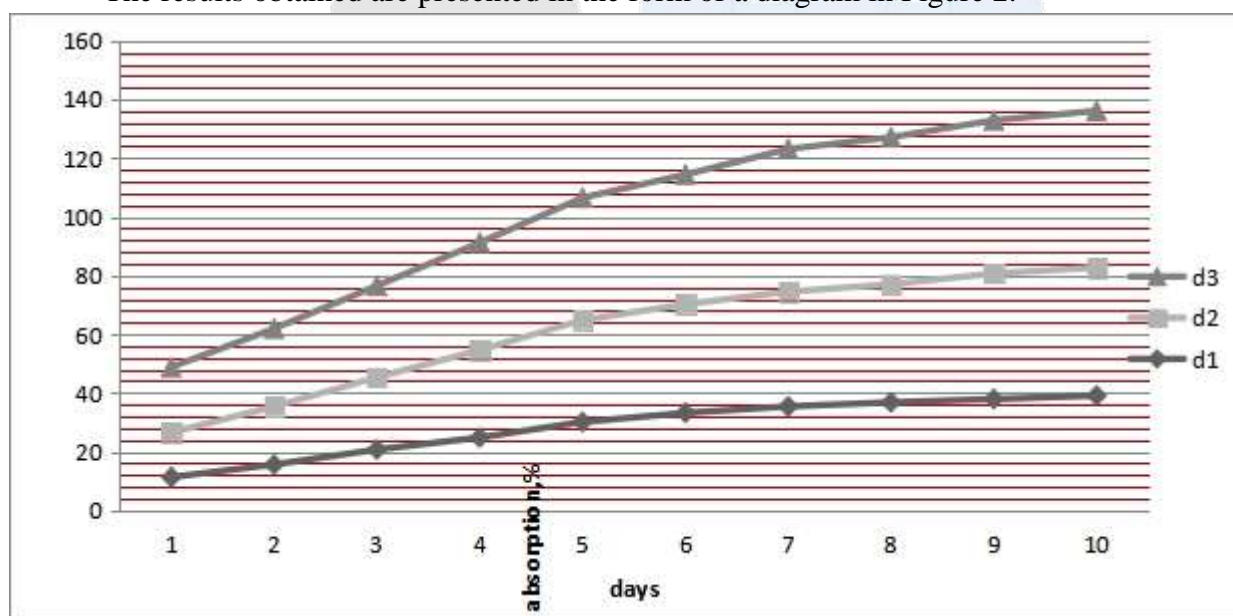


Figure 2. Dependence of wet absorption kinetics of dry extract "Hyposedaf" on the surface area of the sample

Based on the results obtained, samples stored in medium to large diameter buoys were liquefied by absorbing 15.1% and 23.3% moisture at the end of the first day, respectively. But a specimen stored in a small Bux suffered this event only at the conclusion of the second day: in doing so, it sorbed 15.8% moisture. By the end of the experiment, the mass of the dry extract in the Buks, with a diameter ( $d_1$ ) of 2.8 cm, increased by 38.3%, at the end of the 7th and 5th day this amount of moisture was absorbed in the  $d_2$  and  $d_3$  Buks. A sample in a medium-sized Bix sorbed 39.8% moisture at the conclusion of day 10, while a dry extract sample with the largest surface area – absorbed such amounts of moisture on the 6th day of research.

Thus, a 1.48- and 1.85-fold increase in the sample surface area led to an increase in the amount of moisture ingested by 1.22 and 1.38 times, respectively. The data obtained from the studies have proven that the dry extract "Hyposedaf" has a high hygroscopic property, and that this property directly depends on the relative humidity of the external environment and the area of the sample surface.

Conclusion. It has been proven that the dry extract "Hyposedaf" has a high hygroscopic property, as well as that this property directly depends on the relative humidity of the external environment and the area of the sample surface. That is, taking into account the hygroscopicity of

the dry extract, using auxiliary substances that reduce this property, it was the capsule that showed the feasibility of developing a drug form.

**Literature used:**

1. State Pharmacopoeia Of The Republic Of Uzbekistan. Toskent -2021. Volume 1, part 1-2.
2. European pharmacopeia 7.0, vol. 1 (general texts 5/11).
3. D.Y.Jalilova, E.S.Karieva. The study of the moisture-sorption properties of the dry extract "Helmintabs" // Pharmaceutical Journal.-Tashkent.-2020.-No. 1.- pp.77-80.
4. Turdieva Z.V., Mirakilova D.B., Azizov.U.M. Hypotensive medicinal product based on unabi fruits // Collection of the II International scientific and practical conference "Abu Ali ibn Sino and innovations in modern pharmaceuticals".-Tashkent, 2019 April 25. -pp.78-80.
5. Mol G.S. Studying the features of the modern pharmaceutical market of antihypertensive drugs //International Journal of Experimental Education. - 2015. – № 5-1. – pp. 143-144.
6. Mammadova Z.D., Fateeva T.G., Parfenov V.A. Headaches in patients with arterial hypertension and hypertensive crises // Neurological Journal.-2013.-No. 2.-pp.28-32.
7. R.K.Sadykova., E.S.Karieva. The study of factors affecting the hygroscopicity of the dry extract of the Samarkand immortelle // Collection of materials of the XI All-Russian scientific conference of students and postgraduates with international participation "Young pharmacy - the potential of the future".-St. Petersburg.-2021- Vol.1.-p.223-226.
8. Karpov Yu.A., Shubina A.T. Possibilities of optimization of hypotensive therapy: chronotherapy of nocturnal arterial hypertension //Atmosphere. Cardiology news.-2017.-No. 1.- pp.18-23.
9. State Pharmacopoeia of the Russian Federation, XIV ed., Moscow (2018); [Electronic resource], URL: <https://femb.ru/record/pharmacopea14>.
10. Nosovitskaya S. A., Borzunov E. E., Safiulin R. M. Production of tablets. — M.: Medicine, 1969.— 135 p.

ANALYSIS OF LOW CARBON AND RENEWABLE ENERGY RESOURCES IN  
CENTRAL ASIAN COUNTRIES

**Khotamov Ibodulla**

“Green” economy and sustainable business department, Tashkent State University of Economics,  
Tashkent, Uzbekistan,  
**i.khotamov@tsue.uz**

**Najmiddinov Yakhyo**

“Green” economy and sustainable business department, Tashkent State University of Economics,  
Tashkent, Uzbekistan,  
**y.najmiddinov@tsue.uz**

**Abstract**

It is not secret that climate change is one of the main problems of today's economy. As a result of climate change, the amount of resources available in nature continues to decrease sharply, and as a negative result of this, the lack of resources, which is one of the main problems of the economy, is clearly manifested. This article analyzes the data on the capacity of renewable energy sources and low-carbon energy production capacity of a number of Central Asian countries. The countries of Uzbekistan, Kazakhstan, Kyrgyzstan, Tajikistan and Turkmenistan have been studied.

**Key words:** Central Asia, Uzbekistan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, green economy, green energy, low carbon energy, renewable energy.

**Introduction**

At a global level, the percentage of people with access to electricity has been steadily increasing over the last few decades. In 1990, around 71% of the world's population had access; this has increased to 87% in 2016, not it should be more than 90% percent around the world. Progress has been fast. 1.26 billion got access to electricity for the first time in their lives between 2005 to 2016 [1]. Broken down to average daily change this means that on any average day in the last 11 years there were 314,770 people who got access to electricity for the first time in their lives. This figure is still unacceptably high - and gains in access are moving much too slow to reach our goal of universal access by 2030 [2]. In our research work we have fully given attention for central Asian countries electricity capacity, renewable energy recourses and low carbon energy recourses.

Today, the importance of the energy system is so high that if the stock of this type of goods is not sufficient, the economy of every country will be greatly damaged. For example, social security will decrease, disruptions will occur in the production sector, external economic and social sectors will be damaged, a number of disruptions will occur in the transport logistics sector, problems will arise in the military sector, health sector and a number of other sectors. On the other hand, it should not be forgotten that one of the most common types of electricity production today is thermal power plants. To obtain this type of electricity, we use coal, gas and a large amount of fuel and fuel products, which in turn leads to a decrease in natural resources, environmental degradation, and a decrease in the social status of the population. To make sure that everyone in the world has access to clean and safe energy, we need to understand energy consumption and its impacts around the world today and how this has changed over time.

**Literature review**

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

**Child and Breyer** discussed the definition of transition and transformation in terms of energy systems, and they suggested that changes of physical forms be denoted as transformations, while changes to large socio-technical systems as transitions, when highlighting the ways that society motivates, facilitates, and benefits from the change on a higher level [3]. Energy transition is being discussed more extensively in many countries and regions of the world, not only due to the depletion of fossil fuels, but also because of the challenge of climate change and irreversible pollution [4]. **Jesse Richman, Nurullah Ayyilmaz** scientists “Can the US and Europe contain Russian power in the European energy market? A game theoretical approach”[4]. In doing so, the scientists analyzed Russia’s role in the Euro energy market and the attitudes of its competitors.

In Europe many scholars have done many researches in this field such as **Dr Vaughan Beck** (Australia – the Australian Academy of Technological Sciences and Engineering), **Professor Robert Evans** (Canada – the Canadian Academy of Engineering), **Professor John Loughhead** (UK – Royal Academy of Engineering) and so on, and they collected their researches “Opportunities for Low-Carbon Energy Technologies for Electricity Generation to 2050” energy report [2]. Inside them they focused on every part of the low carbon energy production sector, financial, economical, and others.

#### Methodology

The research sample consists of a total of 5 Central Asian countries: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. The policy review was conducted by reviewing available official documents and reports. The most comprehensive data were obtained by reviewing energy conditions of central Asia and were supplemented by observations from additional scientific literature and reports. Measurement of data statistical methods and econometrical analysis were used for data processing. Quantitative analysis includes mostly series for the period 2010–2020, but in some cases the data for 2021 is also used. To make a comparison with central Asian countries in energy supply we take these indicators: low carbon energy, renewable energy, energy consumption per capita, energy rate in GDP and others. The indicator GDP per capita PPP (current international USD) was obtained by inspecting the database of the World Bank [3], while other indicators were obtained by inspecting the database of the International Energy Agency [5].

#### Results and discussions

Some Central Asian countries used to be the members of the USSR, and after its disintegration they embarked on the path of independence. Nowadays, each country defined certain policies for the energy sector development, which is the subject of this part of the analysis, where 2020 is the last year for which the sources were considered.

#### Kazakhstan

The Republic of Kazakhstan has embarked on the energy transition from the fossil-based to low carbon power. Coal is the dominant source of energy in the country, accounting for 64.7% of total projected generation and 74.0% of thermal generation in 2019 [5]. The government is seeking to diversify Kazakhstan’s energy mix and the National Green Growth Plan envisages the following (optimistic) breakdown by 2030: 49.0% coal, 21.0% gas, 10.0% hydropower and 8.0% nuclear, alongside a sizeable renewables element [6]. However, we predict that the relative contribution of coal will fall at a slower pace than targeted by the government, such that it still accounts for 64.9% of total electricity generation and 74.0% of thermal generation in 2028 [7]. By

**THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY****VOLUME-4, ISSUE-1**

2050, the government anticipates that non-thermal sources will generate at least half of Kazakhstan's energy needs [8]. This plan requires the start of a domestic nuclear energy program and significant growth in non-hydro renewables. Kazakhstan will remain open to foreign investment as a means to import the capital and expertise to realize its objectives, although investor uncertainty about the operating environment will further militate against the government achieving its targets. In this article we have paid attention to the source of fossil based energy production such coal, gas, oil and renewable and low carbon energy production sources in central Asian countries.

**Fossil fuel**

For most of the countries in the world energy from coal is common types of electricity production. Kazakhstan is also one of them. In the first table we have tried to illustrate annual electricity production, annual per capita electricity production and share of total electricity production for Kazakhstan from 2010 to 2022 (Table 1) [11].

**Table 1. Fossil fuel energy production from 2010 to 2022 in Kazakhstan.**

Years	Annual production (in TWh)	Per capita production (in kWh)	Share of total electricity production (in %)
2010	75	4,488	90
2011	79	4,666	91
2012	83	4,853	92
2013	85	4,893	92
2014	86	4,910	91
2015	82	4,609	90
2016	83	4,572	87
2017	91	4,995	88
2018	96	5,198	90
2019	95	5,086	90
2020	97	5,095	89
2021	102	5,329	89
2022	100	5,155	89

Source: Hannah Ritchie, Max Roser and Pablo Rosado. Energy, Our world in one data.

<https://ourworldindata.org/team>

It is obvious from the table that electricity production is main one for this country. The reason for this mini conclusion that every year from 2010 to 2022 its percentage in the whole electricity production is more than 60 percent. In the last three years its percentage is decreasing steadily, because low carbon energy and renewable energy production is increasing in this country. Annual electricity production from coal is measured in TWh, I should mention that 1 TWh (terawatt hours) equal to 1,000,000 megawatt-hours (MWh) or 1,000,000,000 kilowatt-hours (kWh). To compare annual production of electricity from coal to per capita, we should change terawatt to kilowatt, and after that we can easily compare them each other. The highest per capita electricity production we can see in 2010, 2011, 2018 years from 2019 till 2022 its rate was decreasing steadily. The reason for this also an increase in the production of electricity from low carbon energy and renewable energy.



**Low carbon and renewable energy**

The country has taken steps to attract greater investment into the renewable energy segment in recent years - introducing a 15-year feed-in-tariff (FiT) mechanism in 2013 - and there are plans to open up the power and energy sectors to greater numbers of private investors. The main focus for the renewables sector is wind and solar power (Table 2) [11]. Kazakhstan is very rich in wind potential, with around 50.0% of the country's territory having average wind speeds of 4-5m/sec at a height of 30m. The wind potential of Kazakhstan is 1.8trn kWh per year, close to 10 times Kazakhstan's current energy consumption, according to UN estimates. Solar also has great potential given the number of sunny hours per year - typically between 2,200 and 3,000 - implying a capacity of 1,300-1,800kW/sqm per year. In the second table we can see the low carbon and renewable energy production potential of Kazakhstan. Low-carbon electricity is the sum of electricity generation from nuclear and renewable sources. Renewable sources include hydropower, solar, wind, geothermal, bioenergy, wave and tidal. In Kazakhstan there is no any kind of nuclear energy so we do not pay attention for this type of energy production.

**Table 2. Low carbon energy and renewable energy production in Kazakhstan from 2010 to 2022**

Years	Nuclear power	Hydropower (in TWh)	Solar (in TWh)	Wind (in TWh)	Low carbon and renewable energy per capita (in kWh)	Shared of total electricity (in percentage)
2010	-	8,02	0	0	8	10
2011	-	7,88	0	0	8	9
2012	-	7,62	0	0	8	8
2013	-	7,73	0	0	8	8
2014	-	8,26	0	0,01	8	9
2015	-	9,72	0,05	0,13	9	13
2016	-	11,62	0,09	0,27	12	11
2017	-	11,21	0,09	0,34	12	10
2018	-	10,38	0,14	0,39	11	10
2019	-	9,99	0,39	0,71	11	11
2020	-	9,66	1,24	1,03	12	11
2021	-	9,09	1,29	1,67	12	11
2022	-	9,10	1,41	2,28	13	11

Source: Hannah Ritchie, Max Roser and Pablo Rosado. Energy, Our world in one data.

<https://ourworldindata.org/team>

Hydropower accounts for approximately 12.3% of Kazakhstan's total generating capacity. Kazakhstan has abundant hydro resources, which are mainly concentrated in the eastern and southern parts of the country on the Irtysh, Ili and Syrdarya rivers (73 % of the total capacity of hydro resources). Hydropower plants on the Irtysh River constitutes of the Bukhtyrma (750MW), Shulbinsk (702MW) and Ust-Kamenogorsk (315MW), the Kapshagai (364MW) plant on the Ili River, and the Shardarinskaya(104MW) plant on the Syrdarya River [9]. Kazakhstan is rich in wind energy resources. In some regions, the average wind speed at an altitude of 15 m is 27-36 m / s. there are at least 10 areas with a large wind potential with an average wind speed of 8 -10 m/s.

**THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY****VOLUME-4, ISSUE-1**

The most significant are the wind energy resources of the Dzungarian Gate (17,000 kWh / m<sup>2</sup>). Other promising areas include Yerementau (Akmola region), Fort Shevchenko (Caspian Sea coast), Korda (Zhambyl region) [10].

The potential of solar energy in Kazakhstan is estimated at 2.5 billion kWh per year, which corresponds to an area of about 10 km<sup>2</sup> of solar cells with a total efficiency of 16%. The average efficiency of modern solar panels varies in the range of 15-25%. Solar energy can be widely used in two-thirds of the territory of the Republic of Kazakhstan. In the southern regions, the duration of solar radiation is from 2,800 to 3,000 hours per year, and the annual consumption of solar energy is from 1,280 to 1,870 kWh per 1 m<sup>2</sup>. Moreover, in June, the amount of energy per 1 m<sup>2</sup> on the horizontal surface ranges from 6.4 to 7.5 kWh per day, which makes the South Kazakhstan, Kyzylorda and Aral regions extremely favorable to produce solar energy. According to the Strategic development plan of the Republic of Kazakhstan and the Concept of transition to a “green economy” it is planned to put into operation about 28 solar power plants by the end of 2020 [11].

**Tajikistan**

At Tajikistan, the average electricity available amounts to less than 4 hours daily during winter. Tajikistan has enormous hydro power potential as it possesses 4% of the world's hydro power resources and 53% of Central Asia's resources. Yet these resources remain to be sufficiently developed. About 94% of electricity generating capacity is hydroelectric, but only an estimated 5% of its potential is in use.

**Fossil fuel**

Fossil fuel is also main types of electricity for Tajikistan. In the following table three we have paid attention to the electricity production from fossil fuel, fossil fuel contains coal, oil, and gas from 2010 to 2022 (Table 3) [11].

**Table 3. Fossil fuel energy production from 2010 to 2022 in Tajikistan**

<b>Years</b>	<b>Annual production (in TWh)</b>	<b>Per capita production (in kWh)</b>	<b>Share of total electricity production (in %)</b>
<b>2010</b>	0,1	4	0,20
<b>2011</b>	0,1	5	0,25
<b>2012</b>	0,1	9	0,40
<b>2013</b>	0,1	5	0,25
<b>2014</b>	0,2	18	1
<b>2015</b>	0,2	18	0,90
<b>2016</b>	0,6	64	3,29
<b>2017</b>	0,9	103	5,15
<b>2018</b>	1,3	139	6,52
<b>2019</b>	1,4	152	6,90
<b>2020</b>	1,6	170	8,20
<b>2021</b>	2	177	8,80
<b>2022</b>	-	-	-

Source: Hannah Ritchie, Max Roser and Pablo Rosado. Energy, Our world in one data.

<https://ourworldindata.org/team>

From the table there is no doubt that fossil fuel is not the main source of electricity production, the reason for this that low carbon energy and renewable energy is the main source of electricity production. The highest percentage of fossil fuel energy production is 2% in the total production of energy in Tajikistan.

#### **Low carbon and renewable energy**

We have mentioned before that main source of electricity production in Tajikistan is low carbon and renewable energy. In the following table 4 [11], we have paid attention to the low carbon and renewable energy production in Tajikistan.

**Table 4. Low carbon energy and renewable energy production in Tajikistan from 2010 to 2022**

Years	Nuclear power	Hydropower (in TWh)	Solar (in TWh)	Wind (in TWh)	Low carbon and renewable energy per capita (in kWh)	Shared of total electricity (in percentage)
2010	-	16,24	0	0	2,131	99,82
2011	-	16,04	0	0	2,060	99,75
2012	-	16,73	0	0	2,103	99,58
2013	-	16,90	0	0	2,077	99,76
2014	-	15,84	0	0	1,902	99,06
2015	-	16,83	0	0	1,974	99,12
2016	-	16,47	0	0	1,888	99,71
2017	-	16,96	0	0	1,900	94,85
2018	-	18,21	0	0	1,995	93,48
2019	-	19,17	0	0	2,053	93,10
2020	-	18,11	0	0	1,898	91,79
2021	-	18,00	0	0	1,846	91,23
2022	-	-	-	-	-	-

Source: Hannah Ritchie, Max Roser and Pablo Rosado. Energy, Our world in one data. <https://ourworldindata.org/team>

Tajikistan is one of the focus countries of the EU4 Energy programme [12], which is being implemented by the IEA and the European Union along with the Energy Community Secretariat and the Energy Charter Secretariat. The Republic of Tajikistan is a landlocked country situated in the southeast of Central Asia. The government also plans to develop energy sources other than large hydro to diversify the fuel mix and reduce volatility in electricity generation. Having sizeable coal deposits/reserves and a coal production history of more than a century, the government has turned to coal as an ultimate fuel in resolving severe electricity shortages in winter months, when water levels are too low for electricity production. Production of coal in 2020 reached 2.1 Mt, which is a tenfold rise from 2010. Coal has rapidly become a key energy source in Tajikistan (26.3% of total energy supply (TES) in 2020). Barqi-Tojik constructed a new coal-fired power plant, Dushanbe-2 (400 MW capacity), and a new TPP is planned to be built by 2025 in Zarafshon. Over 130 MW of small hydro had been developed by the end of 2014, and other plans include

converting heat generation plants from gas to coal and rehabilitating existing TPPs to improve efficiency. Tajikistan's primary energy production amounted to 2.5 Mtoe in 2020. Domestic energy production mainly consists of hydro (62% of production in 2020) and coal (37%). Hydro generation has increased in recent years (+13% since 2015) as a result of capacity additions. Coal mining has increased from negligible quantities in 2010 to over 2 Mt (1.2 Mtoe) in 2019. Overall self-sufficiency has grown from around 60% of the TES in the early 2010s to almost 75% in 2019 [13].

### **Kyrgyzstan**

In 2016, there was approximately 40 MW of small hydro capacity. The National Energy Program and the Strategy for Fuel and Energy Sector Development (covering 2010-25) [15] are the key policies for sustainable energy development. The rapid expansion of renewables, especially hydro, is a priority for energy sector development, and the Strategy supports the construction of approximately 100 small hydroelectric plants with total capacity of 180 MW.

### **Fossil fuel**

After Kyrgyzstan gained its independence, residential power consumption rose significantly due to intensive use of electricity for heating and cooking. In November 2014, new electricity tariffs were approved based on a 700-kWh monthly threshold for residential electricity consumers (700 kWh is the level of power consumption that can be satisfied through domestic power generation). Above this threshold, residential consumers are charged a higher tariff (assessed for domestic power generation) plus the cost of imported power during the winter months. This threshold and the new tariffs provide incentives for consumers to conserve energy, especially in winter, and to adopt alternative fuels when it is economically efficient (coal, for example). In the table 5 [11], fossil fuel energy production from 2010 to 2022 in Kyrgyzstan is demonstrated.

**Table 5. Fossil fuel energy production from 2010 to 2022 in Kyrgyzstan**

<b>Years</b>	<b>Annual production (in TWh)</b>	<b>Per capita production (in kWh)</b>	<b>Share of total electricity production (in %)</b>
<b>2010</b>	0,8	170	7,80
<b>2011</b>	0,9	173	6,42
<b>2012</b>	0,8	165	6,21
<b>2013</b>	0,7	150	6,20
<b>2014</b>	1	206	8,36
<b>2015</b>	1,7	306	14,14
<b>2016</b>	1,6	276	12,73
<b>2017</b>	1,3	201	8,04
<b>2018</b>	1,2	182	7,39
<b>2019</b>	1,2	179	7,61
<b>2020</b>	1,4	213	8,47
<b>2021</b>	1,5	224	10,10
<b>2022</b>	-	-	-

Source: Hannah Ritchie, Max Roser and Pablo Rosado. Energy, Our world in one data.  
<https://ourworldindata.org/team>

**THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY****VOLUME-4, ISSUE-1**

A more reliable supply of gas and implementation of Gazprom Kyrgyzstan's investment programme to improve the gas grid will further encourage switching from electricity to gas and coal. Under the National Strategy for Sustainable Development for 2018-2040 [14], energy efficiency technologies must be applied in all new construction and the government plans to implement large-scale programmes on energy-efficient reconstruction of old residential and non-residential buildings, and to introduce energy efficiency passports for all buildings.

From the table above it is obvious that fossil fuel is not the main source to produce electricity in Kyrgyzstan. Annual electricity production from the fossil fuel is decreasing year by year in the late 5 years. Electricity production in per capita also decreasing year by year from 2010 to 2022, in 2021 it was increased but not dramatically.

**Low carbon and renewable energy**

The Law on Renewable Energy adopted at the end of 2008 established an important framework for renewable energy development in general, and for small HPPs in particular. It provides a number of incentives and preferences, such as exemption from customs duties on equipment import and export, relief from licensing for generation, the right to sell output to consumers under commercial agreements, and guaranteed purchase of renewable energy output by the distribution company. Renewable energy developers also have a multiplying coefficient of 1.3 for the feed-in tariff (for all renewable sources: hydro, wind, solar, biomass and geothermal). The law also guarantees non-discriminatory access of renewable energy output to the grid and obligates the National Grid and distribution companies to ensure unobstructed transit of renewable energy to consumers. In the table 6 [11], Low carbon energy and renewable energy production in Kyrgyzstan from 2010 to 2022 has been illustrated.

**Table 6. Low carbon energy and renewable energy production in Kyrgyzstan from 2010 to 2022**

Years	Nuclear power	Hydropower (in TWh)	Solar (in TWh)	Wind (in TWh)	Low carbon and renewable energy per capita (in kWh)	Shared of total electricity (in percentage)
2010	-	11	-	-	2,006	92,20
2011	-	14	-	-	2,521	93,58
2012	-	14,04	-	-	2,493	93,79
2013	-	13	-	-	2,273	93,80
2014	-	13,16	-	-	2,263	91,64
2015	-	10,99	-	-	1,858	85,86
2016	-	11,38	-	-	1,891	87,27
2017	-	14,06	-	-	2,297	91,96
2018	-	14,17	-	-	2,277	92,61
2019	-	13,71	-	-	2,168	92,39
2020	-	14,80	-	-	2,302	91,58
2021	-	13	-	-	1,992	89,90
2022	-	-	-	-	-	-

Source: Hannah Ritchie, Max Roser and Pablo Rosado. Energy, Our world in one data.

<https://ourworldindata.org/team>

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

There are currently no waste-to-energy projects or initiatives. Municipalities of large cities have been considering building plants for converting non-recyclable waste materials into electricity and heat, but no plans have yet been fully developed or implemented. Kyrgyzstan's geographic location and climatic conditions are quite favorable for the broader development of solar energy, evident in solar radiation maps. Annual specific power generation by photoelectrical equipment has a potential 300 kilowatt hours per square meter (kWh/m<sup>2</sup>), and annual specific productivity of solar hot water supply could be up to 750 kWh/m<sup>2</sup> (heat). These figures assume the availability of increasingly inexpensive photoelectrical converters, modules and flat solar collectors, as well as the necessary scientific-technical capacity. In Kyrgyzstan's predominantly mountainous terrain, winds of constant direction and strength sufficient for power generation can only be found in remote and sparsely populated areas. Analysis of instrumental observations at meteorological stations reveals that the actual average annual wind speed is much lower than 5 metres per second (m/s) (only at one weather station does it exceed 5 m/s, and that is for two months per year only). As construction of wind power plants is considered feasible from an average annual wind speed of 8 m/s, those areas with average speed of 5 m/s or less are not suitable for wind turbine installation. The potential for wind energy is therefore very low in populated residential areas, and the areas where wind energy could be economically viable are far from consumer centers and difficult to access. The main share of renewable energy in production is hydropower. Its trends are some have fluctuated, there is no exact increase or decrease. Hydropower energy production is somehow the same average 13 or 14 TWh, in per capita it is average 2000 kWh.

#### **Turkmenistan**

The electrification rate in Turkmenistan is 99.6%. Electricity is mostly produced in 8 thermal power plants with an installed capacity of 3.3 GW. Electricity consumption by sector is the following: agriculture and forestry 31.8%, industry 36%, transport 2.6%, and residential 21%. Demand for renewable energy sources in Turkmenistan is practically inexistent. Turkmenistan has relatively low potential for bio energies, hydro power, and geothermal energy. While it does have tremendous wind and solar power with 300 sunny days per year (equaling 2,00 kW/m<sup>2</sup>/yr) and wind potential equal to the country's fossil fuel potential, its wealth of oil and gas overshadow these potentials.

#### **Fossil fuel**

Turkmenistan has the world's fourth-largest reserves of natural gas and is one of the region's key suppliers of this fuel. The devastating effects of climate change felt most keenly in Central Asia are spreading desertification, water scarcity, heat waves, and droughts. Official Ashgabat plans to take several measures, according to experts at the regional finance institute. The first measure under consideration is to improve energy efficiency in the production, consumption, and transportation of hydrocarbons, including preventing methane leaks. Second, Turkmenistan has vast potential for developing renewable energy such as solar and wind power, so investments to diversify sources could bring gains. Third, in fostering technological advances, the country plans to explore the development of green hydrogen by learning and adopting modern practices used in developed countries. It also plans to introduce various carbon capture, use, and storage technologies to reduce harmful emissions into the atmosphere. In the table 7 [11], Fossil fuel energy production from 2010 to 2022 in Turkmenistan has been illuminated.

Table 7. Fossil fuel energy production from 2010 to 2022 in Turkmenistan

Years	Annual production (in TWh)	Per capita production (in kWh)	Share of total electricity production (in %)
2010	16	2973	100
2011	16	3020	100
2012	17	3056	100
2013	18	3191	100
2014	19	3387	100
2015	21	3673	100
2016	21	3609	100
2017	21	3549	100
2018	21	3492	100
2019	21	3439	100
2020	20	3217	100
2021	21	3374	100
2022	-	-	-

Source: Hannah Ritchie, Max Roser and Pablo Rosado. Energy, Our world in one data.

<https://ourworldindata.org/team>

From the table it is obvious that 100% electricity production is based on the fossil fuel energy. Annual electricity production from fossil fuel and per capita electricity production from fossil fuel have increased steadily from 2010 till 2021 respectively.

Turkmenistan, possessing one of the largest energy potential in the world, strives to establishment of stable structure of the global energy security, which is built on the principles of justice, balance of interests of both supplying countries and transit countries and consumers. Energy cooperation, based on beneficial and long-term partnership, formed on the basis of common principles and rules, is a condition of steadfast development of the world community. Energy is life which has been endangered because of power politics and scarcity of energy resources in the region as well as around the globe. Energy fuels development and Turkmenistan implements an energy policy of easy and smooth supply of energy resources to consumers, as well as export of electricity to foreign consumers. It has the world's fourth largest estimated reserves of natural gas. Turkmenistan strives to give its unlimited energy resource potential to the disposal of the mankind, realizing the energy policy based on the principles of combined modernization of fuel and energy complex and diversification of energy supplies to the world markets. Energy policy of Turkmenistan is based on diversified operationalization and channelization of energy resources, efficiency and saving of energy, optimal use of energy resources, energy security, investments, energy diplomacy, innovations and the last but not the least development of renewable or green energy resources. Moreover, increasing internal/national production capacity to meet external demands, diversifying energy export routes, increasing export capacity, securing energy transportation and networks to external markets are also salient features of its energy policy. For the further development of national energy resources and production channels, the government of Turkmenistan will make investments of 240 billion manats in oil and gas sector. The Government of Turkmenistan announced total existing generation capacity equals 5,432,4 megawatt (MW). In 2016, Turkmenistan produced more than 24 billion kWh. Turkmenistan has ambitious plans to bring power generation capacity to about 26 billion kWh by 2020 and to 35 billion kWh by 2030

by upgrading existing power stations and building new ones. The country has announced plans to build 14 new gas turbine power stations with a total capacity of 4,000 megawatts by 2020. Turkmenistan exports approximately 65bcm (Billion cubic metres) gas to China. It exports 10bcm gas to Russia. It supplies more than 50bcm gas to Iran too. Dream Gas Pipeline in shape of TAPI would export up to 33bcm and Turkmenistan-Europe gas pipeline exports 30bcm through the Trans-Caspian Gas pipeline.

#### **Low carbon and renewable energy**

Today, it is no secret that Turkmenistan ranks among the world's most developed countries in terms of natural resources. Therefore, due to the lack of demand for low-carbon and renewable energies, the production of this type of electricity has not been established in Tajikistan. That's why, finding information in terms of low carbon and renewable energy production is somehow hard.

#### **Uzbekistan**

Uzbekistan has been implementing large-scale reforms in recent years to strengthen its energy industry. Problems are associated with high wear and tear on equipment as well as with the slow pace of infrastructure updates, faulty equipment operations, inadequate installations, and both gas pipelines and power lines that have exceeded their service life. The country's unstable financial situation and inadequate introduction of resource- and energy-saving technologies have raised technological losses and made fuel and energy resource supply interruptions more frequent. In Uzbekistan fossil fuel is main source to produce electricity.

#### **Fossil fuel**

Uzbekistan is implementing comprehensive measures to deepen structural reforms, modernize and diversify basic sectors of the economy, and balance the socioeconomic development of its territories. Presidential Decree No. PP-4477 of 4 October 2019 approved the Strategy for the Transition of the Republic of Uzbekistan to the Green Economy for the Period 2019-2030 [15].

Today Uzbekistan's electricity production capacity from the fossil fuels is given in the following table seven. The table 9 [11], includes the information about the electricity production from fossil fuels (such as coal, gas, oil) from 2010 to 2022.

**Table 9. Fossil fuel energy production from 2010 to 2022 in Uzbekistan**

<b>Years</b>	<b>Annual production (in TWh)</b>	<b>Per capita production (in kWh)</b>	<b>Share of total electricity production (in %)</b>
<b>2010</b>	41	1,438	84
<b>2011</b>	44	1,524	89
<b>2012</b>	44	1,476	87
<b>2013</b>	46	1,534	89
<b>2014</b>	47	1,534	89
<b>2015</b>	48	1,536	87
<b>2016</b>	49	1,550	87
<b>2017</b>	50	1,556	86
<b>2018</b>	54	1,651	90
<b>2019</b>	54	1,627	89
<b>2020</b>	51	1,519	90



**THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY**

**VOLUME-4, ISSUE-1**

<b>2021</b>	54	1,590	92
<b>2022</b>	-	-	-

Source: Hannah Ritchie, Max Roser and Pablo Rosado. Energy, Our world in one data.

<https://ourworldindata.org/team>

Development of annual production of fossil fuel in Uzbekistan and forecast values for the following periods is important in working out prospects for further development of the industry. For this, it is necessary to analyze the characteristics of the time series of the forecasted indicator.

**Low carbon and renewable energy**

As global GDP and population growth have aggravated environmental problems and raised awareness of energy resource limitations, many countries have made the transition to sustainable development their main goal. Intergovernmental Panel on Climate Change (IPCC) research shows that raising the CO<sub>2</sub> price to USD 50 per tonne of carbon dioxide (/tCO<sub>2</sub>) emitted into the atmosphere and expanding the use of RESs would help reduce CO<sub>2</sub> emissions 38% by 2030, and 70% by 2050 [16].

In 2018, Uzbekistan ratified the Paris Agreement and adopted a national commitment to reduce GHG emissions per unit of GDP by 10% of the 2010 level by 2030 [17]. According to the Strategy on the Transition of the Republic of Uzbekistan to the “Green” Economy for the Period 2019-2030, Uzbekistan aims to increase the share of RESs in total electricity generation to more than 25% by 2030 [17]. It also plans to double its energy efficiency indicator, reduce the carbon intensity of GDP, and provide the entire population and all economic sectors with access to modern, inexpensive and reliable energy.

Uzbekistan’s considerable RES potential could spur significant development of a green, environmentally friendly economy. The country’s total RES potential is 117 984 Mtoe, while its technical potential is 179.3 Mtoe.

The bulk of this potential lies in solar energy (total potential of 51 Gtoe and technical potential of 177 Mtoe). In fact, solar energy’s technical potential is almost four times the country’s primary energy consumption. Its favorable climate and geographical location would allow Uzbekistan to use solar energy for a wide range of industrial purposes. Wind energy potential totals 2.2 Mtoe, with 19% technical development possible. Although total geothermal energy potential (67 Gtoe) exceeds that of solar, the underdevelopment of simple and cost-effective technologies to exploit this type of energy limits technical development to only 0.3 Mtoe.

In the following table 11 [11], low carbon and renewable energy production information is given from 2010 to 2022. Renewable energy and low carbon energy are not main types of energy production for Uzbekistan, but it is time to change it.

**Table 11. Low carbon energy and renewable energy production in Uzbekistan from 2010 to 2022**

<b>Years</b>	<b>Nuclear power</b>	<b>Hydropower (in TWh)</b>	<b>Solar (in TWh)</b>	<b>Wind (in TWh)</b>	<b>Low carbon and renewable energy per capital (in kWh)</b>	<b>Shared of total electricity (in percentage)</b>
<b>2010</b>	-	8,11	0	-	283	17
<b>2011</b>	-	5,65	0	-	194	11
<b>2012</b>	-	6,59	0	-	223	13

## VOLUME-4, ISSUE-1

2013	-	5,65	0	-	189	11
2014	-	6,01	0	-	197	11
2015	-	7,00	0	-	226	13
2016	-	7,25	0	-	230	13
2017	-	8,34	0,01	-	261	14
2018	-	5,84	0,01	-	180	10
2019	-	6,46	0,01	-	196	11
2020	-	5,00	0,01	-	149	9
2021	-	5,00	0,01	-	147	8
2022	-	-	0,01	-	-	-

Source: Hannah Ritchie, Max Roser and Pablo Rosado. Energy, Our world in one data.

<https://ourworldindata.org/team>

While Uzbekistan's annual electricity production amounted to 54.2 billion kWh in 1991, it had dropped to 45.4 billion kWh by 1996 because the power units at its largest power plants had become obsolete. Electricity production rose steadily between 1996 and 2018, however, as a result of modernization and commissioning of new power units. Uzbekistan's total electricity generation capacity is 14.1 GW, with TPPs accounting for 85.8%. With GDP and population growth, the country's electricity demand is bound to increase. Production is therefore forecast to rise to 84.9 billion kWh by 2025 – 40% above the 2018 level. Electricity generation capacity is expected to expand 2.5 times to double annual production by 2030 [17].

The development of forecast values of the hydropower indicator for the next period is important in working out the prospects for further development of the sector. For this, it is necessary to analyze the characteristics of the time series of the forecasted indicator. In the figure 6, changing trends of hydropower of Uzbekistan is shown.

### Conclusion and recommendations

Today, many countries' renewable energy goals include reducing GHG emissions, increasing the share of renewable energy in final energy consumption, and meeting growing demand for energy. Uzbekistan is also developing objectives to promote renewable energy and increase its share in the overall energy balance. It particularly aims to increase the share of renewable energy in total electricity production from 10-12% in 2018 to 20% by 2025, including raising the HPP portion from 10-12% to 15.8%, solar energy from 1.95% to 2.3% and wind energy from 1.36% to 1.6% [18].

As in other developing countries, a number of factors continue to hinder renewable energy development in Uzbekistan.

**First**, the high cost of producing renewable energy and its limited generating capacity compared with traditional energy sources, as well as the low cost of traditional energy sources compared with other countries.

**Second**, there are no specific financial support mechanisms (tariffs and taxes) that stimulate RES use. The legal framework for economic mechanisms promoting RES use is inadequate.

**Third**, progressive techniques and technologies based on modern control systems are not sufficiently developed. One of the main reasons for the low rate of RES development is the

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

technical imperfection of these types of energy production technologies. Plus, short-term energy system profitability is low.

**Fourth**, as in many other developing countries, public awareness of modern forms of energy – especially renewable energy – is lacking.

**Fifth**, innovative renewable energy technologies are being developed too rapidly for Uzbekistan to keep up. For example, solar panels made of semiconductor silicon were quickly replaced by photoelectric panels made of amorphous silicon, and then by flexible solar cells. Because there is no local renewable energy technology manufacturing in Uzbekistan, purchase, installation and maintenance costs remain high. Rapid development of the industry requires that outdated technologies be quickly replaced with new ones.

**Sixth**, nuclear power influences the scale of renewable energy use and hampers development of the energy sector.

Above, some shortcomings of the central Asian countries' energy production are mentioned. To tackle them we should implement these innovations or changes in central Asian countries. **Firstly**, we should create well developed energy logistics system in central Asian countries. With the help of these new innovative system energy outlook will increase in all countries in central Asia. **Secondly**, it is necessary to increase the number of photoelectric power stations in all the countries of Central Asia, which are among the sunny countries, and as a result, it is necessary to strengthen the field of energy production to European countries. **Thirdly**, in the countries of Central Asia, it is necessary to establish the sector of obtaining electricity through the processing of waste, which is not yet developed, in which the systems existing in Korea and Germany should be used.

### REFERENCES

1. Mohammadi, V.; Mozaffari Shamsi, H.; Asadi, F. Investigating the relationship between economic growth, energy consumption and human development in selected MENA countries (MENA). *Iran. J. Energy Econ.* 2019, 8, 811–850.
2. Our world in one date. Oxford Martin School, University of Oxford, Global Change Data Lab.  
<https://ourworldindata.org/>
3. Child, C.; Breyer, C. Transition and transformation: A review of the concept of change in the progress towards future sustainable energy systems. *Energy Policy* 2017, 107, 11–26. [Cross Ref].
4. Pye, S.; Sabio, N.; Strachan, N. An integrated systematic analysis of uncertainties in UK energy transition pathways. *Energy Policy* 2015, 87, 673–684. [Cross Ref].
5. Jesse Richman, Nurullah Ayyilmaz. Can the US and Europe contain Russian power in the European energy market? A game theoretic approach. *Energy Strategy Reviews*, Volume 26, 2019, 100393, ISSN 2211-467X, <https://doi.org/10.1016/j.esr.2019.100393>.  
<https://www.sciencedirect.com/science/article/pii/S2211467X19300860>
6. Dr Vaughan Beck, Professor Robert Evans, Professor John Loughhead. “Opportunities for Low-Carbon Energy Technologies for Electricity Generation to 2050”. Energy report. 2013
7. Carlo Brancucci Martinez-Anido and Benjamin Botor and Anthony R. Florita and Caroline Draxl and Siyuan Lu and Hendrik F. Hamann and Bri-Mathias Hodge, “The value of day-

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

- ahead solar power forecasting improvement,” Solar Energy, vol. 129, pp. 192 – 203, 2016. [Online]. Available: <http://www.sciencedirect.com/science/article/pii/S0038092X16000736>
8. International Energy Agencies. <https://www.iea.org/>
9. Asian Research Institute. Alternative energy Sources of Kazakhstan. <https://www.eurasian-research.org/publication/alternative-energy-sources-of-kazakhstan/>
10. International Trade Administration. Energy Resource Guide - Kazakhstan - Renewable Energy. <https://www.trade.gov/energy-resource-guide-kazakhstan-renewable-energy>
11. Hannah Ritchie, Max Roser and Pablo Rosado. Energy, Our world in one data. <https://ourworldindata.org/team>
12. Anatoli Vakhguelt. Renewable Energy Potential of Kazakhstan. Nazarbayev University, 53 Kabanbay Batyr Ave., Astana 010000, Kazakhstan Email: [anatoli.vakhguelt@nu.edu.kz](mailto:anatoli.vakhguelt@nu.edu.kz)
13. Energy Community. Regional initiatives: EU4Energy Governance. <https://www.energy-community.org/regionalinitiatives/EU4EnergyII.html>
14. Kyrgyzstan energy profile. Sustainable development. International energy Agency. <https://www.iea.org/reports/kyrgyzstan-energy-profile/sustainable-development>
15. “National Development Strategy of the Kyrgyz Republic for 2018-2040”. Bishkek, November, 2018. [https://policy.thinkbluedata.com/sites/default/files/National%20Development%20Strategy%20of%20the%20Kyrgyz%20Republic%20for%202018-2040%20\(EN\).pdf](https://policy.thinkbluedata.com/sites/default/files/National%20Development%20Strategy%20of%20the%20Kyrgyz%20Republic%20for%202018-2040%20(EN).pdf)
16. “Uzbekistan’s energy profile”. International energy agency. <https://www.iea.org/reports/uzbekistan-energy-profile>
17. Presidential Decree “Strategy for the Transition of the Republic of Uzbekistan to the Green Economy for the Period 2019-2030”. No. PP-4477 of 4 October 2019. <https://lex.uz/en/search/all?actnum=4477&lang=4>
18. Paris Agreement. United Nations. UN Climate Change Conference (COP21) in Paris. 12 December 2015. <https://www.un.org/en/climatechange/paris-agreement>
19. Saidova, Munisa; Yadgarov, Akram; Kodirova, Dilrabo; Turdialiev, Jamol; Embergenova, Gulayxan. Econometric analysis of the influence of climate characteristics on the ecological condition of soils and the productivity of agricultural crops. E3S Web of Conferences. International Conference on Energetics, Civil and Agricultural Engineering, ICECAE 2022Tashkent14 October 2022. <https://www.scopus.com/record/display.uri?eid=2-s2.0-85152684436&origin=resultslist&sort=plf-f>
20. Yadgarov A. (2020). AgroInsurance-As A Mitigating Financial Lever For Climate Change In Agriculture. International Journal of Advanced Science and Technology, 29(7), 2251 – 2258. <http://serisc.org/journals/index.php/IJAST/article/view/17501>.

ENGLISH LANGUAGE TEACHING METHODOLOGY

**Mirzabekova Nargiza Rakhmatovna**

MIA of the Republic of Uzbekistan No. 1 Tashkent academic

Lyceum English teacher

**ABSTRACT**

This research paper aims to identify the methodology of teaching English language at Primary School children and strategies to enhance the language skills. It is obvious that more than 50% of world population is bilingual. Thus, demand on language learning is growing up to day. The acceleration of globalization processes in the world, the transition to free market relations and the promotion of the introduction of high technologies in production increase the need for "linguistic capital", i.e. specialists who have a perfect command of foreign languages (especially English). In order to ensure quality and efficiency in foreign language education, the experience of reducing the age of learning/teaching foreign languages is becoming popular. This was caused by the widespread concept of "the younger the better / early is better". Hence, the authors try to scrutinize deeply the methodology of teaching English language and means of enhancement of language skills. It can be summed up that according to the research results, at present, that the results are unsatisfied. The authors find research gap in the field of language learning process. Below, some suggestions and language learning strategies are given for further investigations.

**Keywords:** teaching English; language learning; primary school; language skills; bilingual; methodology.

**INTORUCTION**

In this fast growing competitive world English has been spoken by one quarter of world's population. (1), English language has become a compulsory link language, "the lingua franca" (language that is adopted as a common language between speakers whose native languages are different) (2) in the world of language acquisition and in school education, it has been adopted as a subject, medium of instruction and examination as well. Most of the students learn English to enhance their competence and efficacy in education, training and work. Though their mother tongue and medium of instruction varies from one another their choice of second language in the school is undeniably English. Out of the world's approximately 7.5 billion inhabitants, 1.5 billion speak English that's 20% of the Earth's population. (2) However, most of those people aren't native English speakers. Such learner remains deficient to face the interview and participate in group discussions which make them feel inferior in the job market and work environment. The main obstruction for them to learn the language is the medium of instruction, students from medium of English could speak the English language comparatively better than the other medium of instruction, "once in a blue moon" some students pick up speaking English even from other medium, vise- verse English medium students fails to come up to acceptable standard to communicate fluently in English. In this case students of different backgrounds commit different types of errors in the learning process such as pronunciation, spelling, grammar and vocabulary usage. (3)

Mostly students pacify themselves for not speaking English fluently because of their medium of instruction, ambiance and background. This hitch will not highly impact them until they get

decline in the interviews and failure in competitive exams. The diplomatic ways to learn English language are as follows:

- Grammar-cum-Translation Method.
- The Direct Method.
- The Audio-Lingual Method.
- Communicative Language Teaching.
- Total Physical Response.

In language training Teachers play a vital role “A good learner can only be a good teacher” (5) that every teacher should bear in mind, and our teaching methods are changing every now and then according to the advancement of the technologies so teachers are also expected to be updated accordingly. In learning a new language process listening, reading louder and writing are the key factors to improve the vocabulary and mirror practice and practice is to gain confident for the learners, it's a challenge for the teachers to handle these types of students because they are late adolescents and matured so they cannot be treated so childish by giving them homework, imposition and punishment etc., but at the same time they have to be taught the basic things like rules of grammar and so on. This study intends on a comparative analysis of the students difficulties faced while learning English as a language from English medium students and other medium of instruction. The difficulties encountered by the students when they were taught in the similar manner. To carry out an analytical study, we underwent two stage of field work: (a) conducted analytical test and (b) personal interview for both the set of medium students and some teachers. The aim was to get a honest feedback and to analyze the data and bring out remedies and suggestions.

## II .Motive of the study

In the language learning process different background students faces different types of problems in making mistakes while speaking a second language and the teacher's effort to analyze the error and to overcome the issues like grammar, vocabulary, fluency and pronunciation, also to conquer the fear of speaking a second language without errors.

### 1. Grammar-cum-Translation Method.

The name itself explains the functionality of the grammar-cum-translation method. This is one of the popular methods of teaching English in grammar orientation. However, it depends on a ton of interpretation. The technique is the conventional or 'old style' language learning method. A few nations approach this teaching style. The fundamental thought behind this strategy is that the students become familiar with all grammar rules to translate various sentences easily. Yet, many teachers recognise this technique as incapable since it does not include the spoken form of the language and communication skills are ignored. Furthermore, it does not allow the learners to think directly in the target language. Thus, it hinders the creation of a direct link between thoughts and expression. Consequently, this technique doesn't improve the student's communicative ability in the language but builds strong language writing skills.

### 2. The Direct Method.

The audio method is also known as the direct method, which involves thinking And speaking in English. Here the communication between the teacher and the student is strictly in English, and the student is barred from using their native language This way, the student can get a strong hold on the accent and fluency, the frequency of grammatical errors in this would

be less. This method is widely used as it helps the students learn the English language in a way a native English speaker would speak like and not the orthodox textbook way. The following principles and procedures that guide the natural method are,

Teachers and students both use the target language in the classroom.

Students tend to have daily sessions on vocabulary and sentences.

Grammar is instructed inductively.

### 3. The Audio-Lingual Method.

The audio-lingual method is also recognized as the Army Method. During the first world war, the American Armed forces started escalating oral courses known as the 'Military particular Training Program' (ASTP). Instructive organisations later received it as an audio-lingual method. It is among the common methods of teaching English and striking highlights of the audio-lingual method are,

Language teaching starts with communication; the material is educated before it is offered in composed structure.

The objective language is the study hall's main language; the student's primary language isn't utilised.

The teacher is the role model for the student; student-to-student interaction happens in chain drills.

The army method is identified with the natural method. The most significant difference between the audio-lingual method and the natural method is its focal point of teaching.

### 4. Communicative Language Teaching.

The thought behind this method is to help students convey all the more successfully and effectively in a sensible situation they may wind up in. So, this teaching includes focusing on essential capacities like thanking, complaining, suggesting, inviting, and requesting directions to give some examples. There are some learning and teaching techniques that can be used in Communicative Language Teaching class, for example, role play, information gap, language exchanges, simulation, discussion, games, pair work, and group work. All these techniques can engage the learners in the communication process. The Communicative Language Teaching approach focuses on giving students the skills to clearly and confidently communicate in real-world situations with native speakers of their target language.

### 5. Total Physical Response.

Total Physical Response, also called TPR, is a method that follows 'learning by doing'. For example, the new learner will learn English through a series of activities, "Close the door", "Stand up", "Open your book", and "Stroll to the window and open it." With TPR, the most significant aptitude is aural perception, and everything else will be regular. The majority of class time in TPR lessons is spent doing drills in which the instructor gives commands using the imperative mood. Students respond to these commands with physical actions. In the beginning, students learn the meaning of the commands they listen to by direct observation. After they learn the meaning of the words in these commands, the teacher provides a command that uses novel combinations of the words the students have learned.

## **REFERENCES**

1. Abdullaev, R. (2021). The impact of national independence and globalisation on the status of English language instruction within Uzbekistan. *New Challenges to Education: Lessons from around the World*, 19, 133–137. <https://files.eric.ed.gov/fulltext/ED613959.pdf>

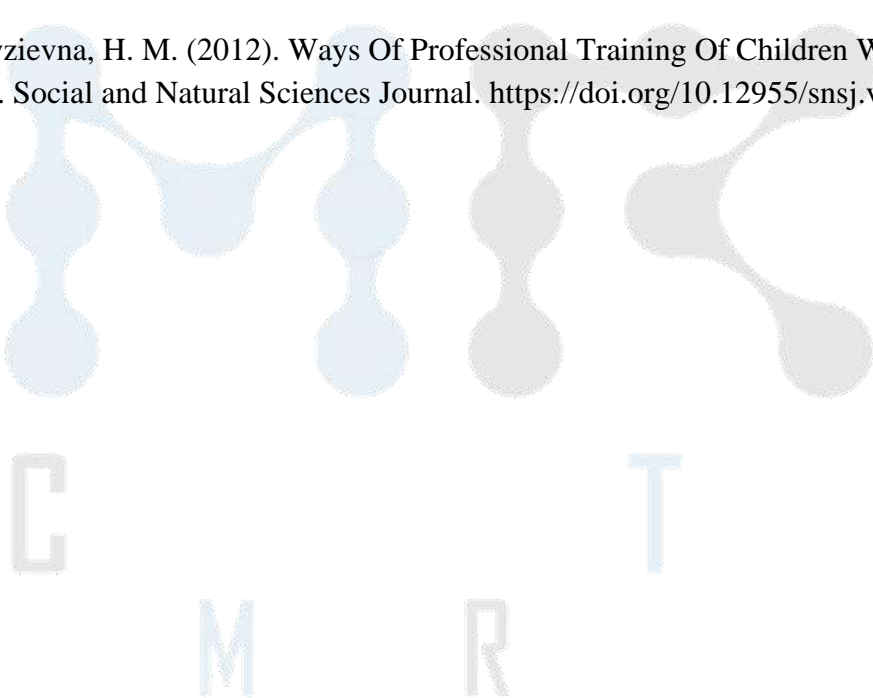
2. Bolsunovskaya, L. M., Phillips, C., Korotchenko, T. V., Matveenکو, I. A., Strelnikova, A. B., & Ulyanova, O. S. (2015). Project-based Method in Teaching Foreign Language for Specific Purposes. *Procedia - Social and Behavioral Sciences*, 215, 176–180. <https://doi.org/10.1016/J.SBSPRO.2015.11.615>

3. Calafato, R. (2021). “I’m a salesman and my client is China”: Language learning motivation, multicultural attitudes, and multilingualism among university students in Kazakhstan and Uzbekistan. *System*, 103, 102645. <https://doi.org/10.1016/J.SYSTEM.2021.102645>

4. Čoh, M. (2021). MOTOR AND INTELLECTUAL DEVELOPMENT IN CHILDREN: A REVIEW. *Facta Universitatis, Series: Physical Education and Sport*. <https://doi.org/10.22190/fupes200918049c>

5. Cronin, C., Hungerford, C., Wilson, R. L., Falkingham, J., Evandrou, M., Qin, M., Vlachantoni, A., Lopes, J. Z., Williams, W. J., Richard, D. D., Johnson, L. M., Zenouzi, M., Dow, D. E., Fraser, A., Whitley, E., Johnman, C., Alvergne, A., Garcia, J. F. R., Caldeira, J. M. L. P., ... Moncur, W. (2020). Menopause: Deficiency Disease or Normal Reproductive Transition? *Maturitas*.

6. Fayzievna, H. M. (2012). Ways Of Professional Training Of Children With The Limited Opportunities. *Social and Natural Sciences Journal*. <https://doi.org/10.12955/snsj.v4i0.289>





**About the finance and auditing activities of the states in Uzbekistan in the early periods and its legal foundations.**

**Хо'jabekova Ulug'oy Ithom qizi**

2nd year student of Jizzakh Polytechnic Institute

**Abstract:** In this article, some theoretical issues of studying the history of state finance in Central Asia in ancient times, as well as state management and management expenses, state treasury and state income, and the legal basis of audit activity are explained in this article.

**Аннотация:** В данной статье излагаются некоторые теоретические вопросы изучения истории государственных финансов в Центральной Азии в древности, а также государственного управления и управленческих расходов, государственной казны и государственных доходов, а также правовые основы аудиторской деятельности.

**Key words:** Central Asia, finance, state treasury, income, audit activity, exploitation, expenses.

**Ключевые слова:** Средняя Азия, финансы, государственная казна, доходы, аудиторская деятельность, эксплуатация, расходы.

One of the oldest countries in Central Asia is Uzbekistan. Uzbekistan and the Uzbek people occupy a very important place in the history of all Turkic countries and all Turkic peoples in Asia. In this regard, while studying the history of state finance, we have to analyze it in the context of the origin of the state in Central Asia, especially in Uzbekistan. The origin of the state in the territory of Central Asia, especially in the region of Uzbekistan, took place 2700 years ago, that is, in the 7th century BC. Of course, this process did not take place without the participation of states. The state was first formed on the scale of some districts, then cities, regions. We can state the desire to form a centralized state mainly for 3 reasons. First, it required the active participation of the public in the organization of irrigated agriculture, the digging of tens of kilometers of canals, the opening of new lands, the construction of palaces, defensive walls, and military fortifications. The involvement of thousands of people was not without the participation of the state. Secondly, he demanded the formation of material and monetary funds for the implementation of tasks before the state. Thirdly, it requires the protection of the country from the attacks of foreign countries, as well as the development of trade and other economic relations with neighboring countries, etc. The implementation of all the mentioned tasks created great conditions for the origin of centralized states and their finances. As we know from history, one of the main characteristics of slavery is that the slave is considered the personal property of one or more masters. Secondly, not having the means of production, and thirdly, the slave is forced into exploitation in an uneconomic way. The word Exploitation means use, use and profit. We can understand that the owners of the means of production appropriate the product of others' labor. Although such principles existed in the territory of Uzbekistan for crafts and trade, but serfdom in the agricultural sector had such characteristics that these characteristics show that it did not differ sharply from feudalism. For example, Koshavarz served in production during the Kushan period and grew crops. The military nobles were landowners, called "peasants", peasants were like the Russian landowners in feudalism, with servants, large gardens, livestock, a quarter of slaves, and even many wives and concubines. has been. They distributed the material goods created by the farmer at their discretion. A small part of these benefits was left to the koshavarz, and the rest was owned by the farmer. He gave a part of the additional product to the state in the form of taxes. When we talk

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

about some countries with these relations, it is difficult to determine whether they lived under feudalism or slavery. In most cases, their state revenues and expenditures differ little from each other. Fulfilling the priority tasks of the development of the Republic of Uzbekistan, developing the economy in a stable and balanced manner, taking a strong place in the world markets, ensuring consistent economic growth based on these, fully and effectively implementing the tasks of further increasing the standard of living and well-being of the population. In the current situation, a thorough study of the mechanisms of public finance remains more relevant than ever. For this reason, specialists working in the State Finance System are required to know the mechanisms of correct and effective organization of state financial relations and to be able to apply them in practice. An effective state is necessary for the normal socio-economic and political development of any country. The state creates the legal basis of regulatory and institutional structures for the production and provision of necessary goods and services to the society and the citizens of the country, for the effective functioning of the economy and social networks, and thereby creates material and other conditions for the living and work of its citizens. perform tasks of giving. State finance is a set of relationships related to the formation of centralized monetary revenues of the state and their use in various directions in order to fully fulfill their functions. Based on the diversity of these relations, a number of specific organizational forms of state finance are formed. These are: the state budget, non-budgetary special funds of the state, state credit and finance of state enterprises. According to its economic content, state finance is the formation of financial resources at the disposal of the state and its state-owned enterprises and the implementation of expenses for expanded reproduction, meeting the growing socio-cultural needs of society members, national defense and state administration. is a set of monetary relations that occur on the basis of the distribution and redistribution of the value of the gross domestic product. State finance is a set of economic relations arising in real money circulation related to the formation, distribution and use of centralized funds of financial resources. The material basis of financing is money circulation. State finance is financial relations in the field of organization, distribution and, at the same time, spending of money reserves at the disposal of the state. The funds of the state finance are used for national interests and serve to fulfill the functions of the state. Public finance includes money reserves, financial mechanism, financial institutions, offices and financial policy of the state. It is divided into such types as the state budget, local municipal budgets, finances of state enterprises, their budgets, special funds belonging to the government, state credit, state borrowing and lending instruments. Currently, public finance is of great importance in the implementation of the economic and financial policy of the state. It is a leading tool in ensuring repeated labor processes, increasing the material and spiritual well-being of the people, providing funds to state bodies, growing the country's economy, financing the national economy, social sphere, investing the economy, social protection of the population, ensuring national security, state administration, and others. is considered. Finances of all existing enterprises and sectors of the national economy are the main source of state finances and reserves of the financial system. In the past years, the normative legal and methodological basis of auditing was formed in our country, as well as a simplified and unlimited system of auditing activity licensing was introduced, which made it possible to form the market of auditing services and ensure the entry of local auditing organizations into large international networks of auditing companies. At the same time, a number of problems and shortcomings are preventing the further development of audit activity, increasing the importance of audit services for making management decisions and improving the quality of corporate governance. Audit services that help solve these problems have begun to form. Its main task is to provide unbiased

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

feedback on reports presented to information users. Auditors perform this task competently, as they have sufficient knowledge and experience, as well as access to accounting documents and supporting information. In addition, they do not obey the administration of the enterprise and are free from its pressures. In the conditions of economic liberalization and deepening of reforms aimed at strengthening the foundations of the market economy in our Republic, the audit service, which ensures the stability of the banking and financial system, is of great importance. In the years of independence, special attention is paid to the development of audit activity. Wide opportunities are created for organizations operating in this field and for scientists and researchers conducting scientific research aimed at developing the theoretical foundations of audit activity. The term audit is derived from the Latin language and means "listener", "to hear". There are different views on the introduction of this term into practice. We can divide them into the following three main groups: 1. In ancient times, when people still did not know the art of reading and writing, the ruler of a region constantly felt the need for information about the amount of his wealth. Then the ruler used the services of preliminary auditors, that is, the wealth owned by this ruler, in particular, the employees who were responsible for looking after and caring for the cattle, described and told the auditors about these wealth at a certain time of the year. After some time, the same auditor listened to these employees again and reported to the ruler about the difference between the previous and the following information, or the absence of such differences. 1 According to the second view, During the Middle Ages, in Western countries, the public finance office read out the final annual financial information to the general public. Through this broadcast, he made sure to the public that the taxes paid are used for the right purposes, without allowing extravagance. In this process, the public played the role of auditor, i.e. "listener". 2 And the third view is that the teachers who teach in the religious institutions of Western countries, that is, the monasteries, are the most important among their students. Those who selected talented students who mastered the lessons at the required level and entrusted them with the task of checking that the rest of the students read the book without mistakes by listening. Based on this point of view, the term auditor, i.e., "listener" came into practice based on its application to these gifted students. 3 Although these views put forward different opinions about the origin of the term audit, they have commonalities about the essence of audit. This commonality is that in each of the above situations, the auditor: - gained public trust and stood out from others with his certain skills and knowledge. In addition, he appears as a person who has served the welfare and development of the society.

To sum up, this article provides information about the stages of the creation and development of the financial system of Uzbekistan, one of the countries in Central Asia, and the solution of the shortcomings in the financial system based on audit conclusions. In addition, the legal basis of auditing activity is explained. Auditing, like a number of other practical fields, is considered to have its own subject and methodology of studying this subject. The subject of inspection in this field is, first of all, the financial reports of the enterprise. The independent auditor is requested to certify that these financial statements are prepared in accordance with the requirements of the law and that they provide accurate and complete information about the financial position, changes in the financial position and cash flows of this enterprise. The set of measures used is the methodology of the audit investigation.

References:

1. D. Taylor, G. Glezen «Auditing: integrated concepts & procedures».
2. P. A. Алборов, Л.И. Хоружий, С.М. Концевая «Основы аудита». — М: «Дело и сервис», 2001.
3. Fayziev Sh.N., Dusmurotov R.D., Karimov A.A., Kuziev I.N., Avlokulov A.Z. Audit: Darslik -T.: «Iqtisod-Moliya», 2015y. – 430 b.
4. Tuychiev A., Qo'z'iev I., Avloqulov A., Sherimbetov I., Avazov I. Audit. Darslik. – T.: «Iqtisod-Moliya», 2019. – 620 b.
5. Kuziev I., Tuychiev A., Xojiev M., Yakubov M. Vnutrenniy audit. «Iqtisod-Moliya», 2019 g. – 421 str.”
6. Do'smurotov R.D. Audit asoslari.-T.: O'zbekiston milliy entsiklopediyasi. 2003.-612 s.
7. Audit. Darslik 1-jild. M.M.Tulaxodjaeva, Sh.I.Ilxomov, K.B.Axmadjonov va boshq.- T.: NORMA.-2008.-320 b.
8. Audit. Darslik 2-jild. M.M.Tulaxodjaeva, Sh.I.Ilxomov, K.B.Axmadjonov va boshq.- T.: NORMA.-2008.-320 b.
9. O'zbekiston Respublikasi «Auditorlik faoliyati to'g'risida»gi Qonuni (yangi tahriri). 2000 yil 26 may. 78-II-son.
10. O'zbekiston Respublikasi Prezidentining 2018 yil 19 sentyabrdagi “O'zbekiston Respublikasida auditorlik faoliyatini yanada rivojlantirish chora-tadbirlari to'g'risida”gi PQ-3946-son Qarori
11. O'zbekiston Respublikasi Prezidentining 2019 yil 17-yanvardagi “2017-2021 yillarda O'zbekiston Respublikasini rivojlantirishning beshta ustuvor yo'nalishi bo'yicha harakatlar strategiyasini" faol investitsiyalar va ijtimoiy rivojlanish yili"da amalga oshirishga oid davlat dasturi to'g'risida”gi PF-5635-sonli Farmoni.
12. O'zbekiston Respublikasi Vazirlar Mahkamasining 2017 yil 12 maydagi 274-sonli «Auditorlik tashkilotlari faoliyatining huquqiy asoslarini yanada takomillashtirishni ta'minlash bo'yicha qo'shimcha chora-tadbirlar to'g'risida»gi Qarori.
13. O'zbekiston Respublikasi moliya vazirining 2018 yil 21 dekabrdagi “Auditor malaka sertifikatini berish tartibi to'g'risidagi nizomni tasdiqlash xaqida”gi 3105 sonli buyrug'i.
14. Audit va sifat nazoratining xalqaro standartlari. 2012. 1 qism, 3-jild. -T.: O'BAMA, 2014.-1049 b.
15. “O'zbekiston Respublikasini yanada rivojlantirish bo'yicha harakatlar strategiyasi to'g'risida”gi O'zbekiston Respublikasi Prezidentining 2017 yil 7 fevraldagi PF-4947-sonli Farmoni.
16. Arens A., Lobbek Dj. Audit. Per. s angl. pod red. Ya.V. Sokolova. - 2013. -560s.
17. Fayziev Sh.N., Karimov A.A. Audit. Uchebnoe posobie. –T.: «IQTISOD-MOLIYA», 2013. -S. 157-158.
18. Sheremet A.D., Suyts V.P. Audit. Uchebnik.- M.: INFRA-M, 2009. -456 s.
19. World Trade Statistical Review 2019 - World Trade Organization.
20. 4. G'aybullayev Sarvar O. et al. O 'ZBEKISTONDA ISTE'MOL SAVATCHASI HOZIRGI HOLATINI VA UNI SHAKILLANTIRISH YO'NALISHLARI //Talqin va tadqiqotlar ilmiy-uslubiy jurnali. – 2022. – T. 1. – №. 4. – C. 119-125.

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

21. 5. Nizametdinov A., Ahmedova H. Elektron taʼlim metodologiyasi rivojlantirish-ning usullari //Zamonaviy innovatsion tadqiqotlarning dolzarb muammolari va rivojlanish tendensiyalari: yechimlar va istiqbollar. 2022. – T. 1. №. 1. – C. 29-31.
22. 6. Muxtarov B., Murotjonova M. Oʻzbekiston respublikasida kichik biznes va xususiy tadbirkorlik subʼektlarining rivojlanishi //Zamonaviy innovatsion tadqiqotlarning dolzarb muammolari va rivojlanish tendensiyalari: yechimlar va istiqbollar. 2022. – T. 1. – №. 1. – C. 581-584.



CHEMICAL AND BIOLOGICAL PROPERTIES OF IRRIGATED SIEROZEM-MEADOW SOILS

Olimaxon Ergasheva, Nargiza Paxradinova, Lazizakhon Gafurova

National University of Uzbekistan, Uzbekistan

[o.ergasheva@nuu.uz](mailto:o.ergasheva@nuu.uz)

**Abstract.** The agrochemical, chemical, agrophysical, and biological activity of the irrigated sierozem-meadow soils in the conditions of the Khavas district of the Syrdarya region was comprehensively studied. Soils are of varying degrees of salinity, and their content of ammonifiers, spore formers, actinomycetes and nitrogen fixers has been determined according to the salinity level and types. In the conditions of irrigated sierozem-meadow soils, changes in biological activity were observed in winter wheat and repeated mash crop fields according to options, and the number of soil ammonifiers, nitrogen fixers, axinomycetes and spore-forming microorganisms in the mash planted area. As soil salinity increased, it was found that ammonifiers and nitrogen fixers decreased. According to the soil profile, the most amount of microorganisms was observed in 0-15 cm and 15-30 cm. The pattern of distribution of phytonematodes in irrigated sierozem-meadow soils according to the level of salinity was also determined.

**Key words.** Sierozem-meadow soils, salinization, biological activity, phytonematodes

## INTRODUCTION

According to UN data, 12 million people in the world every year. about one hectare of fertile land is out of production due to various reasons, as well as 1 bln. It is shown that the population is malnourished. Increasing the productivity of the soil requires a rational use of land and water resources, which creates the problem of establishing the process of obtaining a high yield and high-quality product in an ecologically reasonable manner. In this case, the differentiated application of a set of agro-ameliorative, agro-technical and agro-chemical measures and the placement of crops taking into account the soil-climatic conditions are important in the sustainable development of agriculture [15,17].

One of the reasons for the decrease in soil fertility is the decrease in humus and nutrients. Nutrient elements removed to improve soil fertility: nitrogen, phosphorus, potassium, copper, molybdenum, zinc, cobalt, sulfur, calcium and such other macro- and microelements, using various organic fertilizers and composts rich in nutrients excluding toxic substances are effective methods [16].

A group of microorganisms and pedofauna play an important role in increasing soil fertility and soil formation processes.

In the stabilization, restoration and increase of soil fertility, the use of microbiological biopreparations and the planting of repeated leguminous crops improve soil humus, agrochemical properties, biological activity, soil structure and density, and optimize the supply of water and nutrients, activation of microbiological processes and soil fertility increases [1,3,13].

Research object and used methods. An experiment was conducted on irrigated sierozem-meadow soils of Khavos district of Syrdarya region with varying degrees of salinity. Scientific research, taking soil samples by genetic layers, observations, chemical and biological analyzes of UzPITI "Metody agrokhimicheskix, agrofizicheskix i mikrobilochicheskix issledovaniy v polivnyx

hlopkovyx rayonakh", "Rukovodstvo po khimicheskomu analizu pochv" by E.V. Arinushkina and soil and microbiological analysis methods accepted at the Institute of Soil Science and Agrochemistry and Microbiology Institute of UzFA were carried out.

**The obtained results and their analysis.**

Soil salinity varies with its level, salt content, location of the saline horizon, and depth of groundwater.

The amount of physical clay (<0.01 mm) in soils is 24.2% in the arable layer and 17.6% in the sub-arable layer. Soils are mainly sandy and light sand, sometimes in the lower parts of the profile there are medium sandy layers.

The volume mass of the upper driving layer of the irrigated sierozem-meadow soils is 1.45-1.48 g/cm<sup>3</sup> and becomes denser towards the lower layers, and accordingly, the porosity also decreases to a certain extent. According to the level of nutrient supply, it is classified into very low and low supply groups.

Irrigated sierozem-meadow soils were formed in conditions where the ground water level, which has a certain influence on the processes of soil formation, is located at a depth of 2-3 m. Their water regime is irrigation. These soils are (intermediate) soils transitioning from sierozem soils to sierozemland soils. The transition of sierozem soils to sierozem-meadow soils is associated with the rise of groundwater and strong wetting of the lower part of the soil profile. The location of mineralized ground water near the surface of the earth accelerates the salinization processes, resulting in the salinization of the ground [12,16].

Information about the salinity levels of the soil of the experimental area, the content of salts in the soil, and the amount of carbonates is given.

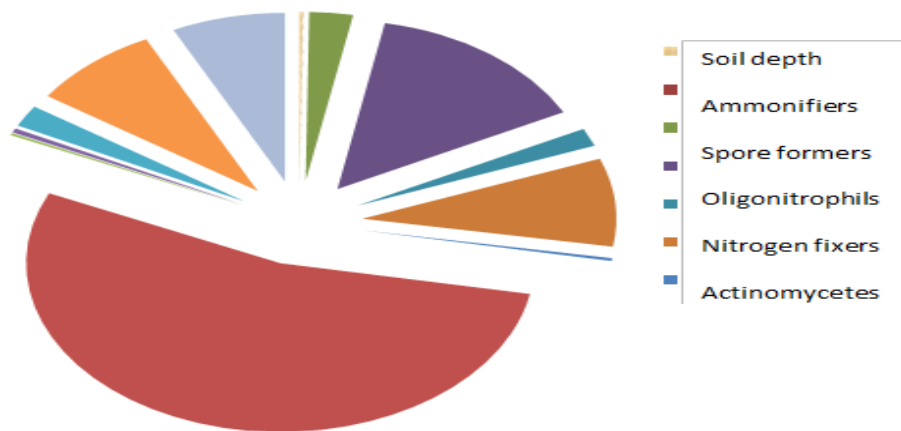
According to the degree of salinity, soils are divided into weakly, moderately and strongly saline groups. Chlorine takes the main place in the composition of salts that are easily soluble in water, in some cases they are found in a certain proportion with sulfates.

According to the type of salinity of the irrigated sierozem-meadow soils of the studied area, they are chloride-sulfate and sulfate-chloride. Some of the soils are characterized by plastering. According to the amount of gypsum, it is divided into groups with weak and moderate gypsum. According to the data of these tables, the amount of dry residual salts from the surface to the gypsum layer in irrigated sierozem-meadow soils is 1.920-2.588%, in the gypsum layer is 2.012-2.458%, in the sub-gypsum layer is 1.708-1.812%, and the amount of chlorine ions in the composition of salts is 0.590-0.652 %, sulfate ion is 0.693-0.710%. The carbonation of the soil section (profile) is uniform (7.0-8.9% SO<sub>2</sub>, carbonates), we can see that calcium carbonate (CaCO<sub>3</sub>) content is relatively predominant in the carbonates.

In order to improve soil fertility, it is specially noted that the land areas should be alternated and replanted. As a result of the cultivation of leguminous plant species, a fine-grained and granular water-retaining structure is formed in the soil layer. In this case, the root system of the main crop and leguminous crops penetrates to different depths in the soil layer, and in turn, after harvesting, it is observed that different amounts of root residues remain in the soil [3,6,7,14].

Under the influence of plant residues, different amounts of organic matter remain in the soil layer, and in turn, there is an opportunity to maintain the value of soil fertility and get a higher yield from agricultural crops during the next year even without significant expenses. It is known that the biological activity of soils is one of the relatively accurate indicators of fertility and also plays an important role in the assessment of the ecological status of soils. According to the results obtained in

the conducted studies, the indicator of the amount of microorganisms is also determined by the change in the number of microorganisms in the soil layer after the autumn wheat and leguminous crops.



**Figure.1 Quantification of microorganisms in irrigated sierozemland soils**

In the control variant, ammonifiers, oligonitrophiles, nitrogen fixers, actinomycetes and fungi were determined in the count of 1000 cells in 1 g of soil. The number of ammonifiers (0-15cm) is  $30 \times 10^4$  thousand colony-forming units (KHB) cells, (15-30cm)  $33 \times 10^4$  thousand (30-50cm) is  $25 \times 10^4$  thousand, oligonitrophils (0-15cm)  $39 \times 10^4$  thousand, (15-30 cm)  $24 \times 10^4$  thousand, (30-50 cm)  $19 \times 10^4$  thousand, nitrogen fixers (0-15 cm)  $2 \times 10^3$  thousand, (15-30)  $3 \times 10^4$  thousand, (30-50 cm)  $3 \times 10^4$  thousand, actinomycetes (0-15 cm)  $2 \times 10^4$  thousand, (15-30 cm)  $3 \times 10^4$  thousand, (30-50 cm)  $4 \times 10^4$  spore formers (0-15 cm)  $13 \times 10^3$  thousand, (15-30 cm)  $18 \times 10^3$  thousand, (30-50 cm)  $6 \times 10^3$  thousand colony forming unit (KHB) cell number was determined.

After a repeated crop of mash plants, these indicators are as follows; the number of ammonifiers (0-15cm),  $91 \times 10^4$  thousand colony-forming units (KHB) cells, (15-30cm)  $96 \times 10^4$  thousand (30-50cm)  $69 \times 10^4$  thousand, oligonitrophils (0-15cm)  $37 \times 10^4$  thousand, (15-30cm)  $38 \times 10^5$  thousand, (30-50cm)  $12 \times 10^5$  thousand, nitrogen fixers (0-15cm)  $12 \times 10^4$  thousand, (15-30)  $6 \times 10^4$  thousand, (30-50cm)  $6 \times 10^4$  thousand, actinomycetes (0-15cm)  $3 \times 10^4$  thousand, (15-30 cm)  $6 \times 10^4$  thousand, (30-50 cm)  $4 \times 10^4$  thousand, spore-forming units (0-15 cm)  $16 \times 10^3$  thousand, (15-30 cm)  $27 \times 10^3$  thousand, (30-50 cm)  $7 \times 10^3$  thousand colony-forming unit (KHB) cells was determined. According to the results of the experiment, it was observed that the amount of ammonifiers in 1 gram of the soil of the area planted with mash was  $61 \times 10^4$  thousand at 0-15 cm,  $63 \times 10^4$  thousand at 15-30 cm, and  $44 \times 10^4$  thousand at 30-50 cm. Accordingly, the number of oligonitrophils, nitrogen fixers, actinomycetes, spore-forming microorganisms also increased.

As a result of the study of the fauna of phytonematodes in wheat agrocenoses with varying degrees of salinity, irrigated sierozem-meadow soils, 33 species and 1173 individuals of phytonematodes were identified. Identified phytonematodes belong to 2 subclasses, 7 genera, 16 families, and 21 genera [4,8,10].

The analysis of phytonematodes identified in irrigated sierozem-meadow soils with varying degrees of salinity by genera showed that Tylenchida, Dorylaimida, Aphelenchida genera are diverse in terms of nematode types and numbers. Representatives of the Tylenchida family were especially abundant in our samples. The genera Enoplida, Rhabditida, Plestida and Mononchida were very rare compared to other genera.



## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

A.A. phytonematodes found in soils with different levels of salinity. It was divided into 5 ecological groups according to the classification of Paramonov (1962). pararhizobionts, eusaprobionts, devisaprobionts, non-specialized phytohelminths and specialized phytohelminths.

It is known that pararhizobionts are soil nematodes living around roots. Pararhizobionts feed on plant sap. Representatives of this group have a spear or stylet in their stoma (mouth cavity) and suck the sap of plant tissue with the spear or stylet. Nematodes found around the roots can also move into the plant tissue. Parasitic species are also inoculators that infect plant tissue. There are 13 species of pararhizobionts in our samples - *Prizmatolaimis dolichurus*, *Prizmatolaimis primitivus*, *Ironus ignavis*, *Mylonchylus solus*, *Eudoraylaimus elegans*, *Eudoraylaimus monohustera*, *Eudoraylaimus obtusicaudatus*, *Eudoraylaimus pratensis*, *Eudoraylaimus parvis*, *E. sulphasae*, *Eudoraylaimus sp.*, *Mesodoraylaimus bastian*, *Drepanodorus laetificanus*. species met. The total number of individuals of pararhizobionts (136) was 11.6% compared to the number of other nematodes. Numerically *Eudoraylaimus parvis*, *Eudoraylaimus elegans* types were the majority. Pararhizobionts are abundant in highly saline soils.

Eusaprobionts - true saprobiotic nematodes were found in the studied soils and they are found in plant residues and various decaying organic matter and feed on detritus. Saprozoa reproduce very quickly, their life span is limited to a few days, for example, they develop and lay eggs in 3-4 days. Although these nematodes do not cause disease in the plant, they are of great importance in the process of rotting organic matter. 2 species from this group in soil samples - *Mesorhabditis monhystera*, *Rhabditis brevispina* met.

Eusaprobionts were mostly found in the upper layers of the soil, 0-10 cm, but were almost absent in the 10-20 cm layers. Representatives of this group were found in moderately saline soils.

Devisaprobionts are immature or semi-saprobionts, they live in the humus environment, feed like saprobionts, so these nematodes can also enter healthy plant tissue. Representatives of this group have a rough cuticle, strong growths on the head, with the help of which they have the ability to tear plant tissue. There are 3 types of representatives of this group - *Cephalobus persegnis*, *Eucephalobus laevis*, *Plectus parietinus* met Devisaprobionts constantly migrate in the soil, expanding the range of decay. The total number of individuals (48) of foreign species was 4.1%. They are more common in weak and moderately saline soils than in strongly saline soils.

Unspecialized phytohelminths are ectoparasites that eat plant cell membranes and feed on plant sap, but do not cause disease in the plant, but cause disease in plant tissues along with other organisms. Non-specialized phytohelminths - 12 species make up 304 25.9%, this group *Aphelenchus avenae*, *Aphelenchoides limberi*, *Aphelenchoides parietinus*, *Aphelenchoides xylophilus*, *Cryptaphelenchus latus*, *Aglenchus agricola*, *Tylenchus davaini*, *Filenchus filiformis*, *Tylenchus clavicaudatus*, *Fylenchus leptosome*, *Tylenchus sp.*, *Ditylenchus tulaganovi* types include. Unspecialized phytohelminths are more common in weakly saline soils.

Phytohelminths specialized in research - 3 types make up 652 55.6% of this group *Bitylenchus dubius*, *Ditylenchus dipsaci*, *Helicotylenchus multicinctus* It was found that the species met. Unspecialized phytohelminths are uniformly distributed in all soil layers in weakly saline soils. It was observed that phytonematodes differ in ecological-trophic composition in irrigated sierozem-meadow soils. Saprophages form the biocenotic complex of nematodes in humus soils. As a result of studying the fauna of phytonematodes in irrigated sierozem-meadow soils with varying degrees of salinity, it is explained that the composition of their species and ecological-trophic groups depends on the types of soil, its chemical composition of humus and salinity [2,5,9,11].

On the basis of the obtained results, the results of the studies carried out on the studied soil biological properties and the optimization of the activity of phytonematodes were noted in the fields planted with a repeated leguminous crop (mosh) after winter wheat.

### **CONCLUSION**

Irrigated sierozemland soils Microorganisms play an important role in increasing soil fertility and stability and in soil formation processes. According to the agrochemical and agrophysical properties of the soil in the studied area, according to the degree and type of salinity, it was noted that the number of microorganisms increased several times in the area planted with mash. Among the groups of microorganisms, the dominance of oligonitrophilic bacteria was observed. The second place in terms of quantity was occupied by ammonifiers and nitrogen fixers. It was noted that the relatively low number of microorganisms in the soil is positively influenced by the lack of temperature value or the lack of moisture, the low amount of organic matter in the soil depends on the salinity of the soil and the location of the soil.

In irrigated sierozem-meadow soils, phytonematodes have been found to differ in species diversity and quantity, which depends on the chemical composition of the soil and the level of humus. Saprophages formed the biocenotic complex of nematodes in humus soils. A comparative analysis of the qualitative and quantitative indicators of phytonematodes in soils with different levels of salinity revealed that phytonematodes are not uniformly distributed in the soils. Depending on the salinity level, the number of nematodes and the total number of phytonematodes decreased with increasing soil salinity.

### **REFERENCES**

1. Gafurova L., Axmedov A., Yamnova I., Ramazanov A. – Osobennosti zasoleniya gipsirovannix pochv podgornoy ravnini Golodnoy stepi. J.: «Vestnik agrarnoy nauki Uzbekistan», №1-2, T., 2007, - S. 24-29.
2. Gafurova L.A., Saidova M.E. Pochvi Priaral'ya i ix biologicheskaya aktivnost: Monografiya.-Tashkent, 2015. - S.53-54.
3. Gafurova L., Muratkasimov A., Yusupov H., Ergasheva O., Mahkamova D., Hakimova M. Current status of rainfed grey soil and ways of using them. International Journal of Psychosocial Rehabilitation ISSN:1475-7192. Vol.24 – Issue 8. - P. 6422-6434.
4. Gafurova L.A., Ergasheva O.X., Bioindication in ecological assessment of eroded soils in mountain areas // Journal of Critical Reviews ISSN- 2394-5125 Vol 7, Issue 2, 2020, p.288-291.
5. Djalilova G. T., Gafurova L.A., Kadirova D.A., Ergasheva O.X. Degraded soils of Surkhan-Sherabad valley and their biological activity // Journal of Critical Reviews ISSN: 2394-5125. Vol. 7, Issue 2, 2020, - P. 292-295. DOI: 10.31838/jcr.07.02.54.
6. Zelenskiy N.A. i dr. Rol' bobobix kul'turi biologizatsii zemledeliya. Uspexi sovremennogo yestestvoznaniya, № 8, 2005.
7. Kuziev R., Axmedov A., Gafurova L., Yamnova I., Turapov I., Bairov A. - Sovremennoe sostoyanie oroshaemix pochv Golodnoy stepi i ix meliorativnaya otsenka. J.: «Vestnik agrarnoy nauki Uzbekistan», № 4, T., 2006. - S. 35-44.
8. Kiryanova YE.S., Krall' E.L. Paraziticheskie nematodi rasteniy i meri bor'bi s nimi. - Leningrad: Nauka, 1971. - T.II. - 522 s.
9. Malaxov V.V., Rijikov K.I., Sonin M.D. Sistematika krupnix taksonov nematod: podklassi, otryadi, podotryadi // Zool. j., 1982. - T. 61.-Vip. 8. - S.1125-1134.
10. Maligin V.S. – Glubokiy zakritiy drenaj. Izd., SoyuzNIXI, T., 1939 - S.132.

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

11. Novitskaya N.V., Barzo I.T., Gorbach L.N. Vliyanie mineral'nogo azota na effektivnost' simbioticheskoy azotfiksatsii uroжайnost' bobovix kul'tur v lesostepi Ukraini. Vestnik Altayskogo gosudarstvennogo agrarnogo universiteta, № 9 (119), 2014.
12. Norqulov U. Sho'rxok gipsli tuproqlar melioratsiyasi. Toshkent, 2018-77 B.
13. Pulatova O.M. Izuchenie chislennosti anaerobnix azotfiksiruyushix bakteriy v serozemnoy pochve// V s'ezd mikrobiologov Uzbekistana. Tezisi dokladov, T., 2012.
14. Romanenko YE.N. Fauna pochvennix nematod i pochvenno-ekologicheskie zakonomernosti ix rasprostraneniya: avtoref. diss. kand. biol. nauk. -Moskva, 2000. – 18 s.
15. Ferris H. The importance of nematodes in ecosystems and their advantages as biological indicators // Abstracts of 1 st international symposium on nematodes as environmental bioindicators. Edinburgh. UK. 12-13 June 2007. 1p.
16. Hodda M. Phylum Nematoda Cobb, 1932 // Zootaxa, 2011. V. 3148. - P. 63-95.
17. Witkowsky T. Zmiany struktury zgrupowania nicieni gledowych w związku z'jego rozmieszczeniem w. rozmuch wartwach gloy // Studia Soc. Scient Torun. -1967. -Vol.9. -№ 1-2.-24 p.

QUYOSH AKTIVLIGI VA QUYOSH DOG‘LARINI O‘RGANISH

**Shaymardonova Sabohat Ziyodullo qizi**

Termiz davlat universiteti Fizika mutaxassisligi 1-kurs magistranti

**Abstract:** Ushbu maqolada quyosh aktivligi va quyosh dog‘lari va uning Yer sayyorasiga ta’siri aks ettirilgan. Quyosh osmondagi milliardlab yulduzlarning fizik tabiatini o‘rganishda muhim ahamiyat kasb etishi yoritib berilgan.

**Kalit so‘z:** Yer sayyorasi, Quyosh, Quyosh dog‘lari, Quyosh sirti, Quyosh aktivligi.

**A STUDY OF SOLAR ACTIVITY AND SUNSPOTS.**

**Shaimardonova Sabokhat Ziedullo kizi**

1st year master's degree in physics at Termiz State University

**Abstract:** This article describes the activity of sunspots and sunspots and their impact on the planet. It is explained that billions of stars in the starry sky are of great importance in studying the physical nature of Kyosh.

**Key words:** Earth, Sun, Sunspots, Sun's surface, Sun's activity.

Kunduzi olamni yoritib munavvar etadigan Quyosh, tunda miltillab nur sohib turadigan yulduzlar kabi Yer sayyorasiga eng yaqin yulduzdir. Yerdagi hayot Quyoshga bog‘liq ekanligini hammamiz yaxshi bilamiz. Quyosh nurisiz Yerdagi hayot vujudga kelmas edi. Quyosh nurisiz o‘simliklar dunyosi, hayvonot olami, odamlar ya’ni hayot omili ham bo‘lmas edi. Quyosh yulduzlar ichida yerga eng yaqini hisoblanadi. Quyosh osmondagi osmondagi milliardlab yulduzlarning fizik tabiatini o‘rganishda muhim ahamiyat kasb etadi. Quyosh sokin yulduz hisoblanib Yerdan qariyib 150 million kilometr uzoqlikda. Quyoshda bo‘ladigan o‘zgarishlarni maxsus apparatlar yordamida ko‘rish imkoniyatlari mavjud. Maxsus teleskoplar yordamida Quyosh atmosferasining uchta qatlamini kuzatishimiz mumkin. Fizik tabiatiga ko‘ra farqlanadigan bu qatlamlar fotosfera, xromosfera, va Quyosh toji deb ataladi.

Quyoshni ko‘rish chegarasida yotuvchi to‘lqin uzunliklardagi nurlarni chiqaruvchi Quyosh atmosferasining ostki qatlami fotosfera deyiladi. Aylanuvchi qatlam ya’ni fotosferani teleskopda kuzatganimizda Quyosh sirtida asalari uyasini eslatuvchi ajoyib katakchalardan iborat ekanligini ko‘ramiz. Ular granulyatsiya deb ataladi va yunoncha so‘z bo‘lib (“granul” – donador demakdir). Granullarning uzunligi ba’zan 500–700 kilometrgacha yetadi va fotosferasida granulyatsiyasidan tashqari, yuzasi bir necha million kilometr kvadrat keladigan shulalanuvchi maydonlarni va qora dog‘larni ham ko‘rishimiz mumkin bo‘ladi.

Xromosfera Quyosh atmosferasining o‘rta qatlami bo‘lib, qalinligi taxminan 12–15 ming kilometrga yaqin. Xromosfera yunonchadan olingan bo‘lib (“xromos” – rangli demakdir). Xromosfera nurlanishi fotosferaga nisbatan juda kuchsiz bo‘lib, asosiy nurlanishi bir necha kuchli spectral chiziqlarning to‘lqin uzunliklaridagina kuzatishimiz mumkin bo‘ladi.

Quyosh toji Quyosh atmosferasining sirtki qismi bo‘lib, baalndligi turli radial va yo‘nalishlarda turlicha bo‘ladi. Ba’zi radial yo‘nalishlarda Quyosh tojining balandligi 10 million

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-, ISSUE-1

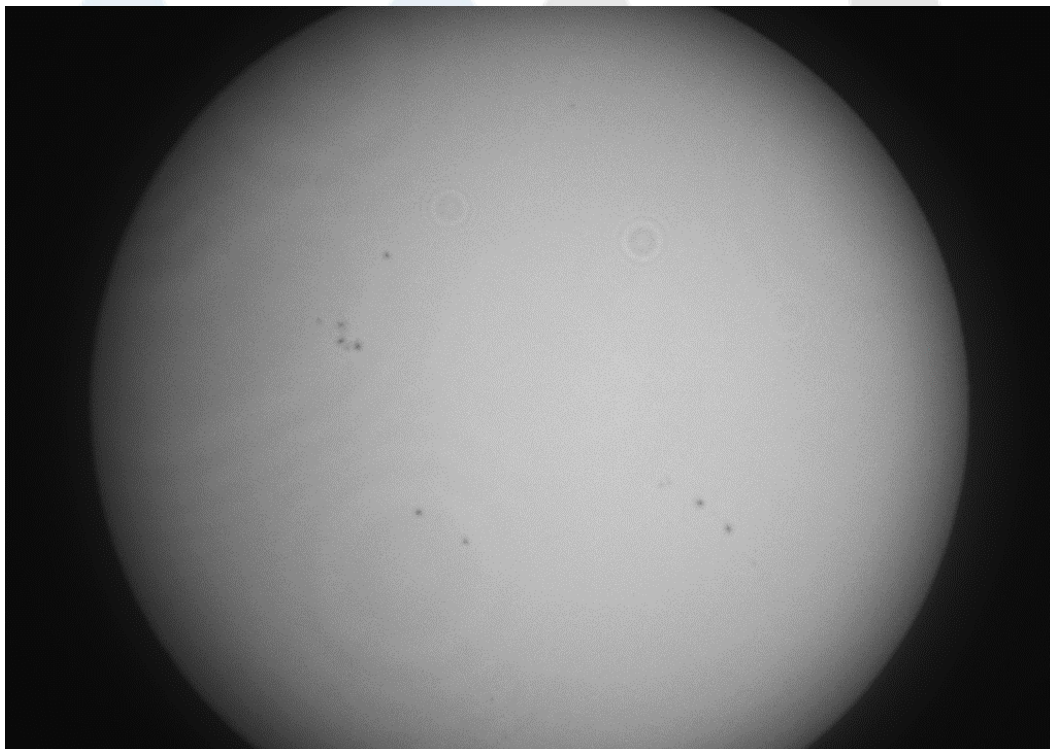
kilometrgacha yetadi. Quyosh tojining ravshanligini oyning to'lin Oy fazasidagi ravshanligi ham yetmasligi tufayli uni oddiy ko'z bilan ko'rishning iloji yo'q.

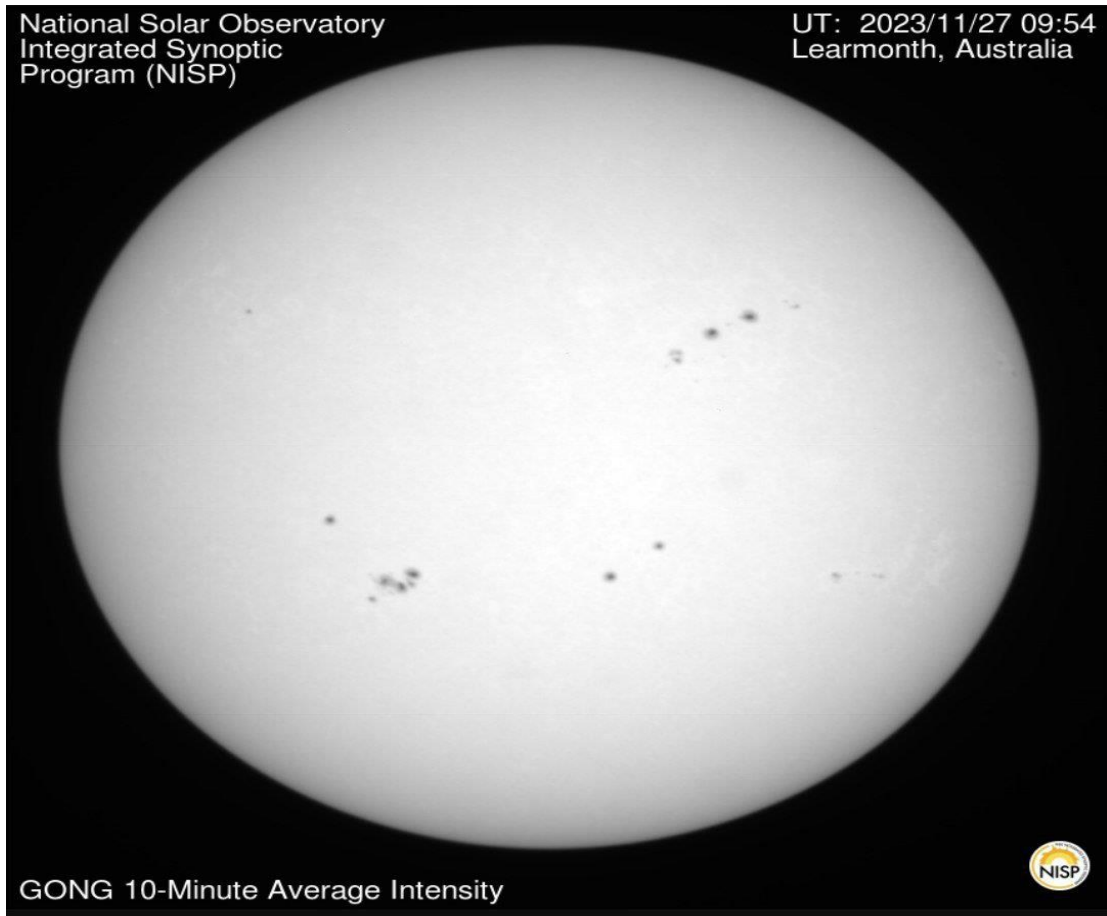
Yer sayyorasida hozirda ko'plab sodir bo'layotgan fizik va biologik hodisalarning kechishi, tabiat iqlimining o'zgarishi, va boshqa holatlar quyosh dog'larining ko'payishidan yuzaga kelmoqda.

Men hozirgi kunda o'zimni Quyosh teleskopi Coronado SolarMax II 60mm xromosferali bo'lib u Quyosh yuzasida sodir bo'layotgan maftunkor jarayonlarni ham batafsil ko'rish mumkin. Patentlangan RichView tizimi teleskopni oddiy, juda tez va qulay sozlashni ta'minlaydi. 10mm diametrlilik blokrovka qiluvchi filtr ham yaxshi ko'rish burchagini ta'minlaydi. Noyob patentlangan RichView tizimi barcha SolarMax II teleskoplarining muhim xususiyatlari hisoblanadi. Bu esa bizga ajoyib o'tish diapazonini o'zgartirishga imkon beradi, boshqa tomondan esa, bir tomondan, quyosh diskidagi shakllanishlarning maksimal ko'rinishi bilan diapazonga moslashishga imkon beradi, Doppler effektini qoplash va ushbu tafsilotlarni kontrastlash imkonini beradi. Quyosh xromosferasi, uning radial tezligi o'rtachadan juda farq qiladi. Coronado SolarMax II teleskopini ba'zi xususiyatlari bilan tanishtirib o'tdim, endi esa teleskopga qo'shimcha ravishda ZWO ASI290mm camerasini o'rnatdim. Bu menga quyoshni erkin ko'rish imkoniyati, dog'larini va unda sodir bo'layotgan protuberanetslarni ham ko'rsatib berish imkoniyatini beradi. Bu ZWO ASI290mmli monoxromatik kamera bo'lib Coronado teleskopiga ulab bemalol kompyuter qurilmasiga ulab, Quyoshdagi o'zgarishlarni bemalol ko'rish imkonini beradi. Men har kuni quyosh tasvirlarini olib NASA observatoriyasi olgan suratlar bilan solishtirib kelmoqdaman.

Bu suratlarda shuni ko'rishimiz mumkinki NASA tashkilotida olingan suratlar bilan o'zimiz olgan suratlar bilan solishtirib ko'ramiz.

Bundan ko'rinadiki NASA tashkiloti tomonidan olingan suratlar bilan bilan o'zimiz Coronado SolarMax II teleskopimizda olingan suratlar bilan mos kelmoqda. Bu izlanishlarimiz hali hammasi emas albatta kiyingi maqolalarimizda bu haqda yanada kengroq va suratlariga boy bo'ladi. Quyosh suratlaridan lavhalar 27.11.2023yil





#### Foydalanilgan adabiyotlar:

1. Umumiy astranomiya. "Mamadmusa Mamadazimov" Toshkent "Yangi asr avlodi" 2008-yil
2. Astrofizika. "I.Sattorov" Toshkent "Turon-Iqbol" 2007-yil
3. Astrofizika va yulduzlar astranomiyasi. "I.R.Kamolov, A.R.Sattorov, D.I.Kamolova, G.I.Sayfullayeva, S.T.Barakayeva, S.Hamroyeva, A.B.Narbayev" Termiz-2023
4. Quyosh fizikasi. "Zokirov M.M" Toshkent 2003-yil
5. Umumiy astranomiya kursi. "Nuriddinov.S.N" Toshkent 2000-yil
6. www. Google.uz
7. www. Ziyonet.uz
8. www. Astronet.uz
9. Astrometriya va kosmik dasturlar. "Ziyaxanov.R.F" 2005-yil
10. Galaktikalar fizikasi asoslari. "Nuriddinov.S.N" Toshkent 2002-yil.

AUTOMATION AND ROBOTICS FIELD PLANNING, MANAGEMENT SYSTEM

**Qahhorova Nargiza Hayit qizi**

email: [qahhorovanargiza02@gmail.com](mailto:qahhorovanargiza02@gmail.com)

**Abstrakt.** The construction industry is a major economic sector, but it is plagued with inefficiencies and low productivity. Robotics and automated systems have the potential to address these shortcomings; however, the level of adoption in the construction industry is very low. This paper presents an investigation into the industry-specific factors that limit the adoption in the construction industry. A mixed research method was employed combining literature review, qualitative and quantitative data collection and analysis. Three focus groups with 28 experts and an online questionnaire were conducted. Principal component and correlation analyses were conducted to group the identified factors and find hidden correlations. The main identified challenges were grouped into four categories and ranked in order of importance: contractor-side economic factors, client-side economic factors, technical and work-culture factors, and weak business case factors.

**Keywords:** Automated construction, Robotics, Additive manufacturing, Exoskeletons, Autonomous vehicles, Off-site construction.

**1. Introduction** Construction industry in most countries amounts to 10–20% of the GNP, making it the largest economic employing sector. Construction work is laborintensive and is conducted in dangerous situations, also the work content and materials change frequently. Robots are used widely to help human workers in construction sites. This approach demonstrates a decentralized, autonomous, flexible, simple, and adaptive approach to construction. Therefore, construction robotics has been a very hot research area in the construction industry. The main goal of this paper is to convince building designers and managers to incorporate robotic systems when managing modern buildings to save manpower and improve efficiency. The objectives of this paper include, among others:

- 1) Studying recent applications and projects for using robots and automation in the construction industry;
- 2) Setting opportunities and challenges facing the use of robots in the construction industry;
- 3) Predicting changes in construction industry resulting from robot usage, and ;
- 4) Setting framework for better planning and control of construction operations. The need for automating is justified first and the existing techniques, technologies and applications for robotics in construction industry are identified. Tools for selecting/assembling optimal automated and robotics system according to required tasks in construction works are then identified.

**2. Automation in construction** The project success from the project management's viewpoint is achieved when the project is completed with the lowest possible cost, the highest quality, no accidents, etc. In other words, success means bringing each of the project performance indicators (PPI)- such as cost, schedule, quality, safety, labor productivity, materials consumption or waste, etc. to an optimum value. Applying automation and robotics in construction is addressed from the perspective of raising building projects performance to serve the client and the environment. Robotics and automation systems in construction industry can achieve the following

advantages: - Higher safety for both workers and the public through developing and deploying machines for dangerous jobs. - Uniform quality with higher accuracy than that provided by skilled worker.

- Improving work environment as conventional manual work is reduced to a minimum, so the workers are relieved from uncomfortable work positions - Eliminating complains about noise and dust concerning works such as removal, cleaning or preparation of surfaces - Increasing productivity and work efficiency with reduced costs. The past two decades have witnessed an intense/active search among researchers for suitable ways to introduce robotics into the construction field. In Japan, robotic manipulators were used as assistants to human construction workers. This approach allows the robot to be less autonomous and technically simpler, needing only limited sensing abilities. According to this approach, the human performs the vital parts of the task, and the robot is used to expand the human physical limits. Such systems, of less autonomous performance, can be more easily adapted for assistance in a variety of building tasks. As improvement of the construction process will be the task of the future, new developments cover design strategies, human machine technologies, employee safety, progress monitoring, and distributed production information. Various approaches of integrating the work of humans and robots in construction fields are introduced hereafter.

Finishing Works The following tasks related to finishing works can be achieved. - Development of a robotic system for indoor plastering while human operator completes final delicate parts of the task. - A masonry robot that pre-plans its tasks in detail. Within that project, adding a global positioning sensor corrects deviations of the robot's Tool Center Point (TCP) due to static deflection of the manipulator structure.

- Window glass mounting or panel fixing using a hybrid-type robot with pneumatic actuator and servo motor. The hybrid-type robot mechanism has a wide range of workspace and precision, and it consists of a serial and parallel part. - Welding as the robot identifies the seam to be welded and tracks the seam while welding it. - Surface finishing in tunneling, leveling and compacting concrete, tile-setting, interiorfinishing such as painting, plastering, tiling, etc. - Pre-fabrication of GRC parts manufacturing such as robotic spraying of panels, also optimization and rationalization including panels' transportation and storage. - Simple, identical, autonomous robots assemble two-dimensional structures using prefabricated modules as building blocks. Modules are capable of some information processing, enabling them to share long range structural information and communicate it to robots. This communication allows arbitrary solid structures to be rapidly built using a few fixed, local robot behaviors. - Attaching heavy ceramic tile on walls using a designed robot which lifts or manipulates the tile, while a human worker attaches it on wall. In experiment, the proposed construction robot lifts the tile (5 kg) and moves it through the circle path. The designed sliding controller is adequate for a pneumatic cylinder control (Figure 5) . - Renewal of facades using a proposed System consisting of three components: tool head, a telescoping manned platform or another lifting unit, and a vacuum cleaner. The principal application is the removal of roughcast or other old coating by means of a brush. The vacuum "swallows" the particles loosened from the treated surface, passing them through its hoses to a receptacle. The air is then filtered, and the remaining refuse divided among designated

**3. Conclusions** The following conclusions are made: - Robots are increasingly involved in construction operations to maintain highly accurate actions and to reduce hazardous risks achieving improved control and safety. - Automated construction can be further developed to



include: design, engineering, maintenance of existing and planned structures. - Many research works suggest highly autonomous robotic system for the construction performance. The “Sense-and-Act” may indeed become a reality in the development of more advanced robotic systems for construction applications. - Real-time planning is commonly employed in tasks that require the robot to contend with uncertainties and undefined environments. - Efforts should be paid to convince professionals in building management to look into the possibility of integrating robotics and building

automation together to improve the quality of services for modern intelligent buildings. - All new ideas for Automation or robotizing on the building site have to be generated by a combination of new designs, new forms and new materials that meet the requirements for building in a metropolis. However, many problems in construction engineering cannot be fully addressed through optimization and computation. - With intelligence activities such as generalization, analysis and decision-making for multi-objectives, there can be a better understanding of the construction engineering problem.

#### **4. Evaluation for using robots and automation**

Initially, robots were developed for the manufacturing industry and were intended to perform routine task in a very familiar environment. Unlike such robots, those designated for work on construction sites must be mobile, maneuver in changing environments, and perform a different task at almost every step. Construction engineering is changed by the application of more industrial production, sustainable production, mass individualization, and intelligent building to improve constructability. Therefore, recent research indicates that robot technologies can; in fact; significantly improve quality and equipment control in several construction automation applications. The ability to automate construction would be useful particularly in settings where human presence is dangerous or problematic; for instance, robots could be initially sent to underwater or extraterrestrial environments, to create habitats to await later human travelers. Actually, there is plenty of room for improvement in all process elements concerning robotics and automation.

#### **5. Challenges facing automation and robotics in construction**

The primary contribution of automation in construction is the development of a comprehensive, multidimensional analysis of costs and benefits associated with a specific robotic application. It is quite important to analyze success through the technical and economic feasibility. The technical feasibility is determined by an ergonomic evaluation of individual steps taken to accomplish the given work task, and by analysis of the requirements for robot control and process monitoring. The economic feasibility, which is perceived to be the decisive factor in the market success of the proposed robotic systems, is determined by the analysis of the costs and benefits associated with their development and field implementation. Specific technologically challenging process and characteristic of robot construction applications include: - Performance in a harsh work site environment, or undefined and sometimes hostile conditions such as: - Difficult climatic conditions - Exposure to dust - Calibration in relation to environment - Adjustment to changing surface conditions - Complexity of the working environment

In contrast, a robotic system that would operate with no need for detailed pre-planning would be less technologically demanding and may, therefore, be easily developed during early stages of robotics integration into the construction field. The “Senseand-Act” process can probably eliminate the need for high accuracy when positioning the robot at its workstation, a fact that saves

time and leads to greater economic feasibility of the system. Some researchers attempted to increase the autonomy level of robots by enabling them to map their environments and independently navigate through them. Although construction sites are characterized by inaccurate geometries, numerous obstacles, etc. the mapping and navigation methods may be adapted to it. Such navigation methods are expected to deal with these difficulties and succeed in achieving accurate enough results. Researchers and developers of autonomous robots have attempted to solve the problem of adjusting the robot to its environment by developing automatic mapping and self-positioning methods. The robot then autonomously navigates from one workstation to another. Forsberg et al. suggested a plastering robot that uses a rotational laser beam to measure and map its surroundings (walls and openings). The mapping data was to be translated into a working plan, which would be presented to the operator for improvements. The suggested system depended on accurate navigation methods, and was supposed to bring the robot to within  $\pm 1$  cm of its workstation. Beliveau described an orientation system for indoor automated guided vehicles (AGVs), using three laser transmitters accurately positioned on the floor at known points. Experiments with this system revealed that the deviation of the measured path from the desired path was  $\pm 10$  cm. Shohet and Rosenfeld examined the accuracy achievable by automatic mapping of indoor construction environments. It was found that when robot positioning was precise (orientation and location errors of  $0.2^\circ$  and 3 cm, respectively), the achievable accuracy of indoor environment mapping was 3–5 cm. This degree of accuracy is sufficient for tasks that do not require contact with the treated element (e.g. spraying). However, tasks that involve precise placing of elements (e.g. block laying and tiling) require a mapping accuracy of 2–3 mm, as well as the utilization of well-controlled end-tools.

The types of automation and robotic technologies for construction can be grouped in four general categories (see Table 1):

- (1) Off-site prefabrication systems,
- (2) On-site automated and robotic systems,
- (3) Drones and autonomous vehicles, and
- (4) Exoskeletons. The first construction robots were developed in Japan to increase the quality of building components for modular homes .

(Category 1: Off-site prefabrication systems). The adoption of these robots was the result of the successful use of robots in the automotive manufacturing sector in Japan. Later, construction robots started appearing on construction sites, and automated construction sites systems were developed (Category 2: On-site automated and robotic systems) . The latest developments have been robots and autonomous vehicles for inspection, monitoring, maintenance, etc. (Category 3: Drones and autonomous vehicles). Lastly, exoskeletons are wearable mechanical devices that augment the capabilities of the user. Note, that exoskeletons are not strictly a robotic system, because they augment the capabilities of the worker instead of replacing it altogether. However, it was decided to include exoskeletons here because this study focuses on all hardware technologies that improve construction activities. Also, in the future, this distinction will not be as clear cut. For example, exoskeletons require a high degree of automation and a considerable potential exists on human-robot collaboration . In this sense, before construction sites are entirely devoid of human workers, it can be expected that robots, automated systems and augmented workers will work together seamlessly.

**What is robot fleet management system for?**

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

The Fleet Management System is responsible for centralising the management of the robot fleet, allowing operators to act from several standard communication devices. In this way, the robots can be accessed from any location (office, warehouse, home...) and by any device (PDA, mobile phone, tablet, computer, ...).

FMS offers a higher layer of abstraction that allows interacting with the entire fleet of robots as if it were a single system. Different access levels can be defined so that it is possible to specify typologies of users, each of which will have certain privileges to interact with the system.

In addition, a user can define missions with different levels of detail. It is possible to assign a robot to a specific mission or let the intelligent system decide which robot in the fleet will be given the mission.

Capable of coordinating fleets of robots.

Can be deployed locally / in the cloud.

Graph based orchestration .

Monitors fleet status.

Customizable.

Within robotic logistics tasks, it is essential to minimise transport times. It goes without saying that saving transport time for loads or goods saves costs. In addition to minimising transport times, there are other advantages offered by robot fleet management. For example, maximising autonomy times, priority management, quality control if it is a mobile manipulator, etc.

Modern robots are increasingly capable of performing “basic” activities such as localization, navigation, and motion planning. However, for a robot to be considered intelligent, we would like it to be able to automatically combine these capabilities in order to achieve a high-level goal. The field of automated planning (sometimes called AI planning) deals with automatically synthesizing plans that combine basic actions to achieve a high-level goal. In this article, we focus on the intersection of automated planning and robotics and discuss some of the challenges and tools available to employ automated planning in controlling robots. We review different types of planning formalisms and discuss their advantages and limitations, especially in the context of planning robot actions. We conclude with a brief guide aimed at helping roboticists choose the right planning model to endow a robot with planning capabilities.

#### References:

1. Agrawal, R. 2020, “Technologies for Handling Big Data.” In Eds. Fausto Pedro Garcia
2. Marquez, Handbook of Research on Big Data Clustering and Machine Learning, pp.34–49. Hershey,PA: IGI Global.
3. Barks, C. 2017, Caution: Robot crossing. A show with robots so advanced, when they dance, they ‘do the human, Electrical Apparatus, May 2017.
4. Bogue, R. 2018, Growth in e-commerce boosts innovation in the warehouse robot market, The Industrial Robot, vol.43, no. 6, pp. 583–587.
5. Da Silveira, G. J. C. & Cagliano, R. 2006, The relationship between inter-organizational information systems and operations performance, International Journal of Operations and Production Management, vol. 26, no. 3, pp. 232–253.
6. Deutsche Post DHL Group. 2016, Robotics in logistics: A DPDHL Perspective on implications and use cases for the logistics industry, DHL Trend Research, DHL Customer Solutions, and Innovation, viewed December 18, 2019,

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

7. [https://www.dhl.com/content/dam/downloads/g0/about\\_us/logistics\\_insights/dhl\\_trendreport\\_robotics.pdf](https://www.dhl.com/content/dam/downloads/g0/about_us/logistics_insights/dhl_trendreport_robotics.pdf)

8. Diaknov, R. & Kuffner, J. 2008, Openrave: A planning architecture for autonomous robotics, Robotics Institute and Technology, viewed December 15, 2019, <https://pdfs.semanticscholar.org/c28d/3dc33b629916a306cc58cbff05dcd632d42d.pdf>

9. Donna, T. 2015, Meet amazon's busiest employee – The kiva Robot, viewed October 15, 2019,

10. <https://www.digitalpulse.pwc.com.au/infographic-evolution-robots-ai/>



УДК 661.668.9

**ИССЛЕДОВАНИЕ ПРОЦЕССА РАСТВОРЕНИЯ ФОСФОРНОКИСЛЫХ ПЛАВОВ  
НАТРИЯ ДЛЯ РЕЦИРКУЛЯЦИИ НА СТАДИЮ ОБЕСФТОРИВАНИЯ  
ЭКСТРАКЦИОННОЙ ФОСФОРНОЙ КИСЛОТЫ**

**Ходжамкулов Сахомиддин Зоирович,**

к.т.н, доцент Термезский инженерно-технологический институт

**Зоиров Сироджиддин Сахомиддин угли**

Студент химико-технологического факультета Термезского инженерно-технологического  
института *Научный руководитель:*

**Мирзакулов Холтура Чориевич,**

*д.т.н, профессор Ташкентский химико-технологический институт*

**Аннотация:** В данной научно-исследовательской работе изучены оптимальные условия извлечения фосфорной кислоты из фосфоритов Центральных Кызылкумов и ее дефторирования для получения минеральных удобрений на их основе. По полученным результатам установлено, что уровень дефторирования зависит от мольного соотношения исходных веществ и температуры.

**Ключевые слова:** дефторирование, экстрагируемая фосфорная кислота, фосфорит, фосфат натрия

**STUDY OF THE PROCESS OF DISSOLUTION OF SODIUM PHOSPHORIC ACID  
MELTS FOR RECYCLING TO THE STAGE OF DEFLUORIDATION OF  
EXTRACTION PHOSPHORIC ACID**

**Khojamkulov Sakhomiddin Zoirovich,**

*Ph.D., Associate Professor Termez Engineering and Technology Institute*

**Zoirov Sirojiddin Sakhomiddin Ugli**

*Student, Department of Chemical Technology, Termez Engineering and Technology Institute*

*Scientific advisor:*

**Mirzakulov Kholtura Chorievich**

*Doctor of Technical Sciences, Professor Tashkent Institute of Chemical Technology*

**Abstract:** In this research work, the optimal conditions for extracting phosphoric acid from Central Kyzylkum phosphorites and defluorinating it to obtain mineral fertilizers based on them were studied. According to the obtained results, it was determined that the level of defluorination depends on the mole ratio of the starting materials and the temperature.

**Keywords:** defluoridation, extractable phosphoric acid, Phosphorite, sodium phosphate

**Введение.** В связи с этим, нами проведены исследования по растворению плава фосфатов натрия, образующихся при фосфорнокислотном разложении продуктов обесфторивания ЭФК в оптимальных условиях, следующего состава, масс. %;  $P_2O_5$  -

56,84;  $\text{Na}_2\text{O}$  - 3,85;  $\text{CaO}$  - 5,16;  $\text{MgO}$  - 3,55;  $\text{Al}_2\text{O}_3$  - 1,81;  $\text{Fe}_2\text{O}_3$  - 1,75; F - 0,24. Плав фосфатов имел pH – 1,0[1].

Исследования по растворению плава проводили в термостатированном реакторе (точность термостатирования  $\pm 1^\circ\text{C}$ ), снабженном мешалкой. В качестве варьируемых переменных выбраны температура, диаметр частиц плава, массовое соотношение плава к воде, продолжительность опыта. При этом визуально фиксировали время полного растворения частиц ( $\tau$  п) и переход катионов натрия из плава в раствор через определенные промежутки времени[2; С. 107-112].

Для установления оптимального размера частиц плава, обеспечивающих высокую скорость растворения, в интервале температур  $20-90^\circ\text{C}$  изучено влияние диаметра гранул (3-15 мм) на время полного растворения плава при Ж:Т=50:1, что позволяет исключить влияние прочих параметров (кислотность среды, влияние концентрация катионных примесей  $\text{MgO}$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Fe}_2\text{O}_3$ , скорость перемешивания) на процесс. Анализ полученных данных показывает, что с увеличением размера частиц плава от 3 до 15 мм при температуре  $30^\circ\text{C}$  время полного растворения плава возрастает от 150 до 510 с. По мере повышения температуры процесса от  $30$  до  $90^\circ\text{C}$  скорость растворения резко возрастает и  $\tau$  и в зависимости от размеров гранул снижается в 4-9 в раз[3; С 36]. Причем с ростом температуры влияние размера частиц на продолжительность растворения нивелируется и для гранул с диаметром 3-4 мм оно становится при  $70-90^\circ\text{C}$  достаточно низким. В связи с вышеизложенным в последующих опытах использовали плав фосфатов натрия с диаметром частиц 3-4 мм[4].

В связи с этим изучение кинетики выщелачивания натрия из плава проводили при  $50-65^\circ\text{C}$  и соотношениях Т:Ж=1:(0,5-2) путем отбора через каждые 30 с пробы (диаметр частиц 3-4 мм). Последние расфилтровывались через фильтр Шотта с диаметром пор 40 мкм и в фильтрате определялось содержание  $\text{Na}_2\text{O}$  и  $\text{P}_2\text{O}_5$ [5].

Результаты этих исследований представлены в таблице, из которой видно, что извлечение щелочных металлов практически заканчивается в исследуемом диапазоне варьирования Ж:Т и температуры за  $180-300^\circ\text{C}$ . Причем за первые  $150-180^\circ\text{C}$  с концентрация  $\text{Na}_2\text{O}$  в жидкой фазе суспензии достигает максимума, а затем остается постоянной (при высоких Ж:Т) или несколько снижается. Это связано с различной скоростью растворения фосфатов натрия и фосфатов железа и алюминия, поскольку значительная часть последних связана в полифосфаты, ввиду их секвестрирующей способности и обладающих меньшей скоростью растворения, т.е. в первую очередь при прочих равных условиях в жидкой фазу переходит  $\text{Na}_2\text{O}$  и концентрация  $\text{Al}_2\text{O}_3$ ,  $\text{Fe}_2\text{O}_3$  в начальный период растворения мала[6; С. 18-21.].

Далее по мере растворения фосфатов полуторных оксидов объем жидкой фазы увеличивается и происходит снижение концентрации  $\text{Na}_2\text{O}$  при повышении степени выщелачивания. Переход  $\text{P}_2\text{O}_5$  в жидкую фазу с увеличением продолжительности растворения пропорционально возрастает за первые  $180^\circ\text{C}$  и затем концентрация  $\text{P}_2\text{O}_5$  остается практически постоянной.

#### Таблица 1

**Влияние соотношении Ж:Т и температуры на кинетику выщелачивания фосфатов натрия из фосфорнокислого плава**

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-4, ISSUE-1

№	Массовое соотношение Ж:Т	Температура, °С	Продолжительность процесса, сек	Содержание компонентов в жидкой фазе суспензий мас, %		Степень перехода Na <sub>2</sub> O в р-р, отн. %
				Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	
I	1.0:0,5	50	30	10,06	25,61	24,98
			60	12,38	31,52	34,97
			180	15,72	40,03	79,92
			300	16,11	41,02	91,91
			600	16,62	42,32	94,91
		65	30	12,56	31,97	29,97
			60	13,75	35,02	39,96
			180	16,62	42,32	82,92
			300	16,78	42,72	93,91
			400	16,88	42,97	95,90
			600	16,88	42,98	96,40
2	1.0:1.0	50	30	9,08	23,11	47,95
			60	11,20	28,51	69,93
			180	11,80	30,05	94,91
			300	11,81	30,07	97,90
			400	12,18	31,02	98,90
		65	30	9,51	24,21	53,95
			60	11,59	29,51	73,93
			180	12,50	31,82	97,30
			300	12,68	32,29	98,60
			400	12,77	32,52	99,30
			600	12,81	32,62	99,60
3	1.0:2.0	50	30	3,91	9,94	68,93

		60	4,92	12,52	83,92
		180	6,48	16,51	98,20
		300	7,74	19,71	98,90
		400	8,29	21,11	99,20
		600	7,94	20,21	99,70
	65	30	6,49	16,52	78,92
		60	6,80	17,31	90,01
		180	8,17	20,81	98,90
		300	8,33	21,22	99,10
		400	8,41	21,41	99,50
		600	8,45	21,51	99,70

Полученные нами данные хорошо согласуются с литературными, согласно которым растворимость одноименных солей щелочных и щелочно-земельных металлов располагается в ряд:  $\text{Na}^+$ ,  $\text{Mg}^{+2}$ ,  $\text{Fe}^{+3}$ ,  $\text{Al}^{+3}$ ,  $\text{Ca}^{+2}$ .

Таким образом, проведенными исследованными установлено, что одним из рациональных путей рециркуляции фосфатов натрия для обесфторивания ЭФК из фосфоритов ЦК, является возврата на начальную стадию процесса раствор фосфатов натрия, полученные из кислых фосфатов натрия, образующихся при фосфорнокислотном разложения кремнефторидов натрия.

#### Список источников

1. Меликулова Г.Э., Мирзакулов Х.Ч., Усманов И.И., Исаков А.Ф. Исследование процесса получения кормового дикальцийфосфата из фосфоритов Центральных Кызылкумов // *Universum: технические науки: электрон. научн. журн.* 2018. №6(51). URL: <https://7universum.com/ru/tech/archive/item/6037>.
2. Молдабеков К.Т., Жантасов Ж.К., Жанмолдаева Ж.М., Балабеков О. Кинетика разложения низкокачественных фосфоритов фосфорной кислоты и получение двойного суперфосфата циклическим способом. *Современные наукоемкие технологии.* 2013, № 11, - С. 107-112.
3. Jančaitienė K. Sustainable technology of potassium dihydrogen phosphate production and liquid waste recovery // *Summary of Doctoral Dissertation Technological Sciences, Chemical Engineering (05T).* Kaunas, Germany. 2017, 36 p.
4. Сотиболдиев Б.С., Хошимханова М.А., Дехканов З.К., Арипов Х.Ш. Технология получения новых комплексных фосфорных удобрений // *Universum: Химия и*



биология: электрон. научн. журн. 2020. № 6(72). URL:  
<http://7universum.com/ru/nature/archive/item/9375>.

5. Дормешкин О.Б., Воробьев Н.И., Шатало В.И. Безотходный технологический процесс получения бесхлорного водорастворимого комплексного удобрения на основе фосфата калия. // Химическая технология, Минск, Белоруссия, 2014. - Т.15. № 6. - С. 324-332.

6. Хужамбердиев Ш.М., Арифджанова К.С., Мирзакулов Х.Ч. Исследование процесса получения растворов и солей натрия, пригодных для получения полифосфатов // Журнал «Химия и химическая технология». – Ташкент, 2018. – № 3. - С. 18-21.



## LENDING RISKS AS REFLECTED BY INDIVIDUAL BANKING INDICATORS

Irina Bitner<sup>1</sup>, Nadiia Viadrova<sup>1</sup>, Samer Mehjar<sup>2</sup>

<sup>1</sup>Department of Banking Business and Financial Technologies, Educational and Scientific Institute «Karazin Banking Institute», V. N. Karazin Kharkiv National University, Ukraine

<sup>2</sup>Head of project and assets accounts at the Jordan Petroleum Refinery, Amman, Jordan

### Abstract:

Banking activities are one of the objects of study and research in various scientific publications. This is due to the role that banks play in the functioning and development of the country's economy and individual business entities. One area of such consideration is lending risks. This issue is important and relevant, as it allows us to monitor the efficiency of the bank's activities and its sustainability. To study this issue, an analysis of various banking indicators is necessary. This will allow us to understand the continuity of the bank's financial flows and the possibility of lending risks. In this case, it is advisable to know both the dynamics of individual indicators of banking activity and their relationship with each other. Based on this, the work examines the dynamics of various indicators of banking activity and examines their relationship. Such indicators for a number of countries are also considered. For research purposes, we use various statistical methods: from descriptive statistics to complex analysis of explicit and implicit relationships between data. The work presents various graphs, which generally allows you to understand the progress of the study and evaluate the results obtained.

**Key words:** Risk, Lending, Dynamics, Banking indicators, Time series, Statistical analysis, Comparison, Loan rates

### Introduction

Economic development and the continuous functioning of individual business entities are inextricably linked with the attraction of free financial resources [1], [2]. Such resources help to carry out certain activities and fulfill obligations. This is important for any economic agents and allows them to ensure their interaction with each other and the relevant government institutions. Therefore, research of this kind is relevant and significant from both scientific and practical points of view.

Traditionally, attracting the necessary resources is possible through the stock market or bank loan [3], [4]. This is determined by the specific development of each country individually. However, one area of scientific interest is bank lending [5]-[8].

Banks are able not only to accumulate, but also to effectively redistribute available resources by providing loans. As a rule, both attracted funds in the form of deposits and the bank's own resources are used as sources of lending. Therefore, an important aspect of research is to consider possible lending risks. An important aspect of such analysis is the uninterrupted functioning of the bank, the continuous movement of relevant financial flows [5], [8].

The source of consideration of lending risks can be individual indicators of banking activity, which are a generalization of the movement of various financial flows of the bank. For

these purposes, it is necessary to consider the dynamics of individual indicators of banking dynamics both in their interrelation and from the point of view of individual economies. Various indicators and individual countries can be selected here, as will be defined later. For the purpose of comparing such data, various classical methods and approaches can be used [9]-[15], as well as those that have found application in other areas of research [16]-[21].

Thus, the main goal of this work is to consider the dynamics of a number of indicators of banking activity for different countries from the point of view of a possible study of lending risks. To do this, it is advisable to conduct a brief analysis of studies related to this topic, determine a set of banking indicators for analysis and select individual countries for comparison.

#### **Related work**

Given the importance of lending risks, researchers pay attention to various aspects of this issue. Here you can see both theoretical works and studies that present relevant statistical analysis.

N. P. Barsky and A. H. Catanach Jr conduct a comprehensive analysis of risk assessment when making bank lending decisions [22]. The authors consider various aspects in decision making. In this case, special attention is paid to the factors that determine the possibility of occurrence of relevant risks. For the purposes of such analysis, descriptive statistical methods are used, which allow some important conclusions to be drawn.

R. Lenz pays attention to peer-to-peer lending, considering the possible risks [23]. For this purpose, financial intermediation via the Internet based on P2P is analyzed. The work notes that this is the most popular type of crowdfunding, in which an Internet platform collects small amounts of funds from individuals for collective financing [23]. At the same time, it becomes possible to reduce some credit risks. Based on this, the author concludes that it is necessary to develop this type of lending. However, this requires the development and implementation of a special unified European regulatory framework.

T. Chmielewski considers the interrelationship between banking risks, risk preferences and lending [24]. Particular attention is paid to the issues of capital regulation on the behavior of banks. At the same time, the work notes that the possibility of various banking risks may affect the volume of loans issued. Among the factors in the analysis of lending risks, the financial stability of the bank in the implementation of monetary policy stands out. It is also noted that variables reflecting the riskiness of lending and the possible level of its acceptance are significant in the corresponding regression equations [24].

S. Behncke studies the effect of macroprudential policy on bank lending and credit risks [25]. An example of such an analysis is data for Switzerland. The author examines the impact on lending and the possibility of risks arising from two factors: the activation of the countercyclical capital buffer (CCyB) and the limitation of the loan-to-value ratio (LTV) [25]. The work considers the following risk indicator measures: LTV and loan-to-income (LTI) ratios and mortgage growth rates. This allows you to draw the necessary conclusions and make informed decisions regarding bank lending and minimizing relevant risks.

T. Beutler, R. Bichsel, A. Bruhin and J. Danton consider the impact of interest rate risk on bank lending [26]. The paper examines data on Swiss banks. For these purposes, various supervisory information is analyzed. The authors note the impact of weakening bank capital on reducing aggregate loan growth a year after a jump in nominal rates by one percentage point

[26]. The heterogeneity of loan risks taking into account the activities of various banks was also noted. This must be taken into account when developing global measures to overcome lending risks in the banking system as a whole.

The study by M. Naili and Y. Lahrichi conducts a critical review of literature sources that are devoted to the problems of credit risk of banks [27]. First of all, the authors note that the credit risk of banks is in the level of non-performing loans (NPL). The paper also discusses the main theories about problem loans and their bank-specific, macroeconomic and industry determinants [27]. The study is based on 69 papers that were published between 1987-2019. However, the authors emphasize that the problem of credit risk remains an unresolved area of research [27].

H. Abdelaziz, B. Rim and H. Helmi consider the relationship between credit risk, liquidity risk and bank profitability [28]. The work examines data for the countries of the Middle East and North Africa (the so-called MENA region). Observations are carried out in the period 2004-2015. For the purpose of the study, the apparent unrelated regression (SUR) method was used. The paper shows that bank profitability is negatively sensitive to an increase in credit risk. At the same time, the profitability of banks significantly reduces the level of credit risks [28].

M. F. Hsieh and C. C. Lee examine the relationship between bank liquidity, regulation and credit risk [29]. It uses data from 3,007 banks from 27 Asian countries over the period 1999–2013. It has been shown that the creation of bank liquidity is positively related to the real output of the economy, as well as to illiquid assets and fixed deposits [29]. At the same time, large banks are able to increase liquid assets and lend to countries with stricter financial rules [29].

We see that studies examine various parameters of banks' activities in the study of credit risks. It all depends on the task at hand and further directions of research. Next, we will present some parameters of banking activities that we examine when considering this issue. Here we only note that we will consider data for the entire banking system, and not for an individual bank.

#### **Analysis of individual indicators of banking activity in the study of lending risk**

To conduct our research, we will consider such indicators as the interest rate on loans and the interest rate spread (loan rate minus deposit rate, %).

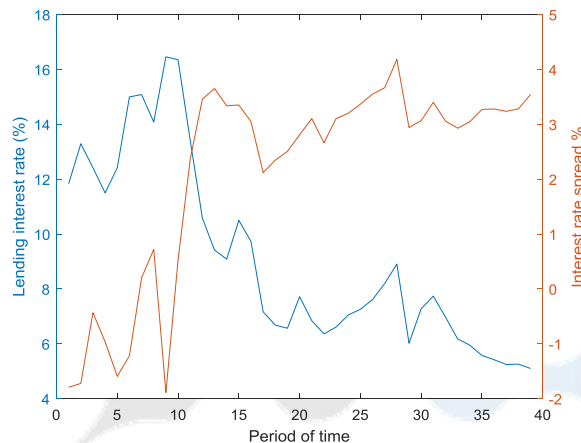
The first indicator reflects the dynamics of the availability of credit resources and in some way may be one of the indicators of lending risk. This is due to the fact that when the loan rate decreases, the availability of the resource increases. Then there is a possibility that such a resource can be taken by anyone, and its return may be in question.

The second indicator reflects the efficiency of lending and is also in some way one of the indicators of lending risk. A summary of lending risk is the non-performing loan ratio.

We will look at this data for banking systems such as Australia, Canada and China.

All data from the World Development Indicators website (<https://databank.worldbank.org/>).

In Fig. 1 shows the dynamics of the loan interest rate and the interest rate spread for the Australian banking system in the period 1981-2019.



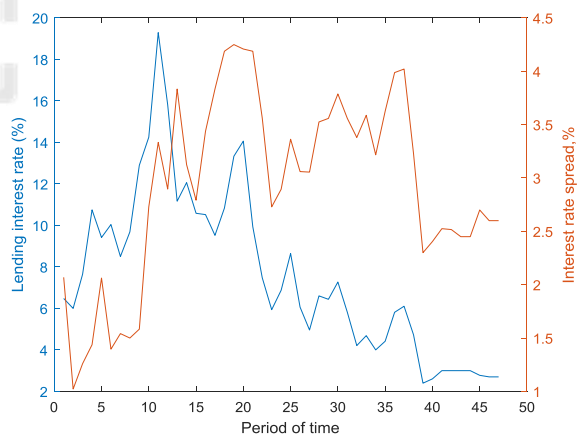
**Figure 1:** Loan interest rate dynamics and interest rate spreads for the Australian banking system during the period 1981-2019

In Fig. 1 presents 40 values for analysis on the Australian banking system. We can see that at the beginning of the period under study, the dynamics of lending rates increases. This occurs in the period 1981-1990. Then there is a sharp decline in lending rates until the end of the study period. Thus, we can talk about the availability of credit resources, and therefore the possibility of the occurrence of corresponding lending risks.

Changes in the interest rate spread for the Australian banking system as a whole have a positive trend. A sharp jump in this dynamics occurred in 1991. Further, minor changes in the dynamics of the spread are observed. If we compare the dynamics of the spread and interest rates on loans, we can talk about increasing the efficiency of the banking process in this aspect. Nevertheless, this is most likely due to a decrease in deposit rates.

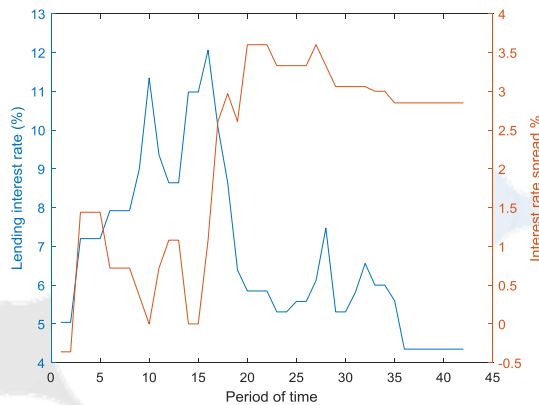
In Fig. 2 shows the dynamics of the loan interest rate and the interest rate spread for the Canadian banking system in the period 1971-2017.

In Fig. 3 shows the dynamics of the loan interest rate and the interest rate spread for the China banking system in the period 1980-2021.



**Figure 2:** Loan interest rate dynamics and interest rate spreads for the Canadian banking system during the period 1971-2017

Trends in data for the Canadian banking system echo trends in the corresponding data for the Australian banking system. One of the key differences is the decrease in the interest rate spread across the Canadian banking system, which is typical for the latest time intervals from the time period under study.



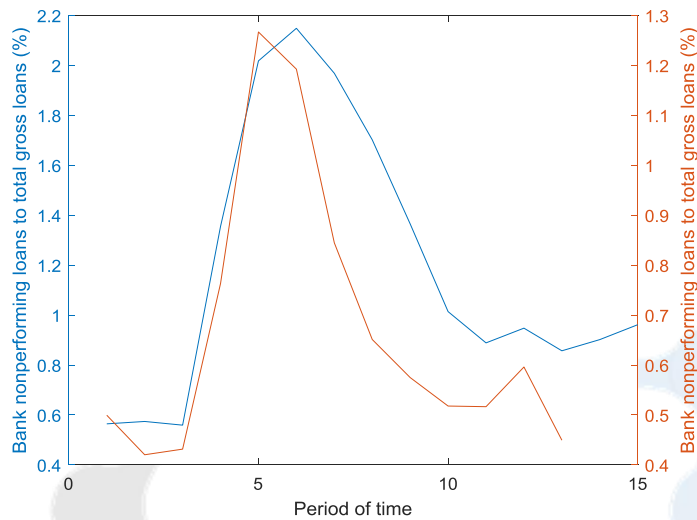
**Figure 3:** Loan interest rate dynamics and interest rate spreads for the China banking system during the period 1980-2021

Shown in Fig. 3 trends in changes in the studied data on the Chinese banking system differ from those discussed above. Nevertheless, in some periods we also see a coincidence in such trends. A feature of the data dynamics for the Chinese banking system is that at the end of the period under study, both quotes for lending rates and spreads stabilize.

What is common with the previously discussed data is the fact that when loan rates decrease, spread quotes increase. Then the spread stabilizes. On the one hand, we note the effectiveness of the banking process in this aspect, and on the other hand, it should be noted about the influence of deposit rates on such a process.

As noted, one of the key indicators in assessing lending risks is the percentage of non-performing assets of banks. As an example, consider this indicator for the banking systems of Australia and Canada.

In Fig. 4 shows the dynamics of the percentage of non-performing assets for the banking systems of Australia and Canada. The left scale (blue) shows the dynamics of non-performing assets for the Australian banking system in the period 2005-2019. On the right scale (red) is the dynamics of non-performing assets for the Canadian banking system in the period 2005-2017.



**Figure 4:** Dynamics of the percentage of non-performing assets for the banking systems of Australia and Canada

Comparing the data Fig. 4 with data Fig. 2 and Fig. 3, it can be noted that an excessive reduction in interest rates on loans tends to lead to an increase in the volume of non-performing loans. Thus, consideration of lending risks in displaying indicators of the banking system is justified.

### Conclusion

The article examines and discusses important topics related to the functioning of the banking system. Lending issues and the possibility of certain risks arising are considered. For these purposes, we consider the following indicators: dynamics of interest rates on loans; interest rate spread as the difference between loan and deposit rates; dynamics of the percentage of non-performing assets. The work also presents the various banking systems of Australia, Canada and China. The work notes that various indicators of the banking system are good indicators for considering the possibility of occurrence and forecasting lending risks. This thesis is based on real data, which is displayed in the corresponding graphs.

### REFERENCES:

1. Nasrullayevich Khasanov, K., Alisherovna Baratova, D., Faxriddinovich Uktamov, K., & Alisher o'g'li Djuraev, S. (2021, December). Developing Attraction of Financial Resources from the International Capital Market to the Corporate Sector of the Economy with the Help of it Technologies. In *The 5th International Conference on Future Networks & Distributed Systems* (pp. 755-768).
2. Bakhodirovich, S. B. (2022). Analysis of attraction and distribution of attracted resources of international financial institutions. *Asia Pacific Journal of Marketing & Management Review*, 11(02), 30-35.
3. Malikova, D. (2020). Deposit base of Uzbekistan commercial banks. *World Scientific News*, (143), 115-126.
4. Ibrahim, M. H. (2006). Stock prices and bank loan dynamics in a developing country: The case of Malaysia. *Journal of Applied Economics*, 9(1), 71-89.

5. Vasyurenko, O., & et al.. (2014). Efficiency of lending to natural persons and legal entities by banks of Ukraine: methodology of stochastic frontier analysis. *Herald of the National Bank of Ukraine*, 1, 5-11.
6. Kuzemin, A., Lyashenko, V., Bulavina, E., & Torojev, A. (2005). Analysis of movement of financial flows of economical agents as the basis for designing the system of economical security (general conception). In *Third international conference «Information research, applications, and education»* (pp. 27-30).
7. Азаренкова, Г., & Ляшенко, В. (2009). Відношення переваг у порівняльній оцінці діяльності банків. *Банківська справа*, 5, 65-72.
8. Lyashenko, V. (2014). Efficiency of bank crediting of real sector of economy in the context of separate banking groups: an empirical example from Ukraine. *International Journal of Accounting and Economics Studies*, 2(2), 74-79.
9. Dobrovolskaya, I., & Lyashenko, V. (2013). Interrelations of banking sectors of European economies as reflected in separate indicators of the dynamics of their cash flows influencing the formation of the resource potential of banks. *European Applied Sciences*, 1-2, 114-118.
10. Kots, G. P., & Lyashenko, V. (2012). Banking sectors of the economies of European countries in the representation of statistical interrelation between indices that characterize their development. *European Applied Sciences*, 1, 461-465.
11. Ляшенко В. В. (2007). Интерпретация и анализ статистических данных, описывающих процессы экономической динамики. *Бизнес Информ*, 9(2), 108-113.
12. Слюніна, Т. Л., Бережний, Є. Б., & Ляшенко, В. В. (2007). Розвиток вітчизняної мережі банківських установ: особливості та регіональні аспекти. *Вісник ХНУ ім. В. Н. Каразіна. Економічна серія*, 755. 84–88.
13. Куштим, В. В., & Ляшенко, В. В. (2007). Динаміка розвитку банківського сегмента міжнародного фінансового ринку. *Фінанси України*, (12), 96-105.
14. Baranova, V., Zeleniy, O., Deineko, Z., & Lyashenko, V. (2019, October). Stochastic Frontier Analysis and Wavelet Ideology in the Study of Emergence of Threats in the Financial Markets. In *2019 IEEE International Scientific-Practical Conference Problems of Infocommunications, Science and Technology (PIC S&T)* (pp. 341-344). IEEE.
15. Kuzemin, A., & Lyashenko, V. (2009). Methods of comparative analysis of banks functioning: classic and new approaches. *Information Theories & Applications*, 16(4), 384-396.
16. Al-Sharo, Y. M., Abu-Jassar, A. T., Sotnik, S., & Lyashenko, V. (2021). Neural Networks As A Tool For Pattern Recognition of Fasteners. *International Journal of Engineering Trends and Technology*, 69(10), 151-160.
17. Nevliudov, I., & et al.. (2020). Method of Algorithms for Cyber-Physical Production Systems Functioning Synthesis. *International Journal of Emerging Trends in Engineering Research*, 8(10), 7465-7473.
18. Omarov, M., & et al.. (2019). Internet marketing metrics visualization methodology for related search queries. *International Journal of Advanced Trends in Computer Science and Engineering*, 8(5), 2277-2281.



19. Kuzemin, A., & Lyashenko, V. (2006). Fuzzy set theory approach as the basis of analysis of financial flows in the economical security system. *International Journal Information Theories & Applications*, 13(1), 45–51.
20. Attar, H., Abu-Jassar, A. T., Lyashenko, V., Al-qerem, A., Sotnik, S., Alharbi, N., & Solyman, A. A. (2023). Proposed synchronous electric motor simulation with built-in permanent magnets for robotic systems. *SN Applied Sciences*, 5(6), 160.
21. Ahmad, M. A., Lyashenko, V. V., Deineko, Z. V., Baker, J. H., & Ahmad, S. (2017). Study of Wavelet Methodology and Chaotic Behavior of Produced Particles in Different Phase Spaces of Relativistic Heavy Ion Collisions. *Journal of Applied Mathematics and Physics*, 5, 1130-1149.
22. Barsky, N. P., & Catanach Jr, A. H. (2005). Evaluating business risks in the commercial lending decision. *Com. lending Rev.*, 20, 3.
23. Lenz, R. (2016). Peer-to-peer lending: Opportunities and risks. *European Journal of Risk Regulation*, 7(4), 688-700.
24. Chmielewski, T. (2006). Bank risks, risk preferences and lending. University Library of Munich, Germany.
25. Behncke, S. (2023). Effects of macroprudential policies on bank lending and credit risks. *Journal of Financial Services Research*, 63(2), 175-199.
26. Beutler, T., Bichsel, R., Bruhin, A., & Danton, J. (2020). The impact of interest rate risk on bank lending. *Journal of Banking & Finance*, 115, 105797.
27. Naili, M., & Lahrichi, Y. (2022). The determinants of banks' credit risk: Review of the literature and future research agenda. *International Journal of Finance & Economics*, 27(1), 334-360.
28. Abdelaziz, H., Rim, B., & Helmi, H. (2022). The interactional relationships between credit risk, liquidity risk and bank profitability in MENA region. *Global Business Review*, 23(3), 561-583.
29. Hsieh, M. F., & Lee, C. C. (2020). Bank liquidity creation, regulations, and credit risk. *Asia-Pacific Journal of Financial Studies*, 49(3), 368-409.

Arabova Gulsanam Saburovna

Mamun University teacher

**Abstract:** This scientific article is aimed at studying the commonality and uniqueness of motifs in the epic plot, their role in conveying themes, enhancing character development, and strengthening the overall structure of the story. A deeper understanding of the power and versatility of motifs in an epic plot can be gained by studying famous epic works from different cultures and eras.

**Keywords:** epic plot, motives, genre, epic.

In the field of literature, epic plots have long attracted readers with their rich and complex narratives. It is worth noting that one element that often stands out in these epic stories is the presence of motifs. Motifs are recurring ideas, symbols, or patterns that contribute to the overall thematic development of a work of literature. They are important building blocks for understanding the deeper meanings and nuances of a story. Although motifs can be found in a variety of literature, they play a specific role and importance in epic plots.

In addition to providing a basis for understanding the complexity and depth of the epic plot, motifs also serve as powerful tools for enhancing the overall thematic coherence and meaning of the story. Recurring throughout the story, motifs can create connections between different characters, settings, and events, reinforcing the epic's main themes and messages. For example, in Homer's *Odyssey*, the mask motif serves to emphasize the theme of deception and reveal the true nature of the characters. The repeated use of this motif not only adds layers of intrigue and suspense to the plot, but also emphasizes the importance of appearances and hidden identities in the epic world. In addition, motifs can contribute to the characterization of heroes and heroines, providing insight into their personalities, motivations, and moral dilemmas. In this way, motifs play a crucial role in enriching the story and drawing the audience into a deeper exploration of the universal human experience within the epic plot.

In epic literature, certain motifs constantly appear in different cultures and periods. One recurring motif is the "hero's journey," a narrative structure first popularized by Joseph Campbell. This motif involves a protagonist embarking on a transformative adventure, facing various challenges and overcoming obstacles to achieve a greater goal. A hero's journey is often characterized by stages such as a call to adventure, supernatural assistance, and a final return. Another common motif in epic plots is divine intervention or the intervention of supernatural beings. These interventions often act as catalysts for the hero's journey or contribute to the hero's success. In addition, the theme of fate or destiny appears frequently in epic plots, emphasizing the notion that the characters' actions are controlled by forces beyond their control. Despite the wide range of epic narratives, these motifs serve as the main elements that connect the stories of different cultures and eras, emphasizing the enduring importance of certain thematic patterns in the genre.

In addition to common motifs in epic plots, there are also unique motifs that add depth and uniqueness to the narrative. One such unique motif can be observed in the medieval epic poem "Beowulf". In this epic, the motif of the monstrous mother figure is the traditional motif of the monstrous father figure. A terrifying mother figure acts as a formidable adversary for the

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

protagonist and adds a layer of complexity to the plot. This motif is not only unique, but also serves to challenge the traditional gender roles often found in epic literature. Another example of a rare motif is Virgil's Aeneid. The motif of fate and divine intervention is explored in great detail in this epic. Gods play an important role in the lives of heroes, determine their destinies and shape the outcome of their actions. These unique motifs not only distinguish the epics from each other, but also contribute to their enduring importance and influence in the field of literature.

Analyzing the commonality and uniqueness of motifs in epic plots reveals the complexities and complexities of these literary works. While various epics have several recurring motifs, such as the hero's journey and the battle between good and evil, each epic has unique motifs that reflect the specific cultural, historical, and social context in which it was written. These unique motifs serve to differentiate each epic and provide valuable insight into the values, beliefs, and concerns of the respective cultures. Furthermore, by examining the ways in which common motifs are used and modified, it becomes clear that these narratives serve as tools for exploring universal themes that transcend time and place. By studying the patterns and diversity of motifs in epic plots, scholars can gain a deeper understanding of the human experience across cultures and periods.

#### Summary

In short, the analysis of motifs in epic plots reveals their commonality and uniqueness, which enhances the understanding of the narratives as a whole. The presence of recurring motifs such as battles, quests, and supernatural creatures across different epic traditions provides evidence of common themes and cultural universality. These motifs serve as building blocks in the construction of an epic plot, allowing for a cohesive structure that resonates with diverse audiences. However, the specific characteristics of motifs in specific cultures also emphasize the uniqueness and individuality of each epic tradition. They contribute to the overall richness and variety of epic stories, and demonstrate the creativity and imagination of different societies throughout history. Therefore, the study of motifs in epic plots not only deepens our appreciation for these ancient texts, but also reflects the human need for storytelling and continuing.

#### References:

- Doug T. T. Haug. Relative Chronology in Early Greek Epic Poetry. Universiade, Cambridge University Press, 1/1/2012
- Lang Ying. THE EPICS OF CHINA. Rinchindorji, American Academic Press, 2/5/2020
- Doug T. T. Haug. Relative Chronology in Early Greek Epic Poetry. Øivind Andersen, Cambridge University Press, 1/1/2012

## SIMILARITIES AND DIFFERENCES BETWEEN UZBEK AND ENGLISH PROVERBS

**Mirzaeva Maftuna Shovkat qizi**

MIA of the Republic of Uzbekistan No. 1 Tashkent academic

Lyceum English teacher

### ABSTRACT

The article discusses the features of the translation of English sayings and proverbs means of the Uzbek language. Phraseological units act as a tool representations of the features of the national mentality, are characterized by a high cultural and national marking, contain, in addition to linguistic, extra linguistic aspects, which causes numerous difficulties when translating from one language to another. The need to convey the extra linguistic aspects of the translated construction necessitates the search for new ways of translating English proverbs and sayings into Uzbek. The article is devoted to the study of the features of the interaction of cultures in the process of implementing translation activities. The study revealed that within the framework of the linguoculturological approach, the most common ways of translating phraseological units are search equivalent, phraseological analogue. Cases of the use of Uzbek phraseological units in situations where it is absent in the original language seem to be not rare.

**Keywords:** proverbs, sayings, translation, phraseology, translation equivalence, the adequacy of the translation.

### INTORUCTION

The proverbs are popularly defined as short expressions of popular wisdom which refer to common experience are often expressed in metaphor, alliteration, or rhyme. A proverb (from the Latin proverbium) is a simple and concrete saying popularly known and repeated, which expresses a truth, based on from generation to generation" [1, p. 27]. It is clear from the definition that proverb is not a simple unit of a language; it is a ready-made sentence that gives metaphorical meaning with words of wisdom or traditional thoughts of people or nation.

Literature review As linguist Eugene Nida noticed that in order to learn the language of a nation ,it is important to study it's culture. He emphasized that language and culture are interrelated. He explained it as follows:"Cultural factors are deeply interwoven with the language and thus are morphologically and structurally reflected in the forms of the language ". The scientist of linguistics Veronika Telia (

PhD,Dr.habil.,Prof) calls proverbs as "direct cultural signs " and believes that proverbs are factors that reflect the culture of the people. In Telia's (PhD,Dr.habil.,Prof) opinion each proverb is a mirror that people's way of life can be fully expressed .She wrote:“After having described the interaction between language, culture and proverbs,seems also important to mention the ways in which culture is implemented through language. Each culture has a set of proverbs that could be defined as basic, when they enter the lexicon and the language, it is possible they act as “direct cultural signs”.

#### MATERIALS AND METHODS

The proverbs of each country are different from one another, depending on the history of creation and the ways which people express in their lifestyle. There are similarities between proverbs in English and Uzbek. This attitude is that when we analyze proverbs in various ways [Palmer, 1981]:

1. Morphological;
2. Lexical;
3. Etiological;
4. Stylistic.

We can clearly see differences between them in the analysis. One of the first differences between the two languages is the images used in them. In many English proverbs, the expression of human nature is often used by animal images: Eagles do not catch flies (eagles do not hold flies). The higher the monkey climbs the more he shows his tail (the more the monkey looks up, the more tail it looks) In contrast, Uzbek proverbs refer as a simple human lifestyle without getting an animal image. For instance: - O’xshatmasdan uchratmas (They do not meet who do not look like each other). Here, we should mention a few variations in translating proverbs from one language into common sense or the practical experience of humanity (Latin, 2011). The linguist W. Mieder defines a proverb in his book: “A proverb is a short, generally known sentence of the folk which contains wisdom, truth, morals, and traditional views in a metaphorical, fixed and memorisable form and which is handed down another. It helps to translate proverbs from the English language to the Uzbek language through these types of translation. There is equivalent form of the above mentioned Uzbek proverb in English: O’xshatmasdan uchratmas (They do not meet who do not look like each other)- Birds of a feather flock together.

- There are several types of proverbs that can be translated into other languages :
- Using phraseological Equivalent;
  - Absolute Equivalent; - Similar Equivalent.
  - Use direct translation

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

There are the same proverbs in English and Uzbek which can be translated into absolute style. A watched pot never boils - Kutilgan qozon qaynamas. Wisdom is the beauty of men - odam bezagi aql (beauty of man is his wisdom). Manners make the man - insonni fazilatlar ulug'laydi (Manners earn reputation for man). In conclusion, many Uzbek's and English's proverbs on Evil have the same meaning. Only words in both languages are different. Proverbs that have different meanings in the process of semantically analysis are observed the same meaning. In all English and Uzbek proverbs evil is shown as the most vile and disgusting side. We can mention that there are some proverbs which are very difficult to translate, in some cases almost impossible, as they are narrowly linked to the cultural and social system of the society. Comparison of two nations' proverbs reveals that proverbs reflect the rich historical experience of the people, ideas which related with work, lifestyle and culture of people. Using proverbs correct and appropriate makes speech unique originality and the expressiveness.

#### CONCLUSION

Proverbs are the transmission of people's linguistic phrases and cultural manners from one generation into another. That's why the treatment of rendering proverbs must be careful, precise, and not to be expected literally. Not to forget to take into account the proverb cultural, religious, historical background to use the appropriate translation method, hence, achieving a balance between form and content, and also rendering the information the proverb wants to give successfully into the other language without losing the essence of the its meaning.

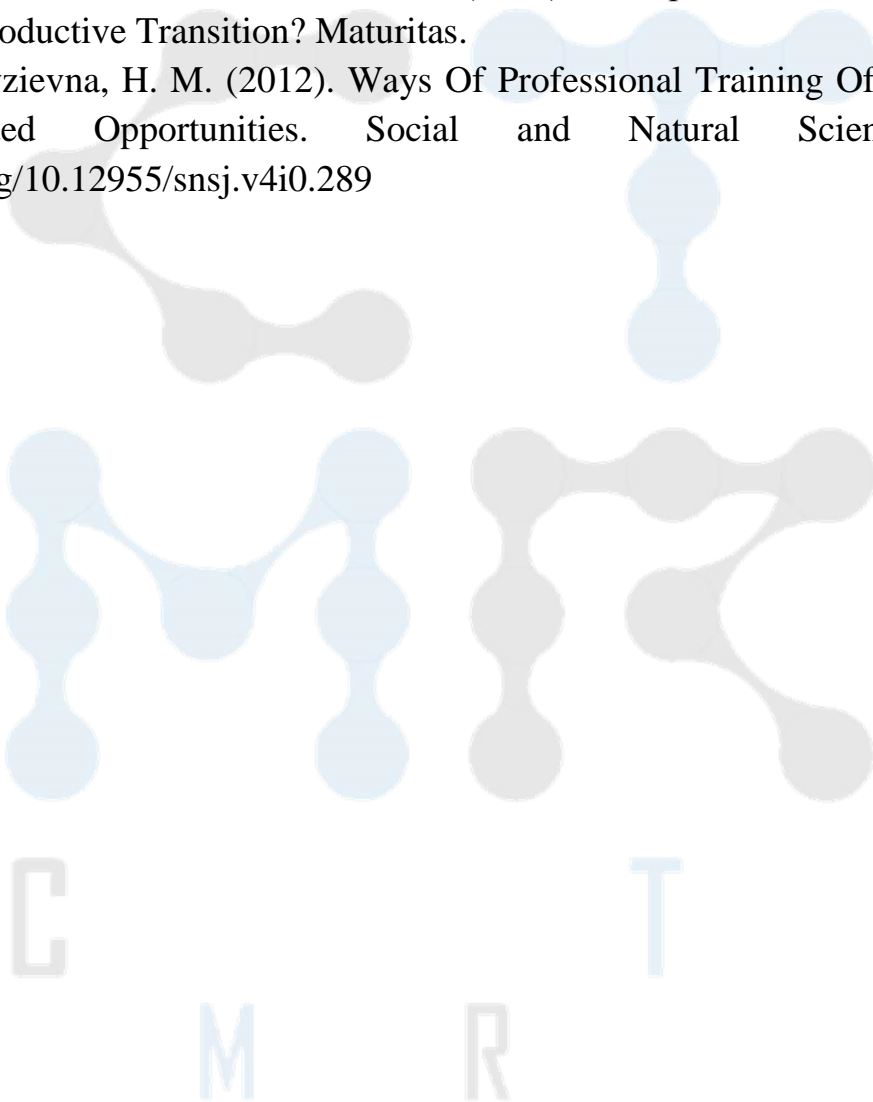
#### REFERENCES

1. Abdullaev, R. (2021). The impact of national independence and globalisation on the status of English language instruction within Uzbekistan. *New Challenges to Education: Lessons from around the World*, 19, 133–137. <https://files.eric.ed.gov/fulltext/ED613959.pdf>
2. Bolsunovskaya, L. M., Phillips, C., Korotchenko, T. V., Matveenکو, I. A., Strelnikova, A. B., & Ulyanova, O. S. (2015). Project-based Method in Teaching Foreign Language for Specific Purposes. *Procedia - Social and Behavioral Sciences*, 215, 176–180. <https://doi.org/10.1016/J.SBSPRO.2015.11.615>
3. Calafato, R. (2021). "I'm a salesman and my client is China": Language learning motivation, multicultural attitudes, and multilingualism among university students in Kazakhstan and Uzbekistan. *System*, 103, 102645. <https://doi.org/10.1016/J.SYSTEM.2021.102645>

4. Čoh, M. (2021). MOTOR AND INTELLECTUAL DEVELOPMENT IN CHILDREN: A REVIEW. Facta Universitatis, Series: Physical Education and Sport. <https://doi.org/10.22190/fupes200918049c>

5. Cronin, C., Hungerford, C., Wilson, R. L., Falkingham, J., Evandrou, M., Qin, M., Vlachantoni, A., Lopes, J. Z., Williams, W. J., Richard, D. D., Johnson, L. M., Zenouzi, M., Dow, D. E., Fraser, A., Whitley, E., Johnman, C., Alvergne, A., Garcia, J. F. R., Caldeira, J. M. L. P., ... Moncur, W. (2020). Menopause: Deficiency Disease or Normal Reproductive Transition? Maturitas.

6. Fayzievna, H. M. (2012). Ways Of Professional Training Of Children With The Limited Opportunities. Social and Natural Sciences Journal. <https://doi.org/10.12955/snsj.v4i0.289>



**ПОСАДКА СЕМЯН ЛУКА В РЯДОК РЕЗУЛЬТАТЫ ЭКСПЕРИМЕНТАЛЬНЫХ  
ИССЛЕДОВАНИЙ НА ПРЕДМЕТНОМ ОСНОВАНИИ**

**Эшдавлатов Акмал Эшпулатович**

**Юсупов Фузайл Фарход ўгли**

“ТИИИМСХ” Каршинский институт ирригации и агротехнологий НИУ

**Аннотация:** В статье приведены результаты экспериментальных исследований по обоснованию радиуса кривизны передней части полоза сошника и приложенной вертикальной нагрузки на нее сеялки для сева семян лука ленточно-многорядному способу.

**Ключевые слова:** Сеялка, гребень, сошник, полоз, радиус кривизны передней части полоза, вертикальная нагрузка.

Известно, что, поскольку в нашей республике нет специальных сеялок, посадку семян лука проводят не приспособленными к местным условиям зарубежными сеялками и различными искусственными приспособлениями. Эти устройства не могут сеять семена лука в несколько рядов и на одну и ту же глубину. Кроме того, на подготовленных к посадке полях проводятся вскрывающие и посадочные работы отдельными агрегатами. Это приводит к удлинению сроков посева, увеличению расхода семян, рабочей силы, горюче-смазочных материалов.

На основе этого в НИИ механизации сельского хозяйства разработана сеялка, открывающая односторонние оросительные затворы, создающая насыпи и высеваящая семена лука во много рядов полосовым способом [1], проводятся исследования по обоснованию параметров своих рабочих органов, которые сажают семена.

В данной статье представлены результаты экспериментальных исследований влияния радиуса передней изогнутой части семенной направляющей многорядной сеялки на ее производительность.

Перед проведением экспериментов определяли влажность, плотность, твердость и агрегатное состояние почвы по ГОСТ 20915-11 [2] в слоях 0-5, 5-10, 10-15 и 15-20 см. При этом влажность почвы в слоях 0-5, 5-10, 10-15 и 15-20 см равна 14,1; 17,2; 18,5; 20,6%, плотность 0,41; 0,56; 0,71; 0,78 г/см<sup>3</sup> и твердость 1,11; 1,24; Оно составляло 1,21 и 1,25 МПа. Уровень уплотнения почвы (количество фракций менее 25 мм) составил 82,4%.

В качестве критериев оценки за основу радиуса передней отогнутой части салазок были выбраны плотность грунта, среднеквадратичное отклонение неровностей на поверхности грунта и его сопротивление тяге. В экспериментах радиус передней отогнутой части затвора изменялся от 140 мм до 230 мм с интервалом 30 мм. При этом высота передней отогнутой части ползуна равна 9 см, длина его уплотняющей рабочей поверхности - 16 см, ширина - 30 см, приложенная к ней вертикальная сжимающая сила  $Q_T=400$  Н, а Скорость агрегата 5,2 и 7,5 км/ч. Результаты, полученные в экспериментах, представлены в таблице.

**Влияние радиуса передней изогнутой части салазок на ее агротехнические и энергетические показатели.**



Из показателей имя	Значение показателей							
	$r_c=140$ мм		$r_c=170$ мм		$r_c=200$ мм		$r_c=230$ мм	
Скорость движения, км/ч	5,2	7,5	5,2	7,5	5,2	7,5	5,2	7,5
Плотность почвы, г/см <sup>3</sup>	1,06	1,04	1,11	1,08	1,18	1,14	1,20	1,14
Среднеквадратич ное отклонение шероховатости на поверхности щетки, $\pm\sigma$	2,18	2,41	1,94	2,11	1,21	1,32	1,20	1,31
Сопротивление сопротивления затвора, Н	306,4	317,6	274,1	286,8	244,7	263,4	239,2	260,7

Из информации, представленной в таблице, видно, что агрегат 5,2 и при скорости 7,5 км/ч плотность грунта увеличилась с 1,06 г/ см<sup>3</sup> до 1,04 г/ см<sup>3</sup> и с 1,11 г/ см<sup>3</sup> до 1,08 г/ см<sup>3</sup>, соответственно при увеличении радиуса переднего изгиба затвора со 140 мм до 170 мм. см<sup>3</sup>,

среднеквадратичное отклонение шероховатости на поверхности кисти увеличилось с 2,18 см до 2,41 см и с 1,94 см до 2,11 см.

Затем с увеличением радиуса с 200 мм до 230 мм плотность грунта уменьшалась с 1,18 г/см<sup>3</sup> до 1,14 г/см<sup>3</sup> и с 1,20 г/см<sup>3</sup> до 1,14 г/см<sup>3</sup>. Отклонение увеличилось с 1,21 см до 1,32 см и с 1,20 см до 1,31 см. Основная причина этого заключается в том, что при увеличении радиуса передней изогнутой части суппорта со 140 мм до 170 мм наблюдается, что частицы почвы скапливаются перед суппортом, а не выталкиваются вниз по рабочей поверхности. Позже, когда было 200 мм и 230 мм, такой ситуации не наблюдалось.

На скоростях агрегата 5,2 и 7,5 км/ч с увеличением радиуса передней изогнутой части суппорта его тяговое сопротивление уменьшалось с 306,4 Н до 239,2 Н и с 317,0 Н. от 6 Н до 260,7 Н соответственно.

Увеличение скорости агрегата с 5,2 км/ч до 7,5 км/ч привело к снижению плотности почвы до 0,06 г/см, а среднеквадратического отклонения до 0,23 см. Основную причину этого можно объяснить уменьшением времени взаимодействия салазок с почвой при увеличении скорости агрегата. Предел прочности увеличился до 21,5 Н. Это можно объяснить увеличением силы реакции грунта по мере увеличения скорости агрегата. При радиусе передней отогнутой части горки 200 мм и более неровности на рисовых поверхностях уменьшаются на среднеквадратичное отклонение, а плотность почвы находится на уровне агротехнических требований для посева семян лука (1,1). -1,2 г/см<sup>3</sup>).

В заключение: Таким образом, согласно результатам проведенных экспериментальных исследований, радиус передней отогнутой части горки должен быть не менее 200 мм, чтобы поверхность рисового поля была ровной и почва уплотнялась при необходимом уровне при низком энергопотреблении.

#### **LIST OF LITERATURES:**

1. Ibragimov A., Karakhanov A., Abdurakhmanov A., Eshdavlatov A., Uteniyazov P., Khadzhiev A. Research results for a new onion seed drill // *Agricultural machinery and technologies*. – Moscow, 2020. – N 4. – С.12-16.
2. ГОСТ 20915-2011. Сельскохозяйственная техника. Методы определения условий испытаний. – Москва, 2011. – 23 с.
3. Hoque M.A., Wohab M.A. Development and evaluation of a drum seeder for onion // *Int. J. Agril. Res. Innov. & Tech.* 2013. N3(1). pp.23-28.
4. Маматов Ф.М. Сельскохозяйственные машины. –Ташкент: Ворис, 2014. – 387 с.
5. Шоумарова М.Ш., Абдуллаев Т.А. Сельскохозяйственные машины. – Ташкент: Укитувчи, 2002. – 424 с.
6. Ibragimov A., Karakhanov A., Abdurakhmanov A., Eshdavlatov A., Uteniyazov P., Khadzhiev A. Research results for a new onion seed drill // *Agricultural machinery and technologies*. – Moscow, 2020. – N 4. – С.12-16.
7. E E Eshdavlatov, F M Mamatov, A E Eshdalatov, A A Suyunov and F F Yusupov. Drum dispenser of feed additives. *Conf.Series:Earth and Environmental Science* 1284 (2023) 012012 IOP ETESD-II-2023.IOP

# THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

## VOLUME-4, ISSUE-1

### ENERGY MARKET DYNAMICS AS REFLECTED IN SELECTED EUROPEAN GLOBAL INDICES

Mykhailo Bril<sup>1</sup>, Oleksiy Petrukhnov<sup>2</sup>, Samer Mehyar<sup>3</sup>

<sup>1</sup>Department of Public Administration and Economic Policy, Simon Kuznets Kharkiv National University of Economics, Ukraine

<sup>2</sup>Department of Business, Trade and Logistics, National Technical University «Kharkiv Polytechnic Institute», Ukraine

<sup>3</sup>Head of project and assets accounts at the Jordan Petroleum Refinery, Amman, Jordan

#### Abstract:

The energy market plays an important role in providing appropriate resources, both for the needs of each person and for the development of various economic agents. Such provision makes it possible for individual business entities to function normally, to develop the economy and to satisfy the basic needs of people. Energy resources include oil, gas, fuel oil, and coal. The sale of these resources is carried out through their free sale on the market using various instruments in the form of certain securities. For the purposes of energy market analysis, it is important to know the quotes of such securities, taking into account the peculiarities of the functioning of a certain market segment. Based on this, the work examines the dynamics of the energy market as reflected by individual European global indices. The article presents the dynamics of individual indicators of the corresponding indices and conducts their comparative analysis. This allows you to determine the best time to enter the market. The work presents various graphs and diagrams that allow you to understand the progress of the study and evaluate the results obtained.

**Key words:** Dynamics, Stock indices, Comparison, Analysis, Oil, Gas, Stock market, Energy market

#### Introduction

Various resources play an important role in the development of society and its individual economic structures. Among such resources, a special place is given to energy resources, such as oil, gas, coal, fuel oil [1], [2]. These resources are both the basis for processing and transformation into other types of energy, and the basis for the production of various chemical compounds. Such resources are the raw material base for certain types of production, which determines their constant and growing demand from humanity, technological processes and economic development. Ultimately, this determines the interest in this research topic and its practical significance. Therefore, consideration of any issues on this topic is relevant.

The sale of energy resources is carried out in a separate segment of the stock market through the purchase and sale of relevant securities [3]-[5]. Such a market is well structured and is determined by the characteristics of each region where the relevant securities are traded. One of the interesting regions is the European region, which has recently undergone significant transformations.

To analyze trends that reflect the dynamics of the corresponding segment of the energy market, it is advisable to consider the values of global indices. These values reflect securities prices

for a range of energy resources. For the purpose of analysis, you can use both classical approaches and methods [6]-[15], and those that have proven themselves in other studies [16]-[19]. Moreover, in the latter case, the methodology for conducting such studies is attractive. Another important point in the analysis is the comparison of the dynamics of various indices. This helps to better understand the dynamics of market development and justify market entry strategies. Various procedures can also be used for such analysis [20], [21].

Thus, the main goal of this work is to study the dynamics of the energy market as reflected by selected European global indices. However, before moving on to such a consideration, we will analyze several related robots on this topic.

#### **Related work**

The European energy market, its problems and development trends are constantly in the spotlight of scientists.

In his study, B. Eberlein examines in detail the process of formation and development of the European energy market [22]. This is done through the prism of the interaction of management and government influence on this process. Thus, the issue of the effectiveness of sectoral management and the necessary measures to improve the effectiveness of such regulation are discussed. From that point of view, the dilemma between increasing market surveillance and promoting competition is considered.

G. Pepermans pays attention to the liberalization of the European energy market [23]. For this purpose, the experience and emerging problems in the development of such a market are studied. The work notes that there are still a number of significant obstacles to the liberalization of the European energy market. Particularly at the retail market level, additional efforts are needed to increase retail competition. Additional efforts are also needed to physically integrate existing regional markets [23]. Therefore, the EU should intensify efforts to harmonize and integrate electricity markets and electricity market policies [23].

M. Kanellakis, G. Martinopoulos and T. Zachariadis provide a detailed review of European energy policy [24]. The authors carry out such an analysis through a brief historical background in the period 1951-2-12. It examines the principles of policy development and the consultations that take place before proposing each option for possible changes in the functioning of a given market. In this case, special attention is paid to: renewable energy sources, energy efficiency, energy saving, safety, environmental protection [24].

S. Soeiro, and M. F. Dias explore the interactions and consequences of the impact of renewable energy sources on the European energy market [25]. This is due to the fact that in modern conditions there is a transition to a new energy system. This leads to deep involvement of individual consumers or citizens in a community-based initiative. But here it is necessary to take into account the unequal development of the energy market in individual countries. Therefore, understanding citizen energy initiative is important.

A. Spelta and M. E. De Giuli study the relationship between renewable energy and the price of fossil fuels [26]. The article examines data from the European energy market. For these purposes, data comparison is carried out using tools obtained from wavelet analysis. The authors use the European Renewable Energy Index and the MSCI Europe Energy Index for comparison. The results show the existence of regions with significant joint motions between rows. This allows us to assess the efficiency of the energy market as a whole.

T. T. Thanh and V. M. Linh analyze the sources of volatility in the European energy market [27]. The authors apply an extension of the joint coupled TVP-VAR approach. The paper examines the relationship between four markets: energy, crude oil, gold and silver. The data covers the period 2018-2021. The silver market has been shown to act as a net transmitter of spillover shocks to the energy market during periods of uncertainty [27]. At the same time, the authors note that pairwise connectivity emphasizes the importance of crude oil, gold and silver as net transmitters of the consequences of shocks in the energy market [27].

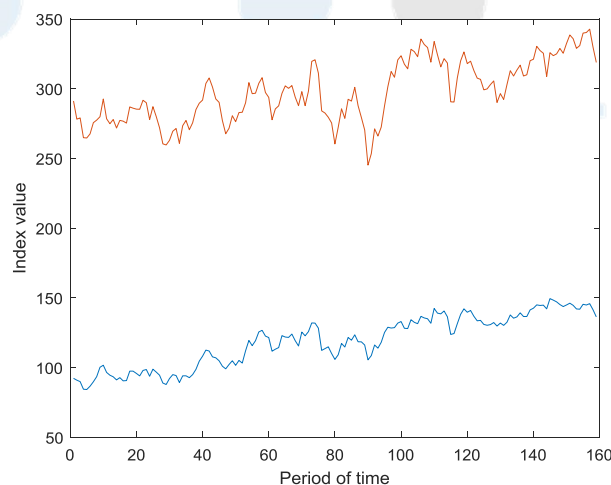
M. E. De Giuli and A. Spelta analyze Wasserstein barycenter regression to estimate the joint dynamics of renewable and fossil fuel energy indices [28]. At the same time, the authors note the presence of nonlinear dynamics in the data under study. It is for the analysis of such data that Wasserstein barycenter regression is used. The object of the study is the efficiency of the European energy market, where renewable energy and fossil fuels are present. The methodology proposed in the work makes it possible to evaluate, first of all, the time structure of conditional joint distributions. This expands the possibilities for conducting appropriate analysis.

Thus, we see different directions in the study of the European energy market. This allows us to understand the features of its functioning and development. It should also be noted that various approaches are used for the corresponding analysis, which makes it possible to study various factors influencing the energy market. Therefore, any new research is important in the overall process of studying such a market.

#### **Selected European global indices as a reflection of energy market dynamics**

For the purposes of further research, we will consider some European global indices that characterize the corresponding segment of the energy market. All data is taken from the site <https://www.investing.com/>.

In Fig. 1 shows the dynamics of the values of such indices as BNY Mellon European Oil & Gas ADR (BKEOG) and Dow Jones Europe ex-UK Oil & Gas (E2ENE).



**Figure 1:** Dynamics of BKEOG and E2ENE index values

First of all, it should be noted that various stock indices are considered that characterize the development of the European energy market. Such indices differ in the methodology of their

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

calculation and the coverage of the various securities that make up them. This allows us to better understand the dynamics we are exploring.

In Fig. 1 dynamics of the BKEOG index are displayed in blue, and E2ENE in red. In this case, we continue to consider the average values of the indices in their weekly calculations for the period 01.03.2021-01.14.24. This period allows us to fully assess existing trends.

In general, the dynamics of the BKEOG and E2ENE indices is slightly increasing. At the same time, for each data series such dynamics are special and different from one another.

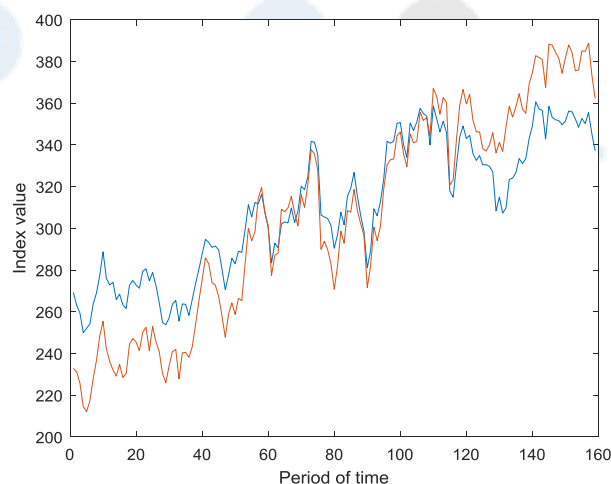
The dynamics of the BKEOG index have insignificant volatility, given that the index values have increased by approximately 60% over the analyzed period of time. There are also no sharp changes in the values of this index. Based on the data on the BKEOG index, it should be noted the progressive growth in the dynamics of the European energy market.

The dynamics of the E2ENE index are more volatile. The index values over the studied period of time increased by 24%. At the same time, we also note sharp fluctuations in the values of this index at certain time intervals. Based on the dynamics of the E2ENE index values, we can say that the European energy market is significantly influenced by external factors.

Thus, here we see that a necessary stage of the study is to conduct a comparative analysis of the dynamics of various energy indices of the European market. This will allow us to better understand the dynamics of the market and the possible conditions for optimal entry into such a market.

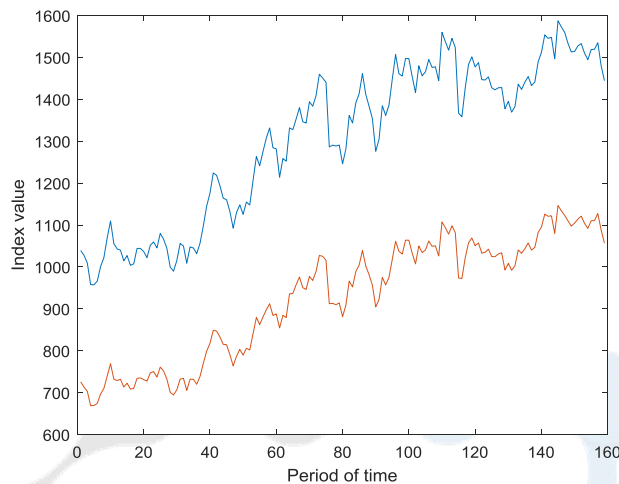
In Fig. 2 the performance of the EURO STOXX Oil & Gas EUR Price (SXEE) index is shown in blue, and the MSCI Europe Energy NR USD (MIEU0EN00NUS) is shown in red.

It should be noted that there is significant volatility in the dynamics of both indices. The growth of such indices is also significant. One can also note approximately the same dynamics of such indices.



**Figure 2:** Dynamics of SXEE and MIEU0EN00NUS index values

In Fig. 3 The performance of the FTSEurofirst 300 Oil & Gas (FTE3X60) index is shown in blue, and the STXE Oil & Gas NR (SXER) is shown in red.



**Figure 3:** Dynamics of FTE3X60 and SXER index values

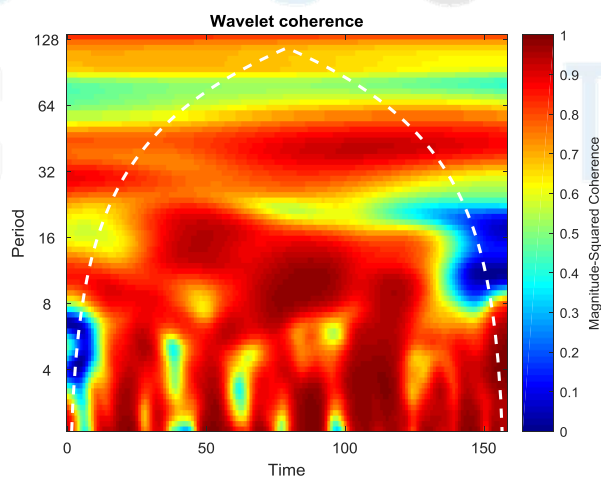
Here there is a positive dynamics in the values of the studied indices, as in the previous case. At the same time, the increase in index values is significant. This confirms the thesis and the significant influence of external factors on the functioning and development of the European energy market.

**Comparative analysis of the dynamics of the values of individual global indices of the European energy market**

For the purpose of conducting a comparative study of the dynamics of individual data series, it is advisable to use the wavelet analysis methodology. Here we should highlight wavelet coherence estimates, which are widely used in such studies [29]-[34].

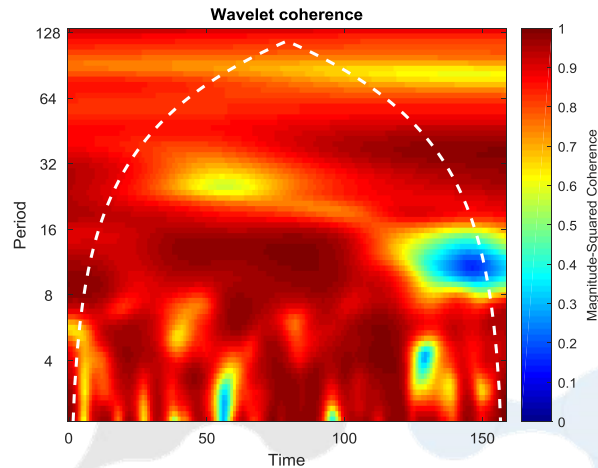
In Fig. 4 shows the estimate of wavelet coherence for the data series shown in Fig. 1. It should be noted that there is complete consistency between the data that characterize the dynamics of the values of such European market energy indices as BKEOG and E2ENE. This consistency is typical for all time intervals and also extends to a significant depth of interconnection of such data.

In Fig. 5 shows the wavelet coherence estimate for the data in Fig. 2.



**Figure 4:** Estimation of wavelet coherence between BKEOG and E2ENE

Data Fig. 5 indicate even greater consistency in the dynamics of the values of such European energy indices as SXEE and MIEU0EN00NUS.



**Figure 5:** Estimation of wavelet coherence between SXEE and MIEU0EN00NUS

Here there is absolute consistency between the relevant indices of the European energy market. This consistency is evident throughout the time-frequency domain. It is characteristic both for the entire time axis and for the entire depth of connections between data.

A similar situation is typical for the dynamics of data values that display quotes for the FTE3X60 and SXER indices.

This confirms the thesis about the significant influence of identical factors on the dynamics of changes in such indices, and therefore on the functioning of the energy market as a whole. We can also talk about the same trends in the development of the European energy market in terms of their respective indices.

Then the strategy for entering such a market will be the same, taking into account the dynamics of different indices. The prevailing factor is only the quotes for such securities. It is then possible to protect riskier transactions less valuable securities. In other words, use some strategy for hedging risks.

In general, it should be noted that it is advisable to consider the dynamics of the energy indices of the European market as an object of analysis and study of possible trends in its functioning and development. This emphasizes the objectivity of this study.

### Conclusion

The article examines current issues of the functioning and development of the European energy market. Based on a brief but critical literature review, the complexity of this issue is shown.

In order to study the European energy market, a number of its global indices were considered. Analysis of the dynamics of such indices allows us to determine the main trends in the development of this segment of the European market. It is shown that this market is under the influence of the same influencing factors. A characteristic feature of the European energy market is the volatility of index quotations and their significant growth over a relatively short period of time.

A comparative analysis of the dynamics of European energy market indices demonstrates their close relationship with each other. This allows you to determine your market entry strategy and the ability to hedge risks.



**REFERENCES:**

1. Pao, H. T., & Chen, C. C. (2019). Decoupling strategies: CO2 emissions, energy resources, and economic growth in the Group of Twenty. *Journal of cleaner production*, 206, 907-919.
2. Pao, H. T., & Fu, H. C. (2013). The causal relationship between energy resources and economic growth in Brazil. *Energy Policy*, 61, 793-801.
3. Baranova, V., Zeleniy, O., Deineko, Z., & Lyashenko, V. (2019, October). Stochastic Frontier Analysis and Wavelet Ideology in the Study of Emergence of Threats in the Financial Markets. In 2019 IEEE International Scientific-Practical Conference Problems of Infocommunications, Science and Technology (PIC S&T) (pp. 341-344). IEEE.
4. Zeleniy, O., Lyashenko, V., & Shapran, O. (2022). Analysis of Trade Trends in Global Non-Precious Metal Markets. *International Journal of Academic Multidisciplinary Research (IJAMR)*, 6(10), 223-230.
5. Lyashenko, V., Bril, M., & Pyvavar, I. (2021) Empirical Estimates of Data on the Dynamics of Changes in the World Foreign Exchange Market. *International Journal of Academic Management Science Research (IJAMSR)*, 5(11), 52-58.
6. Vasyurenko, O., & et al.. (2014). Efficiency of lending to natural persons and legal entities by banks of Ukraine: methodology of stochastic frontier analysis. *Herald of the National Bank of Ukraine*. 1, 5-11.
7. Kuzemin, A., Lyashenko, V., Bulavina, E., & Torojev, A. (2005). Analysis of movement of financial flows of economical agents as the basis for designing the system of economical security (general conception). In Third international conference «Information research, applications, and education (pp. 27-30).
8. Азаренкова, Г., & Ляшенко, В. (2009). Відношення переваг у порівняльній оцінці діяльності банків. *Банківська справа*, 5, 65-72.
9. Lyashenko, V. (2014). Efficiency of bank crediting of real sector of economy in the context of separate banking groups: an empirical example from Ukraine. *International Journal of Accounting and Economics Studies*, 2(2), 74-79.
10. Dobrovolskaya, I., & Lyashenko, V. (2013). Interrelations of banking sectors of European economies as reflected in separate indicators of the dynamics of their cash flows influencing the formation of the resource potential of banks. *European Applied Sciences*, 1-2, 114-118.
11. Kots, G. P., & Lyashenko, V. (2012). Banking sectors of the economies of European countries in the representation of statistical interrelation between indices that characterize their development. *European Applied Sciences*, 1, 461-465.
12. Ляшенко В. В. (2007). Интерпретация и анализ статистических данных, описывающих процессы экономической динамики. *Бизнес Информ*, 9(2), 108-113.
13. Слюніна, Т. Л., Бережний, Є. Б., & Ляшенко, В. В. (2007). Розвиток вітчизняної мережі банківських установ: особливості та регіональні аспекти. *Вісник ХНУ ім. В. Н. Каразіна. Економічна серія*, 755. 84–88.
14. Куштим, В. В., & Ляшенко, В. В. (2007). Динаміка розвитку банківського сегмента міжнародного фінансового ринку. *Фінанси України*, (12), 96-105.

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

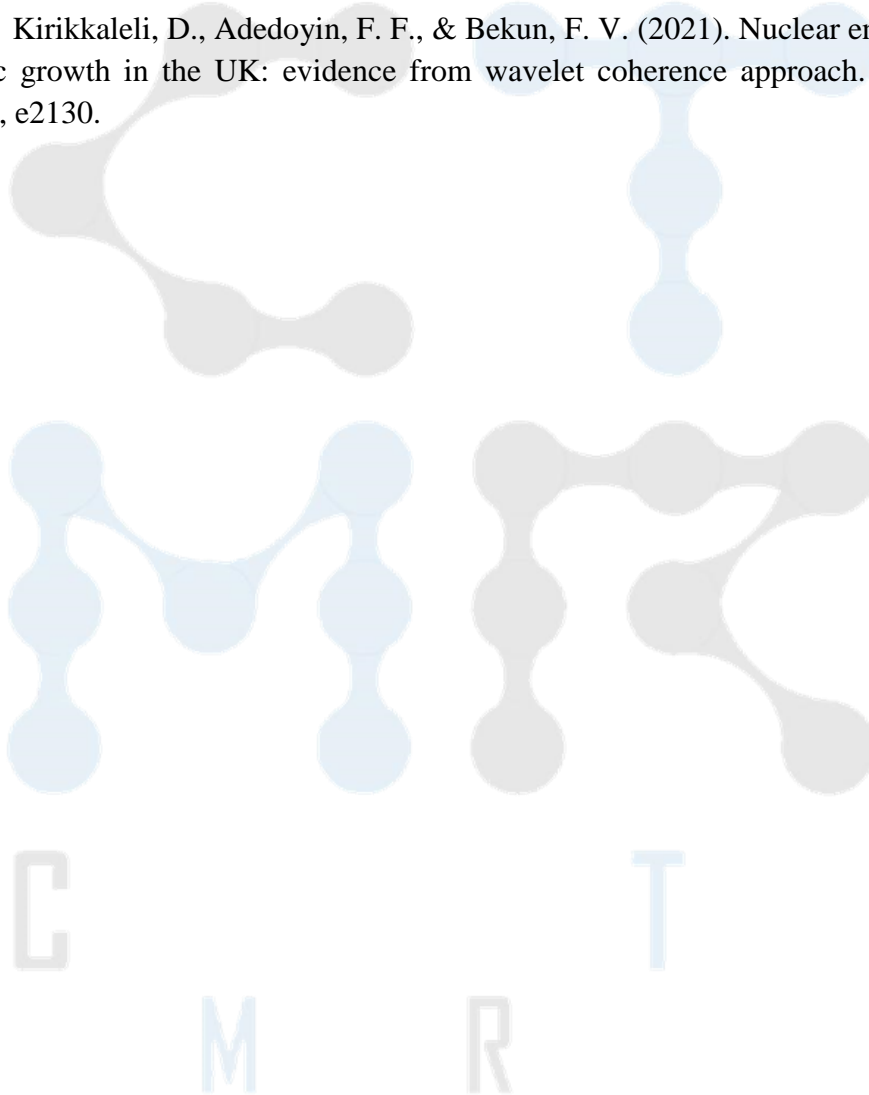
### VOLUME-4, ISSUE-1

15. Kuzemin, A., & Lyashenko, V. (2009). Methods of comparative analysis of banks functioning: classic and new approaches. *Information Theories & Applications*, 16(4), 384-396.
16. Al-Sharo, Y. M., Abu-Jassar, A. T., Sotnik, S., & Lyashenko, V. (2021). Neural Networks As A Tool For Pattern Recognition of Fasteners. *International Journal of Engineering Trends and Technology*, 69(10), 151-160.
17. Nevliudov, I., & et al.. (2020). Method of Algorithms for Cyber-Physical Production Systems Functioning Synthesis. *International Journal of Emerging Trends in Engineering Research*, 8(10), 7465-7473.
18. Omarov, M., & et al.. (2019). Internet marketing metrics visualization methodology for related search queries. *International Journal of Advanced Trends in Computer Science and Engineering*, 8(5), 2277-2281.
19. Attar, H., Abu-Jassar, A. T., Lyashenko, V., Al-qerem, A., Sotnik, S., Alharbi, N., & Solyman, A. A. (2023). Proposed synchronous electric motor simulation with built-in permanent magnets for robotic systems. *SN Applied Sciences*, 5(6), 160.
20. Vasiurenko, O., Lyashenko, V., Baranova, V., & Deineko, Z. (2020). Spatial-Temporal Analysis the Dynamics of Changes on the Foreign Exchange Market: an Empirical Estimates from Ukraine. *Journal of Asian Multicultural Research for Economy and Management Study*, 1(2), 1-6.
21. Vasiurenko, O., & Lyashenko, V. (2020). Wavelet coherence as a tool for retrospective analysis of bank activities. *Economy and Forecasting*, (2), 43-60.
22. Eberlein, B. (2008). The making of the European energy market: The interplay of governance and government. *Journal of Public Policy*, 28(1), 73-92.
23. Pepermans, G. (2019). European energy market liberalization: Experiences and challenges. *International Journal of Economic Policy Studies*, 13(1), 3-26.
24. Kanellakis, M., Martinopoulos, G., & Zachariadis, T. (2013). European energy policy—A review. *Energy Policy*, 62, 1020-1030.
25. Soeiro, S., & Dias, M. F. (2020). Renewable energy community and the European energy market: Main motivations. *Heliyon*, 6(7).
26. Spelta, A., & De Giuli, M. E. (2023). Does renewable energy affect fossil fuel price? A time–frequency analysis for the Europe. *Physica A: Statistical Mechanics and its Applications*, 626, 129098.
27. Thanh, T. T., & Linh, V. M. (2022). An exploration of sources of volatility in the energy market: An application of a TVP-VAR extended joint connected approach. *Sustainable Energy Technologies and Assessments*, 53, 102448.
28. De Giuli, M. E., & Spelta, A. (2023). Wasserstein barycenter regression for estimating the joint dynamics of renewable and fossil fuel energy indices. *Computational Management Science*, 20(1), 1.
29. Mustafa, S. K., & et al.. (2020). Using wavelet analysis to assess the impact of COVID-19 on changes in the price of basic energy resources. *International Journal of Emerging Trends in Engineering Research*, 8(7), 2907-2912.
30. Orhan, A., Kirikkaleli, D., & Ayhan, F. (2019). Analysis of wavelet coherence: service sector index and economic growth in an emerging market. *Sustainability*, 11(23), 6684.

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

31. Kirikkaleli, D., & Gokmenoglu, K. K. (2020). Sovereign credit risk and economic risk in Turkey: empirical evidence from a wavelet coherence approach. *Borsa Istanbul Review*, 20(2), 144-152.
32. Wang, Y., Wei, M., Bashir, U., & Zhou, C. (2022). Geopolitical risk, economic policy uncertainty and global oil price volatility—an empirical study based on quantile causality nonparametric test and wavelet coherence. *Energy Strategy Reviews*, 41, 100851.
33. Adebayo, T. S. (2020). Revisiting the EKC hypothesis in an emerging market: an application of ARDL-based bounds and wavelet coherence approaches. *SN Applied Sciences*, 2(12), 1945.
34. Kirikkaleli, D., Adedoyin, F. F., & Bekun, F. V. (2021). Nuclear energy consumption and economic growth in the UK: evidence from wavelet coherence approach. *Journal of Public Affairs*, 21(1), e2130.



**Qarshiyev Bekzod O'ktam o'g'li**

[bekhzadkarshiyev@gmail.com](mailto:bekhzadkarshiyev@gmail.com)

**Otamurodov Ramziddin Zokirovich**

[otamurodovramziddin2@gmail.com](mailto:otamurodovramziddin2@gmail.com)

Department of Pharmacology and Clinical Pharmacology,

Termiz Branch of the Tashkent Medical Academy

Research advisor-**Chariev Muzaffar Yuldashevich**

[charievmuzaffarbek@gmail.com](mailto:charievmuzaffarbek@gmail.com)

**Termiz Branch of the Tashkent Medical Academy, Uzbekistan**

### ANNOTATION

Patients with renal colic are usually treated in emergency care units or by their family doctors and require immediate diagnosis and treatment. The life-time risk is up to 10 %. The prevalence amounts to 4.7 % in Germany. In addition to confirming the diagnosis and inducing an adequate pain therapy it's very important for patients to be directed correctly and, above all, prevention is important, too. Without treatment the recurrence rate ranges between 50 and 100 %. Particularly, these principals should give useful advice, wherever patients are treated without urological department.

**Keywords:** renal stones; ureteric stones; pyonephrosis; lithotripsy, pharmacologic, patient.

### INTRODUCTION

Patients with kidney disease carry an increased medication burden compared with patients with normal kidney function, with 80% of patients taking more than 5 medications per day. The prevalence of polypharmacy increases as chronic kidney disease (CKD) stage worsens and comorbidities increase. Dialysis patients have among the highest pill burdens of any disease state, with a median of 19 pills per day and with 25% of patients exceeding 25 pills per day. Elderly patients with CKD take a median of 9 medications daily and have additive alterations in pharmacokinetics and pharmacodynamics due to advanced age plus CKD. Their risk of an adverse drug event is 3 to 10 times higher than elderly patients without CKD. A study of 83,000 veterans with a creatinine clearance ( $CL_{cr}$ ) of 15-49 mL/min reported inappropriate medication dosages or contraindications to therapy in 13% to 29% of patients, clearly demonstrating the importance of a systematic approach to reviewing and managing medications in patients with reduced kidney function.

Nephrologists are frequently faced with managing a variety of medication therapies that each have their own pharmacologic considerations for maximizing benefits and minimizing risks. Compounding this challenge is the paucity of pharmacokinetic or clinical data for many medications in patients with declining kidney function. The lack of therapeutic drug monitoring and frequent difficulties with medication adherence due to polypharmacy add significant complexity to the decision-making process. This installment of the AJKD Core Curriculum in Nephrology builds upon the basic pharmacologic principles laid out in the previous Core Curriculum installment from 2005 and highlights major concepts for the most common comorbidities and medications that require special consideration in patients with declining kidney function.

Several types of stones may develop in response to urinary composition imbalances. Each case is different and necessitates highly individualized care.

Several risk factors have been clearly identified :

Dietary factors

Adjusting one's diet is often key to preventing the recurrence of kidney stones.

Genetic factors

Family antecedents exist in nearly 40 percent of cases.

Infectious factors

The enzymatic activity of certain UTI-causing bacteria such as *Proteus mirabilis*, *Klebsiella* and *Pseudomonas* can cause kidney stones to form.

Abnormal urinary pH

Overly acidic or alkaline urinary pH contributes to the development of various types of kidney stones.

Anatomical defects in the urinary tract

Certain anatomical defects in the kidneys or urinary tract contribute to urinary stasis and therefore to the formation of stones.

Infection Fever, or history suggesting fever, raises the possibility of pyonephrosis (infection above an obstructing stone). The obstructed kidney drains by means of calyceal rupture, pyelovenous and pyelolymphatic backflow. Therefore infection in an obstructed system can result in life threatening Gram negative sepsis. Antibiotics alone cannot reliably treat pyonephrosis, and urgent hospital admission for drainage of the upper tract above the stone is required. Previously, percutaneous nephrostomy under local anaesthetic was considered to be the ideal treatment, but this has recently been challenged by a randomised study demonstrating equivalent outcomes from retrograde stenting and percutaneous nephrostomy.<sup>8</sup> Patients often find stents uncomfortable and complain of lower urinary tract symptoms. Despite this, stents still play an important role in the management of pyonephrosis. Following drainage and a 1–2 week course of antibiotics, these patients then need to return for definitive management of their stone and removal of the stent. There has been a reluctance of urologists to undertake 'hot' ureteroscopic laser lithotripsy in these patients for fear of worsening endotoxaemia, although the evidence for this is only Level III.<sup>9</sup>

Shock wave lithotripsy

Shock wave lithotripsy is the least invasive method of eliminating stones, but also the least effective. The efficacy of SWL depends on:

- stone size – less effective once stone is >1 cm, almost never used for stones >2 cm
- stone position – stone clearance rates from the lower pole are poor, particularly for stones >1 cm (20%).<sup>15</sup> This improves to 75% for stones in the middle and upper calyces.<sup>15</sup>

Complications

- Significant pain with the passage of stone fragments is seen in 15% of patients
- Haematuria is almost universal, but is problematic for less than 1% of patients
- Perinephric haematoma is rare.

Contraindications

- Pregnancy
- Urinary tract infection
- Antiplatelet or anticoagulant drugs
- Abdominal aortic aneurysm
- Abnormalities of drainage from the kidney.

For these reasons, SWL is generally reserved for stones that are not causing any or much trouble at the time of presentation, or for patients with stones inaccessible to retrograde or percutaneous access.

**ИҚТИБОСЛАР/ ЧОШКИ/ REFERENCES:**

1. Lee M-C, Bariol S. Epidemiology of stone disease in Australia. In: Talati J, Tiselius H-G, Ye Z, Albala D, editors. The management of urolithiasis: the rational deployment of technology. Springer 2011; in press.

2. Messersmith WA, Brown DF, Barry MJ. The prevalence and implications of incidental findings on ED abdominal CT scans. *Am J Emerg Med* 2001;19:479– 81.

3. Saxena SK, Saxena S, Saxena R, et al. (2010) Emerging trends, challenges and prospects in antiviral therapeutics and drug development for infectious diseases. *Electronic Journal of Biology* 6: 26–31. [[Google Scholar](#)]

4. Son of Khushvaktov Ilyas Shadiqul o'g'li, son of Tugalboyev Daniyoy Abdurasulovich, and son of Khursandov Husniddin Yusubali. (2023). LEARNING THE FUNDAMENTALS OF ANTISEPTIC AND ASEPTIC. MEDICINE, PEDAGOGY AND TECHNOLOGY: THEORY AND PRACTICE, 1(4), 79–82. izvlecheno ot <https://universalpublishings.com/index.php/mpttp/article/view/3709>

5. Mirzaali Oglu, A. J., Shadiqul Oglu, X. I., Eminjon Oglu, S. H., Aliqul Oglu, N. B., & Begzod Oglu, M. M. (2022) . Importance of medical prevention in medicine. *Texas Journal of Medical Science*, 13, 175-176.

6. Mirzaali oglu, A. J., Shadiqul oglu, H. I., Fazil oglu, N. A., & Davronbek Ulugbek oglu, T. (2022). TERMINAL CASES LUNG AND HEART RESUSCITATION TRANSFER PRINCIPLES. *Galaxy International Journal of Interdisciplinary Research*, 10(10), 729-731.

7. Tashboltayevna A. S. et al. STUDY OF SEASONAL BIOLOGICAL BACTERIAL INTESTINAL INFECTIONS IN THE EXAMPLE OF ESHERICHIA //Journal of Universal Science Research. – 2023. – T. 1. – №. 3. – C. 110-115.

8. Mirzaali son A. J. et al. THE LAST BRAIN, ITS CHANGES DEPENDING ON AGE. RELIEF OF PLASH. LATERAL WHITE MATTER OF THE BRAIN. BASAL STEMS //PEDAGOG. - 2022. - T. 5. – no. 6. - S. 319-326.

9. Rakhmon Og A. M. et al. PHYSIOLOGY OF THE HEART, AUTOMATIC HEART, ELECTROCARDIAGRAM //SUSTAINABILITY OF EDUCATION, SOCIO-ECONOMIC SCIENCE THEORY. - 2022. - T. 1. – no. 4. – S. 4-8.

10. Choriyeva Z. et al. INFORMATION ON DIABETES DISEASE. THE ORIGIN OF DIABETES DISEASE AND MEASURES APPLIED IN THIS DISEASE //Theoretical aspects in the formation of pedagogical sciences. - 2022. - T. 1. – no. 4. – S. 96-99.

CLINICAL PHARMACOLOGY OF PSYCHOTROPIC DRUGS

**Pirmatov Shohrux Xolto'rayevich**

[shohruxjonpirmatov11@gmail.com](mailto:shohruxjonpirmatov11@gmail.com)

**Xojiyev bahrom abduraxmon o'gli**

Department of Pharmacology and Clinical Pharmacology,

Termiz Branch of the Tashkent Medical Academy

Research advisor-**Chariev Muzaffar Yuldashevich**

[charievmuzaffarbek@gmail.com](mailto:charievmuzaffarbek@gmail.com)

**ANNOTATION**

There are many reasons why once a day oral dosage may be advantageous in administration of psychotropic drugs to mental patients, such as convenience for the patient, avoided side effects, ease of remembering, all of which contribute to reliable dosage as well as cost savings. This paper illustrates cost data, pharmacokinetics of psychotropic drugs, and suggests a basis for determining adequate pill size for unit dosage. On a cost per milligram basis, there is economic savings if medication is prescribed in the largest size the patient can conveniently take. Pharmacological data support a rationale for higher unit dosage. They indicate a dose response relationship between dose and therapeutic effectiveness and probably a blood level relationship. The long half-life indicates that once-a-day medication is a reasonable dosage schedule. The most important evidence for once-a-day medication, however, is the empirical evidence that it works, and is safe. Dosage information from double blind investigations provides a basis for determining adequacy of pill size for antipsychotic therapy.

**Keywords:** Psychotropic drug, antipsychotic therapy, gamma-aminobutyric, depression, pharmacology, behavior.

**INTRODUCTION**

Psychotropic drug, in pharmacology, any agent that induces changes in awareness, behaviour, mood, perception, or sensation. Most psychotropic drugs are classified as one of five different types: antianxiety agents, antidepressants, antipsychotics, hypnotics, or mood-stabilizing drugs. Psychotropic drugs are used to treat a broad array of conditions, from sleep disorders and pain to anxiety, depression, and psychosis.

Psychotropic drugs exert their actions by either mimicking the effects, blocking the activity, or altering the storage, release, or uptake of neurotransmitters (signaling molecules in the brain that relay information between neurons and between neurons and other types of cells). Some psychotropic drugs restore the balance of neurotransmitters by preventing their breakdown once released from neurons. Examples of neurotransmitters that can be affected by psychotropic drugs include dopamine, gamma-aminobutyric acid (GABA), norepinephrine, and serotonin. The five main classes of psychotropic drugs are distinguished primarily by the effects that result from their actions on neurotransmitters. Many antianxiety drugs, for example, are benzodiazepine compounds (e.g., clonazepam, diazepam), which bind to neurons at locations near ion channels that admit chloride ions into the cell and also near sites of action for GABA. GABA exerts inhibitory actions on certain neurons and thereby reduces the transmission of nerve impulses; benzodiazepines

generally enhance the effects of GABA, resulting in a calming effect. Other antianxiety drugs have similar physiological effects but do not act on GABA. Buspirone, for example, is thought to be a partial agonist of receptors for serotonin, the activity of which is associated with mood changes.

In the ATC classificatory system, the anatomical site of action could be the CNS (e.g., carbamazepine), the respiratory system (e.g., salbutamol), the cardiovascular system (e.g., digoxin), the gastrointestinal system (e.g., omeprazole), and so on. A problem here is that, for example, antimicrobials and antineoplastic drugs do not act on a specific anatomical system; however, they do act at a specific anatomical target, such as bacterial or neoplastic cells. Vitamins are other examples of drugs that are hard to classify with regard to an anatomical target.

For Level 1 CNS drugs, Level 2 includes analgesics, anesthetics, antiepileptics, anxiolytics, antidepressants, antipsychotics, antidementia drugs, mood stabilizers, hypnotics, and others. A problem here is that drugs are classified according to the original indication for which they were studied and approved. However, many drugs have many indications. For example, SSRIs have demonstrated efficacy in depression, generalized anxiety disorder, panic disorder, social anxiety disorder, posttraumatic stress disorder, obsessive-compulsive disorder (OCD), premenstrual dysphoric disorder, migraine (prophylaxis), and other conditions. Nevertheless, SSRIs are still classified as antidepressants.

Similarly, antipsychotics such as aripiprazole are effective in schizophrenia, in mania, as antidepressant augmentation treatment in major depressive disorder, as SSRI augmentation treatment in OCD, and in the treatment of delirium. Quetiapine and lurasidone are specifically effective as monotherapy for bipolar depression, and quetiapine is effective as monotherapy for generalized anxiety disorder. Some of these are not approved indications but are indications for off-label use.

#### Mechanism of action

Psychoactive drugs are thought to exert their effect through actions on the neurotransmitters in the central nervous system (CNS). Thus far, over 100 neurotransmitters have been identified. The most important ones include gamma amino butyric acid (GABA), acetylcholine (Ach) and the biogenic amines (monoamines), of which the last can be further subdivided into tryptophan-derived indoleamines (serotonin and melatonin) and tyrosine-derived catecholamines (dopamine, norepinephrine, and epinephrine) (Table 5-5). Following the depolarization of the presynaptic cell membrane, neurotransmitters are released into the synaptic cleft. These released neurotransmitters then bind to the receptors, which results in the transduction of the signal to the postsynaptic membrane. Signal transduction ceases again upon deactivation of the activity of the neurotransmitters. This may occur through enzymatic degradation, reuptake in the presynaptic cell via membrane channels, and activation of the autoreceptors (located on the presynaptic membrane) that block the continued release of the neurotransmitters.

#### ИҚТИБОСЛАР/ СНОККИ/ REFERENCES:

1. Zohar J, Nutt DJ, Kupfer DJ, Moller HJ, Yamawaki S, Spedding M, et al. A proposal for an updated neuropsychopharmacological nomenclature. *Eur Neuropsychopharmacol.* 2014;24:1005–14. [[PubMed](#)] [[Google Scholar](#)]

2. Zohar J, Stahl S, Moller HJ, Blier P, Kupfer D, Yamawaki S, et al. A review of the current nomenclature for psychotropic agents and an introduction to the Neuroscience-based nomenclature. *Eur Neuropsychopharmacol.* 2015;25:2318–25. [[PubMed](#)] [[Google Scholar](#)]



3. Fowler, Michael J. "[Diabetes treatment, part 2: oral agents for glycemic management.](#)" *Clinical diabetes* 25.4 (2007): 131-134.
4. Son of Khushvaktov Ilyas Shadiqul, son of Tugalboyev Daniyoy Abdurasulovich, and son of Khursandov Husniddin Yusubali. (2023). LEARNING THE FUNDAMENTALS OF ANTISEPTIC AND ASEPTIC. MEDICINE, PEDAGOGY AND TECHNOLOGY: THEORY AND PRACTICE, 1(4), 79–82. izvlecheno ot <https://universalpublishings.com/index.php/mpttp/article/view/3709>
5. Mirzaali Oglu, A. J., Shadiqul Oglu, X. I., Eminjon Oglu, S. H., Aliqul Oglu, N. B., & Begzod Oglu, M. M. (2022) . Importance of medical prevention in medicine. *Texas Journal of Medical Science*, 13, 175-176.
6. Mirzaali oglu, A. J., Shadiqul oglu, H. I., Fazil oglu, N. A., & Davronbek Ulugbek oglu, T. (2022). TERMINAL CASES LUNG AND HEART RESUSCITATION TRANSFER PRINCIPLES. *Galaxy International Journal of Interdisciplinary Research*, 10(10), 729-731.
7. Tashboltayevna A. S. et al. STUDY OF SEASONAL BIOLOGICAL BACTERIAL INTESTINAL INFECTIONS IN THE EXAMPLE OF ESHERICHIA //Journal of Universal Science Research. – 2023. – T. 1. – №. 3. – C. 110-115.
8. Mirzaali son A. J. et al. THE LAST BRAIN, ITS CHANGES DEPENDING ON AGE. RELIEF OF PLASH. LATERAL WHITE MATTER OF THE BRAIN. BASAL STEMS //PEDAGOG. - 2022. - T. 5. – no. 6. - S. 319-326.
9. Rakhmon Og A. M. et al. PHYSIOLOGY OF THE HEART, AUTOMATIC HEART, ELECTROCARDIAGRAM //SUSTAINABILITY OF EDUCATION, SOCIO-ECONOMIC SCIENCE THEORY. - 2022. - T. 1. – no. 4. – S. 4-8.
10. Choriyeva Z. et al. INFORMATION ON DIABETES DISEASE. THE ORIGIN OF DIABETES DISEASE AND MEASURES APPLIED IN THIS DISEASE //Theoretical aspects in the formation of pedagogical sciences. - 2022. - T. 1. – no. 4. – S. 96-99.
11. Asfandyorov J. et al. SOME CONSIDERATIONS ABOUT PYLOnephritis DISEASE AND ITS CONSEQUENCES //Akademicheskije issledovaniya v sovremennoy nauke. - 2022. - T. 1. – no. 15. - S. 55-57.

CLINICAL PHARMACOLOGY OF HYPOGLYCEMIC DRUGS

**Rayimnazarov Shaxzot Muhiddin o'g'li**

[shaxzot.doctor.rayimnazarov@mail.ru](mailto:shaxzot.doctor.rayimnazarov@mail.ru)

**Abduraxmonov Alijon Shodmon o'g'li**

[alimedic.uz@gmail.com](mailto:alimedic.uz@gmail.com)

Department of Pharmacology and Clinical Pharmacology,

Termiz Branch of the Tashkent Medical Academy

Research advisor-**Chariev Muzaffar Yuldashevich**

[charievmuzaffarbek@gmail.com](mailto:charievmuzaffarbek@gmail.com)

**ANNOTATION**

In patients with diabetes mellitus type 2, non-insulin antihyperglycemic therapy is aimed to control symptoms of hyperglycemia and to limit microvascular complications. It is introduced early after diagnosis of the disease. Antihyperglycemic agents may predominantly act through one of four ways. The involved mechanisms are: enhancement of insulin secretion, through which act sulfonylureas, meglitinides and two types of incretin mimetics - glucagon-like peptide-1 (GLP-1) receptor agonists and inhibitors of dipeptidyl peptidase-4 (DPP-4) activity -gliptins; suppression of hepatic glucose production - biguanides; enhanced sensitivity to insulin - thiazolidinediones, and decrease of the rate or extent of glucose absorption: islet amyloid polypeptide (amylin) analogs and  $\alpha$ -glucosidase inhibitors. With exception of GLP-1 receptor agonists and pramlintide, a synthetic form of amylin, all these drugs are administered orally.

**Keywords:** complex, diabetes, pharmacological, insulin, Glucose-lowering agent Guidelines, Pharmacotherapy, Type 2 diabetes

**INTRODUCTION**

Type 2 diabetes mellitus (T2DM) is a complex disease that progressively aggravates with time, is associated with diverse comorbidities, can lead to a variety of complications, may result in premature death, and ultimately represents a huge burden for both individuals and society [1]. Choices for the pharmacological treatment of T2DM have multiplied as our understanding of the underlying pathophysiological defects of the disease improved. [Treatment of hyperglycaemia](#) should target multiple organ defects (impaired pancreatic [insulin secretion](#), hepatic and muscular insulin resistance, reduced intestinal-driven [incretin](#) effect, increased glucose renal threshold) [2]. Thus, a combination of glucose-lowering agents with complementary modes of action is commonly required to reach optimal glucose control in T2DM. Furthermore, a new paradigm has emerged during the last two decades. Optimal management of patients with T2DM should consider other risk factors beyond [glycaemic control](#), including body weight excess, cardiovascular (CV) risk, heart failure, and [renal disease](#) [3]. Overall, a patient-centered approach is recommended, with a shift from a “glucocentric” view to an “organ-disease” approach [4,5].

Oral Hypoglycemic Medications

Sulfonylureas (glipizide, glyburide, gliclazide, glimepiride)

Meglitinides (repaglinide and nateglinide)

Biguanides (metformin)

Thiazolidinediones (rosiglitazone, pioglitazone)

$\alpha$ -Glucosidase inhibitors (acarbose, miglitol, voglibose)

DPP-4 inhibitors (sitagliptin, saxagliptin, vildagliptin, linagliptin, alogliptin)

Insulin

FDA-approved indications for the use of oral hypoglycemic drugs primarily focus on type 2 diabetes mellitus.

Non-FDA approved indications of oral hypoglycemic drugs, such as metformin, are for the prevention of type 2 diabetes mellitus, treatment of gestational diabetes mellitus, treatment of polycystic ovary syndrome (PCOS) with menstrual irregularities, and prevention of ovarian hyperstimulation syndrome in PCOS patients undergoing intracytoplasmic sperm injection (ICSI) or in vitro fertilization (IVF), and management of antipsychotic-induced weight gain.

Mechanism of Action

Sulfonylureas-bind to adenosine triphosphate-sensitive potassium channels (K-ATP channels) in the beta cells of the pancreas; this leads to the inhibition of those channels and alters the resting membrane potential of the cell, causing an influx of calcium and the stimulation of insulin secretion.

Meglitinides- exert their effects via different pancreatic beta-cell receptors, but they act similarly to sulfonylureas by regulating adenosine triphosphate-sensitive potassium channels in pancreatic beta cells, thereby causing an increase in insulin secretion.

Metformin- increases hepatic adenosine monophosphate-activated protein kinase activity, thus reducing hepatic gluconeogenesis and lipogenesis and increasing insulin-mediated uptake of glucose in muscles.

Thiazolidinediones- activate peroxisome proliferator-activated receptor gamma (PPAR- $\gamma$ ), a nuclear receptor, which increases insulin sensitivity and resultant peripheral uptake of glucose and increases the level of adiponectin, a fat tissue-secreted cytokine, that increases not only the number of insulin-sensitive adipocytes but also stimulates fatty acid oxidation.

Alpha-glucosidase inhibitors- competitively inhibit alpha-glucosidase enzymes in the intestinal brush border cells that digest the dietary starch, thus inhibiting the polysaccharide reabsorption and the metabolism of sucrose to glucose and fructose.

DPP-4 inhibitors- inhibit the enzyme dipeptidyl peptidase 4 (DPP- 4). These deactivate glucose-dependent insulinotropic polypeptide (GIP) and glucagon-like peptide 1 (GLP-1), among others. Therefore, these influence glucose control through multiple effects, such as decreasing glucagon release and increasing glucose-dependent insulin release, decreasing gastric emptying, and increasing satiety.

Insulin

Even if [insulin therapy](#) may be considered at all stages of T2DM, in clinical practice it is most commonly used after failure of a combination of oral antidiabetic agents. The classical approach for a long time was the addition of a bedtime basal insulin [\[107\]](#). The dose should be up-titrated in order to control overnight plasma glucose according to the so-called “fixing the fasting first” strategy [\[108\]](#). However, because of the presence of insulin resistance, insulin dose should be markedly increased in some patients, especially if obesity is present, which exposes to [nocturnal hypoglycaemia](#) and further weight gain. In a meta-analysis of 7 RCTs with 1119 patients assigned to insulin therapy and 1080 to a GLP-1 analogue, GLP-1RAs and basal insulin were equally effective in lowering HbA1c; however, GLP-1RAs had additional non-glycaemic benefits (reduction in body weight and arterial blood pressure) and were associated with a lower risk of hypoglycaemia [\[98\]](#).

Conclusion

The landscape of T2DM treatment is constantly changing as new therapies emerge and the understanding of currently available agents deepens. The personalization of T2DM management has gained precedence in more recent guidance and should account for several medical factors that include the patient phenotype (age, body weight, disease duration, life expectancy ...), available biomarkers of insulin secretion/resistance (insulin/C-peptide, ...), risk of treatment-related adverse effects (hypoglycaemia, gastrointestinal intolerance) and the presence of comorbidities/complications (cardiovascular and renal diseases, ...). Diabetes precision medicine offers plenty of potential but is not yet ready for prime time [118,119].

**ИҚТИБОСЛАР/ ЧОСКИ/ REFERENCES:**

1. Lorenzati, Bartolomeo, et al. "[Oral hypoglycemic drugs: pathophysiological basis of their mechanism of action.](#)" *Pharmaceuticals* 3.9 (2010): 3005-3020.
2. Kimmel, Bonnie, and Silvio E. Inzucchi. "[Oral agents for type 2 diabetes: an update.](#)" *Clinical Diabetes* 23.2 (2005): 64-76.
3. Fowler, Michael J. "[Diabetes treatment, part 2: oral agents for glycemic management.](#)" *Clinical diabetes* 25.4 (2007): 131-134.
4. Son of Khushvaktov Ilyas Shadiqul, son of Tugalboyev Daniyoy Abdurasulovich, and son of Khursandov Husniddin Yusubali. (2023). LEARNING THE FUNDAMENTALS OF ANTISEPTIC AND ASEPTIC. MEDICINE, PEDAGOGY AND TECHNOLOGY: THEORY AND PRACTICE, 1(4), 79–82. [izvlecheno ot https://universalpublishings.com/index.php/mpttp/article/view/3709](https://universalpublishings.com/index.php/mpttp/article/view/3709)
5. Mirzaali Oglu, A. J., Shadiqul Oglu, X. I., Eminjon Oglu, S. H., Aliqul Oglu, N. B., & Begzod Oglu, M. M. (2022) . Importance of medical prevention in medicine. *Texas Journal of Medical Science*, 13, 175-176.
6. Mirzaali oglu, A. J., Shadiqul oglu, H. I., Fazil oglu, N. A., & Davronbek Ulugbek oglu, T. (2022). TERMINAL CASES LUNG AND HEART RESUSCITATION TRANSFER PRINCIPLES. *Galaxy International Journal of Interdisciplinary Research*, 10(10), 729-731.
7. Tashboltayevna A. S. et al. STUDY OF SEASONAL BIOLOGICAL BACTERIAL INTESTINAL INFECTIONS IN THE EXAMPLE OF ESHERICHIA //Journal of Universal Science Research. – 2023. – T. 1. – №. 3. – С. 110-115.
8. Mirzaali son A. J. et al. THE LAST BRAIN, ITS CHANGES DEPENDING ON AGE. RELIEF OF PLASH. LATERAL WHITE MATTER OF THE BRAIN. BASAL STEMS //PEDAGOG. - 2022. - T. 5. – no. 6. - S. 319-326.
9. Rakhmon Og A. M. et al. PHYSIOLOGY OF THE HEART, AUTOMATIC HEART, ELECTROCARDIAGRAM //SUSTAINABILITY OF EDUCATION, SOCIO-ECONOMIC SCIENCE THEORY. - 2022. - T. 1. – no. 4. – S. 4-8.
10. Choriyeva Z. et al. INFORMATION ON DIABETES DISEASE. THE ORIGIN OF DIABETES DISEASE AND MEASURES APPLIED IN THIS DISEASE //Theoretical aspects in the formation of pedagogical sciences. - 2022. - T. 1. – no. 4. – S. 96-99.
11. Asfandyorov J. et al. SOME CONSIDERATIONS ABOUT PYLOnephritis DISEASE AND ITS CONSEQUENCES //Akademicheskije issledovaniya v sovremennoy nauke. - 2022. - T. 1. – no. 15. - S. 55-57.

CLINICAL PHARMACOLOGY OF ANTIVIRAL DRUGS

**Ergashev Asilbek Qudrat o'g'li**

[asilbekergashev534@gmail.com](mailto:asilbekergashev534@gmail.com)

**Abdunazarov Azimjon Alisher o'g'li**

[a.a.azimjon.07@gmail.com](mailto:a.a.azimjon.07@gmail.com)

Department of Pharmacology and Clinical Pharmacology,

Termiz Branch of the Tashkent Medical Academy

Research advisor-**Chariev Muzaffar Yuldashevich**

[charievmuzaffarbek@gmail.com](mailto:charievmuzaffarbek@gmail.com)

**ANNOTATION**

This article discusses the clinical pharmacology, mechanism of action, time of action, types and composition of antiviral drugs. The article introduces new antiviral drugs being developed in the pharmaceutical industry, their pharmacotherapeutic groups, international non-patented names, and the country of manufacture. Nowadays, the need for antiviral drugs is increasing. Because it is the time when seasonal viral diseases and allergies are on the rise and immunity decreases to a certain extent. Therefore, we will get acquainted with the new anti-viral drugs included in the State Register.

**Keywords:** antiviral drugs, integrase inhibitors, mechanism of action, nucleoside and nucleotide reverse transcriptase inhibitors, protease inhibitors, viral infections.

**INTRODUCTION**

Viruses are major pathogenic agents causing a variety of serious diseases in humans, other animals, and plants.

Viruses are one of the most widespread of all organisms and are capable of infecting every species of animal from mammals down to insects, plants, and even bacteria. It seems there are more species of viruses in the world than of all other creatures put together.

The most common viral infections are respiratory (infections of the nose, throat, upper airways, and lungs); gastrointestinal (gastroenteritis); liver (hepatitis); and skin (warts or other blemishes, rashes).

Viral diseases include influenza (causing fever, severe aching, and catarrh, often occurring in epidemics); severe acute respiratory syndrome (a form of pneumonia); chickenpox (disease caused by the herpes zoster virus, which manifests in a mild fever and a rash of itchy inflamed blisters); herpes (herpes simplex or herpes zoster, causing the eruption of small blister-like vesicles on the skin or mucous membranes); hepatitis (a disease characterized by inflammation of the liver); cold sores (diseases affecting mouth or genitals); measles (disease causing fever and a red rash on the skin, typically occurring in childhood); shingles (painful inflammation of the nerve ganglia, with a skin eruption often forming a girdle around the middle of the body); poliomyelitis (disease that affects the central nervous system that can cause temporary or permanent paralysis); acquired immunodeficiency syndrome (AIDS) caused by human immunodeficiency virus (HIV) (disease includes dry cough or shortness of breath, difficult or painful swallowing, diarrhea, white spots or unusual blemishes in and around the mouth, pneumonia-like symptoms, fever, vision loss, nausea, abdominal cramps, and vomiting); smallpox (disease started from fever, overall discomfort, headache, severe fatigue, severe

back pain, vomiting. A few days later, flat, red spots appear on whole trunk, which become lesions. Occur first in the mouth and spread to the face, then to entire body); rabies (a contagious and fatal viral disease that causes madness and convulsions); dengue (jungle fever) causing sudden fever and acute pains in the joints); Ebola (fatal disease marked by fever and severe internal bleeding); and Lassa (fever with headaches, mouth ulcers, muscle aches, hemorrhages under the skin, heart and kidney failure, and a high mortality rate).

Antiviral medication and its mechanism of action

Acyclovir

Acyclovir is the basis of 2'-deoxiguanosin which applies antiviral effects after manipulation on acyclovir triphosphate. The hidden development of this methodology, an increase in acyclovir monophosphate, is catalysed by thymidine kinase caused by cells contaminated by herpes simplex infection<sup>11,12</sup> or varicella zoster infection or phosphotransferase made by cytomegalovirus. Cellular protein then adds phosphate to produce acyclovir diphosphate and acyclovir triphosphate. Acyclovir triphosphate slows the mixing of viral DNA by countering 2'-deoxy guanosin triphosphate as a substrate for viral DNA polymerase.<sup>11,12</sup> After acyclovir (not 2'-deoxiguanosin) was implanted in a duplicate of viral DNA, fusion stopped.

Valacyclovir

Valacyclovir, L-valyl ester from acyclovir, is also available in oral form. After swallowing, drug is immediately changed to acyclovir by the substance valacyclovir hydrolase in the digestive tract and liver. The original bioavailability is three to several times that of acyclovir.<sup>19</sup> Valacyclovir has proven exceptional in treatment of pollution obtained by the herpes simplex virus and varicella-zoster virus and in prophylaxis against cytomegalovirus. Ganciclovir, which starts overseeing the Journal late, contrasts with acyclovir by extending a hydroxymethyl group in position 3' from a non-cyclic side chain. The assimilation and arrangement of its action are similar to acyclovir, on the other hand, it actually has carbon 3' with a hydroxyl package that can allow the widening of the foundation design similar to levelled DNA chain terminators.

Penciclovir

Penciclovir is basically like ganciclovir, in contrast only by replacing the methylene connection for oxygen either in the non-cyclic ribose portion of the particle. Its digestive component and activity are similar to acyclovir, so again, it is only a DNA chain terminator that is bound. The inhibitory effect of in vitro penciclovir on herpes simplex 1 and 2 types and varicella-zoster infection is alike to acyclovir.<sup>22</sup> Now, it has claimed only as topical plan for the treatment of cold sores. Intravenous preparations are considered as treatment for mucocutaneous herpes in immunocompromised patients.

Famciclovir

Famciclovir is a simple diacetyl-6-deoxy from penciclovir. All this is assimilated after oral organisation and is quickly used for penciclovir by deacetylation in digestive tract, blood and liver, next it is oxidised by liver in position 6 of purine cycle. Half of the presence of a dynamic intracellular drug, penciclovir triphosphate, is very long, offering the possible for a dose once a day. Famciclovir works against genital herpes and the shingles virus.<sup>23</sup>

Conclusion

The fight between human and viruses in on and both are rapidly improving the strategies of attacking and defence. In recent years, there has been tremendous progress in understanding the

genetic basis and molecular mechanism of diseases. Various new drugs have been formulated and the development of a lot more is in underway. Though, the new infectious diseases caused by viruses such as COVID-19 remain a challenge. Furthermore, the drugs failure in human trials is a general process that requires to be worked out and addressed. The promising results are expected through the emergence of many new technologies.

**ИҚТИБОСЛАР/ ЧОШКИ/ REFERENCES:**

1. Balloux F, van Dorp L. (2017) Q&A: What are pathogens, and what have they done to and for us? *BMC Biology* 15: 1–6. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
2. Champe HRAPC, Fisher BD. (2007) *Lippincott's Illustrated Reviews: Microbiology*. Philadelphia:Lippincott Williams & Wilkins. [[Google Scholar](#)]
3. Saxena SK, Saxena S, Saxena R, et al. (2010) Emerging trends, challenges and prospects in antiviral therapeutics and drug development for infectious diseases. *Electronic Journal of Biology* 6: 26–31. [[Google Scholar](#)]
4. Son of Khushvaktov Ilyas Shadiqul, son of Tugalboyev Daniyorb Abdurasulovich, and son of Khursandov Husniddin Yusubali. (2023). LEARNING THE FUNDAMENTALS OF ANTISEPTIC AND ASEPTIC. MEDICINE, PEDAGOGY AND TECHNOLOGY: THEORY AND PRACTICE, 1(4), 79–82. izvlecheno ot <https://universalpublishings.com/index.php/mpttp/article/view/3709>
5. Mirzaali Oglu, A. J., Shadiqul Oglu, X. I., Eminjon Oglu, S. H., Aliqul Oglu, N. B., & Begzod Oglu, M. M. (2022) . Importance of medical prevention in medicine. *Texas Journal of Medical Science*, 13, 175-176.
6. Mirzaali oglu, A. J., Shadiqul oglu, H. I., Fazil oglu, N. A., & Davronbek Ulugbek oglu, T. (2022). TERMINAL CASES LUNG AND HEART RESUSCITATION TRANSFER PRINCIPLES. *Galaxy International Journal of Interdisciplinary Research*, 10(10), 729-731.
7. Tashboltayevna A. S. et al. STUDY OF SEASONAL BIOLOGICAL BACTERIAL INTESTINAL INFECTIONS IN THE EXAMPLE OF ESHERICHIA //Journal of Universal Science Research. – 2023. – T. 1. – №. 3. – С. 110-115.
8. Mirzaali son A. J. et al. THE LAST BRAIN, ITS CHANGES DEPENDING ON AGE. RELIEF OF PLASH. LATERAL WHITE MATTER OF THE BRAIN. BASAL STEMS //PEDAGOG. - 2022. - T. 5. – no. 6. - S. 319-326.
9. Rakhmon Og A. M. et al. PHYSIOLOGY OF THE HEART, AUTOMATIC HEART, ELECTROCARDIAGRAM //SUSTAINABILITY OF EDUCATION, SOCIO-ECONOMIC SCIENCE THEORY. - 2022. - T. 1. – no. 4. – S. 4-8.
10. Choriyeva Z. et al. INFORMATION ON DIABETES DISEASE. THE ORIGIN OF DIABETES DISEASE AND MEASURES APPLIED IN THIS DISEASE //Theoretical aspects in the formation of pedagogical sciences. - 2022. - T. 1. – no. 4. – S. 96-99.
11. Asfandyorov J. et al. SOME CONSIDERATIONS ABOUT PYLOnephritis DISEASE AND ITS CONSEQUENCES //Akademicheskije issledovaniya v sovremennoy nauke. - 2022. - T. 1. – no. 15. - S. 55-57.

**RATIONAL THERAPY OF LIVER COLIC, JAUNDICE SYNDROME, LIVER DYSFUNCTION SYNDROMES.**

**Ishmurodov Sherzod Parda o'g'li**  
[ishmurodovsherzodbek7@gmail.com](mailto:ishmurodovsherzodbek7@gmail.com)

**Raupov Asadbek Yoqub o'g'li**  
[asadbekmedic113@gmail.com](mailto:asadbekmedic113@gmail.com)

Department of pharmacology and clinical pharmacology,  
Termiz Branch, Tashkent Medical Academy  
Research advisor: ass. **Chariev Muzaffar Yuldashevich**  
Termiz Branch of Tashkent Medical Academy. Uzbekistan.

**Abstract:** This article provides information on the causes, treatment, and immediate relief of hepatic colic. In addition, this article provides detailed information on the types of jaundice syndrome, its causes and elimination, and rational therapy of liver dysfunction syndromes.

**Key words:** therapy, rational therapy, liver colic, types of jaundice, jaundice syndrome

**Hepatic colic** is the most common clinical manifestation of cholelithiasis, an acute attack of visceral pain caused by obstruction of the cystic duct by a calculus. This condition has typical symptoms: intense pain in the right hypochondrium or epigastrium, which lasts from fifteen minutes to 5-6 hours and is accompanied by vomiting. Diagnosis is based on analysis of the clinical picture, physical examination and ultrasound diagnostics. Treatment is aimed at relieving pain and spasm. After the attack, the question of whether it is advisable to remove the gallbladder with stones is decided.

- Causes of hepatic colic
- Symptoms of hepatic colic
- Diagnosis of hepatic colic
- Treatment of hepatic colic
- o Forecast and prevention of hepatic colic
- Treatment prices

**General information**

Hepatic colic in 75% of patients is the first clinical sign of cholelithiasis. According to statistics in gastroenterology, recurrent attacks of hepatic colic are diagnosed in every tenth patient with gall bladder stones. In men, this complication of cholelithiasis occurs twice as often as in women, despite the fact that the female gender is more predisposed to the formation of stones. With age, the risk of developing biliary colic in patients with asymptomatic stone carriers increases: during the first five years of the disease, attacks occur in 20% of patients, after ten years - in 25%.

Hepatic colic is characterized by a typical clinical picture; the main symptom is severe pain. The intensity of pain depends on both the size of the stone and its location. When the stone is localized in the area of the bottom and body of the gallbladder and in the absence of inflammation, pain does not occur. Moderate intensity of pain is typical for the location of the stone closer to the neck of the bladder. The duct area is a zone in which the presence of a stone is accompanied by an intense attack



of pain; a sharp disruption of the outflow of bile, spasm of the ducts, ischemic changes in their walls. The overlying sections of the ducts are overstretched, which causes an additional increase in peristalsis. This vicious circle leads to incessant pain until the stone passes.

### **Symptoms of hepatic colic**

The symptoms of hepatic colic are typical. In most cases, against a background of complete rest, an attack of intense pain occurs. The pain is localized in the area of the right hypochondrium, most often in the projection of the gallbladder (Keur's point), less often in the epigastrium, and can have a cutting, stabbing, tearing character. During an attack, the patient rushes about in bed and cannot find a body position that will relieve the pain. Irradiation of pain to the area of the right shoulder blade, collarbone, supraclavicular area, neck, and shoulder is typical. Sometimes the pain radiates to the heart area and simulates an attack of angina.

An episode of hepatic colic is accompanied by nausea, possible mild vomiting of bile, which does not bring relief, and bloating. Uncontrollable vomiting in hepatic colic is a diagnostic criterion for the involvement of the pancreas in the pathological process.

The greatest intensity of pain is observed in patients with small stones in the gallbladder. This is due to the fact that the occurrence of pain is caused not so much by the stretching of the bladder wall by stones, but by its overstretching when the ducts are blocked by stones and a significant increase in intravesical pressure.

An attack of hepatic colic can last from fifteen minutes to 5-6 hours. A longer attack of pain may be a sign of complications, in particular acute cholecystitis. This is also evidenced by significant hyperthermia - more than 38°C. Obstruction of the biliary tract can lead to obstructive jaundice.

### **Diagnosis of hepatic colic**

At a consultation with a gastroenterologist, a patient with suspected hepatic colic undergoes a detailed physical examination and a study of anamnestic data. The history almost always contains information about previous attacks of pain in the right hypochondrium of varying intensity and duration. As gallstone disease progresses, episodes of hepatic colic recur more and more often, the intensity of the pain syndrome increases, and attacks become protracted. Many patients have a history of nonspecific symptoms: dyspeptic complaints, a feeling of heaviness in the right hypochondrium, especially after errors in diet.

When examining the patient, pallor of the skin is determined, icterus of the skin and sclera is possible. The forced position of the patient's body is typical: on the side with the legs brought to the stomach. Palpation of the abdomen reveals a symptom of muscle protection (tension of the muscles of the anterior abdominal wall), pain when palpating the projection point of the gallbladder during inspiration (positive Kehr's sign) and when tapping the right costal arch with the edge of the palm (Grekov-Ortner sign); with deep palpation of the Kehr point during inspiration, the patient involuntarily holds his breath (positive Murphy's symptom). At the end of the attack (the stone is released), these symptoms are absent.

A highly informative method for diagnosing hepatic colic is ultrasound of the liver, gallbladder, and biliary tract. When visualizing stones, characteristic signs of an increase in the size of the bladder and stretching of its walls, and the presence of a typical clinical picture, the diagnosis does not cause difficulties.

In laboratory tests for hepatic colic, a third of patients show leukocytosis, and half have an increased ESR. The results of a general urine test are unchanged; after an attack, bile pigments may

be detected (this is an early sign of obstructive jaundice). In 20% of patients, an increase in urine amylase is detected. However, there are no laboratory signs confirming hepatic colic without the addition of cholecystitis.

Plain radiography of the abdominal organs plays a certain role in verifying the diagnosis (but in the presence of gallstones, the information content of this method does not exceed 15% due to the X-ray negativity of the stones); Radionuclide methods may also be used. When performing intravenous cholecystography, a sign of obstruction of the cystic duct by a stone is a “disabled” gallbladder. To clarify the diagnosis, determine the number of stones and their approximate density, CT and MRI of the liver and gallbladder are performed.

Differential diagnosis of hepatic colic is carried out primarily with acute non-calculous cholecystitis or exacerbation of chronic, pain syndrome due to pathology of the kidneys and intestines (renal colic, intussusception, intestinal spasm, etc.), appendicitis, pancreatitis, peptic ulcer of the stomach and duodenum.

#### **Treatment of hepatic colic**

Patients diagnosed with hepatic colic are subject to hospitalization in the gastroenterology department. During the attack and for another day, complete fasting is prescribed, then diet No. 5. One of the drugs is administered for antispasmodic purposes: atropine sulfate, papaverine, platiphylline, drotaverine, hyoscine butyl bromide, mebeverine. In the case of a severe, prolonged attack, a combination of two antispasmodics with metoclopramide is used. To relieve pain, metamizole sodium, ketoprofen, and ketorolac are administered intramuscularly. If the pain syndrome is not relieved within six hours, the patient should be hospitalized in the surgical department, where, after consultation with a surgeon, the issue of surgical treatment is decided.

With frequent relapses of hepatic colic, cholecystectomy is performed. Laparoscopic intervention is the standard treatment for this pathology and is used in most cases. This method can significantly reduce treatment time, is less traumatic, has a better cosmetic effect, and also prevents recurrence. The operation is performed in the long term after the attack - six to eight weeks. In case of a single episode of hepatic colic, a wait-and-see approach is justified.

**Jaundice (icterus)** in adults is not an independent disease, but a whole symptom complex, which is characterized by yellowing of the patient’s skin and mucous membranes. It indicates an increase in the concentration of bilirubin (bile pigment) in the blood. Accumulating in excessive quantities, it is deposited in the epidermis, which is accompanied by the appearance of characteristic visual symptoms. Pathology in most cases occurs in diseases of the hepatobiliary system. However, yellowing of the skin is also possible with hematological problems and/or infectious diseases with liver damage.

The classification of this condition is quite extensive and involves the identification of different types of symptom complex, taking into account the origin, nature of the clinical picture and a number of other parameters.

Experts classify three main types of jaundice that occur in adult patients:

- hemolytic, when the cause of the pathology is the destruction of red blood cells due to exposure to toxins or an autoimmune disease;
- parenchymal or hepatic, which is based on damage to hepatocytes (liver cells);
- mechanical or subhepatic, when the outflow of bilirubin is obstructed by physical objects, for example, a tumor, calculus or inflammatory focus.

Each type of jaundice also has its own subtypes, is accompanied by certain symptoms and poses a different level of danger to the patient's body.

There is also the concept of pseudojaundice. This condition is characterized only by yellowing of the skin without involvement of the mucous membranes. Most often, this form of jaundice is associated with the consumption of large amounts of carotenes, which are found in certain foods, for example, in ordinary carrots, pumpkin or orange bell peppers.

In newborns, other variants of icterus occur, the most dangerous of which is kernicterus, which almost always leads to severe brain damage, the so-called bilirubin encephalopathy.

Jaundice can accompany various diseases of the blood and hepatobiliary system. The symptom complex itself is manifested by yellowing of the skin and visible mucous membranes. The color intensity can vary from pale yellow to orange. It all depends on the cause of the development of jaundice and the individual characteristics of the adult patient.

A laboratory sign of the condition is an increase in the concentration of bilirubin in the blood (hyperbilirubinemia). An increase in the amount of pigment in the patient's serum leads to its release into the urine. Urine becomes dark in color.

Considering that jaundice in 80-85% of cases is a consequence of a certain disease of the blood or hepatobiliary system of an adult patient, this syndrome is very often accompanied by clinical signs of a primary pathology, which are:

- pain and discomfort in the right hypochondrium;
- bitter taste in the mouth;
- increase in body temperature to 37-38°C;
- darkening of urine;
- loss of appetite, nausea, vomiting;
- weight loss;
- spider veins;
- enlargement of the liver and spleen in size;
- skin itching and others.

Some patients experience lightening of the stool, while others report persistent bruising of the skin even after minor impacts or pressure.

There are a number of signs in which jaundice, regardless of the cause, can have serious consequences for the body. If such symptoms occur, consult a doctor immediately. These include:

- acute abdominal pain;
- sudden changes in mental state: sudden aggression, irritability, drowsiness, emotional agitation, apathy, etc.;
- blood in vomit or feces;
- unstoppable nosebleeds, cuts.

Such phenomena may indicate extremely unstable and dangerous conditions, when delay can result in a serious threat to the health and even life of the patient.

**REFERENCES:**

1. Son of Khushvaktov Ilyas Shadiqul, son of Tugalboyev Daniyov Abdurasulovich, and son of Khursandov Husniddin Yusubali. (2023). LEARNING THE FUNDAMENTALS OF ANTISEPTIC AND ASEPTIC. MEDICINE, PEDAGOGY AND TECHNOLOGY: THEORY AND PRACTICE, 1(4), 79–82. izvlecheno ot <https://universalpublishings.com/index.php/mpttp/article/view/3709>
2. Mirzaali Oglu, A. J., Shadiqul Oglu, X. I., Eminjon Oglu, S. H., Aliqul Oglu, N. B., & Begzod Oglu, M. M. (2022) . Importance of medical prevention in medicine. Texas Journal of Medical Science, 13, 175-176.
3. Mirzaali oglu, A. J., Shadiqul oglu, H. I., Fazil oglu, N. A., & Davronbek Ulugbek oglu, T. (2022). TERMINAL CASES LUNG AND HEART RESUSCITATION TRANSFER PRINCIPLES. Galaxy International Journal of Interdisciplinary Research, 10(10), 729-731.
4. Tashboltaevna A. S. et al. STUDY OF SEASONAL BIOLOGICAL BACTERIAL INTESTINAL INFECTIONS IN THE EXAMPLE OF ESHERICHIA //Journal of Universal Science Research. - 2023. - T. 1. – no. 3. - S. 110-115.
5. Mirzaali son A. J. et al. THE LAST BRAIN, ITS CHANGES DEPENDING ON AGE. RELIEF OF PLASH. LATERAL WHITE MATTER OF THE BRAIN. BASAL STEMS //PEDAGOG. - 2022. - T. 5. – no. 6. - S. 319-326.
6. Rakhmon Og A. M. et al. PHYSIOLOGY OF THE HEART, AUTOMATIC HEART, ELECTROCARDIAGRAM //SUSTAINABILITY OF EDUCATION, SOCIO-ECONOMIC SCIENCE THEORY. - 2022. - T. 1. – no. 4. – S. 4-8.
7. Choriyeva Z. et al. INFORMATION ON DIABETES DISEASE. THE ORIGIN OF DIABETES DISEASE AND MEASURES APPLIED IN THIS DISEASE //Theoretical aspects in the formation of pedagogical sciences. - 2022. - T. 1. – no. 4. – S. 96-99.
8. Asfandyorov J. et al. SOME CONSIDERATIONS ABOUT PYLOnephritis DISEASE AND ITS CONSEQUENCES //Akademicheskije issledovaniya v sovremennoy nauke. - 2022. - T. 1. – no. 15. - S. 55-57.
9. Asfandyorov J. et al. ON GENERAL CHARACTERISTICS OF ADENOCARCINOMA DISEASE //Current approaches and new research in modern sciences. - 2022. - T. 1. – no. 4. – S. 70-72.
10. Asfandyorov J. et al. Liver immunity and its importance for human health //Solution of social problems in management and economy. - 2022. - T. 1. – no. 4. – S. 17-19.
11. Asfandyorov J. et al. BLOOD. FORMAL ELEMENTS OF BLOOD. ERYTHROCYTES. THE IMPORTANCE OF ERYTHROCYTES IN THE ORGANISM AND DISEASES RELATED TO ERYTHROCYTES //Models and methods in modern science. - 2022. - T. 1. – no. 15. - S. 132-135.

**RATIONAL USE OF NARCOTIC ANALGESICS, ANESTHETICS AND LOCAL ANESTHETICS IN PAIN SYNDROME.**

**Raupov Asliddin Yoqub o'g'li**

[raupovasliddin593@gmail.com](mailto:raupovasliddin593@gmail.com)

**Qosimov Shoxrux Sa'dulla o'g'li**

[shohruhqosimov9@gmail.com](mailto:shohruhqosimov9@gmail.com)

Department of pharmacology and clinical pharmacology,  
Termiz Branch, Tashkent Medical Academy

Research advisor: ass. **Chariev Muzaffar Yuldashevich**  
Termiz Branch of Tashkent Medical Academy. Uzbekistan.

**Abstract:** This article provides detailed information on the use of narcotic analgesics used in severe pain syndromes, mechanisms of action, how to use them, and how and in what amount to take them. In addition, this article provides detailed information about the rational use of anesthetics and local anesthetics.

**Key words:** analgesics, narcosis, pain, syndrome, local anesthetics, anesthetics, narcotic analgesics, nonnarcotic analgesics

Analgesic drugs are drugs that eliminate or reduce the sensation of pain. These include drugs with different chemical structure and mechanism of action.

Pain-reducing drugs (analgesics) take the main place among painkillers by affecting the nervous system. Narcotic analgesics and non-narcotic analgesics are distinguished. Narcotic analgesics include morphine and its synthetic substitutes (promedol, fentanyl, etc.).

Narcotic analgesics relieve various pains, including injuries, burns, severe pain that occurs in myocardial infarction. Morphine affects the central nervous system, sharpens hearing, fear, and tactile senses, and causes specific hallucinations. It suppresses the negative emotions associated with pain (panic, excitement, sadness, etc.) and creates a sense of security, relief, and calmness.

When narcotic analgesics are taken repeatedly, a person gets used to them and becomes addicted to them, which can cause drug addiction. Therefore, narcotic analgesics are strictly calculated and given in limited quantities. It is forbidden to take narcotic analgesics without a doctor's permission.

Non-narcotic analgesics include synthetic substances with different chemical structures (amidopyrin, analgin, acetylsalicylic acid, paracetamol, etc.). These analgesics have a weaker pain-relieving effect than narcotic analgesics, and are mainly used for neuralgia-like pain, myalgia for muscle inflammation, toothache and headache, and arthralgia. Non-narcotic analgesics can relieve pain as well as reduce fever (see Antipyretics). Many non-narcotic analgesics also have an anti-inflammatory effect (see Anti-inflammatory drugs). Do not take these medicines without a doctor's permission.

A number of drugs that do not belong to the group of analgesics can also cause pain. For example, drugs that relax smooth muscles - atropine, bangidevon drugs, papaverine, no-spalar, etc. are vasodilator drugs used in spasm of blood vessels.

Analgesic drugs are divided into non-opioid, combined (including non-opioid and opioid components) and opioid. An important additional element of analgesic pharmacotherapy is adjuvant and symptomatic agents used according to appropriate indications, increasing the effectiveness of therapy and leveling or preventing its side effects. All non-opioid analgesics are non-narcotic and are available freely at pharmacies or with a regular doctor's prescription. Among opioid analgesics, most belong to the category of narcotic drugs, which are subject to special rules for recording, prescribing, dispensing, and reporting. Some opioids are not classified as narcotic drugs due to their low narcotic potential, i.e. the ability to cause addiction (mental dependence) and are among the "potent" ones, the system of working with which is simpler. These features are important for the correct prescription, prescription and medical use of analgesic drugs.

An important condition for the effectiveness and safety of systemic pharmacotherapy of acute and chronic pain is knowledge by doctors not only of its clinical foundations, but also of the rules for working with potent and narcotic drugs established by the relevant normative and regulatory documents, orders of the Ministry of Health and Social Development of the Russian Federation, available to the administration of each licensed medical institution the right to participate in the legal (medical) trafficking of drugs and other state-controlled drugs.

### **1. Non-opioid analgesics**

Non-opioid analgesics (Table 1 - paragraphs 1.1, 1.2, 1.3, 1.4, 1.5) include drugs of five pharmacological groups: NSAIDs, selective cyclooxygenase-2 (COX-2) inhibitors, pyrazolone derivatives, paracetaminophen derivatives and flupirtine.

Non-opioid analgesics are non-narcotic drugs. Available without a prescription (except for flupirtine). However, this does not mean that they are completely safe and can be used uncontrolled. When prescribing a patient any of the non-opioid analgesics of different pharmacological groups, it is necessary to inform him about the danger of exceeding the recommended doses, since all of these drugs have certain side effects. Flupirtine is available with a regular doctor's prescription. If the prescribed non-opioid analgesic is ineffective at the maximum recommended dose, the patient should consult a doctor to adjust therapy, and not exceed the dose.

All non-opioid analgesics have limited analgesic activity and are not able to eliminate severe pain, but may reduce pain and reduce the need for opioids.

### **2. Combined analgesics**

For the treatment of CHD of various etiologies, combination drugs based on paracetamol in combination with small narcotologically safe doses of weak opioid analgesics - codeine or tramadol - are of particular interest. These combination drugs are more effective than paracetamol in its pure form and are not classified as narcotic drugs.

The combination of paracetamol (500 mg), codeine (8 mg) and caffeine (30 mg) improves the quality of analgesia achieved with the isolated use of the same dose of paracetamol. The drug is presented in the form of tablets and soluble tablets. A single dose is 1–2 tablets (0.5–1.0 g paracetamol), a daily dose is up to 6–8 tablets (maximum 4 g paracetamol, 64 mg codeine and 240 mg caffeine).

A combined drug in tablets for oral administration, including safe doses of paracetamol (325 mg) and tramadol (37.5 mg). The first ensures a rapid onset of the analgesic effect, the second enhances and prolongs it. A single dose of a combination of paracetamol and tramadol is 1-2 tablets (maximum 650 mg of paracetamol and 75 mg of tramadol), a daily dose is a maximum of 8 tablets

(2600 mg of paracetamol and 300 mg of tramadol). In patients over 75 years of age, the interval between taking single doses of an analgesic should be at least 8 hours. The drug is effective in acute and chronic pain syndromes of moderate intensity of various origins, as evidenced by world literature data and the results of using a combination of paracetamol and tramadol in outpatient medical institutions in Russia in more than 10 thousand patients with different types of pain. Contraindications to the use of the drug are liver and respiratory failure, epilepsy, pregnancy, breastfeeding, simultaneous intake of alcohol (increases the toxic effect on the liver), sedatives, drugs containing paracetamol and tramadol. It is classified as a means subject to subject-quantitative accounting and is prescribed by a doctor on a prescription form form 148-1/u-88 with the stamp of the medical institution "For prescriptions". The conditions for issuing funds from this group to preferential categories of citizens are determined by the new Order of the Ministry of Health and Social Development of the Russian Federation No. 110 dated February 12, 2007.

### **3. Opioid analgesics**

Opioid analgesics (Table 2) are the main treatment for pain syndromes of moderate and high intensity in various fields of medicine. Their analgesic effect is significantly superior to all known non-opioid analgesics. Opioid analgesics have a central mechanism of action, which is realized through interaction with opioid receptors in different parts of the central nervous system.

The class of modern opioid analgesics includes agents with varying analgesic activity and a different range of other additional properties, which is of great importance for the correct choice of opioid in specific clinical situations. The differences in properties between different opioids are due to their different relationships with opioid receptors:

- a) affinity for a certain type of receptor (m-; k-; s-receptors);
- b) the degree of binding to the receptor (strength and duration of the effect);
- c) competitive ability (antagonism) to a certain type of receptor.

In accordance with this, opioids can be agonists or antagonists of certain receptors, which determines the spectrum of properties inherent in each opioid.

Of main clinical importance are opioid m-receptor agonists - true narcotics (morphine, fentanyl, trimeperidine, etc.) drugs with morphine-like properties, since they have the most powerful analgesic effect. It is fundamentally important that opioid receptors are nonspecific, and when they are activated by an opioid analgesic, not only analgesia develops, but also a number of side effects, including dangerous ones (depression of breathing and consciousness, nausea, vomiting, impaired motor skills of the PC, urinary and biliary tract, weakness, dizziness, sometimes mental disorientation, hallucinations). Along with the typical opioid agonists listed, there is only one drug that belongs to the category of partial opioid agonists of m-receptors - buprenorphine. This strong opioid is somewhat inferior to morphine in its analgesic effect, has a less pronounced dose-dependent depressive effect on the central nervous system and a lower potential for tolerance and dependence than morphine. As a partial agonist, buprenorphine, unlike morphine and its analogues, has a so-called ceiling effect, i.e. When a certain dose is reached, analgesia and central depression stop increasing. Buprenorphine also has k-receptor agonist properties, so it is also classified as an agonist-antagonist. In Russia it is classified as a narcotic drug.

Compliance with the rules for the clinical use of narcotic analgesics is a necessary condition for preventing possible complications.

K-receptor agonists (butorphanol, nalbuphine) have a slightly different range of properties: less pronounced analgesia than m-receptor agonists, significant sedation (drowsiness), mild respiratory depression and other side effects characteristic of morphine-like drugs. An important distinctive feature of k-receptor agonists is their antagonism towards m-receptors, therefore they are both antagonists of morphine and its analogues and belong to the category of mixed agonists-antagonists. The combined use of an m-agonist opioid and a mixed agonist-antagonist is unacceptable.

The properties of s-receptor agonists are possessed by the phencyclidine derivative ketamine and the k-receptor agonist butorphanol. In addition to moderate analgesia, they can cause dose-dependent activation of blood circulation (arterial hypertension, tachycardia), psychomotor agitation, euphoria, and hallucinations.

Opioids of different groups also differ in the degree of expression of such specific properties as the ability to cause tolerance and dependence.

Tolerance, i.e. Resistance to opioid analgesia is associated with the “addiction” of receptors to the applied dose of opioid and a decrease in the analgesic effect during long-term therapy (for morphine, tolerance begins to appear after 2–3 weeks), which requires a gradual increase in the analgesic dose of the opioid.

Drug dependence (physical and/or mental) can develop at different times from the start of therapy. Physical dependence manifests itself upon sudden cessation of drug use by a characteristic withdrawal syndrome (psychomotor agitation, chills, cramping abdominal pain, nausea, vomiting, drooling, etc.) and requires special therapy. Mental dependence (addiction or drug addiction) is characterized by an irresistible psychological need to obtain a drug (even in the absence of pain) in order to avoid severe emotional experiences and severe discomfort when stopping taking the drug.

The ability to cause addiction (narcogenic potential) is expressed differently in opioids of different groups. Some opioids (tramadol, butorphanol, nalbuphine), due to their minimal narcotic potential, are not classified as narcotic drugs and are classified as potent drugs (Table 2, paragraph 1), subject to subject-quantitative accounting, with less strict regulations, unlike drugs.

#### **REFERENCES:**

1. Son of Khushvaktov Ilyas Shadiqul, son of Tugalboyev Daniyoy Abdurasulovich, and son of Khursandov Husniddin Yusubali. (2023). LEARNING THE FUNDAMENTALS OF ANTISEPTIC AND ASEPTIC. MEDICINE, PEDAGOGY AND TECHNOLOGY: THEORY AND PRACTICE, 1(4), 79–82. izvlecheno ot <https://universalpublishings.com/index.php/mpttp/article/view/3709>
2. Mirzaali Oglu, A. J., Shadiqul Oglu, X. I., Eminjon Oglu, S. H., Aliqul Oglu, N. B., & Begzod Oglu, M. M. (2022) . Importance of medical prevention in medicine. Texas Journal of Medical Science, 13, 175-176.
3. Mirzaali oglu, A. J., Shadiqul oglu, H. I., Fazil oglu, N. A., & Davronbek Ulugbek oglu, T. (2022). TERMINAL CASES LUNG AND HEART RESUSCITATION TRANSFER PRINCIPLES. Galaxy International Journal of Interdisciplinary Research, 10(10), 729-731.
4. Tashboltaevna A. S. et al. STUDY OF SEASONAL BIOLOGICAL BACTERIAL INTESTINAL INFECTIONS IN THE EXAMPLE OF ESHERICHIA //Journal of Universal Science Research. - 2023. - T. 1. – no. 3. - S. 110-115.



5. Mirzaali son A. J. et al. THE LAST BRAIN, ITS CHANGES DEPENDING ON AGE. RELIEF OF PLASH. LATERAL WHITE MATTER OF THE BRAIN. BASAL STEMS //PEDAGOG. - 2022. - T. 5. – no. 6. - S. 319-326.

6. Rakhmon Og A. M. et al. PHYSIOLOGY OF THE HEART, AUTOMATIC HEART, ELECTROCARDIAGRAM //SUSTAINABILITY OF EDUCATION, SOCIO-ECONOMIC SCIENCE THEORY. - 2022. - T. 1. – no. 4. – S. 4-8.

7. Choriyeva Z. et al. INFORMATION ON DIABETES DISEASE. THE ORIGIN OF DIABETES DISEASE AND MEASURES APPLIED IN THIS DISEASE //Theoretical aspects in the formation of pedagogical sciences. - 2022. - T. 1. – no. 4. – S. 96-99.

8. Asfandyorov J. et al. SOME CONSIDERATIONS ABOUT PYLOnephritis DISEASE AND ITS CONSEQUENCES //Akademicheskije issledovaniya v sovremennoy nauke. - 2022. - T. 1. – no. 15. - S. 55-57.

9. Asfandyorov J. et al. ON GENERAL CHARACTERISTICS OF ADENOCARCINOMA DISEASE //Current approaches and new research in modern sciences. - 2022. - T. 1. – no. 4. – S. 70-72.

10. Asfandyorov J. et al. Liver immunity and its importance for human health //Solution of social problems in management and economy. - 2022. - T. 1. – no. 4. – S. 17-19.

11. Asfandyorov J. et al. BLOOD. FORMAL ELEMENTS OF BLOOD. ERYTHROCYTES. THE IMPORTANCE OF ERYTHROCYTES IN THE ORGANISM AND DISEASES RELATED TO ERYTHROCYTES //Models and methods in modern science. - 2022. - T. 1. – no. 15. - S. 132-135.



УДК 621.01

## ВСПОМОГАТЕЛЬНЫЙ ЭЛЕКТРОПРИВОД С АСИНХРОННЫМИ ДВИГАТЕЛЯМИ НА ОСНОВЕ КОМПОЗИЦИОННЫХ МАТЕРИАЛОВ

Хасанов Ф.Ф.

Ташкентский государственный транспортный университет, г. Ташкент, Узбекистан

**Аннотация.** В данной статье рассмотрен вопрос одним из приоритетных направлений научных исследований и технических разработок, связанных с энергосбережением и рациональным потреблением энергии, а также широкое внедрение с высоким удельным расходом магнитных материалов при производстве электротехнических устройств, весьма перспективным направлением является разработка безотходной технологии металлургии. Использование в качестве вспомогательного электропривода (ЭП) на электроподвижного состава (ЭПС) всё большее распространение и развитие продолжает получать ЭП переменного тока на базе трёхфазных асинхронных двигателей (АД) с короткозамкнутым ротором. ЭП на базе АД демонстрирует сравнительно высокие показатели надёжности и энергоэффективности, характеризуется относительной дешевизной в производстве и эксплуатации, что способствует его массовому использованию композиционных материалов, полученных методами порошковой металлургии, позволяет снизить потери электротехнической стали и исключить многие трудоемкие операции и обеспечить необходимую энергосбережение и дадут рациональным потреблением энергии.

**Ключевые слова.** Композиционный, коэрцитивная, магнитные свойства, элементы двигатели, вспомогательного электропривода, энергосбережение, нетрадиционный принципы, магнитомягкие сплавы, индукция, потери.

**Введение (Introduction).** В стратегии развития железнодорожном транспорте Узбекистана к основным направлениям инновационной деятельности работы подвижного состава относят: увеличение скорости движения, снижение массы грузовых и пассажирских вагонов, их модернизация, а также проектирование новых современных составов с улучшенными характеристиками элементов и узлов локомотивов [1, 4, 11].

Применение композитных материалов на основе порошковой металлургии позволяют обеспечить облегчение вес пассажирского и грузового составов, удешевить их стоимость обеспечить долговечность и малые затраты на их эксплуатацию. Внедрение современных композиционных материалов позволит внедрить на железнодорожном транспорте инновационных технологию по продлению эксплуатационных ресурсов основным резервам подвижного состава [9, 11, 15]. В настоящее время в качестве вспомогательного электропривода (ЭП) на электроподвижного состава (ЭПС) всё большее распространение и развитие продолжает получать ЭП переменного тока на базе трёхфазных асинхронных двигателей (АД) с короткозамкнутым ротором. ЭП на базе АД демонстрирует сравнительно высокие показатели надёжности и энергоэффективности, характеризуется

относительной дешевизной в производстве и эксплуатации, что способствует его массовому использованию [11, 13, 17].

Магнитные свойства материалов, спеченных из разных исходных порошков приведены в таблице 3.

Магнитные свойства материалов.

Железный порошок	Плотность изделия, кг/м <sup>3</sup>	Максимальная магнитная проницаемость	Напряженность H, А/м, при индукции $\beta=1$	B, Тл, при H=3160 А/м	Остаточная индукция $B_r$ после	Коэрцитивная сила $H_c$ после намагничивания
Электролитический	6820	31	308,1	1,27	0,93	126,4
Обезуглероженная измельченная стальная дробь	6690	21,5	1106	1,1	0,9	158
Восстановленная в водороде измельченная окалина	6200	13,4	2370	1,03	0,85	244,9
Восстановленный в водороде оксид железа из скрапа	6010	13,8	3160	1	0,83,	229,1
Малокремнистое железо (полюсное)	7850	60	158	1,56	0,9	53,25
Для сравнения Ст. 10	7850	13	395	1,62	0,65	158

**Метод (Methods).** В последнее время применяют метод порошковой металлургии. Этот метод имеет значительные преимущества при создании магнитомягких материалов. Этот метод позволяет изготавливать материала с химическим составом в значительно узком пределе. Он позволяет вводить в материал прослойки, наполнители, измеряющей материал [2, 4, 5]. Как известно при изготовлении листов трансформаторной стали 40-60% материала уходит в отходы. Применение порошковой металлургии можно изготовить равноценные электромагнитные системы, выпускаемые в настоящее время. К этим материалам предъявляются требования: получение максимального значения индукции “B” и магнитной проницаемости “ $\mu$ ”, минимальные удельные магнитные потери  $P_{y0}$ , достаточная механическая прочность [3, 6, 7].

После однократного прессования и спекания получены магнитные свойства образцов железного порошка, представленные в таблице 4.

Таблица 4

Железный порошок	Магнитная постоянная $\mu$ , Гн/м	$\mu_{max}$ , Гн/м	B, Тл, при H, А/м					A/м	B, Тл	Плотность $B$ , кг/м <sup>3</sup>
			7,9	79	790	7900	11850			
Карбонильный	20	240	0,0805	1,28	1,52	1,75	1,83	11,14	0,62	7895
Электролитический	4,5	154	0,01	1,23	1,45	1,77	1,84	23,7	0,9	7850

На основании этих магнитомягких материалов был разработан статор электродвигателя вспомогательных устройств на железнодорожном транспорте. Он получен на основе железного порошка ABC 100.30 с добавлением раствора силиката Na с модулем 2,8, образующий пленку за счет поверхностной адгезии [5, 7, 12]. На магнитные свойства порошковых материалов оказывает влияние дислокаций.

Энергия магнитоупругой анизотропий для материала определяется;

$$E = \frac{3}{2} \lambda_{100} (\alpha^2 + \sigma_{yy} \beta^2 + \sigma_{zz} \gamma^2) + 2\lambda_{111} (\sigma_{xy} \alpha \beta + \sigma_{yz} \beta \lambda + \sigma_{xz} \alpha \lambda) \quad (1.1)$$

где  $\lambda_{100}, \lambda_{111}$  – магнитоупругие константы;

$\alpha, \beta, \gamma$  – направляющие косинусы углов спонтанной намагниченности относительно трех осей X, Y, Z, легкого намагничивания;

$\sigma_{yy}, \sigma_{zz}, \sigma_{xy}, \sigma_{xz}$  – компонента тензора упругого поля.

Магнитные свойства порошковых материалов зависят таких от типа дислокации их ориентации и вектора Бюргерса. Типы дислокаций подразделяются на краевые и винтовые. Общая теория влияния дислокаций на магнитные свойства материалов разработана Е.Кондорским.

Влияние плотности дислокаций на коэрцитивную силу впервые было определено Ф. Винценом и получена им зависимость;

$$H_c = \frac{N^{\frac{1}{2}} \delta^{\frac{1}{2}} [\Delta E] /}{2I_s L^{\frac{3}{2}} \sin \omega [\Delta X]} \left[ \ln \frac{L}{\delta} \right]^{\frac{1}{2}} \quad (1.2)$$

где N-плотность дислокаций;

$\Delta$  - средний линейный размер домена;

$\delta$  - ширина междоменной границы;

$I_s$ - спонтанное намагниченность насыщения;

$\Delta X$ - изменение расстояния;

$\Delta E$  – изменение магнитоупругой энергии при переходах через дислокацию.

Коэрцитивная сила определяются;

$$H = \frac{I}{2I_s L_1 L_3 \cos \varphi} \cdot F_{max} \quad (1.3)$$

Магнитная восприимчивость:

$$H_0 = 4 \cos^2 \varphi I_s \frac{L_1 L_2}{L_3} \left( \frac{dF}{dZ_{H=0}} \right) \quad (1.4)$$

$L_1, L_2, L_3$ -линейные размеры доменов.

$\varphi$ - угол между напряженностью поля и намагниченностью доменов. Сила взаимодействия междоменной границы с дислокацией, определяется на основании А.Зеегера [8, 14]:

$$F = \left( \pm \frac{\sqrt{3}}{2} \right) \tau b \delta \lambda_{100} (c_1 - c_2) \quad (1.5)$$

где  $\delta$ - ширина междоменной границы;

$b$ - вектор Бюргера;

$\lambda_{100}$  – магнитоэрикссионная константа для направления  $\langle 100 \rangle$ ;

$C_1, C_2$ - упругие модули кристалла коэрцитивная сила по А.Зеегера определяется при температуре 873 К без обоснования:

$$H_c = \frac{3 \lambda_{100} \tau}{5 I_s} = \frac{\lambda_{100} G}{I_s} \quad (1.6)$$

Где  $\tau$ - упругое напряжение

$G$ - упругий модуль сдвига.

Формула 1.6. не совсем соответствует экспериментальным данным, так как не учитывает магнитоупругую анизотропию. Согласно работ А.И.Мицека и В.Н.Пушкаря, где рассматривается винтовая дислокация получено выражения [7,10, 13]:

$$H_c(T) = \frac{\alpha_0 c_3 \lambda_{III} \sigma^{\gamma_2}}{2 I_s \sqrt{L_1 L_2}} \sqrt{3 N D \ln \frac{L_1}{\delta}}; \quad (1.7)$$

$$H_0 = \frac{2 I_s^2 \delta^{\gamma_2}}{c_3^3 \lambda_{III} \alpha_0 L_1} \sqrt{\frac{L_2 L_3}{3 N D}}; \quad (1.8)$$

где  $\alpha_0$ - параметр кристаллической решетки;

- $C_3$ - модуль упругости;  
 $\lambda_{III}$ - константа магнитострикции;  
 $\delta$ - ширина междоменной границы;  
 $N$ - плотность дислокации;  
 $D$ - ширина доменов.

$U_3$  формулы 1.7 следуют, что при нагревании коэрцитивная сила уменьшается, т.к.  $\lambda_{III}$  обладает большой чувствительностью от температуры, чем все остальные. Кривые намагниченности при разной температуре спекания показано на рис. 1.

На рис 2. показаны зависимости изменения коэрцитивной силы магнитопровода магнитомягкого материала от времени при различных температурах спекания.

Как видно из рисунка 1. с повышением температуры спекания магнитная индукция увеличивается, а коэрцитивная сила уменьшается (рис. 2). Это говорит о том, что намагничивание в слабых полях (0,55 до 0,96 Т) происходит за счет смещения доменных границ, т.е увеличивается плотность дислокации [2, 5, 8]. Удельные потери убывают в 2,5 раза при частоте 50 Гц и в 3,6 раза при частоте 400 Гц. Это уменьшение связано с увеличением температуры спекания.

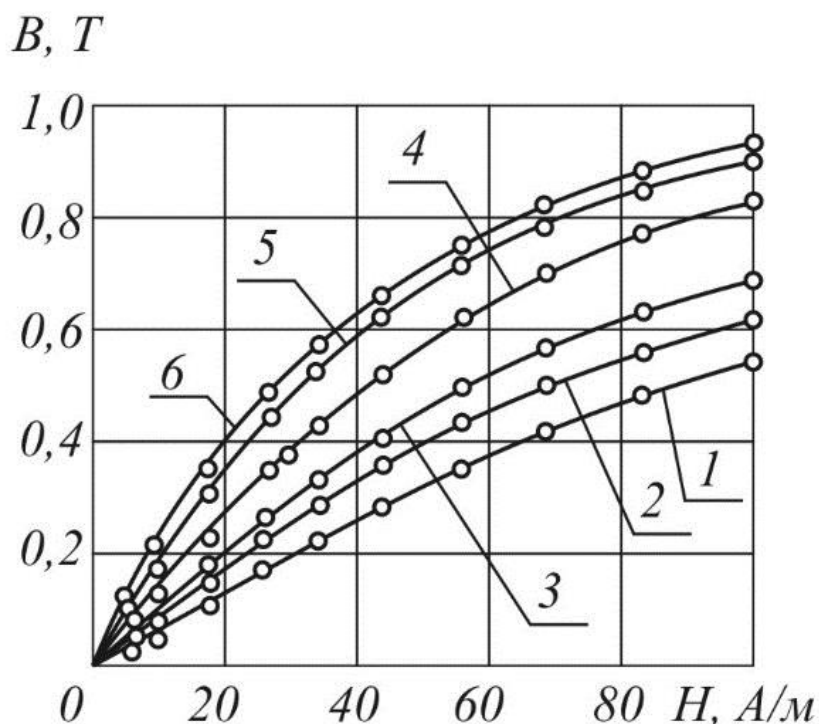


Рис1. Кривые намагниченности: 1-1570 К; 2-1590К; 3-1610К; 4-1630К; 5-1650К; 6-1670К.

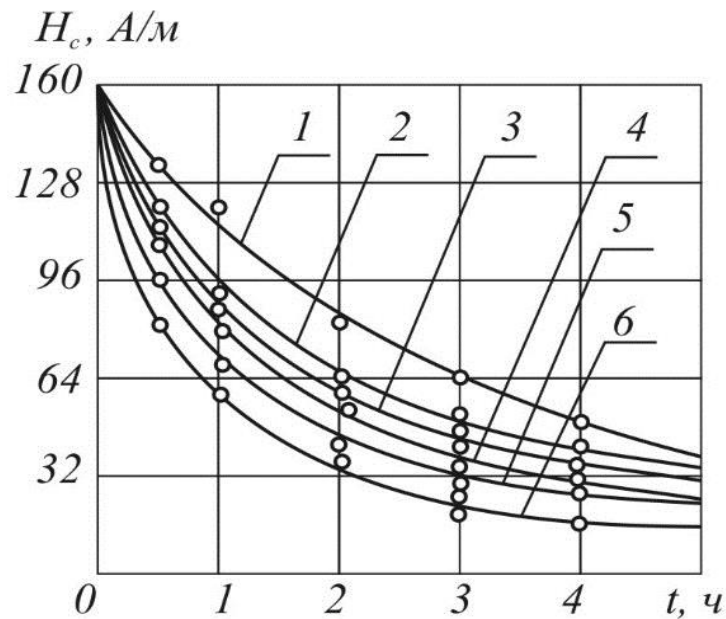
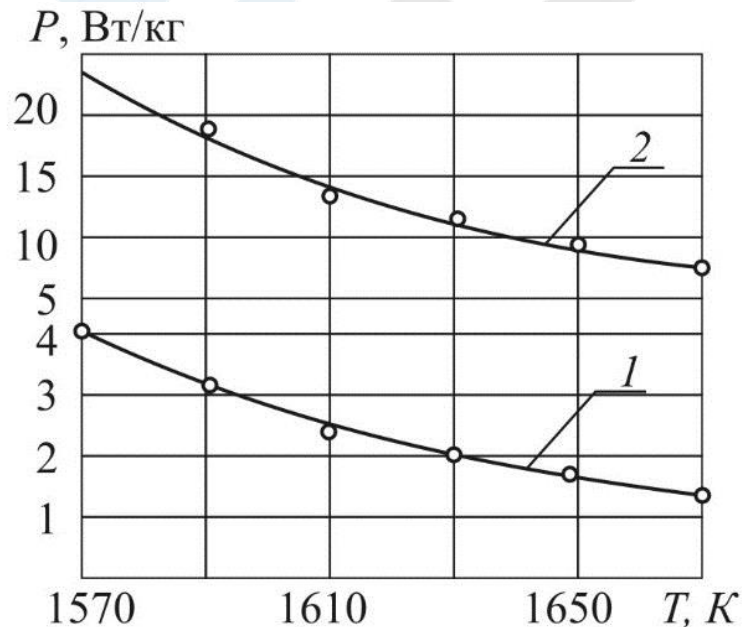
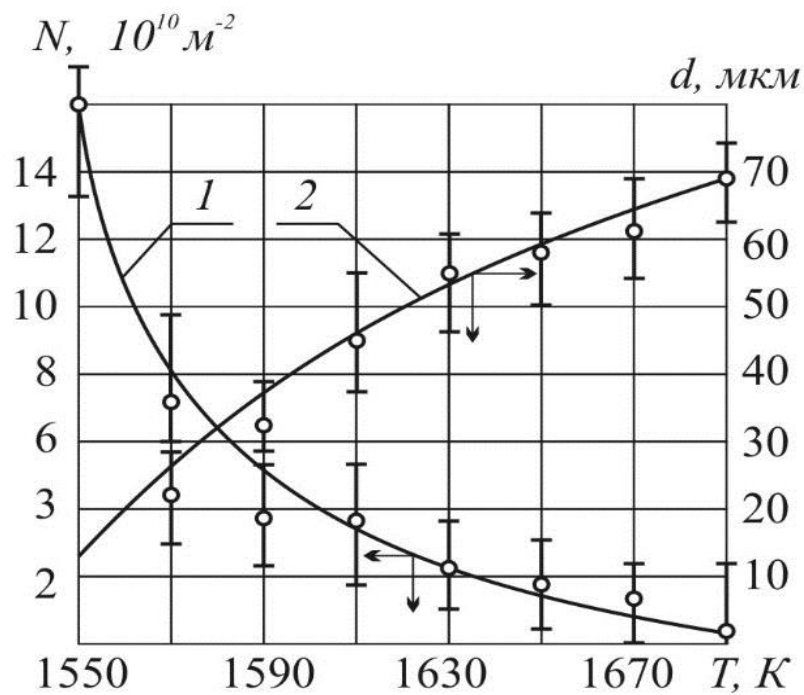


Рис. 2. Изменение коэрцитивной силы магнитомягкого материала от времени спекания: 1-1570К; 2-1590К; 3-1610К; 4-1630К; 5-1650К; 6-1670К.

Зависимости изменения удельных потерь с температурой при индукции  $B = 1T_d$  показана на рис. 3, а плотности дислокаций при этих условиях на рис. 4.



3. Изменение удельной потери магнитомягких материалов от температуры: 1- частота 50 Гц, 2- частота 400 Гц.



4. Изменение плотности дислокаций  $N$  и ширины доменов  $d$  от температуры.

При изменения температуры от 1550 ÷ 1670 К средняя плотность дислокаций уменьшилась от  $16 \cdot 10^{10}$  до  $0,7 \cdot 10^{16} \text{ м}^{-2}$  на рис.5 показана дислокационная структура магнитопровода, полученного по порошковой металлургии [6, 8].

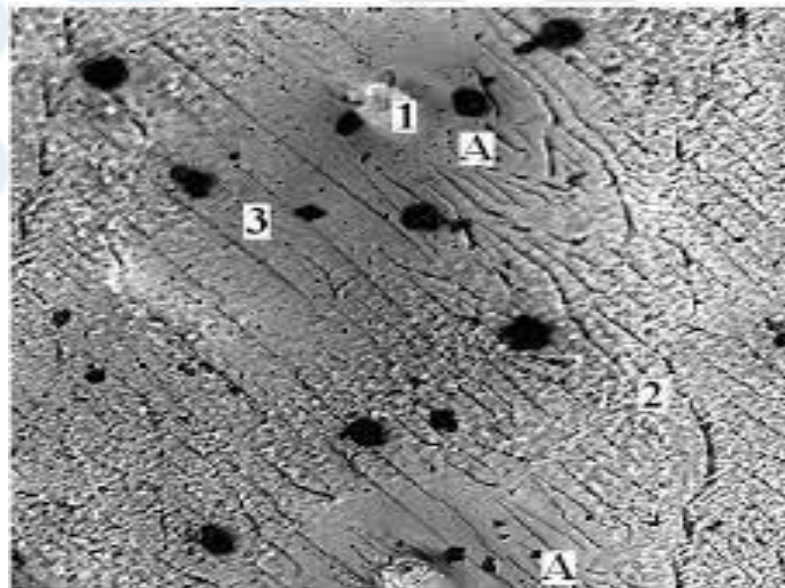


Рис. 5. Структура дислокации магнитопровода (увеличение 700)

а-1590К; б- 1610К; в-1630К; г-1650К;

Доменная структура (рис. 6) магнитопровода при температуре 1590К, спеченного в течении 1 ч.



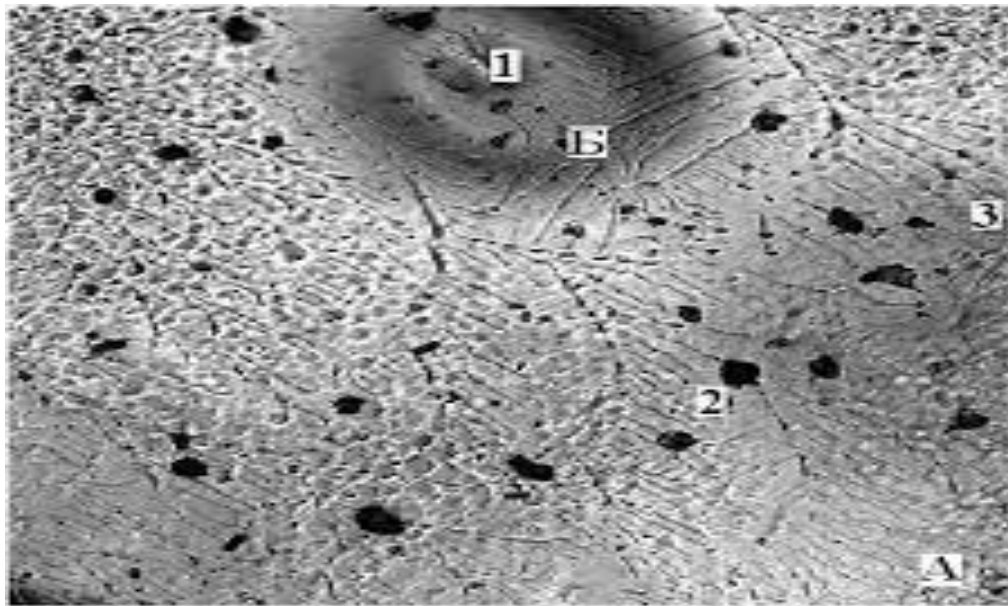


Рис. 6. Доменная структура магнитопровода (увеличение 350) .

**Результаты и обсуждение (Results and Discussion).** Магнитомягкие материалы применяются в источниках питания, фильтрах подавления помех, счетчиках электроэнергии, телекоммуникационных оборудованях [11, 14]. Целью настоящей работы являются получение магнитомягкого материала на основе порошковой металлургии для применения в вспомогательных устройствах электровозов. ЭП на базе АД демонстрирует сравнительно высокие показатели надёжности и энергоэффективности, характеризуется относительной дешевизной в производстве и эксплуатации, что способствует его массовому использованию композиционных материалов, полученных методами порошковой металлургии, позволяет снизить потери электротехнической стали и исключить многие трудоемкие операции и обеспечить необходимую **энергосбережение и дадут рациональным потреблением энергии** [12,13].

#### СПИСОК ИСПОЛЬЗОВАННОЙ ЛИТЕРАТУРЫ

1. A U Gapparov, G A Govor, U T Berdiyev, F F Hasanov, and A M Kurbanov , Magnetic-soft materials based on iron for electromechanical engineering. Internatsional Scientific Conference ICECAE 2020 IOP Conf. Series: Earth and Environmental Science 614 (2020) 012048 IOP. Publishing doi:10.1088/1755-1315/614/1/012048
2. Говор, Г.А. Особенности магнитных характеристик новых композиционных материалов на основе порошков железа / Г.А. Говор, А.К. Вечер, К.И. Янушкевич // Перспективные материалы и технологии : под ред. В.В. Клубовича – Витебск, УО «ВГТУ». – Витебск, 2017. – Т. 2, Гл. 15 – С. 278–299.
3. A. Vetcher, G. Govor, K. Yanushkevich and I. Timoshkov / Magnetic properties of special low-frequency soft magnetic composite material // Book of abstracts of VII Euro-Asian Symposium «Trends in MAGnetism», September 08–13, 2019, Ekaterinburg, Russia. – Vol. II. – P. 172-173.

4. A.Vetcher, K.Yanushkevich / Iron powders with insulating layers: structure and magnetic properties // Proceedings of V International scientific conference Material science «Nonequilibrium phase transformations», 09-12 September, 2019, Varna, Bulgaria. – P.27-29.

5. A. Vetcher, G. Govor, K. Yanushkevich / Metal powder materials with nanomodified oxide coatings and their technical application // Тезисы поданы на МНК International conference ‘Functional materials and Nanotechnologies – 2020’ (FM&NT 2020), Vilnius, Lithuania 5 – 8 May 2020.

6. Kolesnikov I.K. критерии эффективности электропривода по механическое преобразование энергии на совершение. Oriental Renaissance: Innovative, educational, natural and social sciences. 2023-yil, mart, 737-743-betlar.

7. А.К. Вечер, Г.А. Говор, К.И. Янушкевич, У.Т. Бердиев, Ф.Ф. Хасанов / Исследование влияния условий синтеза на магнитные характеристики композиционных материалов на основе порошков железа // Стаття подана в журнал «Весті Національної академії наук України, серія фізика-технічних наук».

8. A.K. Vecher, G. A. Govor, U. T. Berdiyev, F. F. Khasanov, Magnitomyagkiye materialy na osnove zheleza, ispol'zuyemyye v elektromashinostroyenii, Vestnik TashIIT, № 3, 212–217, (2019).

9. U.Berdiev, A. Norboev, Z. Mamarajabova Investigation of Asymmetry in Asynchronous Motor Used in a Borehole Pump List of Author(s):“2023 International Conference February 19-23,2023 San Francisco, CA”, ICNTET-2022-.

10. Kolesnikov, I., Yaronova, N., Ametova, A. Building a “Smart” Electric Network Using 5G and Unmanned Aircraft AIP Conference Proceedings, 2022, 2432, 030037

11. U. T. Berdiyev, U. N. Berdiyev, U. B. Sulaymonov, and L. U. Khalikova, "Ways to improve the energy performance of asynchronous electric motors of rolling stock", AIP Conference Proceedings 2612, 050017 (2023) <https://doi.org/10.1063/5.0117784>

12. Berdiyev U. T., Sulaymonov U. B., Hasanov F. F., Karshiyev K. T. (2022). ENERGY-SAVING MATERIALS FOR ELECTRICAL ENGINEERING. Galaxy International Interdisciplinary Research Journal, 10(5), 444–448. Retrieved from <https://giirj.com/index.php/giirj/article/view/3219>.

13. J. S. Fayzullaev, K. K. Juraeva, “The transfer function of a traction asynchronous motor controlled by a four-square converter” in IOP Conference Series Materials Science and Engineering 734, 012195 (2020).

14. J.S. Fayzullayev. “Improvement of functional diagnostics of asynchronous motors” in AIP Conference Proceedings, 2612, 050034 (2023).

15. Chih-Wen, C. Magnetism and Metallurgy of Soft Magnetic Materials / C. Chih-Wen // Ed. Courier Corporation, 2013. – 592 p.

16. Vetcher A., Govor G., Demidenko O., Popescu A. M., Constantin V., Berdiyev U., A composite magnetic material with insulating anticorrosive coatings. VI-International scientific conference material science “Nonequilibrium phase transformations”, 07-10 September, 2020, Varna, Bulgaria. –p

17. Бердиев У.Т Говор Г.А., Вечер А.К., Пирматов Н.Б., Хасанов Ф.ф. Карабаев А., Магнитно-мягкие материалы на основе железа используемые в электромашиностроение, Вестник ТашИИТа, 2019 г. №3, стр 212-218.

**Effect and use of cardiac glycosides on the body**

**Mahmaraimov Shavkat Tuxtashovich<sup>1</sup>**

**Jurayev Lochinbek Omonovich<sup>2</sup>**

**Shukurov Urol Abduqaxxor o'g'li<sup>2</sup>**

**Ibragimov Turg'un Ikromjon o'g'li<sup>2</sup>**

Head of the Department of Pharmacology and Clinical Pharmacology, Termez branch of  
Toshkent Medical Academy<sup>1</sup>

Students of Termiz Branch of Tashkent Medical Academy<sup>2</sup>

**Abstract** The term cardiac glycosides (CG) combines plant substances and their semisynthetic derivatives that have specific cardiotoxic and antiarrhythmic effects that are due to a common mechanism of action. For a long time, SG was used as the main drug for the treatment of chronic heart failure. SGs normalize cardiac function, which helps to increase stroke volume, increase exercise tolerance and reduce the risk of developing decompensation of chronic heart failure (CHF). SGs reduce excessive sympathetic activity and restore the sensitivity of cardiopulmonary reflexes. However, despite the fact that cardiotonics improve the quality of life of patients for some time, life expectancy is not only not extended, but when using many "non-glycoside" drugs it can even be shortened (partly as a result of their arrhythmogenic effect). Currently, cardiotonics continue to be used, but they are only one component in the complex treatment of chronic heart failure.

**Keywords:** Forensic-medical, lesions, Anatomical Nomenclature,

**Introduction** SGs differ in their pharmacokinetic properties, which determine the rate of development of their effects, duration of action and ability to accumulate in the body. The narrow therapeutic index of drugs and the numerous factors that change their pharmacokinetics and myocardial sensitivity to them create a high risk of developing toxic effects and necessitate regular monitoring of the effectiveness and safety of therapy. All SGs are based on a steroid core with an unsaturated lactone ring and one or more glycosidic residues (sugars). The main pharmacodynamic effects are due to the steroid structure of the molecule, and the properties of the sugar part determine many of the pharmacokinetic characteristics of SG, such as the rate and completeness of absorption, the strength of bonds with proteins, and metabolic features.

**Highlight:** Long-acting glycosides, when administered, the maximum effect when taken orally develops after 8-12 hours and lasts up to 10 days or more. When administered intravenously, the effect occurs within 30-90 minutes, the maximum effect appears after 4-8 hours. This group includes glycosides of digitalis purpurea (digitoxin, etc.), which have pronounced cumulation. Glycosides of medium duration of action, when administered, the maximum effect appears after 5-6 hours and lasts for 2-3 days. When administered intravenously, the effect occurs after 15-30 minutes, the maximum effect occurs after 2-3 hours. This group includes glycosides of foxglove woolly (digoxin, celagid, etc.), which have moderate accumulation. This property is possessed by glycosides of foxglove and adonis. Fast and short-acting glycosides are emergency medications. Administered only intravenously, the effect occurs within 7-10 minutes. The maximum effect appears after 1-1.5 hours and lasts up to 12-24 hours. This group includes glycosides of strophanthus and lily of the valley, which have practically no cumulative properties. The decrease in the activity of the sympathetic nervous system is not the result of the positive inotropic effect of SGs, but is due to their direct effect on the sensitivity of the carotid sinus. The effect of SG on excitability, conductivity and automaticity is explained by

the suppression of  $\text{Na}^+/\text{K}^+ - \text{ATPase}$ , an increase in vagal tone and a decrease in the activity of the SNS. In therapeutic doses, SGs lengthen the effective refractory period and reduce the speed of impulses through the atrioventricular node. Lengthening of atrioventricular conduction is manifested by a decrease in the frequency of ventricular contractions during supraventricular arrhythmias and an increase in the P-Q interval during sinus rhythm. Further inhibition of conduction may lead to bradycardia or complete transverse block. It is important that heart function increases against the background of a decrease in heart rate (negative chronotropic effect) and prolongation of diastole. This creates the most economical mode of heart operation: strong systolic contractions are replaced by sufficient periods of "rest" (diastole), conducive to the restoration of energy resources in the myocardium. The slowing of the heart rate is largely associated with the cardio-cardiac reflex. Under the influence of cardiac glycosides, the endings of the sensory nerves of the heart are excited and, reflexively, through the system of vagus nerves, bradycardia occurs. It is possible that a certain role is played by increased reflexes on the heart from the mechanoreceptors of the sinoaortic zone during systole as a result of increased blood pressure. The ECG shows an increase in the P-P interval. In high doses, SGs can increase the activity of the sympathetic nervous system and directly affect the automaticity of the heart muscle (negative dromotropic effect). The refractory period of the atrioventricular (atrioventricular) node and atrioventricular bundle (bundle of His) increases. The P-Q interval becomes longer. These effects underlie the arrhythmogenic effect of SG, since a simultaneous increase in automaticity and suppression of conduction in the His-Purkinje system creates conditions for the development of tachyarrhythmias and ventricular fibrillation. In toxic doses, cardiac glycosides can cause atrioventricular block. The effect of SG on vascular tone is determined by both direct and indirect effects, which are realized differently in conditions of a healthy and decompensated heart. In the absence of CHF, SGs exhibit a direct myotropic vasoconstrictor effect on arterioles and veins.

**Analysis Results :** Side effects of SG are associated with an overdose of cardiac glycosides. This is more often observed when using digitalis preparations with a pronounced ability to cumulate. They include bradycardia, prolongation of atrioventricular conduction with the development of blocks of varying degrees, as well as an arrhythmogenic effect. However, the greatest danger is the possibility of developing glycoside intoxication. Since SGs are drugs with a low therapeutic index, even a slight excess of their concentration at the site of action can cause a pronounced toxic effect. The mechanism of glycoside intoxication is based on excessive (more than 60%) inhibition of the membrane  $\text{Na}^+/\text{K}^+ - \text{ATPase}$  of myocytes and neurons and the associated disruption of electrolyte transport. The accumulation of intracellular calcium and sodium and the depletion of intracellular potassium reserves lead to changes that are incompatible with the vital activity of the cell. The toxicity of SG is difficult to predict and diagnose, since the initial symptoms of intoxication are nonspecific, and monitoring of drug concentrations in plasma does not provide reliable results due to the pronounced variability of individual sensitivity to SG and a large number of factors that can change their pharmacokinetics. The first and most common symptoms of digitalis intoxication are loss of appetite, nausea, weakness, and bradycardia. FH intoxication can be manifested by any one symptom or a combination of dysfunctions of the gastrointestinal tract, central nervous system, heart or vision.

Toxic effects of SG Cardiac disorders (various disturbances of conduction and heart rhythm arrhythmias - ventricular extrasystole, atrioventricular block of varying degrees, excessive slowing of the ventricular rhythm in atrial fibrillation, accelerated atrioventricular rhythm, supraventricular and ventricular tachycardia, atrial fibrillation, ventricular fibrillation, partial or complete atrioventricular block, ventricular fibrillation, trough-shaped decrease in the ST segment on the ECG).

Extracardiac disorders: Gastrointestinal: anorexia, discomfort and abdominal pain, dyspeptic symptoms (nausea, vomiting, diarrhea). Psychoneurological: headache, fatigue, weakness, insomnia, confusion, pain and paresthesia in the extremities, anxiety, apathy, delirium, hallucinations, rarely convulsions. Visual: loss of visual fields, impaired color perception.

Others: increased pulmonary ventilation in response to hypoxia, rarely gynecomastia. The severity of the toxic effects of SG to a certain extent depends on the level of extracellular potassium, which prevents the binding of SG to Na<sup>+</sup>/K<sup>+</sup> - ATPase. Thus, by increasing the level of extracellular potassium it is possible to weaken the effect of SG. With the most frequent manifestations of intoxication (single ventricular extrasystoles, extrasystoles from the atrioventricular junction, first degree atrioventricular block, bradysystolic form of atrial fibrillation), temporary withdrawal of SG, ECG monitoring and subsequent dose adjustment of the drug are necessary to avoid recurrent violations. With frequent ventricular extrasystoles and paroxysms of tachyarrhythmias, potassium preparations are prescribed intravenously even in the absence of hypokalemia. They are contraindicated in cases of impaired atrioventricular conduction and chronic renal failure. For the treatment of ventricular arrhythmias caused by digitalis intoxication and threatening cardiac hemodynamic disturbances, lidocaine (100 mg intravenously as a bolus) and phenytoin (100 mg intravenously slowly, then 100 mg 4-6 times a day orally) are used, which have a minimal effect on atrioventricular conduction. node. Antiarrhythmic drugs of the quinidine group may be useful, but their use is associated with a high risk of developing new arrhythmias and conduction block. For supraventricular rhythm disturbances, β-blockers are used. For II-III degree atrioventricular blockades, atropine (0.5-1 mg intravenously) is administered. Electrical pulse therapy for SG intoxication is ineffective. To eliminate digitalis intoxication, unithiol or an immunological detoxification method is also used - the introduction of monoclonal antibodies to cardiac glycosides, which neutralize the drug itself. Thus, among the antidotes of digoxin is one of these drugs, Digoxin immune fab. Digitalis intoxication can develop not only as a result of an overdose of drugs, but also when taking therapeutic doses due to increased sensitivity to them or changes in their pharmacokinetics. Many diseases and conditions can change the sensitivity of the myocardium to FH. There are diseases and conditions that increase the risk of developing digitalis intoxication.

**Conclusion** In conclusion, it can be said that Cardiac glycosides have a calming effect on the central nervous system, normalization of excitability and inhibition processes. It is important for us to learn about its use in acute and chronic heart and vascular insufficiency and various heart diseases, myocarditis, hypertension, myocardial infarction, coronartherosclerosis, and the substances that affect them.

#### List of user literature:

1.Hochrein H. [Letter: Liver toxicity of digitalis glycosides]. Dtsch Med Wochenschr 1975 Apr 18; 100 (16): 913. German. [[PubMed](#)]

2. Bigger JT Jr. Digitalis toxicity. *J Clin Pharmacol* 1985; 25: 514-21. [[PubMed](#)]
3. Digitalis Investigation Group. The effect of digoxin on mortality and morbidity in patients with heart failure. *N Engl J Med* 1997; 336: 525-33. [[PubMed](#)]
4. Turakhia MP, Santangeli P, Winkelmayr WC, Xu X, Ullal AJ, Than CT, Schmitt S, et al. Increased mortality associated with digoxin in contemporary patients with atrial fibrillation: findings from the TREAT-AF study. *J Am Coll Cardiol* 2014; 64: 660-8. [[PMC free article](#)] [[PubMed](#)]
5. Chalasani N, Bonkovsky HL, Fontana R, Lee W, Stolz A, Talwalkar J, Reddy KR, et al.; United States Drug Induced Liver Injury Network. Features and outcomes of 899 patients with drug-induced liver injury: The DILIN Prospective Study. *Gastroenterology* 2015; 148: 1340-52. [[PMC free article](#)] [[PubMed](#)]
6. Norqobilov, SYL (2022). BOLALARDA QORINCHALAR ARO TO 'SIQ DEFEKTLARINING D-EXOKG IMKONIYATLARI. XALQARO KONFERENTLARDA ( 1-jild, 21-son, 364-368-betlar).



**FORENSIC CHEMICAL LABORATORY EXAMINATION OF DRUG SUBSTANCES**

**Navbatova Gulnora Xodjimuratovna**

Expert of the forensic chemistry department of the Surkhandarya branch of the Republican Scientific and Practical Center of Forensic Medical Expertise

**Abstract:** The following methods have been approved by the Scientific Working Group on the Analysis of Seizure Drugs. Scientific working groups are composed of subject matter experts who collaborate to identify best practices and develop consensus standards. Thus, these methods have been proven to be effective in the analysis of unknown (forensic) illegal substances and are therefore the best methods used in the identification of unknown substances. Not all of these methods are readily accessible at the point of care, as some require advanced technical knowledge and/or a laboratory setting. Therefore, any of the following methods may be appropriate in each case. This is because some clinics have easy access to more discriminatory methods through direct funding or industry partnerships, while some clinics have less accurate testing due to lack of funding or support. may rely on methods and equipment.

**Key words:** Mass spectrometry, drugs, Infrared spectroscopy

**Applicability:** Mass spectrometry (MS) is the easiest of drug testing methods. Mass spectrometry measures the exact molecular mass of ions, determined by their mass-to-charge ratio ( $m/z$ ), and is the current gold standard in forensic drug analysis [ 1 ]. In general, mass spectrometry requires separation, ionization, and finally detection. The separation can be done by gas chromatography, liquid chromatography or capillary electrophoresis. There are different methods of ionization. Electron ionization, atmospheric pressure chemical ionization, electrospray ionization, matrix-assisted laser desorption ionization, and atmospheric pressure photoionization are the most commonly used in the analysis of illegal substances. Ionization methods can be divided into hard or soft methods.

Fragmentation is useful in analysis because the fragmentation patterns of molecules are known. A spectral database allows a computer to quickly match spectra and identify molecular species. Rigorous techniques are limited to the detection of small molecules. Most illicit drugs are small molecules, with the exception of drugs of a biological nature that are consumed in their crude form. What substances can be detected and how accurately? Almost any substance can be determined using MS in combination with separation (chromatographic) techniques. The sensitivity of current mass spectrometers allows the detection of analytes in concentrations in the attomolar range ( $10^{-18}$ ). MS has increased sensitivity compared to other analytical methods because the analyzer, a massive charge filter, reduces background noise (ie, a more accurate readout/analyte fingerprint can be produced). It exhibits excellent specificity due to its characteristic fragmentation patterns, high resolution, and unique filtering capabilities, especially available in tandem or higher order mass spectrometry. MS provides information on molecular mass and isotopic abundance of elements and time-resolved chemical information, allowing for highly accurate identification. The new devices are easier to use and much smaller than the older versions. Communication with computers allows accurate database searches, which facilitates the process of drug identification. The main disadvantage of MS is that the tested sample taken from the delivery is destroyed by the testing process). Only a very small sample size (milligrams) is required. There are also ongoing costs due to the consumables required and some of these consumables are toxic/hazardous. Complex mixtures must be

separated by chromatographic techniques (gas or liquid chromatography) to accurately identify each component.

**Materials and Methods:** Infrared (IR) spectroscopy is another highly discriminatory technique based on measuring the amount of IR radiation absorbed or emitted by a sample as a function of wavelength. A spectrum is obtained by passing infrared radiation through a sample and determining the amount of incident radiation (radiation that falls on the molecule rather than passing through it) absorbed at each IR frequency [2]. The interpretation of the spectra allows the identification of molecular functional groups. The IR spectra of a pure molecular compound provide a unique fingerprint that can be easily distinguished from the IR absorption patterns of other compounds, including compounds with the same chemical formula but a different arrangement of atoms in the molecule (known as isomers) [3]. The advantage of the IR technique is that almost all compounds have IR active vibrational modes and can therefore be investigated both qualitatively and quantitatively. However, quantitative analysis can present problems with unknown samples and mixtures.

In harm reduction clinics, it may be difficult or impossible to find the spectroscopic expertise needed for forensic analysis and quantification of a substance. Most articles describing relatively simple quantification methods are performed with controlled standards, methodologies, and standards in pharmaceutical research. Although quantification of unknown substances is technically possible, it is truly a case-by-case and painstaking process usually performed by highly skilled technicians and chemists in forensic laboratories. Under these conditions, quantification using this technology is unlikely. Recent advances in IR technology have allowed the development of portable IR devices. What substances can be detected and how accurately? Most compounds can be accurately identified based on their IR spectra when reference spectra are available. Drugs can be identified through a searchable database. Whereas IR cannot distinguish between enantiomers (similar to MS), IR can produce structural information that provides sufficient selectivity to produce the highest discrimination capability. IR can distinguish between diastereomers (eg, pseudoephedrine and ephedrine) and free base/acid and salt forms. The free base/acid and salt forms indicate differences in physical properties that may alter the application of the substance. A free base is usually more volatile and usually has a lower boiling point, allowing the substance to smoke. The salt form is usually more stable, crystalline, and soluble in water, allowing it to be swallowed, inhaled (breathed through the nose), or injected. A common example is crack cocaine (free base) and cocaine (salt); they are actually the same drug (cocaine) and the actual effect on the body is the same, but due to the different absorption and dosage depending on the method of use, a different spectrum of reactions can be observed for each drug. One of the important advantages of IR spectroscopy is that it does not destroy the provided sample - important when working with drugs and the people who use them. It also requires very small sample sizes in the milligram or less range. In addition, samples can be studied in almost any physical state (primarily solid or liquid). Interference is very common and causes difficulties in identification.

**Conclusion:** There are many validated techniques for the identification and/or quantification of drugs. Each of these methods has different pros and cons to consider. With this in mind, this review is not meant to be an in-depth scientific analysis of each of these methods, but rather a guide to practical considerations of use and recommendations for harm reduction at the point of care. Manufacturers have found these technologies to be very easy to use and



effective in identifying unknown analytes. The main disadvantages of this technology are that quantification may require advanced expertise and these units are still quite expensive. Quality use of these units usually requires very little technical experience or training.

**List of literature**

1. Rendle DF. X-ray Diffraction in Forensic Medicine. *Rigaku J.* 2003; 19 (2): 11–22.
2. Trzybiński D, Niedziałkowski P, Ossowski T, Trynda A, Sikorski A. Single crystal X-ray analysis of designer drugs: metaphedrone and pentedrone hydrochlorides. *Forensic Int.* 2013; 232 (1):e28–e32. doi: 10.1016/j.forsciint.2013.07.012. [ PubMed ] [ CrossRef ] [ Google Scholar ]
3. Phadnis NV, Cavatur RK, Suryanarayanan R. Determination of drugs in pharmaceutical dosage forms using X-ray powder diffractometry. *J Pharm Biomed Anal.* 1997; 15(7):929–943. doi: 10.1016/S0731-7085(96)01939-5. [ PubMed ] [ CrossRef ] [ Google Scholar ]
4. Elie MP, Elie LE. Microcrystalline tests in forensic drug analysis. In: Meyers RA, editor. *Encyclopedia of Analytical Chemistry.* Hoboken: Wiley; 2009. pp. 471–481. [ Google Scholar ]
5. Baymanovich, X. B., Xayrullo O'g'li, A. A., Hamidullo O'g'li, A. J., & Yo'lchiyevich, N. S. (2022). CAUSES AND CAUSES OF METAPLASIA OF THE CYLINDRICAL EPITHELIUM IN SMOKERS. *European International Journal of Multidisciplinary Research and Management Studies*, 2(04), 300-303.
6. Boymanovich, X. B., Shodiqul o'g'li, X. I., Yo'lchiyevich, N. S., & Komilovich, M. A. (2022). PARODONTOSIS IN THE ELDERLY PERSONS DUE TO DISORDERS.
7. Boymanovich, X. B., & Yo'lchiyevich, N. S. (2022). EFFECT AND IMPORTANCE OF MICROELEMENTS AND CARBOHYDRATES IN PERIODONTAL DISEASE.
8. Norqobilov, SYL (2022). BOLALARDA QORINCHALAR ARO TO 'SIQ DEFEKTLARINING D-EXOKG IMKONIYATLARI. XALQARO KONFERENTLARDA ( 1-jild, 21-son, 364-368-betlar).

CLINICAL PHARMACOLOGY OF VITAMINS, COENZYMES AND IRON  
PREPARATIONS

**Ibodullayeva Qurbonoy Rahmatullo qizi**

[qurbonoyrahmatullayevna@mail.com](mailto:qurbonoyrahmatullayevna@mail.com)

**Qurbonova Iroda Shuxrat qizi**

[irodakurbanova0505@gmail.com](mailto:irodakurbanova0505@gmail.com)

**Normurodova Nafisa Doniyor qizi**

[normurodovanafisa0102@gmail.uz](mailto:normurodovanafisa0102@gmail.uz)

Department of Pharmacology and Clinical Pharmacology, Termiz branch of the Tashkent Medical Academy Research advisor: ass.

**Chutboyev Bunyod Rustamovich**

[buniktta1115@mail.ru](mailto:buniktta1115@mail.ru)

Termiz Branch of Tashkent Medical Academy. Uzbekistan.

**Abstract:** This article provides information about the functions of vitamins in the body, mechanisms of action, and which vitamins are found in which products. In addition, this article provides detailed information about coenzymes and iron preparations.

**Key words:** coenzymes, vitamins, iron preparations, Ascorbic acid, thiamine, cyanocobalamin,

### FACILITIES

Vitamins are low molecular weight organic substances necessary to ensure biochemical and physiological processes in the body.

Classification of vitamin preparations

- Monocomponent.
  - Water soluble.
  - Fat soluble.
  - Multicomponent.
  - Complex of water-soluble vitamins.
  - Complex of fat-soluble vitamins.
  - Complex of water- and fat-soluble vitamins.
  - Vitamin preparations containing macro- and (or) microelements:
    - complexes of vitamins with macroelements;
    - complexes of vitamins with microelements;
    - complexes of vitamins with macro- and microelements.
  - Vitamin preparations with components of plant origin.
  - Complex of water- and fat-soluble vitamins with components of plant origin.
  - A complex of water- and fat-soluble vitamins with microelements and components of plant origin.
  - Herbal medicines high in vitamins.
- Mechanism of action and main pharmacodynamic effects

Vitamins are a non-plastic material or energy substrate. They participate in the regulation of biochemical processes. Many vitamins are used in the body to build coenzymes or are ready-made coenzymes and, therefore, carry out the processes of biological catalysis.

It is known that vitamins B12, BC, B6, A, E, K, B5 have a predominant effect on protein metabolism; for carbohydrates - B1, B2, C, B5, A and lipoic acid; on fat - B6, B12, PP, B5, choline, carnitine and lipoic acid.

Vitamins are needed by the body in relatively small quantities. In most cases, they are food elements that are not formed in the body or are synthesized in insufficient quantities.

#### **Molecular mechanisms of absorption of water-soluble vitamins**

Recently, the molecular mechanism of absorption and distribution of a number of water-soluble vitamins has been studied. The role of transporters in their absorption and distribution is shown. The regulation of the process at the gene level has been studied.

Ascorbic acid (C). Its absorption sites are found throughout the small intestine. The process is carried out using a Na-ascorbate cotransporter (secondary active transport). The transport of an acid molecule occurs along a Na<sup>+</sup> concentration gradient, supported by the work of Na<sup>+</sup>-K<sup>+</sup>-ATPase. When 2Na<sup>+</sup> moves, one ascorbate anion is absorbed.

Large doses of the vitamin, unlike small amounts of the substance, are not completely absorbed, which may be due to the limited ability of enterocytes to use the transport system.

The Na-ascorbate cotransporter has stereoselectivity: higher affinity was noted for the L-form. Two of its isoforms have been cloned: SVCT1 and SVCT2 (encoded in the SLC23A1 and SLC23A2 genes, respectively).

In older people, lower expression of SVCT was detected, resulting in a deterioration in the ability of cells to capture vitamins.

Control of Na-ascorbate cotransport can be achieved through post-translational modifications and redistribution of SVCT proteins.

Biotin (B8). The Na-dependent multivitamin transporter (SMVT) is involved in the transport of biotin, pantothenic, and lipoic acids with equal affinity. It is assumed that SMVT molecules contain two protein kinase C phosphorylation sites, apparently involved in the regulation of its uptake. The 5'-regulatory segments of the SMVT gene were cloned and studied.

Folic acid (B9). It has been proven that intestinal absorption of folate is regulated by extracellular substrate levels, intracellular protein kinase and developmentally. Dietary deficiency of folic acid leads to a significant increase in its transport through carriers. Recent data suggest the involvement of transcription regulation mechanisms in enhancing the process.

Thiamine (B1). Studies of the molecular nature of the thiamine transport system in the intestine made it possible to clone 2 transporters SLC19A2 and SLC19A3.

Thiamine-dependent megaloblastic anemia (Rogers syndrome) is a disease with an autosomal recessive type of inheritance, its clinical manifestations: megaloblastic anemia, sensorineural tightness ear infections and diabetes mellitus. It is currently believed that its cause is a genetic defect in the thiamine transporter SLC19A2.

The discovery of a large number of vitamin transporters allows scientific research to be carried out in the search for their mutations; explain and correct the cause of some hereditary conditions of reduced absorption of vitamins; study various types of interaction of vitamins, macro- and microelements in the body.

#### **Pharmacokinetics of vitamins**

Vitamin B1 (thiamine) is well absorbed in the intestines. Penetrates into the intestinal epithelial cell with the help of a carrier (active transport), and at high concentrations - by diffusion. A certain amount of vitamin circulates from epithelial cells into the cavity of the small intestine and back. After 15 minutes, thiamine is detected in the blood plasma, and after 30 minutes - in the tissues. The vitamin accumulates in the brain, heart, kidneys, adrenal glands, liver, and skeletal muscles. About 50% of the total amount is contained in muscle tissue. Its maximum concentration when taken orally as a single drug or as part of vitamin complexes is noted after approximately 1.5 hours (see Table 23-3), its values are almost equal in both cases. When taking thiamine at the same dose as part of a vitamin-mineral complex, the maximum concentration is significantly lower. Similar data were obtained for AUC-thiamine. In the liver, vitamin B1 is converted into active metabolites - diphospho- and triphosphothiamin. Elimination of thiamine is carried out due to metabolism in the liver at an average rate of 1 mg/day. The half-life of endogenous thiamine is 9-18 days; when administered as part of vitamin preparations, it is 4-5.5 hours (see Table 23-3).

#### ACTIVATORS AND CORRECTORS OF METABOLISM

The pharmacological properties and therapeutic effectiveness of drugs in this group are determined mainly by the biological role of nucleotides, phosphates, amino acids and other substrates, activators, and regulators of metabolic reactions. Some of them have a pronounced antioxidant effect, others improve metabolism and energy supply to tissues, restore trophism and stimulate regeneration processes, reduce hypoxia, and activate metabolism in tissues (Appendix 5).

However, it should be noted that the effectiveness of such drugs in various diseases of internal organs, and in particular coronary artery disease, has been demonstrated only in small studies. Therefore, their use is often considered to be a treatment with unproven effectiveness.

Metabolic drugs for systemic use can also include biogenic stimulants: ginseng, pantocrine, Eleutherococcus rhizomes and roots, aloe vera leaves, humisol\*, royal jelly (apilak\*), melatonin, etc.

#### Adenosine phosphate

Adenosine phosphate (AMP) is a component of the adenyl system; its biological role:

- activation under anaerobic conditions of a number of Krebs cycle enzymes, increased ATP resynthesis with simultaneous inhibition of glycolysis;
- as a purine nucleotide, it promotes the synthesis of nucleic acids and, consequently, the synthesis of proteins;
- is part of the most important respiratory coenzymes that transport electrons and protons in the initial links of the tissue respiration chain (NAD, NADP and FAD);
- energy supply for synthesis processes - a precursor of high-energy compounds (the formation of ADP and ATP occurs during the phosphorylation of AMP);
- participates in the regulation of carbohydrate metabolism.

It is able to penetrate cells. Entering the body, adenosine phosphate (phosphadene\*) cannot immediately join the high-energy pool - it is first metabolized to adenosine. The latter has biological activity - dilation of arterial capillaries occurs, which entails activation of metabolism due to increased oxygen flow and increased ATP synthesis. In addition, adenosine can be included in the synthesis of macroergs.

At the same time, with a sufficient amount of ATP in the cell, adenosine phosphate is converted not into adenosine, but into inosine monophosphate, which is metabolized differently. Based on the totality of its properties, adenosine can be classified as an anabolic substance.

Indications for use. The drug is used to improve peripheral blood circulation, as well as to restore anabolic processes and microcirculation in acute and chronic myocardial diseases.

Method of administration and dose. Prescribed per os in tablets in a single dose of 25-50 mg, with a daily dose of up to 300 mg. Course duration is 15-30 days (if necessary, treatment is repeated at intervals of 5-7 days).

**REFERENCES:**

1. Butterworth J. Local anesthetics: pharmacology and clinical use. // *Anesth. Analg.*- 2002.-V.94 (3 Suppl S).- P.22-26.
2. Carpenter R. Local anesthetic toxicity: the case for ropivacaine. // *Am.J.Anesthesiol.*- 1997.- V.24 (5, Suppl).- P.4-7.
3. McClure J. Ropivacaine. // *Br. J. Anaesth.* –1996. –V.76. – P.300-307.
4. Rosenberg P. Maximum recommended doses of local anaesthetics – need for new recommendations? // *Highlights in Regional Anaesthesia and Pain Therapy. XI. – Special Edition World Congress on Regional Anaesthesia and Pain Therapy – Barselona, Spain, 2002. – P.30-34.*
5. Turdimuratov B. et al. DIGITALIZATION OF THE MEDICAL FIELD IN UZBEKISTAN // *Mejdunarodnaya konferenstiya akademicheskikh nauk. - 2022. - T. 1. – no. 29. - S. 25-27.*
6. Asfandyorov J. et al. ON GENERAL CHARACTERISTICS OF ADENOCARCINOMA DISEASE // *Current approaches and new research in modern sciences. - 2022. - T. 1. – no. 4. – S. 70-72.*
7. Asfandyorov J. et al. SOME CONSIDERATIONS ABOUT PYLOnephritis DISEASE AND ITS CONSEQUENCES // *Akademicheskije issledovaniya v sovremennoy nauke. - 2022. - T. 1. – no. 15. - S. 55-57.*
8. Choriyeva Z. et al. INFORMATION ON DIABETES DISEASE. THE ORIGIN OF DIABETES DISEASE AND MEASURES APPLIED IN THIS DISEASE // *Theoretical aspects in the formation of pedagogical sciences. - 2022. - T. 1. – no. 4. – S. 96-99.*
9. Rakhmon o‘g‘li A. M. et al. PHYSIOLOGY OF THE HEART, AUTOMATIC HEART, ELECTROCARDIAGRAM // *SUSTAINABILITY OF EDUCATION, SOCIO-ECONOMIC SCIENCE THEORY. - 2022. - T. 1. – no. 4. – S. 4-8.*
10. Mirzaali son A. J. et al. THE LAST BRAIN, ITS CHANGES DEPENDING ON AGE. RELIEF OF PLASH. LATERAL WHITE MATTER OF THE BRAIN. BASAL STEMS // *PEDAGOG. - 2022. - T. 5. – no. 6. - S. 319-326.*
11. Tashboltaevna A. S. et al. STUDY OF SEASONAL BIOLOGICAL BACTERIAL INTESTINAL INFECTIONS IN THE EXAMPLE OF ESHERICHIA // *Journal of Universal Science Research. - 2023. - T. 1. – no. 3. - S. 110-115.*
12. Mirzaali o‘g‘li, A. J., Begzod o‘g‘li, M. M., & To‘ramurodovich, H. F. (2023). SCIENTIFIC BASIS OF MORPHOLOGICAL CHANGES IN THE LIVER DUE TO DIABETES DISEASE. *Web of Semantics : Journal of Interdisciplinary Science, 1(1)*, 25–28. Retrieved from <https://web.semanticjournals.org/index.php/wos/article/view/6>

**Nuriddinova Nigora Sadriddinovna**

[nnuriddinova009@gmail.com](mailto:nnuriddinova009@gmail.com)

**Zokirova Maftuna Zokirovna**

[zokirovamaftuna883@gmail.com](mailto:zokirovamaftuna883@gmail.com)

Department of Pharmacology and Clinical Pharmacology, Termiz branch of the Tashkent Medical Academy Research advisor: ass.

**Chariev Muzaffar Yuldashevich**

[charievmuzaffarbek@gmail.com](mailto:charievmuzaffarbek@gmail.com)

Termiz Branch of Tashkent Medical Academy. Uzbekistan.

**Abstract:** This article discusses a rather interesting topic, such as antiviral drugs. At the moment, viral diseases are one of the most important medical problems and more difficult to treat than the same bacterial diseases. Among the leading viral diseases are influenza and acute respiratory diseases. Concepts about the mechanism of action, the route of penetration and reproduction of viruses give us the opportunity to create new antiviral drugs. At the moment, humanity has a large arsenal of antiviral drugs to combat a wide variety of viruses. But viruses don't sit still and evolve very quickly, forcing us to create new drugs that can defeat new types of viruses. All currently presented antiviral drugs are intended for the treatment and prevention of viral diseases.

**Key words:** infections, organs, rhinovirus, coronavirus, respiratory syncytial, adenovirus, influenza, parainfluenza,

### **Viral diseases and causes of their development**

Viral infections are a group of diseases that are transmitted primarily from person to person and affect a variety of organs and systems. Among them:

- Acute respiratory viral infections: rhinovirus, coronavirus, respiratory syncytial, adenovirus, influenza, parainfluenza. They affect the respiratory tract, cause a runny nose and cough, and make you feel worse. The pathogen is transmitted mainly by airborne droplets.
- Viral hepatitis - infections that affect the liver. The most dangerous types (B and C) are transmitted hematogenously (through blood), sexually, through a medical instrument during various manipulations. Viruses cause chronic inflammation, which often ends in liver cirrhosis or cancer. Hepatitis A virus is the most common of all viral hepatitis. It is transmitted by the fecal-oral route (through dirty hands, poorly washed vegetables and fruits). Causes an acute infection that can affect a person many times.
- Herpes virus infection. Depending on the type of pathogen, it can affect any organs and tissues: skin, pharynx, eyes, nerve fibers, lymph nodes, genitals. The infection is transmitted by airborne droplets, household contact, and sexual contact.
- HIV infection. It affects the cells of the immune system and, in the absence of adequate antiviral therapy or the aggressive course of the infection, can lead to the development of acquired immunodeficiency syndrome - AIDS. The modes of transmission of the disease are the same as for viral hepatitis.

The causative agents of each disease have their own characteristics, but they have one thing in common: the virus cannot live and multiply outside the cells of the human body. It penetrates the cell membrane and transfers its genetic material to it. It is impossible to destroy most viruses without eliminating many cells.

Even in the last century, many viral diseases were considered incurable. But science has created antiviral drugs that neutralize viruses and stimulate the immune system to fight infection. Thanks to them, people infected with the flu survive the disease much easier, and people with HIV or viral hepatitis can now live happily into old age.

### **What are antiviral drugs**

Viral disease is a challenge for drug therapy. The fact is that the virus can live and reproduce only inside the host cell, changing its metabolic processes. Therefore, for a long time it was believed that it was impossible to influence viruses without causing significant harm to the body.

Over time, this hypothesis was revised. Since the second half of the last century, scientists have been developing antiviral drugs that act at different stages of the virus life cycle - they prevent the virus from attaching to the cell, the penetration into and exit of mature viral particles from the cell, and disrupt reproduction (replication).

The effect of these drugs in a therapeutic dose is detrimental to the virus and is practically safe for the body.

### **Drugs with direct antiviral action**

#### **M2 channel blockers<sup>2</sup>**

This class includes the first drug developed in the last century for influenza chemotherapy - amantadine. Studies conducted in accordance with the principles of evidence-based medicine have confirmed its effectiveness against influenza viruses type A. In our country, amantadine is not used in the treatment of influenza. Soviet scientists created a new drug based on it - rimantadine. This drug has higher antiviral activity and relatively less toxicity.

**Operating principle.** The medicine is taken orally - in the form of tablets, syrup. It penetrates the blood, and then spreads throughout the body and accumulates in the secretions of the nasal cavity. The active substance binds M2 proteins. This is a kind of "key" in the virus shell, which opens the "door" to the cell nucleus through ion channels in its membrane. The virus penetrates the cell, but the drug blocks access of the virus's genetic material to the cell's DNA. Without this, the microorganism cannot reproduce, so the concentration of viruses in the body does not increase. In addition, the medicine has an antitoxic effect.

**Application.** In order for the medicine to have a good therapeutic effect, the tablets should be taken no later than two days after the first symptoms of the flu appear. They are taken twice a day for five days. Children aged 1–14 years are given baby syrup.

**Contraindications:**

- hypersensitivity to the active and auxiliary components of the drug;
- acute liver pathologies;
- acute injury and chronic kidney disease;
- hyperfunction of the thyroid gland;
- pregnancy and breastfeeding;
- age up to one year.

**Side effects.** Amantadine often causes a number of negative side reactions:

- irritability;

- weakening of concentration;
- sleep disturbance;
- loss of appetite;
- nausea.

The toxic effect on the central nervous system is enhanced in older people who are simultaneously receiving antihistamines and anticholinergic drugs (medicines that control bronchial asthma, Parkinson's disease, stop vomiting, and are used in the treatment of chronic obstructive pulmonary disease). Another undesirable effect is the formation of resistance in the infectious agent. Over time, some viruses become resistant to the drug.

### **Neuraminidase inhibitors<sup>3</sup>**

These include zanamivir (not currently used in Russia) and oseltamivir. Both types of antiviral drugs have a similar mechanism of action and indications and are effective against influenza A and B viruses. Compared to the previous group, they are not as toxic and have a number of contraindications.

**Operating principle.** Neuraminidase is one of the main enzymes responsible for the replication of both types of influenza viruses. By blocking it, the medicine temporarily slows down the spread of infection throughout the body. The drug is taken orally. It interacts well with other medications and is often used as part of complex therapy.

**Application.** It is recommended to take tablets (suspension prepared from powder) from the first symptoms of infection - no later than 48 hours from the initial manifestations, otherwise the use of neuraminidase inhibitors is inappropriate. The medicine is taken for 5 days, 2 times a day.

**Contraindications:**

- individual intolerance to any components of the dosage form;
- severe renal and liver failure;
- age up to one year.

**Side effects.** Most often (in 10–12% of cases) patients complain of nausea and vomiting after the first dose of the medicine. Other adverse reactions (in 1–2.5% of patients):

- headaches;
- dizziness;
- weakness;
- insomnia;
- feeling of nasal congestion;
- cough;
- sore throat.

### **Hemagglutinin inhibitors 4,5**

In Russia, the group of inhibitors is represented by the old domestic drug umifenovir, which acts against viruses type A and B, and a number of other pathogens of acute respiratory viral infections. However, a study by Russian and British scientists showed that there is a possibility of mutations leading to the emergence of umifenovir-resistant strains of viruses. Resistance was due to the inability of umifenovir to bind to mutated hemagglutinin.<sup>6</sup> Another drug with a similar spectrum of action is enisamium iodide. This drug is claimed to be highly effective and well tolerated, with no resistant strains.



Operating principle. The drugs act on the virus's hemagglutinin, a protein that ensures the fusion of its genetic material with cellular DNA. Hemagglutinin inhibitors block infection already at the initial stage, preventing the penetration of the viral particle into the cell.

In addition to the main one, both drugs have additional effects in the fight against the virus: they stimulate the synthesis of interferons and increase the body's resistance to infection. These properties are especially pronounced in enisamium iodide. The drug is quickly absorbed after oral administration and circulates in the blood for a long time (up to 14 hours), preventing the spread of viral infection throughout the body.

Application. The drugs are used in the treatment of influenza and other acute respiratory viral infections. Umifenovir is taken orally in the form of capsules, tablets, or powder for the preparation of a suspension. The dose, interval, and duration of taking the medication are determined individually by the attending physician. Doctors prescribe enisamia iodide in film-coated tablets, which must be taken orally three times a day for 5–7 days.

**REFERENCES:**

1. Шестакова И.В. Противовирусные препараты // Журнал для непрерывного медицинского образования врачей – <https://cyberleninka.ru/article/n/protivovirusnye-preparaty/pdf>
2. Хатхоху М.Г. Противовирусные препараты: учебное пособие // Майкопский государственный технологический университет – 2014 – [https://mkgtu.ru/sveden/files/Farmakologiya\\_Uчебno-metodicheskoe\\_posobie\\_Protivovirusnye\\_sredstva...](https://mkgtu.ru/sveden/files/Farmakologiya_Uчебno-metodicheskoe_posobie_Protivovirusnye_sredstva...)
3. [https://mkgtu.ru/sveden/files/Farmakologiya\\_Uчебno-metodicheskoe\\_posobie\\_Protivovirusnye\\_sredstva...](https://mkgtu.ru/sveden/files/Farmakologiya_Uчебno-metodicheskoe_posobie_Protivovirusnye_sredstva...)
4. Ленева И.А., Пшеничная Н.Ю., Булгакова В.А. Умифеновир и коронавирусные инфекции: обзор результатов исследований и опыта применения в клинической практике // Терапевтический архив - №11, 2020 - <https://cyberleninka.ru/article/n/umifenovir-i-koronavirusnye-infektsii-obzor-rezultatov-issledovani...>
5. Turdimuratov B. et al. DIGITALIZATION OF THE MEDICAL FIELD IN UZBEKISTAN //Mejdunarodnaya konferenstiya akademicheskikh nauk. - 2022. - Т. 1. – no. 29. - S. 25-27.
6. Asfandyorov J. et al. ON GENERAL CHARACTERISTICS OF ADENOCARCINOMA DISEASE //Current approaches and new research in modern sciences. - 2022. - Т. 1. – no. 4. – S. 70-72.
7. Asfandyorov J. et al. SOME CONSIDERATIONS ABOUT PYLOnephritis DISEASE AND ITS CONSEQUENCES //Akademicheskije issledovaniya v sovremennoy nauke. - 2022. - Т. 1. – no. 15. - S. 55-57.
8. Choriyeva Z. et al. INFORMATION ON DIABETES DISEASE. THE ORIGIN OF DIABETES DISEASE AND MEASURES APPLIED IN THIS DISEASE //Theoretical aspects in the formation of pedagogical sciences. - 2022. - Т. 1. – no. 4. – S. 96-99.
9. Rakhmon oғ A. M. et al. PHYSIOLOGY OF THE HEART, AUTOMATIC HEART, ELECTROCARDIAGRAM //SUSTAINABILITY OF EDUCATION, SOCIO-ECONOMIC SCIENCE THEORY. - 2022. - Т. 1. – no. 4. – S. 4-8.

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

10. Mirzaali son A. J. et al. THE LAST BRAIN, ITS CHANGES DEPENDING ON AGE. RELIEF OF PLASH. LATERAL WHITE MATTER OF THE BRAIN. BASAL STEMS //PEDAGOG. - 2022. - T. 5. – no. 6. - S. 319-326.

11. Tashboltaevna A. S. et al. STUDY OF SEASONAL BIOLOGICAL BACTERIAL INTESTINAL INFECTIONS IN THE EXAMPLE OF ESHERICHIA //Journal of Universal Science Research. - 2023. - T. 1. – no. 3. - S. 110-115.

12. Mirzaali o'g'li, A. J., Begzod o'g'li, M. M., & To'ramurodovich, H. F. (2023). SCIENTIFIC BASIS OF MORPHOLOGICAL CHANGES IN THE LIVER DUE TO DIABETES DISEASE. *Web of Semantics : Journal of Interdisciplinary Science*, 1(1), 25–28. Retrieved from <https://web.semanticjournals.org/index.php/wos/article/view/6>



## О СУДЕБНО-БИОЛОГИЧЕСКИХ ДОКАЗАТЕЛЬСТВАХ И ПОНЯТИЯХ О БИОЛОГИЧЕСКИХ ВЕЩЕСТВАХ

**Суюнова Саодат Абдикодировна**

Эксперт отдела судебно-биологической экспертизы Сурхандарьинского филиала Научно-практического центра судебно-медицинской экспертизы республики

**Аннотация:** Судебная биология использует биологические методы для анализа доказательств, включая ДНК, кровь и ткани, в уголовных расследованиях. Судебные биологи собирают, сохраняют и анализируют доказательства, чтобы помочь идентифицировать подозреваемых, установить связи между подозреваемыми и жертвами, определить причины смерти и восстановить места преступлений. Эта область важна для обеспечения правосудия и находится на переднем крае современного уголовного расследования.

**Ключевые слова:** судебная биология, кровь человека, сперма, биологические доказательства.

**Введение:** Использование крови при судебно-медицинской экспертизе является методом выявления лиц, подозреваемых в совершении отдельных видов преступлений. В начале XX века два учёных, Пауль Уленхут и Карл Ландштейнер, отдельно работавшие в Германии, показали, что между людьми существует разница в крови. Уленхут разработал метод обнаружения присутствия антител, а Ландштейнер и его ученики показали, что у людей есть разные группы крови: А, В, АВ и О. Как только врачи разделили кровь на разные типы, они могли использовать эту информацию для безопасной работы. переливание крови. Кроме того, судебно-медицинские эксперты могут использовать эту информацию для оправдания подозреваемых в определенных видах преступлений, а также помочь определить отцовство детей. Когда ученые определяют группу крови, они полагаются на небольшие различия в антигенах или белковых маркерах на поверхности эритроцитов в образце крови. Эти антигены в организме распознаются и прикрепляются антителами. Антитело — это белок плазмы крови, который используется иммунной системой для идентификации и нейтрализации бактерий, вирусов и других чужеродных веществ. Если белки антител идентифицируют эритроциты с чужеродными антигенами, они прикрепляются к этим антигенам и вызывают их накопление. Судебно-медицинские эксперты часто используют методы определения группы крови (группы крови), поскольку на группу крови человека не влияют болезни, лекарства, климат, профессия, условия жизни или другие физические условия. Кроме того, ученые используют группу крови для определения отцовства. Например, у родителя с группой крови АВ никогда не может быть ребенка с группой крови О. Если женщина с группой О рождает ребенка с группой О, то мужчина с группой АВ не может быть отцом.

**Актуальность научной работы:** Судебная биология – это применение генетики, клеточной и молекулярной биологии и химии для установления связи подозреваемого или жертвы с местом, объектом(ами) или с другим человеком. Такие сообщения могут быть использованы в дальнейших уголовных и гражданских расследованиях. Судебная биология часто включает в себя идентификацию биологических жидкостей и тканей, а также использование ДНК для получения образцов, которые могут иметь доказательную ценность.

Темы, связанные с судебно-биологической экспертизой, включают изучение биологических доказательств, документации, скрининг крови и биологических жидкостей и подтверждающие исследования, извлечение ДНК, количественную оценку, ПЦР-амплификацию, обнаружение аллелей, генотипирование, интерпретацию профиля ДНК, статистическое взвешивание, а также обеспечение качества/качество включает меры контроля.

**Материалы и методы.** Для определения присутствия человеческой крови в доказательствах используется ряд тестов. После выявления возможных пятен крови их анализируют с помощью химического скринингового теста, такого как реагент Кастла-Мейера (фенолталалеин). В этом специальном тесте используется гемовый компонент гемоглобина крови, который дает положительную реакцию при изменении цвета с прозрачного на розовый. Поскольку положительный скрининговый тест является лишь «предполагаемым» тестом, для определения присутствия человеческой крови необходим подтверждающий тест. Если эти тесты дают положительный результат, определяют, что испытуемый образец содержит кровь человека. Если эти тесты дают отрицательные результаты, можно заподозрить кровь животных. Для подтверждения наличия крови можно провести кристаллический тест крови подозреваемого животного. При необходимости можно провести дополнительные тесты для определения типа крови животного. Обнаружение спермы: пятна, предположительно содержащие сперму, также подвергаются серии тестов. Сначала берется образец пятна и проверяется на наличие фермента кислой фосфатазы, содержание которого в сперме очень высокое. Если нанесение ряда химических веществ на образец мазка дает фиолетовую реакцию, этот «предположительный» тест является положительным и необходимы дальнейшие подтверждающие тесты. Присутствие сперматозоидов можно подтвердить путем обнаружения сперматозоидов в экстракте мазка. Экстракт помещают на предметное стекло, химически окрашивают и исследуют под микроскопом. Процесс окрашивания позволяет судебному биологу увидеть и идентифицировать сперматозоиды в дополнение к другим клеткам и бактериям, присутствующим на предметном стекле. Если сперматозоиды не обнаружены, можно использовать другие показатели спермы человека. Эти тесты выявляют наличие семеногелина, или белка семенной жидкости человека, в экстрактах, полученных из рассматриваемого яичка. Другие биологические материалы. Отдел судебной биологии также отвечает за идентификацию других типов биологических материалов, таких как слюна, моча и фекалии. Идентификация этих материалов может быть использована для подтверждения информации, полученной в ходе расследования. Если эксперт установит, что на предмете доказательства нет биологической жидкости, но человек контактировал с предметом, может быть получен образец «соответствующей ДНК». Используя предоставленные данные дела, а также свою подготовку и опыт, судебный биолог может собрать образец из области улики, которая является потенциальным местом расположения клеток кожи.

**Выводы и заключения расследования:** может быть вызван офицер, прибывший первым, чтобы убрать улики с места преступления. Как и в случае с любыми доказательствами, офицер должен обеспечить сохранение цепочки сохранности. Они также должны знать, что прямой солнечный свет и более теплые условия могут привести к разрушению ДНК, и избегать хранения доказательств в местах, где может быть жарко, например, в багажнике полицейской машины. Для лучшей сохранности доказательств ДНК

храните их в холодных условиях. Любой очевидный биологический образец, хранящийся в сухом или замороженном виде, независимо от возраста, может быть рассмотрен для анализа ДНК. Ядерная ДНК из пятен крови и спермы в возрасте старше 20 лет была успешно амплифицирована (скопирована) с помощью полимеразной цепной реакции (ПЦР) и впоследствии проанализирована. Образцы, хранившиеся во влажном состоянии в течение длительного периода времени, могут оказаться слишком разложившимися для анализа ДНК, и их следует проверять с помощью ПЦР. Митохондриальная ДНК, подлежащая анализу, была обнаружена в очень старых образцах костей, зубов и волос. К образцам, обычно считающимся непригодными для исследования современными методами, относятся забальзамированные тела (кроме костей и выщипанных волос), патологии или образцы тканей плода, погруженные в формальдегид или формалин более чем на несколько часов (за исключением заметных патологий). парафиновые блоки и предметные стекла) и пятна мочи. Другие образцы, такие как фекалии, пятна стула и рвотные массы, потенциально могут быть проверены, но большинство лабораторий обычно не принимают их для тестирования.

**Вывод:** Все биологические доказательства ухудшаются. Таким образом, сбор и хранение является очень важным шагом в обеспечении безопасности доказательств и предотвращении загрязнения. Соблюдение надлежащего сбора и хранения доказательств поможет сохранить полезную информацию, которую можно получить после любого конкретного анализа.

#### ИСПОЛЬЗОВАННАЯ ЛИТЕРАТУРА

1. «Судебная биология». [www.cfsre.org](http://www.cfsre.org). Проверено 31 августа 2023 г.
2. «Происхождение судебной экспертизы». Музей преступности. Проверено 31 мая 2023 г.
3. «СУДЕБНАЯ ЭКСПЕРИМЕНТАЦИЯ». [CrimeMuseum.Org](http://CrimeMuseum.Org). Музей преступности. Проверено 4 марта 2022 г.
4. Лонгато, С.; Вёсс, К.; Хатцер-Грубвизер, П.; Бауэр, К.; Парсон, В.; Унтербергер, Ш.; Кун, В.; Пембергер, Н.; Паллуа, Антон К.; Речейс, В.; Лакнер, Р. (07 апреля 2015 г.). «Интервальная посмертная оценка останков человеческого скелета с использованием микрокомпьютерной томографии, микроскопической визуализации в среднем инфракрасном диапазоне и энергодисперсионного рентгеновского картирования». Аналитические методы. 7 (7): 2917–2927. Doi 10.1039/c4ay02943g ISSN 1759-9660. ПМЦ 4383336 ПМИД 25878731.
5. Baymanovich, X. B., Xayrullo O'g'li, A. A., Hamidullo O'g'li, A. J., & Yo'lchiyevich, N. S. (2022). CAUSES AND CAUSES OF METAPLASIA OF THE CYLINDRICAL EPITHELIUM IN SMOKERS. *European International Journal of Multidisciplinary Research and Management Studies*, 2(04), 300-303.
6. Boymanovich, X. B., Shodiquil o'g'li, X. I., Yo'lchiyevich, N. S., & Komilovich, M. A. (2022). PARODONTOSIS IN THE ELDERLY PERSONS DUE TO DISORDERS.
7. Boymanovich, X. B., & Yo'lchiyevich, N. S. (2022). EFFECT AND IMPORTANCE OF MICROELEMENTS AND CARBOHYDRATES IN PERIODONTAL DISEASE.
8. Norqobilov, SYL (2022). BOLALARDA QORINCHALAR ARO TO 'SIQ DEFEKTLARINING D-EXOKG IMKONIYATLARI. XALQARO KONFERENTLARDA ( 1- jild, 21-son, 364-368-betlar).

CLINICAL PHARMACOLOGY OF HYPOGLYCEMIC DRUGS

**Mamanorova Ulug'oy**

[ulugoymamanorova276@gmail.com](mailto:ulugoymamanorova276@gmail.com)

**Turaeva Muxayyo**

[mturayeva267@gmail.com](mailto:mturayeva267@gmail.com)

Department of Pharmacology and Clinical Pharmacology, Termiz branch of the Tashkent Medical Academy Research advisor:

**Amirkulov Sherbek**

[bunyodamirqulov@mail.com](mailto:bunyodamirqulov@mail.com)

Termiz Branch of Tashkent Medical Academy. Uzbekistan.

**Abstract:** Current drugs for the treatment of type 2 diabetes mellitus have different molecular targets and different mechanisms of action. The use of these drugs in the form of monotherapy and combination therapy makes it possible to achieve reliable disease control. However, the rational choice of a pharmacotherapy strategy for type 2 diabetes mellitus is a difficult problem in clinical practice. The article discusses some aspects of this problem.

**Key words:** type 2 diabetes mellitus, glycemic control, choice of pharmacotherapy strategy

Diabetes mellitus (DM) is defined by the World Health Organization as the only chronic non-communicable disease. The pandemic rate of growth of the disease in December 2006 prompted the United Nations to adopt a resolution calling for “the establishment of national programs for the prevention, treatment and prevention of diabetes and its complications and their inclusion in public health programs”.

This determines the intensity of ongoing scientific research both in the field of fundamental theoretical knowledge and in the field of clinical application of existing knowledge. The arsenal of practicing doctors is constantly being replenished with new effective drugs, which, given the existing diversity, makes it relevant to consider clinical and pharmacological approaches to the selection and use of various drugs for the pharmacotherapy of diabetes mellitus, since the selection of adequate glucose-lowering therapy and the necessary degree of compensation for carbohydrate metabolism presents certain difficulties.

Currently, on the entire planet, based on the number of patients treated, there are more than 250 million patients with diabetes mellitus, and about 50% of all patients with diabetes are in the most active, working age of 40-59 years. Considering the growth rate of the prevalence of this disease, experts from the International Diabetes Federation (IDF) predict that the number of people with diabetes will increase by 1.5 times by 2025 and reach 380 million people, mainly due to patients with type 2 diabetes (T2DM), which is developing in adults and is causally associated, first of all, with excess body weight (IDF atlas, 2009). High rates of growth in the incidence of diabetes, especially type 2 diabetes, continue in the Russian Federation. Over the past 10 years, the number of patients with diabetes in terms of visits has doubled and reached more than 3 million people. Meanwhile, data from control and epidemiological studies conducted by the Endocrine Research Center from 2002 to 2008 showed that the real number of patients is 2-3 times higher and amounts to about 9 million people.

According to etiology, pathogenesis and clinical manifestations, diabetes mellitus is usually divided into two types. Type 1 diabetes (T1D) is caused by autoimmune or idiopathic destruction of pancreatic beta cells, usually leading to absolute insulin deficiency. The triggering mechanism for type 2 diabetes is the functional inferiority of the  $\beta$ -cell against the background of severe insulin resistance.

The most dangerous consequences of the global epidemic of diabetes mellitus are its systemic vascular complications: nephropathy, retinopathy, damage to the blood vessels of the heart and brain, and peripheral vessels of the lower extremities. This is the main cause of disability and mortality in patients with diabetes. Therefore, type 2 diabetes is an acute medical and social problem.

#### ORAL GLOW-REDUCERS FACILITIES

In accordance with the application points, PSS are divided into three groups:

1) enhancing insulin secretion: stimulating the synthesis and/or release of insulin by  $\beta$ -cells or increasing the sensitivity of  $\beta$ -cells to physiological stimuli - sulfonylurea drugs, non-sulfonylurea secretagogues (glinides);

2) reducing insulin resistance (increasing sensitivity to insulin): suppressing increased glucose production by the liver and increasing glucose utilization by peripheral tissues; this includes biguanides and thiazolidinediones (glitazones);

3) suppressing the absorption of carbohydrates in the intestine: dietary plant fibers and resins; inhibitors (blockers) of  $\alpha$ -glucosidases.

Since type 2 diabetes is a heterogeneous disease, the available arsenal of PSS allows us to influence various parts of its pathogenesis.  $\beta$ -cell dysfunction is characterized by a decrease in their number and decreased sensitivity to glucose. Impaired insulin secretion may be observed at the time of disease manifestation. There is a decrease in the first (early) phase of insulin secretion, and the concentration of proinsulin and its metabolic products increases. In addition, the phenomenon of glucotoxicity is revealed, which is expressed in an increase in the dysfunction of pancreatic  $\beta$ -cells under the influence of prolonged hyperglycemia. Therefore, the first choice drugs in these patients with type 2 diabetes (in cases where it is impossible to achieve adequate compensation for the disease through lifestyle modification—diet therapy in combination with physical activity) are PSMs.

Sulfonylurea derivatives. In 1942, M. Jeanbon and colleagues, while studying antibacterial sulfonamides, accidentally discovered their side effect in the form of hypoglycemia in laboratory animals. In the early 50s, clinical trials of tolbutamide, the first drug from this group, were carried out,

which was widely used. Sulfonylurea derivatives are usually divided into two generations. The first generation includes tolbutamide, acetohexamide, tolazamide and chlorpropamide. The second generation includes glibenclamide, glipizide, gliclazide, gliquidone and glimepiride. Second-generation drugs have a more pronounced hypoglycemic effect compared to first-generation drugs [8]. Therefore, they are prescribed in significantly smaller doses (measured in milligrams, and not in grams, like 1st generation drugs). Due to smaller doses, they have fewer side effects, interact less frequently with other drugs, and are available in more convenient forms. Currently, 1st generation PSMs, with the exception of chlorpropamide, are practically not used. The mechanism of the hypoglycemic effect is associated with stimulation of insulin secretion by  $\beta$ -cells under the

influence of PSM on specific sulfonylurea receptors (SUR 1) and blocking of ATP-dependent potassium channels, which leads to activation of calcium channels, calcium entry into the cell and exocytosis of secretory granules. Drugs in this group also stimulate the secretion of somatostatin and slightly suppress the secretion of glucagon. An extrapancreatic effect of PSM was also noted (that is, an effect at the level of target tissues, an increase in the density of insulin receptors on monocytes, erythrocytes and lipocytes, the ability to suppress gluconeogenesis in the liver, etc.), which is probably due to a decrease in the manifestation of the phenomenon of glucose toxicity due to insulin secretion. The use of PSM in patients with type 2 diabetes initially increases the secretion of insulin by  $\beta$ -cells of the pancreas and reduces the hepatic clearance of insulin, which leads to an increase in this hormone in the blood. During the first months of treatment, fasting plasma insulin concentrations and insulin secretion in response to glucose intake increase. Subsequently, there is a drop in insulin concentration to the initial level (that is, what was before the start of treatment), but a sharp increase in glucose levels does not occur. This may be explained by the fact that a long-term decrease in glucose levels leads to restoration of tissue sensitivity to insulin. The decrease in the stimulating effect of PSMs with their long-term administration is due to a decrease in the number of sulfonylurea receptors on  $\beta$ -cells. If treatment is suspended, the  $\beta$ -cell response to the drug will be restored.

#### REFERENCES:

1. Butterworth J. Local anesthetics: pharmacology and clinical use. // *Anesth. Analg.*-2002.-V.94 (3 Suppl S).- P.22-26.
2. Carpenter R. Local anesthetic toxicity: the case for ropivacaine. // *Am.J.Anesthesiol.*-1997.- V.24 (5, Suppl).- P.4-7.
3. McClure J. Ropivacaine. // *Br. J. Anaesth.* –1996. –V.76. – P.300-307.
4. Rosenberg P. Maximum recommended doses of local anaesthetics – need for new recommendations? // *Highlights in Regional Anaesthesia and Pain Therapy. XI. – Special Edition World Congress on Regional Anaesthesia and Pain Therapy – Barselona, Spain, 2002. – P.30-34.*
5. Turdimuratov B. et al. DIGITALIZATION OF THE MEDICAL FIELD IN UZBEKISTAN // *Mejdunarodnaya konferenstiya akademicheskikh nauk.* - 2022. - T. 1. – no. 29. - S. 25-27.
6. Asfandyorov J. et al. ON GENERAL CHARACTERISTICS OF ADENOCARCINOMA DISEASE // *Current approaches and new research in modern sciences.* - 2022. - T. 1. – no. 4. – S. 70-72.
7. Asfandyorov J. et al. SOME CONSIDERATIONS ABOUT PYLOnephritis DISEASE AND ITS CONSEQUENCES // *Akademicheskije issledovaniya v sovremennoy nauke.* - 2022. - T. 1. – no. 15. - S. 55-57.
8. Choriyeva Z. et al. INFORMATION ON DIABETES DISEASE. THE ORIGIN OF DIABETES DISEASE AND MEASURES APPLIED IN THIS DISEASE // *Theoretical aspects in the formation of pedagogical sciences.* - 2022. - T. 1. – no. 4. – S. 96-99.
9. Rakhmon oğ A. M. et al. PHYSIOLOGY OF THE HEART, AUTOMATIC HEART, ELECTROCARDIAGRAM // *SUSTAINABILITY OF EDUCATION, SOCIO-ECONOMIC SCIENCE THEORY.* - 2022. - T. 1. – no. 4. – S. 4-8.



10. Mirzaali son A. J. et al. THE LAST BRAIN, ITS CHANGES DEPENDING ON AGE. RELIEF OF PLASH. LATERAL WHITE MATTER OF THE BRAIN. BASAL STEMS //PEDAGOG. - 2022. - T. 5. – no. 6. - S. 319-326.

11. Tashboltaevna A. S. et al. STUDY OF SEASONAL BIOLOGICAL BACTERIAL INTESTINAL INFECTIONS IN THE EXAMPLE OF ESHERICHIA //Journal of Universal Science Research. - 2023. - T. 1. – no. 3. - S. 110-115.

12. Mirzaali o'g'li, A. J., Begzod o'g'li, M. M., & To'ramurodovich, H. F. (2023). SCIENTIFIC BASIS OF MORPHOLOGICAL CHANGES IN THE LIVER DUE TO DIABETES DISEASE. *Web of Semantics : Journal of Interdisciplinary Science*, 1(1), 25–28. Retrieved from <https://web.semanticjournals.org/index.php/wos/article/view/6>



FORMATION PROCESSES OF THE NATIONAL POLITICAL ELITE IN TURKESTAN

**Jalilov Alisher Khudoyberdievich**

Navoi State Pedagogical Institute foundation doctoral student

**Abstract.** This article is devoted to the formation of the national political elite in the conditions of the establishment of the Soviet regime in Turkestan. In this, it was analyzed that the Bolsheviks did not bring the representatives of the local people closer to the Soviet administration, they viewed their activities with distrust, and the nomenclature was introduced, which was considered the practice of promotion from the bottom to the top in the personnel policy.

**Key words:** party, chauvinism, national policy, nationalism, political elite, nomenclature, autonomy, proletarian revolution, declaration, bolshevik, Soviet, autonomy.

After the October coup, the Soviet government pursued a policy of implementing and ensuring the implementation of any decisions and decrees of the Center in order to fully subjugate the former colonial countries to Russia. This, in turn, meant that the colonial system would continue unchanged. To this end, the Bolsheviks put forward the following strict demand in order to strengthen their political power in these countries: “The nations that desire freedom and independence from Russia should accept the program of “socialism” and hand over the management of each country to a government called the soviets of worker-peasant representatives. Condition”[1]. In such difficult conditions, a unique political elite began to form in Turkestan.

In order to keep the nations under Russian influence, the Bolsheviks issued a legal document about it from the first days of the coup, namely the “Declaration of the Rights of the Russian People”. In this regard, the following were defined in the issue of nationalities in the territory of Russia: 1. Equality and sovereignty of the peoples of Russia. 2. The right of the peoples of Russia to self-determine their own destiny up to secession and establishment of an independent state. 3. Prohibition of any national, national-religious privileges and restrictions was established[2]. On the theoretical basis of this declaration, the abolition of national oppression and national inequality, the liberation of the oppressed peoples of colonial and dependent countries from the tyranny of imperialism, the granting of true freedom and equality to all people, regardless of their race and nationality, all peoples o It was written with pride about creating conditions for the development of friendly cooperation and mutual assistance.

Initially, the Bolsheviks did not bring the representatives of the local people closer to the Soviet administration, and their activities were viewed with distrust. Because the cadres sent from the Center occupied the main links of the state apparatus and excluded the local employees from the administration. The Bolsheviks ruled Turkestan General-Governor Kuropatkin's opinion that “Local people cannot be given full rights”[3]. they worked based on his instructions.

The Soviet authorities drew an important conclusion from the experience of Turkestan Autonomy, and on April 20, 1918, the Fifth Congress of Turkestan Soviets was opened in Tashkent. Finally, on April 30, the Sejd adopted a decision to establish the Turkestan Soviet Autonomous Republic within the RSFSR and approved the “Regulation on the Turkestan Soviet Republic”. The People's Commissariat for National Affairs was established within the government of the Turkestan ASSR, which was established on April 30, 1918, and Toshkhoja Ashurkhojaev was appointed as its

commissioner[4]. On June 18 of this year, the following 10 members of the Central Committee of the People's Commissariat of National Affairs were approved: 1. Yusupov; 2. Bulyaboev; 3. Nagaybekov; 4. Sharofiddinov; 5. Akhunov; 6. Joraboev; 7. Ostonboyev; 8. Klevlev; 9. Ibragimov; 10. Kosenko[5]. Also, on this date, departments of the People's Commissariat of National Affairs were established in regions and uezds[6]. In 1919, 10 national departments, consisting of Uzbek, Kyrgyz, Turkmen, Ukrainian, and others, started their activities under the Turkestan Commission[7]. Along with this, in March 1919, at the Second National Party Conference, a special bureau for national affairs of the RKP(b) was established. The Bureau of National Affairs functioned as an auxiliary organization performing the political tasks of party committees. Such a system of governance was introduced not only in Turkestan, but also in other national republics under the leadership of the Bolsheviks. The national affairs bureau of the Turkestan ASSR for the European population consisted of Iranian-Azerbaijani, Czech, Serbian, Ukrainian, Jewish, Armenian, Polish, local-Jewish, Caucasian-Azerbaijani and others[8]. At the same time, they determined the national political direction of the minority European population and the majority indigenous peoples in the region.

On the basis of the Constitution of the RSFSR, the "Constitution of the Turkestan ASSR" was adopted at the 6th session of the Turkestan Soviets (October 5-14, 1918). The Constitution specifically stated that defense, foreign relations, post, telegraph, maritime affairs, railways, customs, trade, industry and finance were left to the Federal Government, that is, all branches of state administration were legally subordinated to the Center. This "autonomy" was not a national autonomy, but a territorial autonomy. Moreover, the benefits of this "autonomy" were primarily benefited by the mainly proletarian part of the European population of the country[9].

One of the main principles of the colonial policy of the Bolsheviks in Turkestan was that they did not trust the local people. That is why the composition of the Soviet of People's Commissars, formed in Turkestan in November 1917, consisted only of representatives of the European nationality, and not a single representative of the local nationality was included in it. This situation continued until the rebellion of military commander K. Osipov on January 19, 1919. Only from February 1919, representatives of the local nation were involved in state administration. Nizamiddi Khojaev, Turar Riskulov, Nazir Torakulov and others began to work in responsible positions in the country. However, there were not enough representatives of the local people in the state bodies, especially in the central administration. As a result, the majority of Turkistan's political elite was still made up of Europeans. Also, the activities of party and state leaders in Turkestan came under the control of organizations with extraordinary powers sent from the Center, such as the Turkestan Commission established in October 1919, the Turkestan Bureau established in July 1920[10].

In September 1919, at the fourth session of the Turkestan Communist Party, Turar Riskulov expressed a strong opinion about the shortcomings of the Soviet national policy in Turkestan: "The proletarian revolution in Turkestan made great mistakes along with its wonderful aspects. This was due to the fact that the main revolutionary representatives were not familiar with the life and conditions of the local population. Therefore, the non-normal nature of the policy was the reason for the errors noted later. The struggle of the Soviet authorities with the forces against the revolution greatly damaged the construction of the Soviet system in this area. The collapse of the Kokan autonomy and the events in Bukhara exposed the negative aspects of the Soviet government for

Muslims. In these events, political leaders made a number of irreparable mistakes. As a result, they brought tragedies to the peaceful Muslim population, led to the emergence of new fronts, for example, the Ferghana front"[11].

It should be noted that in the early years of Turkestan administration, leaders from the Center pursued a policy of not trusting local cadres. The local population, its prominent figures, especially the national intelligentsia, were viewed with hostility. The activities of indigenous employees, including high-ranking officials, were strictly controlled. The Soviet state introduced nomenclature, which was considered the practice of promotion from the bottom to the top in personnel policy. Nomenclature policy played a key role in the formation of the political elite. The nomenclature is a list of the main positions and positions and candidates for them, which began to be formed in 1919. In the same year, a special department for accounting and distribution of communist cadres was established in the Central Committee of the RKP(b). This department was engaged in compiling a list of communists who implemented the decisions of the Soviet government and the Communist Party and sending them to work. As a result, the mechanism of appointing and transferring personnel from one place to another was created instead of the principle of election of personnel in the party apparatus. This mechanism was widely used in Soviet society as a tool for implementing the policy of the Communist Party. On February 12, 1919, People's Commissar of National Affairs of the RSFSR I.V. Addressing the Turkestan soviets and party organizations, Stalin pointed out the need to involve representatives of the local nation in state building[12]. Until now, no representatives of local nationalities have been included in the Soviet government of Turkestan, which means that after the establishment of Soviet power in Turkestan, national leaders were not recruited from the indigenous population.

Theoretician and creator of the nomenclature was the General Secretary of the Central Committee of the RKP (b) I.V. Stalin. At the 12th Congress of the CPSU (b) (April 1923), Stalin put forward the idea of introducing communists in all levels of government. The Bolsheviks, who set themselves the goal of instilling the Soviet ideology into the minds of the local population, made a slight change in the language of business and tactics in personnel matters. It was intended to prepare Bolsheviks from representatives of the local nation and rule the country with them. Also, according to the decision of the Congress, the creation of circles promoting Marxist ideas in the national republics, the formation of the party's instructor department from local workers before the central committee, the strengthening of the party's educational work, the opening of local universities serving the Soviet ideology, the education of every nation publishing literature in the mother tongue and conducting business in local languages[13].

In this session, I.V. Stalin spoke in theses on the topic "National Moments in Party and State Building" to humiliate and humiliate the inhabitants of the national remote areas, deprived of their national language, religion, traditions, values, and national identity. It is noted that the era of the deceptive "elimination of real national inequality - the struggle against all remnants of national tyranny and colonial slavery" [14] has begun.

The 12th Congress of the RKP(b) included the issues of nationalization of Soviet offices and cultural construction among the main issues of the party's national policy. On June 8, 1923, according to decision No. 50, adopted by the All-Union MIK Presidium, it was allowed to conduct public administration in Russian and local languages in the national republics of the Soviet Union[15]. According to the theoretical basis of this decision, the power of the proletariat should be

dear to the national peasants, just as it is dear to the Russian peasants. It was emphasized that in order for the Soviet authorities to be dear to the national peasants, their schools, courts and other authorities should be conducted in the language of the local population. It is also recognized the need to train national personnel who know the behavior, customs, and lifestyle of the local population well in state agencies[16].

On November 8, 1923, the Central Committee of the Communist Party of the Soviet Union (b) made a decision on the selection of personnel and their appointment to responsible positions[17]. As a result, by the decision of the Central Committee, the lists of nomenclature in various fields were approved. The 1st list of the nomenclature includes the members of the leadership, presidium and collegiums of the USSR Communist Party of the USSR and the USSR MIK, BMIK, VVSSPS and heads of trusts, syndicates, heads of the Department of the VSNX, who are specially designated by the RKP (b) MK (later, VKP (b) MK) approved by the commission. The 2nd list includes the deputies of the above main positions, and the 3rd list includes the leading personnel of the republic and localities. Loyalty to the party path and policy of the candidates included in the nomenclature is the main criterion, and this situation was checked by the employees of the security services (GPU and OGPU)[18].

On the theoretical basis of the personnel policy, training of national communists who will serve the Soviet ideology in state administration is defined. However, the distrust of the Russian-speaking leaders in the local cadres and their opposition to their free functioning continued. In the personnel policy system, the problems remained mainly in the central institutions, and certain works were carried out in the regions and districts. There was insufficient control over the implementation of decrees and decisions related to personnel policy in the Turkestan ASSR. Managers of European nationality did not want to train local personnel and involve them in management. Due to this, the problems in the system of placement of local employees in the state administration and local offices have not been fully resolved. In such conditions, the actions of the political elite of the national administration did not bear their full effect.

The theoretical and conceptual bases of the personnel policy are mentioned in a number of historical documents adopted by the Bolsheviks, as well as in the decisions and instructions of the party congresses, congresses, conferences and various agencies. Turkestans welcomed the decisions regarding conducting business in the Uzbek language and training local personnel in management. However, the Bolsheviks interpreted the policy of training personnel from local nationals differently. In the process of personnel training, efforts were made to bring the government departments closer to the working and peasant masses, and training of national personnel sufficient for the population was neglected in management.

#### **REFERENCES:**

1. Bolsheviks and us // "Hurriyat". January 9, 1918. No. 65.
2. Lenin V.I. Central Asia and Kazakhstan. – Tashkent: Uzbekistan, 1982, – P.454.
3. Shamsutdinov R. Martyrs on the path of independence. – Tashkent: Sharq, 2001. - B.14.
4. National archive of Uzbekistan, Fund R-36, List 1, Volume 12, Sheet 160.
5. National archive of Uzbekistan, Fund R-36, List 1, Volume 12, Sheet 136.
6. National archive of Uzbekistan, Fund R-36, List 1, Volume 12, Sheet 132.

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

7. Ата-Мирзаев О, Гентшке В, Муртазаева Р. Узбекистан многонациональный: историко-демографический аспект. – Тошкент: Янги аср авлоди, 2011. – С.163.
8. Саипова К. Д. Социально-экономическое и политическое положение европейской части национальных меньшинств на территории ТАССР // Вестник развития науки и образования. – Москва, 2013. № 1. – С.23-24.
9. Ermetov A. Activities of control bodies in Turkestan (Worker-Peasant Militia and Worker-Peasant Inspectorate 1917-1924). – Tashkent: Abu press-consult, 2007. – В.22.
10. History of Uzbekistan (1917-1991). The first book. 1917–1939 years. Responsible editors: R. Abdullaev, M. Rakhimov, Q. Rajabov. – Tashkent: “Uzbekistan”, 2019. - В.421.
11. Мусбюро Р.К.П.(б) в Туркестане. 2 из Туркестанские Краевые конференции Р.К.П. 1919–1920г.г. – Т.:Туркестанское Государственное Издательство, 1922. – С 57.
12. History of the Uzbek SSR. The victory of the Great October Socialist Revolution and the construction of socialism in Uzbekistan (1917-1937). Volume III. – Т.: Science, 1971. - В. 193.
13. КПСС в резолюциях и решениях съездов, конференций и пленумов ЦК. Том 3. 1922 – 1925. – Москва: Издательство политической литературы, 1984. – С.88.
14. Stalin I. Works. Volume 5. – Tashkent: State publishing house of Uzbekistan, 1949. - В. 208-222.
15. ЦК РКП (б) – ВКП (б) и национальный вопрос. Кн. 1. 1918 – 1933 гг. Сборник документов. Составители: Л.С.Гатагова, Л.П. Кошелева, Л.А. Роговая. – Москва.: РОССПЭН, 2005. – С. 117-118.
16. ЦК РКП (б) – ВКП (б) и национальный вопрос. Кн. 1. 1918 – 1933 гг. Сборник документов. Составители: Л.С.Гатагова, Л.П. Кошелева, Л.А. Роговая. – Москва.: РОССПЭН, 2005. – С. 117-118.17.
17. История России. XX век. – Москва: Издательство АСТ, 2000. – С.244.
18. History of Uzbekistan (1917-1991). The first book. 1917–1939 years. Responsible editors: R. Abdullaev, M. Rakhimov, Q. Rajabov. – Tashkent: “Uzbekistan”, 2019. – P.419-420.

THE USE OF ARTIFICIAL INTELLIGENCE IN COMPUTER SCIENCE LESSONS

Tashkent State Transport University  
Kodirova Elena Vladimirovna

**Abstract.** Observing the processes of the real world, we first describe them verbally, trying to understand the essence of phenomena, then we build mathematical models. However, we do not want to limit ourselves to building formal models, but we want to get a qualitative and quantitative idea of the processes under study, to see them on graphs.

**Keywords:** Numerical methods, mathematics, computer calculations, solutions, complex problems, numbers, arithmetic, geometry, formula, technical

With the development of modern technologies, education is subject to significant changes, and the introduction of artificial intelligence in computer science lessons is one of the most striking examples of this progress. The opportunities provided by the use of artificial intelligence open up new horizons for teaching students the basics of programming, algorithmic thinking and information technology in general. In this article, we will consider the advantages and potential challenges of using artificial intelligence in computer science lessons, as well as identify the most promising areas of this innovation in education.

Computer science teachers face a number of problems and challenges in their professional activities. Here are a few of the main ones:

1. Rapid development of technology: Technology is changing and developing at a tremendous rate, which requires computer science teachers to constantly update their knowledge and skills. Continuous learning and self-education are becoming key aspects of a computer science teacher's job.

2. Lack of educational resources: Not all educational institutions have sufficient educational resources, software and equipment for full-fledged teaching of computer science. This creates additional difficulties in teaching students in the field of information technology.

3. Motivation of students: Students do not always understand the importance of studying computer science and computer science, which can create problems with motivation and interest in studying this subject. Computer science teachers often face the challenge of getting students interested and showing them the practical value of knowledge in the field of IT.

4. Curriculum adaptation: Computer science teachers often have to deal with the need to adapt curricula and teaching methods to different types of students, taking into account their level of training, interests and needs.

5. Teaching new technologies: With the development of new technologies such as artificial intelligence, big data, cybersecurity, etc., computer science teachers face the challenge of introducing these topics into the curriculum, even if they themselves do not have sufficient experience working with them.

Computer science teachers are constantly working to overcome these challenges, providing students with the knowledge and skills necessary for a successful career in the field of information technology.

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

Artificial intelligence finds applications in a wide variety of fields, including medicine, manufacturing, finance, education, transportation and many others. Here are some examples of its application:

1. **Medicine:** AI is used to analyze medical images, diagnose diseases and select individual treatment for patients. Machine learning technologies make it possible to detect diseases at early stages with high accuracy and predict possible complications.

2. **Finance:** In the financial sector, AI is used to analyze market data, identify financial fraud, and develop investment strategies. Machine learning algorithms make it possible to automate decision-making processes in the stock market and in the banking sector.

3. **Transport:** AI is used to manage transport systems, optimize routes and predict traffic flows. Autopilots using artificial intelligence technologies are becoming more common in cars, and robotic public transport management systems are improving transportation safety and efficiency.

4. **Education:** In the educational field, artificial intelligence is used to personalize learning, create individual curricula and automate the processes of evaluating students' knowledge. Adaptive learning technologies based on AI allow students to study according to their level of knowledge and abilities.

This is just a small list of examples of the use of artificial intelligence, and its capabilities are constantly expanding in various fields of human activity.

Artificial Intelligence (AI) has the potential to revolutionize education by making it more personalized, effective, and fun. Here are some examples of how AI can be used in computer science lessons:

- **Personalization of learning:** AI can be used to create personalized learning programs that meet the individual needs and interests of students. For example, an artificial intelligence tool can track the progress of students and offer them additional exercises or materials depending on their level of training.

- **Automation of routine tasks:** AI can be used to automate routine tasks such as checking student papers, evaluating test results, and providing feedback. This can free up time for teachers to engage with students more creatively and individually.

- **Creating new ways of learning:** AI can be used to create new ways of learning that are more fun and interactive. For example, an artificial intelligence tool can use virtual reality or augmented reality to help students visualize complex concepts.

Here are some specific examples of using AI in computer science lessons:

- Some schools use artificial intelligence software to check students' work. This helps teachers to check students' work faster and more effectively, which frees up time for more creative interaction with students.

- Some schools use artificial intelligence software to provide feedback to students. This helps students understand their strengths and weaknesses and improve their skills.

- Some schools use artificial intelligence software to create interactive learning materials. This helps students visualize complex concepts and understand them better.

An example of a lesson using artificial intelligence

Here is an example of a lesson that can be conducted using artificial intelligence:

Lesson topic: Artificial Intelligence in education

Lesson objectives:



- Introduce students to artificial intelligence.
- Discuss ways to use artificial intelligence in education.

Equipment:

- Computers with Internet access
- Artificial intelligence software

The course of the lesson:

- Introduction

The teacher begins the lesson with a brief introduction to artificial intelligence. He explains what artificial intelligence is, how it works and what advantages it has.

- Discussion of the use of artificial intelligence in education

The teacher then conducts a discussion on how artificial intelligence can be used in education. He can ask students questions such as:

- \* How can artificial intelligence be used to personalize learning?
- \* How can artificial intelligence be used to automate routine tasks?
- \* How can artificial intelligence be used to create new ways of learning?

- Practical lesson

In a hands-on lesson, students can try using artificial intelligence software to create their own applications or games. For example, students can use an artificial intelligence tool to create a program that can help them learn new words or solve math problems.

The teacher concludes the lesson by summarizing what the students have learned about artificial intelligence. He may also discuss some of the potential risks of using artificial intelligence in education.

Conclusions

In general, the use of artificial intelligence in computer science lessons has both advantages and disadvantages. It is important to carefully weigh these factors before deciding whether to implement AI in your training program. AI is a powerful technology that has the potential to change the future of work. However, it is important to note that AI is a tool that can be used for both good and evil. It is important that AI is used responsibly and ethically so that it can bring the greatest benefit to society.

### **LITERATURE**

1. Kadirova, E. (2021, March). USING OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN INFORMATICS LESSONS. In E-Conference Globe (pp. 28-33).
2. Mamurova, F. I., Khodzhaeva, N. S., & Kadirova, E. V. (2023). Pedagogy of Technology and its University. Innovative Science in Modern Research, 22-24.
3. Kadirova, E. V., & Mamurova, F. I. (2023). Modern Methods of Teaching Information Technologies at the Lesson of Computer Science. Pioneer: Journal of Advanced Research and Scientific Progress, 2(3), 86-89.
4. Mamurova, F. I., Khadzhaeva, N. S., & Kadirova, E. V. (2023). ROLE AND APPLICATION OF COMPUTER GRAPHICS. Innovative Society: Problems, Analysis and Development Prospects, 1-3.
5. Mamurova, F. I. (2022, December). IMPROVING THE PROFESSIONAL COMPETENCE OF FUTURE ENGINEERS AND BUILDERS. In INTERNATIONAL

SCIENTIFIC CONFERENCE" INNOVATIVE TRENDS IN SCIENCE, PRACTICE AND EDUCATION" (Vol. 1, No. 4, pp. 97-101).

6. Mamurova, F. I. (2021). PROBLEMS OF THEORETICAL STUDY OF PROFESSIONAL COMPETENCE OF CONSTRUCTION ENGINEERS. Таълим ва инновацион тадқиқотлар, (4), 104-108.

7. Islomovna, M. F., Islom, M., & Absolomovich, K. X. (2023). Projections of a Straight Line, the Actual Size of the Segment and the Angles of its Inclination to the Planes of Projections. Miasto Przyszłości, 31, 140-143.

8. Shaumarov, S., Kandakhorov, S., & Mamurova, F. (2022, June). Optimization of the effect of absolute humidity on the thermal properties of non-autoclaved aerated concrete based on industrial waste. In AIP Conference Proceedings (Vol. 2432, No. 1, p. 030086). AIP Publishing LLC.

9. Pirnazarov, G. F., Mamurova, F. I., & Mamurova, D. I. (2022). Calculation of Flat Ram by the Method of Displacement. EUROPEAN JOURNAL OF INNOVATION IN NONFORMAL EDUCATION, 2(4), 35-39.

10. Mamurova, F. I. (2021). The Concept of Education in the Training of Future Engineers. International Journal on Orange Technologies, 3(3), 140-142.

11. Islomovna, M. F. (2023). Methods of Fastening the Elements of the Node. EUROPEAN JOURNAL OF INNOVATION IN NONFORMAL EDUCATION, 3(3), 40-44.

12. Raximov, S. D., and S. S. Sodiqov. "TEXNIK SOHA MUTAXASSISLARI O 'QUV FANLARINI O 'QITISH TAYYORGARLIK JARAYONIDA C++ DASTURIDAN FOYDALANISH ZARURATI." INTERNATIONAL CONFERENCE: PROBLEMS AND SCIENTIFIC SOLUTIONS.. Vol. 1. No. 7. 2022.

13. Khodjayeva, N., & Sodikov, S. (2023). Methods and Advantages of Using Cloud Technologies in Practical Lessons. Pioneer: Journal of Advanced Research and Scientific Progress, 2(3), 77-82.

УДК : 514.18

**POSITIONAL BASED ON THEORETICAL KNOWLEDGE  
AND METRIC ISSUES WORK**

**Jabbarov Anvar Egamovich** (Tashkent State Transport University, Department of Informatics and computer graphics)

E-mail: [anvar.egamovich@mail.ru](mailto:anvar.egamovich@mail.ru). number: +998976206876

**Akhmedov Nurali Odilovich** (Tashkent State transport University, Department of Informatics and computer graphics)

E-mail: [nuraliakhmedov1974@gmail.com](mailto:nuraliakhmedov1974@gmail.com). number: +998946969474

**Annotasiya:** Maqolada muhandislik grafikasida o'rganiladigan metrik va pozision masalalar yechishda nazariy bilimlar asosida qo'lda amalda bajarishni taklif qilishgan. Nazariy bilimlar chizmalarni o'qishni, berilishiga qarab narsalarni fazoviy tasavvur qilishni, masalani yechish uchun qanday amallarni bajarish zarurligini o'rgatadi, qonun va qoidalari bilan tanishtiradi

**Kalit s'ozlar:** ta'lim texnologiyalari; dasturlash; muhandislik grafikasi; metrik masala; pozision masala; taqqoslash; fazoviy tasavvur.

**РЕШЕНИЕ ПОЗИЦИОННЫХ И МЕТРИЧЕСКИХ ЗАДАЧ НА ОСНОВЕ  
ТЕОРЕТИЧЕСКИХ ЗНАНИЙ**

**Аннотация:** В статье предлагается решение метрических и позиционных задач, изучаемых в инженерной графике, на основе теоретических знаний. Теоретические знания учат чтению чертежей, пространственному представлению предметов в зависимости от заданного, какие действия необходимо предпринять для решения задачи, знакомят с законами и правилами.

**Ключевые слова:** образовательные технологии; инженерная графика; метрическая задача; позиционная задача; сравнение; пространственное воображение; компьютерная графика.

**POSITIONAL BASED ON THEORETICAL KNOWLEDGE  
AND METRIC ISSUES WORK**

**Abstract :** The article proposes the solution of metric and positional problems studied in engineering graphics based on theoretical knowledge. Theoretical knowledge teaches the reading of drawings, the spatial representation of objects depending on the set, what actions need to be taken to solve the problem, and introduces laws and rules..

**Key words:** educational technologies; computer technology; engineering graphics; metric task; positional task; comparison; spatial imagination; computer graphics.

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-4, ISSUE-1

In higher education and further education, it is necessary to know the properties of basic projection in science in order to work positional and metric issues from engineering graphics. Without keeping the following properties in mind, solving problems using rules and methods based on these properties is inefficient.

1. The projection of the point will be the point.
2. The projection of a straight line will be a straight line. The projection of a straight line passing through the center or parallel to the direction of light (the projection) will be the point.
3. If a point lies on a line, the projection of such a point is on the projection of that line.
4. The ratio of straight line sections is equal to the ratio of their projections, i.e.,  $\frac{AC}{CB} = \frac{a_1c_1}{c_1b_1}$ .
5. The projections of parallel straight lines are also parallel to each other. If  $AB \parallel CD$ , it will be  $a_1b_1 \parallel c_1d_1$ .
6. If the plane of the angle is not parallel to the projection plane, its projection will not be equal to itself. Only in special cases, the sides of an angle relative to the projection plane of its projection will be equal to itself.

When the plane of any angle of magnitude  $0^\circ$  to  $180^\circ$  is parallel to the projection plane, its projection is self-equal. Figure 1 depicts straight  $\angle B_1A_1C_1 = \angle BAC$  with sides parallel to the H plane, sharp  $\angle C_1A_1D_1 = \angle CAD$  and impenetrable angle  $B_1A_1D_1 = \angle BAD$  angles.

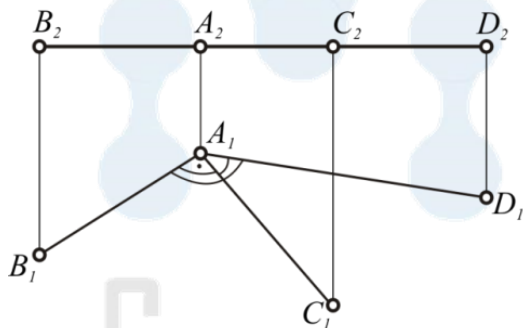


Fig. 1

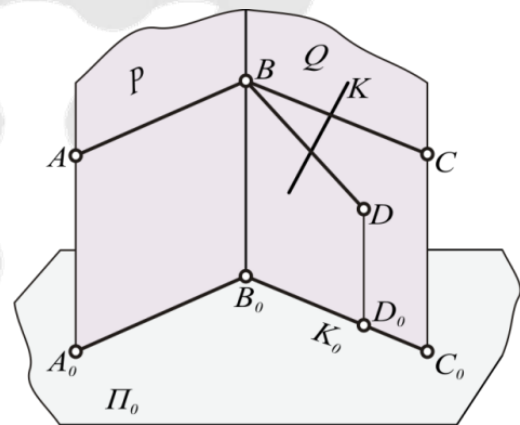


Fig. 2

When one side of a right angle is parallel to the projection plane, its projection is also a right angle.

Let in space both sides are given a right angle that is parallel to the projective plane –  $P_0$  (Fig. 2).  $\angle ABC = 90^\circ \Rightarrow A_0B_0C_0 = 90^\circ$ .

From the second side, the planes P and Q that project the sides of the right angle ABC to the plane  $P_0$  are also mutually perpendicular:  $P \perp Q$ , which means  $AB \perp Q$ .

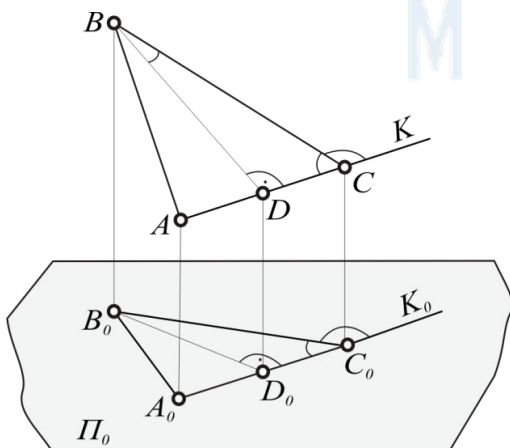


Fig. 3

Therefore, any BD lying in the Q-plane, as well as the K-straight lines lying on AB, are also perpendicular to AB. So,  $\angle ABD = \angle A_0B_0D_0 = 90^\circ$ ;  $\angle ABK = \angle A_0B_0K_0 = 90^\circ$ .

If one side of a sharp or impenetrable angle is parallel to the projection plane, the projection of the impenetrable angle is smaller than its own, the projection of the impenetrable angle is greater than its own.

Let the side of the alternating current  $\triangle ABC$  be parallel to the plane  $P_0$  (Fig.3). The perpendicular BD is lowered from the vertex B of the triangle to the side AC. Where  $C_0D_0 = CD$ ,  $b_0d_0 < BD$ ,  $b_0c_0 < BC$  means  $\angle d_0b_0c_0 = 90$ , because  $\angle BDC$  is the right angle. Therefore, BCD will be smaller than the  $b_0c_0d_0$  projection of the acute angle itself. The projection of the BCK impermeable angle adjacent to the BCD angle is greater than itself, i.e.  $\angle b_0c_0k_0 > \angle BCK$ . This property can also be proved by the example of the angle at the base of the diagonal and side of the cube (Fig. 4).

Where ACD is parallel to the plane of projection of the CD side of the acute angle,  $C_0D_0 = CD$ .

Since  $\angle CDA = 90$ ,  $\angle c_0d_0a_0 = 90$ . Where  $A_0D_0 < AD$  and  $A_0C_0 < AC$ . Hence,  $\angle A_0C_0D_0 < \angle ACD$ .

Therefore, the obtuse angle  $A_0C_0K_0$  that completes the acute angle  $A_0C_0D_0$  by  $180^\circ$  is greater than itself, i.e.  $\angle A_0C_0K_0 > \angle ACK$ .

**1-Task.** Given a straight line MN and a point A that does not lie on it (Fig. 5).

It is necessary to find: ABC is an equilateral triangle. Let the base of the triangle be the side BC to the straight line MN and be equal to the height of the triangle.

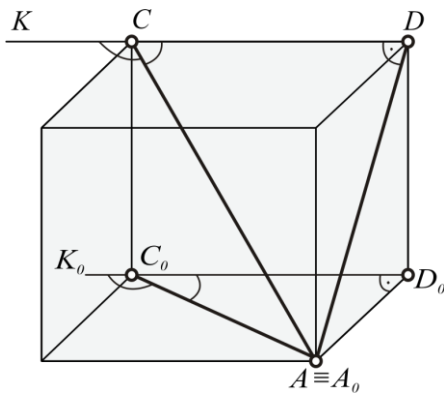


Fig. 4

first, it is necessary to determine the shortest distance from point A to the straight line MN. For this, a plane is drawn from point A to  $A \in R$  ( $ff'$ ,  $hh'$ )  $\perp$  MN.

1. So,

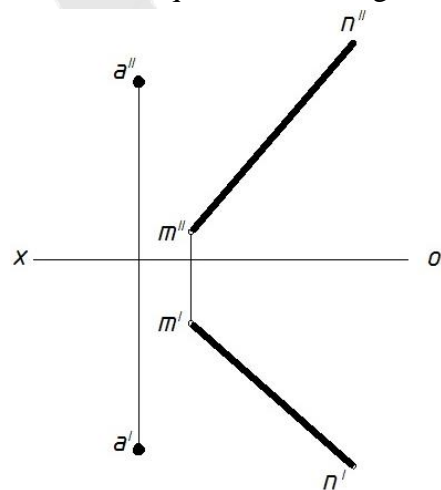


Fig. 5

2.

Then, the plane P (MNEP) is passed through the straight line MN, and  $P \cap R$  is their intersection line 1, 2 is the point of intersection of the line MN with the plane R ( $MN \cap R$ )  $kk'$  is defined. AK is the height of the triangle.

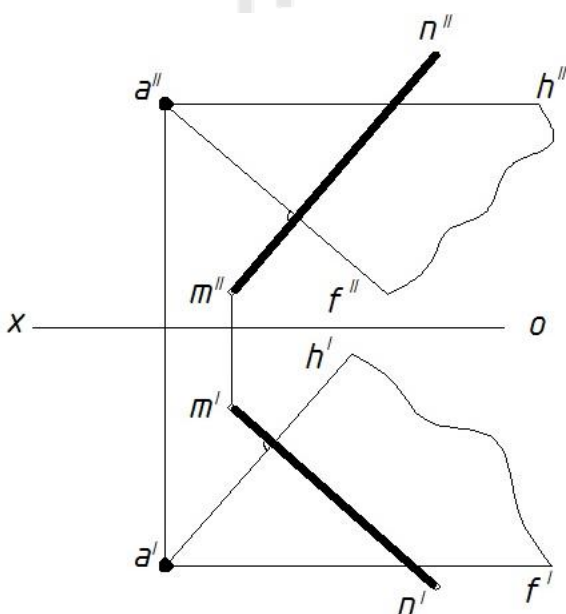


Fig. 6

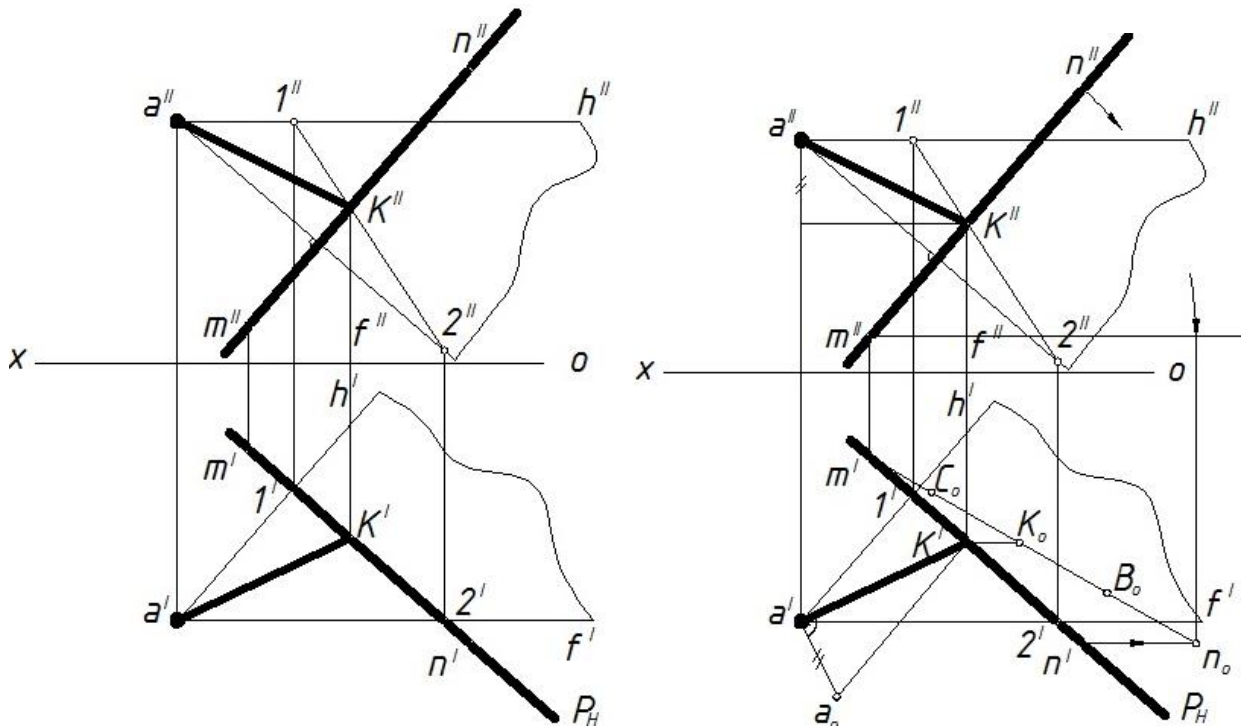


Fig.7

Fig.8

3. To place the side BC of the triangle ABC on the MN, the straight line is rotated around the point M of the line MN until it is parallel to the plane of horizontal projections, and the true length of the line MN is found  $MN_0$ . In it,  $K_0$  is determined, and the actual size of the distance AK is measured in two directions ( $C_0B_0$ ) equal to half the length of  $K A_0$ .

4. Based on  $C_0B_0$ , cb is determined.

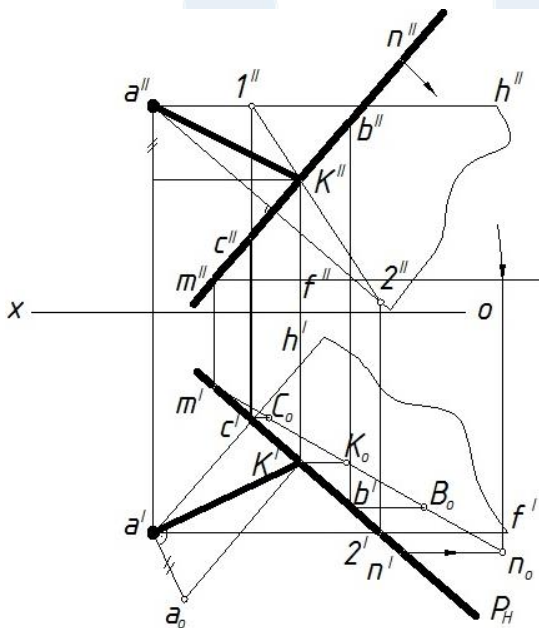


Fig.9

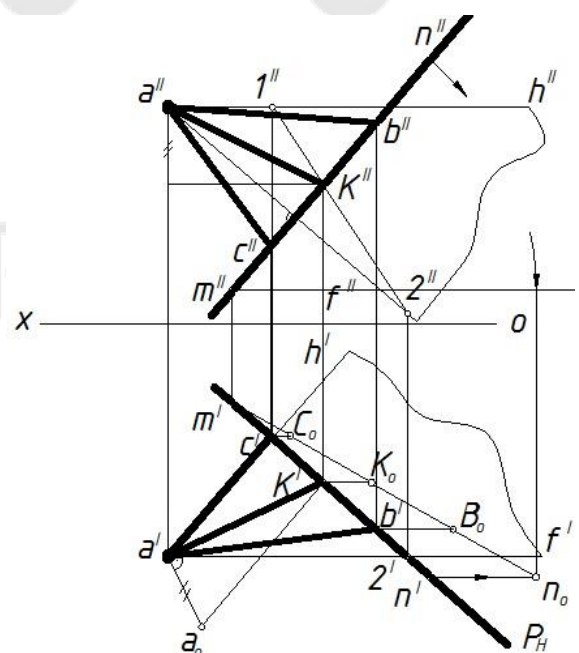
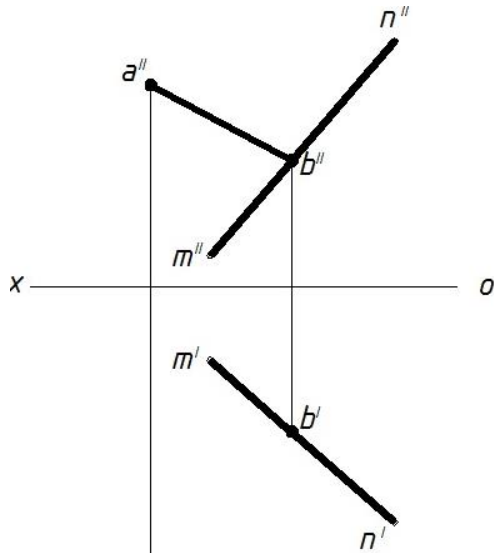


Fig.10

5.  $ABC (abc, a'b'c')$  is an equilateral triangle whose side  $BC$  is on the straight line  $MN$ , and whose length is equal to the height of the triangle ( $AK$ ).

**2-Task.**  $MN$  is a straight line in the general case, and the frontal projection of the cross section  $AB$  in the general case ( $AB \cap MN$ ) intersecting the straight line  $MN$  at right angles is given.

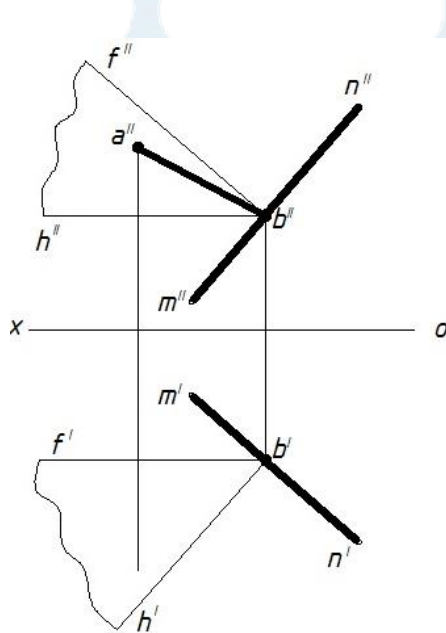
It is necessary to determine: complete the projections of the missing sides of the square  $ABCD$ , whose side  $BC$  is on the line  $MN$ .



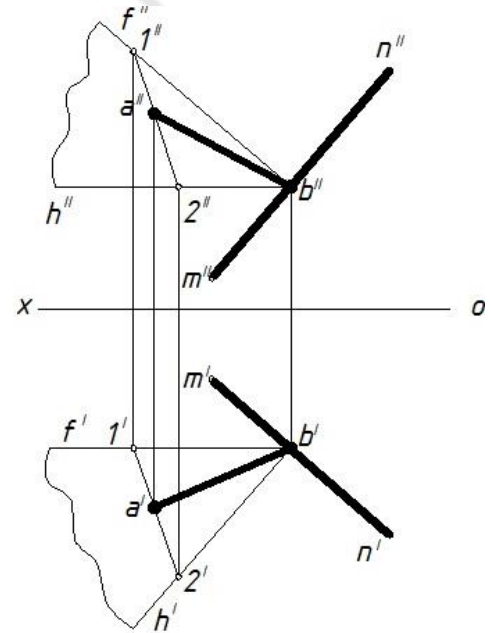
**Fig. 11**

1. First, find the missing projection of side  $AB$  of square  $ABCD$ . For this, a perpendicular plane  $R (ff', hh')$  is passed through the point  $B$  to the line  $MN$ .  $B \in R \perp MN$ .

2. An optional generator  $1, 2 (1' 2', 1'' 2'')$  passing through  $a'$  is passed in the  $R$  plane.  $1' 2' \in R (ff', hh')$ . Point  $a$  is marked on line  $1' 2'$  and  $ab$  is found.



**Fig. 12**



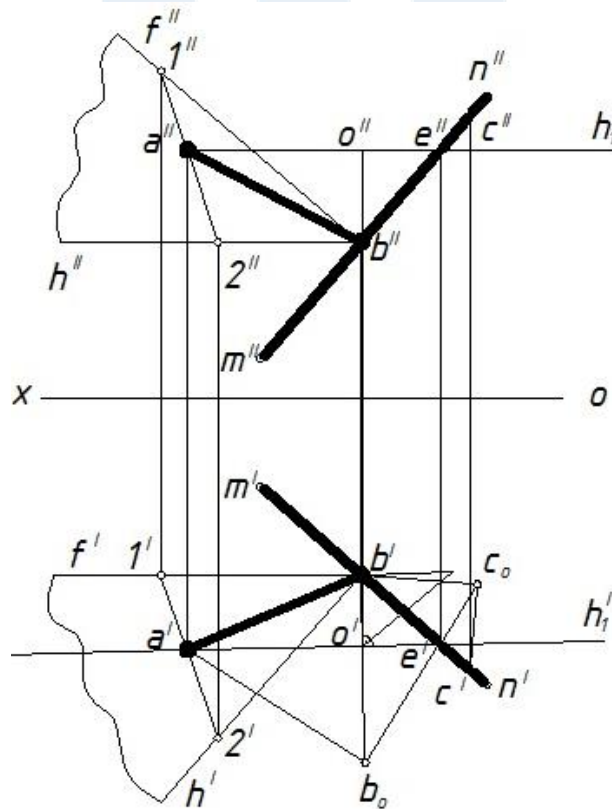
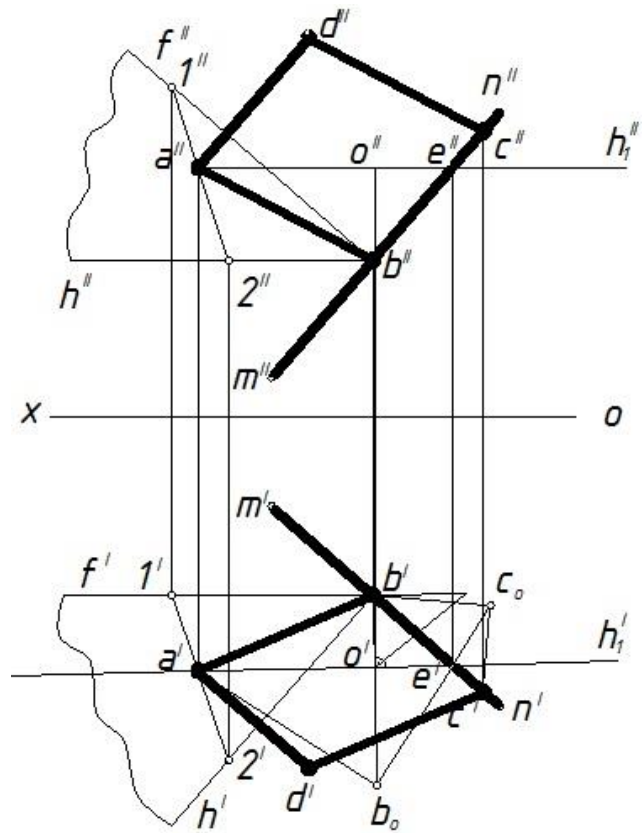
**Fig. 13**

3. To determine the actual size of the sides of the square,  $H_1 (h_1, h_1')$  is rotated around the horizontal rotation axis until it becomes horizontal,

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-4, ISSUE-1

( $aB_0e$ ) is determined. In the continuation of  $B_0e$ , the size of cross-section  $aB_0$  is measured and  $C_0$  is determined. By backtracking,  $c$  is found from  $C_0$ .  $BC(bc, b'c') \cap MN(mn, m'n')$





4. Since the opposite sides of the square are parallel to each other,  $CD(cd, c'd') \parallel AB(ab, a'b')$ ;  $DA(da, d'a') \parallel BC(bc, b'c')$  are respectively parallel straight lines.

#### LITERATURES:

1. Mamurov, Islom; Jabbarov, Anvar Egamovich; Barotov, Ashurali Ixtiyor ugli. Many Sciences are Studied and Explained with the Help of Drawings. American Journal of Science and Learning for Development. Vol 2.№4 (2023). ISSN 2835-2157. <https://inter-publishing.com/index.php/AJSLD/article/view/1437>

2. Mamurov Islam, Jabbarov Anvar Egamovich, Xodjayeva Nodira Sharifovna. Spatial Imagination in the Independent Education of Students. Nexus: Journal of Innovative Studies of Engineering Science (JISES) Volume: 02 Issue: 03| 2023 ISSN:2751-7578 <https://innosci.org/JISES/article/view/1062/919>

3. Mamurov, Islom; Jabbarov, Anvar Egamovich. DESCRIBE CIRCUITS IN COMPUTER GRAPHICS. Modern Journal of Social Sciences and Humanities (<https://mjssh.academicjournal.io/index.php/mjssh/index>) Vol 3(2022) ISSN 2795-4846 <https://mjssh.academicjournal.io/index.php/mjssh/article/view/51>:

4. Jabbarov, Anvar Egamovich; Axmedova, Firuza Anvarovna. HISTORY OF TECHNICAL DRAWINGS. Central asian journal of mathematical theory and computer sciences. Vol 4 No 11 (2023).

<https://cajmtcs.centralasianstudies.org/index.php/CAJMTCS/article/view/560>

5. Ахмедов, О. Н. (2023). Графический Способ Построение Точек Эллипса Как Изометрия Окружности. *Miasto Przyszłości*, 34, 110–113. Retrieved from <https://miastoprzyszlosci.com.pl/index.php/mp/article/view/1265>

**THE RANGE OF EFFECTS OF ANTIBIOTIC DRUGS ON THE HUMAN BODY.**

**Akramov Farrukh Kahramonovich 503 is a student of group B**

[farruxakramov402@gmail.com](mailto:farruxakramov402@gmail.com)

**Umarov Shokhrukh Kholmurod corner 503 group B**

[umarovshoxrux769@gmail.com](mailto:umarovshoxrux769@gmail.com)

**Assistant Jumaeva Nilufar**

[nilufar@gmail.com](mailto:nilufar@gmail.com)

**Termiz Branch of Tashkent Medical Academy**

**Abstract:** Antibiotics are very useful and important drugs when used correctly. They fight infections and diseases caused by bacteria. Well-known antibiotics are: penicillin, tetracycline, streptomycin, chloramphenicol, and sulfonamides. Antibiotics are drugs used to prevent and treat infectious diseases. "Anti" means "against" and "biotic" means "life." They kill only certain life forms, namely disease-causing bacteria. But these substances themselves are made from living organisms such as bacteria, various compounds, and larger plants.

**Key words:** Antibiotics, microorganisms, penicillin, actinomycetes, fungus, bacteria.

Antibiotics are chemical compounds of biological origin that selectively injure or kill microorganisms. Antibiotics used in medical practice are obtained from actinomycetes (light-emitting fungi), molds, and some bacteria. Preparations of this group include synthetic analogues of antibiotics and derivatives of natural antibiotics. In 1928, when Sir Alexander Flemming discovered penicillin, the production of antibiotics began. His discovery was studied by other scientists and led to the discovery of new antibiotics. Soil samples from around the world have been studied to find microorganisms that can produce substances that can be used to fight infectious bacteria. As a result, today there are many antibiotics containing penicillin, streptomycin, aeromycin, terramycin. Some of them are toxic to the body in addition to affecting disease-causing bacteria. The term antibiotics was proposed by the American scientist Z. Waxman to refer to substances that are formed in microbes and have an effect against other microbes. Antibiotics disrupt the metabolism of disease-causing (pathogenic) microbes, killing them or stopping their growth. Antibiotics have different effects on different microbes. For example; while one antibiotic has a strong effect on a specific microbe, it has a weak effect on another microbe or does not affect it at all; Most antibiotics destroy not only microbes, but also human, animal, and plant organisms (tissues and cells). Therefore, in medicine, veterinary medicine and plant science, only its types that kill harmful microbes, but do not destroy human, animal and plant organisms are used. In 1939, Dubo was able to obtain the first antibiotic drug (thyrothricin) from *Bacillus brevis*, a bacterium living in the soil. In 1941, with the English scientist H. Florey, Antibiotics, Fleming managed to obtain penicillin from the broth filtrate of the mold fungus (*Penicillium poshit*), G. F. Gauze and M. G. Brajnikova, in 1942, gramicidin from soil bacteria, and Z. A. Waxman, in 1944, managed to obtain streptomycin from the fungus *Streptomyces griseus*. So far, more than 2000 types of Antibiotics have been identified and this work is ongoing. Only 10-20 of them (penicillin, streptomycin, oxytetracycline, cephaloridine, erythromycin, levomycetin, etc.) are used in practice.

The management of microbial infections in ancient Egypt, Greece, and China is well-documented. The modern era of antibiotics started with the discovery of penicillin by Sir Alexander Fleming in 1928. Since then, antibiotics have transformed modern medicine and saved millions of lives. Antibiotics were first prescribed to treat serious infections in the

1940s. Penicillin was successful in controlling bacterial infections among World War II soldiers. However, shortly thereafter, penicillin resistance became a substantial clinical problem, so that, by the 1950s, many of the advances of the prior decade were threatened. In response, new beta-lactam antibiotics were discovered, developed, and deployed, restoring confidence. However, the first case of methicillin-resistant *Staphylococcus aureus* (MRSA) was identified during that same decade, in the United Kingdom in 1962 and in the United States in 1968.

Antibiotics have a specific effect on different microorganisms. For example, penicillin has a stronger effect on gram-positive microorganisms, and streptomycin, on the contrary, on gram-negative microorganisms. Wide spectrum of action Antibiotics, such as tetracyclines, are effective against a number of bacteria. It is known that the effect of penicillin depends on the inhibition of the synthesis of the microbial cell wall. Antibiotics interfere with specific stages of biosynthesis of proteins and nucleic acids in the microbial cell. Antibiotics are a powerful tool for the treatment and recovery of various infectious diseases such as septic diseases caused by staphylococci and streptococci, dysentery, diarrhoea, rash, cholera, and tuberculosis. They are especially useful in the treatment of diseases of the respiratory tract, stomach, intestines, urinary tract and genitals. Some Antibiotics are added to the main feed of poultry, pigs and calves in order to accelerate their growth and increase the assimilation of food. Due to their selective inhibitory effect on the cell, antibiotics are important in determining the relationship between the synthesis and function of DNA, RNA, proteins and cell wall, which ensure cell growth. They are also widely used in the food industry (canning). In agriculture, it is used to protect plants from fungal and bacterial diseases (see Microbiological protection method). Depending on the way of impact on pathogens Antibiotics with direct effect; Antibiotics that neutralize toxins released by pathogens; Antibiotics affecting the host plant; It is divided into Antibiotics, which become highly active substances in the plant body and increase the resistance of plants to diseases (indirect effect). It includes streptomycin, terramycin, dihydrostreptomycin, griseofulvin (grizovin), anisomycin, omphotersin, filicin and other effective antibiotics. Trichodermin is used in the fight against verticilliosis wilt of cotton and diseases of agricultural crops: protected soil cucumber, tomato root rot, potato rhizoctoniosis, wheat helminthosporiosis, corn scab and others. The technology for obtaining trichodermin was developed based on the Tashkent strain of trichoderma. It is used by dusting with dust and soaking planting materials (seedlings, cuttings, cuttings, seeds) in solutions. Antibiotics are easily absorbed and distributed in the plant body, and are effective at weak (0.1 — 0.01 — 0.001 and less) concentrations. When antibiotics are sprayed, glycerin, sorbitol, and diethylene glycol are added to the solution in order to increase their absorption into the leaves.

Many serious diseases in the world are becoming resistant to antibiotics. The main reason for this is that antibiotics are widely used in common diseases. If we want antibiotics to continue saving people's lives, the scope of their use should be limited compared to the present. It depends on how rationally they are used by medical personnel and people themselves. Most common infections do not require antibiotics. Simple skin infections can usually be treated with soap and water, a warm compress, or a cold compress. Simple respiratory infections are best treated with plenty of fluids, good quality food, and plenty of rest. Antibiotics are unnecessary for many cases of diarrhea and may even be harmful. The main thing is to drink a lot of liquid and feed as often as the child eats.

**References:**

1. Golkar Z, Bagazra O, Pace DG. Bacteriophage therapy: a potential solution for the antibiotic resistance crisis. *J Infect Dev Ctries*. 2014;8(2):129–136. 13. [[PubMed](#)] [[Google Scholar](#)]
2. Sengupta S, Chattopadhyay MK, Grossart HP. The multifaceted roles of antibiotics and antibiotic resistance in nature. *Front Microbiol*. 2013;4:47. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
3. Pharmacology (Harkevich). LESSON 11-13 Antimicrobial and parasitic material Harkevich\_



**Development of a marketing strategy for the enterprise “Farovon-uz”**

**Musayeva Shoira Azimovna**

**Professor of Samarkand Institute of Economic and Service, Samarkand,  
Uzbekistan**

**Email: [musaeva\\_shoira@mail.ru](mailto:musaeva_shoira@mail.ru)**

**Abstract:** This article examines the presence of a strategy, constant analysis of the existing strategy, analysis of the degree of its compliance with current market conditions, and the emergence of new strong competitors.

**Key words:** Enterprises, strategy, competition, market, product, demand, analysis.

“Strategic management is the process of making and implementing strategic decisions, the central element of which is strategic choice based on comparing the enterprise’s own resource potential with the opportunities and threats of the external environment in which it operates. Strategy can be seen as the primary link between what an organization wants to achieve—its goals—and the course of action chosen to achieve those goals.

The essence of strategic management lies in answering three critical questions:

1. What is the current situation of the organization?
2. What position would it like to be in three, five, ten years?
3. How to achieve the desired position?

Strategic management is based on strategic decisions. Strategic decisions are management decisions that:

- 1) are future-oriented and lay the foundation for making operational management decisions;
- 2) are associated with significant uncertainty, since they take into account external factors affecting the organization;
- 3) involve significant resources and can have serious, long-term consequences for the organization.

The concept of “planning” includes defining goals and ways to achieve them. The planning process goes through four stages:

- development of common goals;
- determination of specific, detailed goals for a given, relatively short period of time (2,5,10 years);
- determination of ways and means to achieve them;
- monitoring the achievement of set goals by comparing planned indicators with actual ones.

The Farovon-uz supermarket is distinguished by a personal approach to each client and a high level of service: our specialists will always help with the choice, and gastronomic department experts will help with delicacies and create a menu for the festive table.

Our interiors are designed in such a way that a person immediately finds himself in a special atmosphere of comfort. Supermarket “Farovon-uz” is one of the largest supermarkets in Samarkand. Despite the fact that grocery stores and supermarkets are represented in Samarkand in huge quantities, what distinguishes us from dozens of other respected and well-known brands is, first of all, our uniqueness.

**THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY****VOLUME-4, ISSUE-1**

The Farovon-uz supermarket is distinguished by a personal approach to each client and a high level of service: our specialists will always help with the choice, and gastronomic department experts will help with delicacies and create a menu for the festive table.

“Farovon-uz” is quite successfully fighting for its market share, mainly due to the experience of sellers and relatively low prices for goods.

From current practice it follows that the most important assessment indicators that are widely used are:

- Trade turnover
- Gross profit
- Conditionally net profit
- Profit after paying interest on loans and credits
- Profit after taxes

All data given below are rounded (approximate).

Main economic indicators

Indicators	Years		
	2021	2022	2023
Trade turnover (billion soums)	12.56	12.62	12.71
Gross profit (million soums)	340	370	400
Conditional net profit (million soums)	297	327	357
Profit after interest on loans and credits (million soums)	210	287	310
Profit after taxes (million soums)	164	233	262
Net profit (million soums)	122	206	226
Average annual cost of open pension fund (million soums)	14.6	16.4	19
Average annual stock of goods in warehouses (million soums)	810	860	710
Average number of workers (persons)	6	10	15

The table shows that in general the enterprise operates efficiently. A comparison of key indicators over the years shows that store profits are steadily increasing, although the rate of profit growth in the last year has decreased slightly due to an increase in the number of retail outlets and, accordingly, the costs of their maintenance. This is also due to the factor of enormous external competition from “Orion”, “Korzinka”, “Halol”.

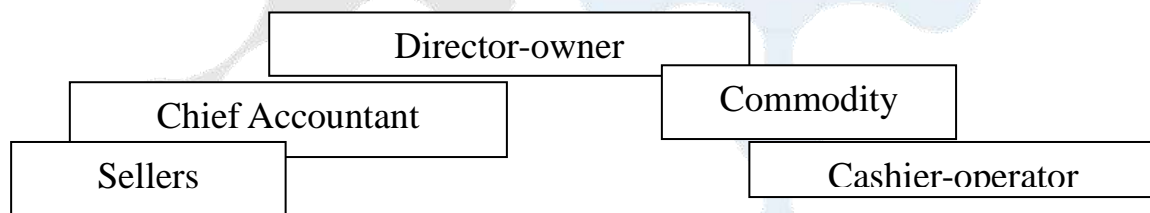
Despite such external factors as competition, the store is increasing the number of its outlets in the city.

Also, the drop in profit growth rates is associated with an increase in the number of employees, both managers and ordinary personnel. This resulted in additional wage costs.

VOLUME-4, ISSUE-1

An increase in the average annual cost of goods in warehouses indicates that warehouses are overloaded, since, in fact, the warehouses themselves are not increasing. The director is actively importing new goods, and these goods are almost always either of higher quality, or more inexpensive, or more advanced and new. This trend leads to cluttering of warehouses, since sellers are interested in selling the most liquid goods, and such goods are the most liquid. As a result, a huge amount of “unliquid” remains in warehouses. All these goods, in essence, simply physically interfere with sales, and plus they are frozen money. It is necessary to approach this issue competently.

Our store is a supermarket. We will begin the analysis by examining the composition of the store’s staff, the number of employees and their positions, all of which we will display in a diagram.



The director assigns only part of his powers to the merchandise manager, in terms of personnel management, as well as in certain functions to the chief accountant and salespeople. On the one hand, such a policy is very effective in the sense that the director (who is also the owner) personally controls the entire work process. This is all the more necessary for him, since he is the owner of this trade organization, and is more interested in its effective work than anyone else.

Also, in practice, almost all store employees perform functions that are not inherent in their position. For example: a cashier-operator, in addition to being a credit inspector, is engaged in filling out documents such as invoices, invoices, bills; sales consultants act as loaders. In general, almost all employees perform cross-functional functions; this strategy or policy is used in almost all small sales organizations. This is due to the fact that such a structure is less expensive and easier to manage.

The biggest advantages of this structure are:

- it does not require large financial costs for maintaining a large staff;
- it does not require additional costs for maintaining a large management apparatus over these personnel;
- in such an organization there is almost always a “good atmosphere”, in the sense that the director is the immediate superior, and everyone else is equal;
- a unique corporate culture that does not rely on any strict rules of behavior, etc.
- the staff has a lot of experience;
- staff versatility.

The disadvantages are the following:

- a very large load on the director himself;
- workload of other personnel;
- shortcomings in performing one's duties due to distraction by others.

From the analysis of the control system, we conclude that, despite the fact that a simple control scheme is the least expensive, there are problems that require immediate solutions. There are hidden reserves that can be realized with the right approach.

**VOLUME-4, ISSUE-1**

The supermarket director, due to his workload with operational and other issues, will not pay due attention to strategic planning issues.

In modern trade organizations, the marketing strategy is especially important in achieving their goals, and especially the goal of increasing profitability, profitability and increasing turnover. This strategy, as a rule, reflects the correct course for promoting goods on the market, segments the market, studies consumer tastes, preferences, etc.

The marketing strategy includes three components:

- 1.Strategy for selecting the target market (segmentation).
- 2.Strategy for positioning and creating competitive advantage.
- 3.strategy for the existence of a product (brand) is a mix strategy, which consists of complex measures relating to the product, price, promotion, distribution.

Let's look at which segments our supermarket is targeting.

Taking into account the peculiarities of the assortment policy, the main buyers in the Farovon - uz supermarket will be:

1. people with average incomes who count on relatively inexpensive and high-quality domestically produced goods: 65%;
2. since the supermarket has a well-developed cashless payment system, according to transfers, a large share of customers are various organizations financed from the State budget: 18%;
3. regular customers 12%;
4. and others: 5%.

For effective operation, an enterprise needs not only the presence of a strategy, but also a constant analysis of the existing strategy, an analysis of the degree of its compliance with the current market conditions. Because without this it is impossible to operate successfully or maintain a stable competitive advantage, which in modern market conditions is extremely important for any enterprise.

After the work done regarding the analysis of the current strategy of the Farovon - uz supermarket, the following conclusions can be drawn.

It should be noted that the current enterprise strategy is rather ineffective, as evidenced by the results of strategy diagnostics. The following facts indicate this:

1. The growth rate of trade turnover is very low;
2. Also, expansion of retail space is slow;
3. Due to the lack of any advertising and the emergence of new strong competitors, the Farovon - uz supermarket is losing a large number of customers.
4. An incorrect management system hinders economic development due to the distraction of the store director to solve operational and other problems.

**References:**

1. Decree of the President of the Republic of Uzbekistan "On approval of the strategy for innovative development of the Republic of Uzbekistan for 2019 - 2021" dated September 21, 2018 No. UP-5544 .T.2018.
2. Musaeva Sh.A. Integrated marketing communication Study guide "Mahorat" publishing house, Samarkand - 2022



## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

3. Musaeva Sh.A., Usmonova DI Innovative marketing Study guide "TURON EDITION" 2021.
4. S Musayeva [WAYS TO IMPROVE DEMAND FORMATION AND SALES PROMOTION AT GOLDEN OIL LLC](#)  
Science and innovation 1 (A5), 215-220
5. MS Azimovna [Development of innovative marketing strategies in agriculture](#)  
Web of Scientist: International Journal of Scientific Research 3 (02), 538-544
6. MS Azimovna, RN Ulugbekovna [Development Conditions and Modern Trends of Business Tourism Worldwide](#) INTERNATIONAL JOURNAL OF BUSINESS DIPLOMACY AND ECONOMY 2 (2), 63-66
7. Kotler F. i dr. Basic marketing. - M.: LLC "ID Williams", 2013.
8. MS Azimovna [THE MAIN RESULTS OF THE LABOR PRODUCTIVITY OF THE STAFF OF THE HOTEL "BILLURI SITORA" LLC](#)  
Galaxy International Journal of Interdisciplinary Research 11(1), 348-352
9. MS Azimovna [THEORETICAL ASPECTS OF MARKETING TOOLS IN INCREASING THE INTERNATIONAL COMPETITIVENESS OF THE TEXTILE ENTERPRISE](#)  
Science and Innovation 2 (1), 47-53
10. S Musayeva [MECHANISMS OF FUNCTIONING OF LOGISTIC STRUCTURES](#)  
Science and innovation 2 (A2), 196-202
11. S Musayeva [WAYS TO IMPROVE THE POLICY OF DISTRIBUTION OF GOODS IN FURNITURE PRODUCTION ENTERPRISES](#) Science and innovation 2 (A2), 152-156
12. S Musayeva [IN THE CONDITIONS OF MODERNIZATION IN UZBEKISTAN THE NEED TO EVALUATE ENTERPRISES](#) Science and innovation 2 (A2), 35-40
13. MS Azimovna [Ways to Improve the Use of Marketing Information in the Assessment of "Stekloplastik" LLC](#) American Journal of Economics and Business Management 5 (11), 338-343
14. MS Azimovna [Efficiency of advertising activities of trading organizations and ways to increase IT](#) Asian Journal of Research in Social Sciences and Humanities 12 (3), 93-97
15. Usmanov IA, Musayeva Sh.A. Features of marketing activities in the construction industry of the Republic of Uzbekistan. NOVATEUR PUBLICATIONS Journal NX- A Multidisciplinary Peer Reviewed Journal ISSN No: 2581 - 4230 VOLUME 7, ISSUE 1, Jan. -2021 <https://repo.journalnx.com/index.php/nx/article/view/793>
16. Usmanov IA Musaeva Sh.A. Features of marketing organization in the market of construction services. Service. Scientific journal. - Samarkand. No. 2, 2021 - pp. 86-90.
17. Usmanov IA Study of the Provision of Construction Facilities with Management Personnel. INTERNATIONAL JOURNAL ON ORANGE TECHNOLOGY. Volume: 03 Issue: 9 | Sep 2021. p.31-33 <https://journals.researchparks.org/index.php/IJOT/article/view/2171>
18. Usmanov IA, Jumanov Sh.N. Ways to improve quality control of construction and installation works. Oriental renaissance: innovative, educational, natural and social sciences scientific journal. ISSN 2181-1784. Volume 1, Issue 10. November 2021. – P. 651-658 <https://cyberleninka.ru/article/n/ways-to-improve-quality-control-of-construction-and-installation-works>

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

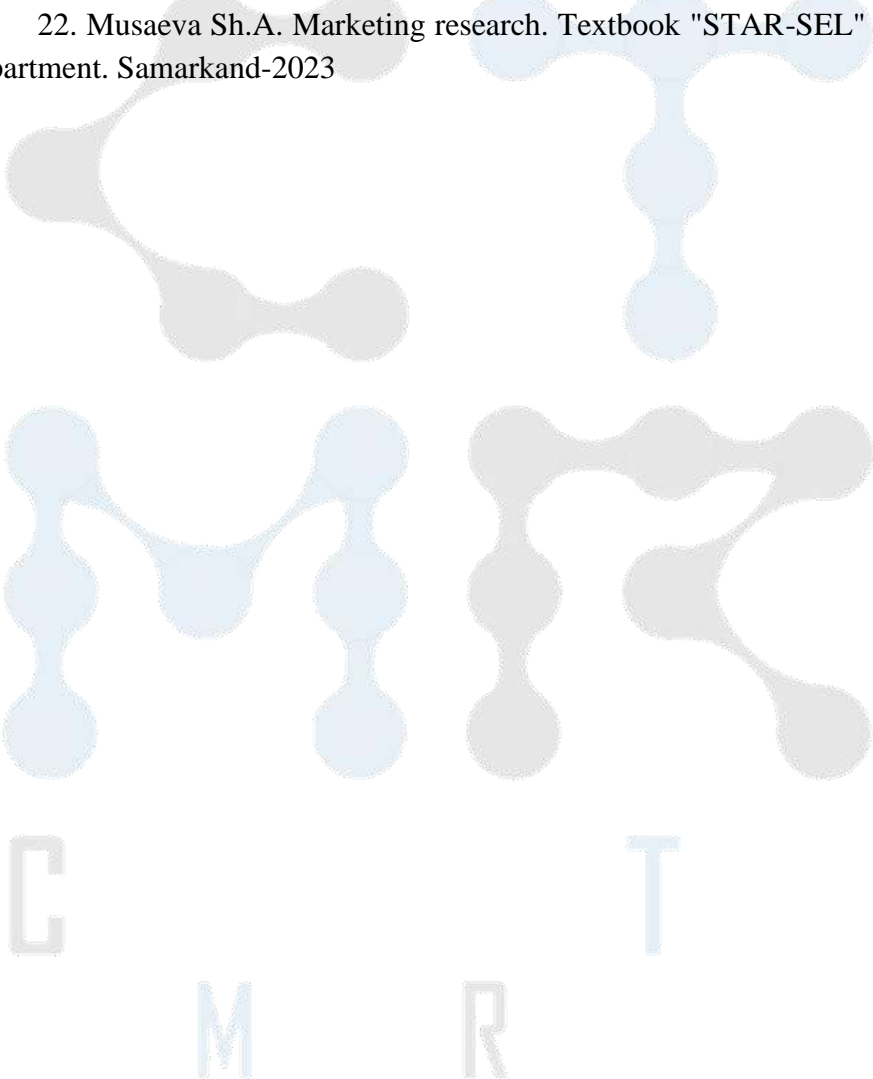
### VOLUME-4, ISSUE-1

19. Usmanov IA Buriev HT A development strategy for the construction industry in Uzbekistan: organizational aspects of implementation. International scientific and technical journal. Real estate: economy, administration. Moscow, MGSU-No. 4 / 2021

20. Usmanov Ilkhom Achilovich, RESEARCH OF MARKETING ACTIVITIES OF S SHARQ-UNIVERSAL-SMK LLC SCIENCE AND INNOVATION INTERNATIONAL SCIENTIFIC JOURNAL VOLUME 1 ISSUE 6 UIF-2022: 8.2 | ISSN: 2181-3337

21. Usmonova Dilfuza Ilkhomovna, EXAMINATION OF THE INVESTMENT PROJECT OF LEASING COMPANIES SCIENCE AND INNOVATION INTERNATIONAL SCIENTIFIC JOURNAL VOLUME 1 ISSUE 7 UIF-2022: 8.2 | ISSN: 2181-3337

22. Musaeva Sh.A. Marketing research. Textbook "STAR-SEL" LLC publishing and creative department. Samarkand-2023



UDC 621.3.0481.

## FUNCTIONAL DIAGNOSTICS OF TRACTION TRANSFORMER OF AC ELECTRIC LOCOMOTIVE USING SPECTRAL ANALYSIS METHOD

*M.S. Yakubov., M.A. Sagatova, M.N. Tuychieva*  
*Tashkent State Transport University*

**Abstract.** The purpose of the study is to use spectral analysis for functional diagnostics of the traction transformer bushing of an AC electric locomotive, which is an important element of its asynchronous electric drive to ensure the reliability and continuity of the motion process and regenerative braking.

**Methods.** A new classification of methods for diagnosing and determining technical conditions of traction transformer bushing is presented, which makes it possible to determine the early stage of the appearance of partial discharges (PD) in them. An assessment of the numerical magnitude and sign of coefficients of the sine and cosine components of the Fourier series and, ultimately, the indication of partial discharges are performed.

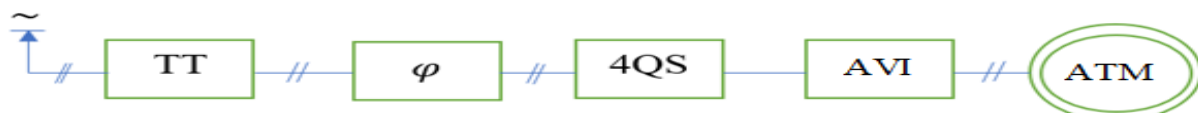
**Practical significance.** In the functional diagnostics of transformer bushing, the possibility of the issues of the principle of information content and invariance is noted.

**Keywords:** control, rolling stock, electric locomotive, traction transformer bushing, spectral analysis, diagnostics.

One of the most crucial elements of an AC electric locomotive is the traction transformer (TT). It is subject to the requirements of maximum use of active materials and high operational reliability; this eliminates additional preventive repairs between periodic maintenance. Traction transformers for electric locomotives differ from conventional transformers in a very wide regulation range of output voltage. The fundamental features of the TT are high dissipation of its windings, necessary for normal operation of the network part of the 4QS converter, a relatively large range of changes in the output voltage (19-31 kV or more), non-sinusoidal current and voltage, the permissibility of operation in over-excitation mode, latching current limitation at idle speed or when an electric locomotive passes a neutral section, the complex design of its bushing that causes the occurrence of partial discharges. Partial discharges increase the temperature of windings, insulation, and oil.

The failure of a traction transformer leads to a stop in the electric locomotive motion, significant losses, and emergencies, so an important task is its periodic functional diagnostics to determine its actual technical condition and prevent the damage of electrical technological equipment. To do this, it is necessary to identify the most common types of TT defects and select effective methods for detecting these faults [4, 8, 9].

AC electric locomotives use TTs with a voltage of 27.5 kW. The largest number of



failures is associated with the failure of TT bushing [1, 2, 15]. Failure of this unit often leads to the triggering of the maximum current relay (MCR) (over-current relay) or is accompanied by a reduction in voltage in the contact network due to the shutdown of automatic protection at the traction substation. However, the protection can be triggered by failures of other elements of the electric locomotive. In this regard, in the depot, it is necessary to determine by simple and objective methods the conditions of traction transformers without disassembling them. The modern system of power circuit control for electric rolling stock (SCERS) has special technological equipment and a variable-frequency electric drive. In addition to the TT, this system includes other units (see Fig. 1).

Fig.1. Functional block diagram of AC SCERS.

The most common is the option with a four-quadrant 4QS converter, which allows for voltage and frequency regulation; it maintains a power factor close to unity and implements regenerative braking; a capacitive filter for voltage smoothing, an autonomous voltage inverter (AVI) using IGBTs controlled by a system of pulse-width modulation and self-diagnostics.

Variable frequency drive converters generate higher harmonics that distort current and voltage, leading to heating of the TT and its bushings.

An electric drive of electric rolling stock (ERS) is characterized by severe operating conditions and the presence of dangerous voltages:

$$L_{III} \frac{di}{dt}, \quad (1)$$

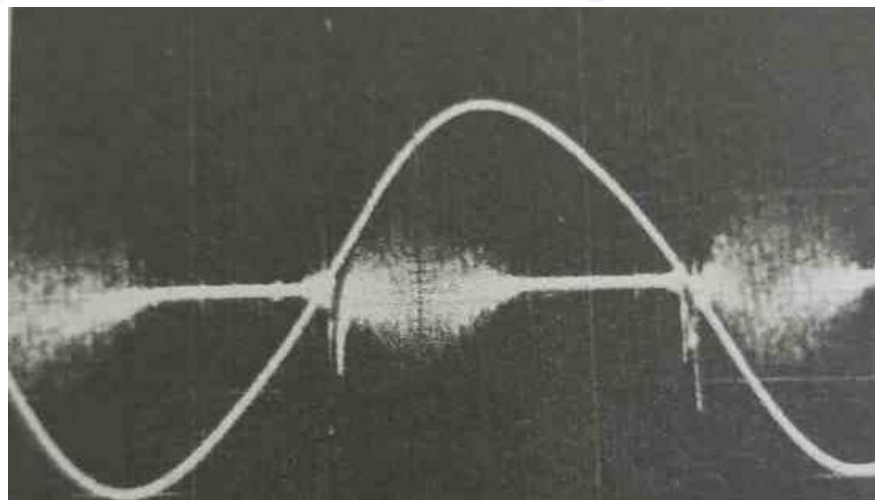
where  $L_{III}$  is the inductance, H;  $\frac{di}{dt}$  is the change in current when switching IGBT and flows:

$$i = C_{IGBT} \frac{du}{dt}, \quad (2)$$

where  $C_{IGBT}$  is the capacitance of the IGBT terminals;  $\frac{du}{dt}$  is the change in voltage when switching IGBT.

The above operating conditions of SCERS put higher demands on reliability and lead to an increase in wear.

*Types of TT bushings for electric locomotives and their defects.* There are TT bushings of the following designs [1]: bushings with oil insulation; oil retaining bushings and insulated rigid bushings.



a)

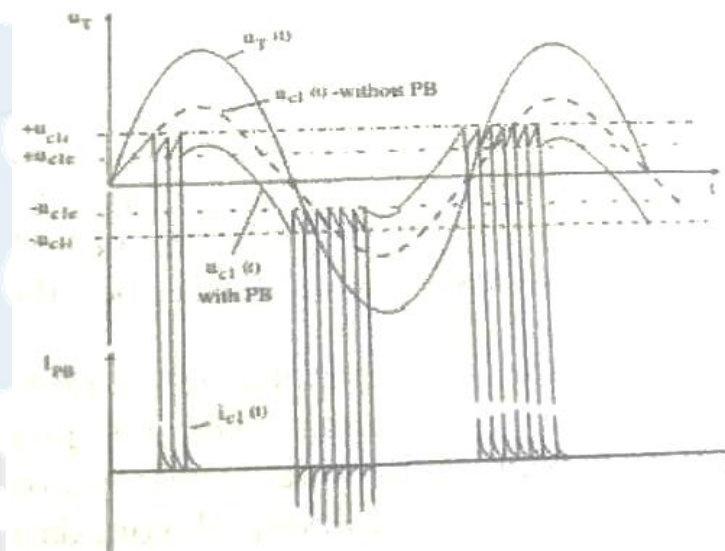
Fig. 2. a) oscillogram of discharges

The classification of the reasons for the deterioration of the technical condition of the TT bushing is shown in Fig. 2.

It is advisable to divide diagnostic properties (dielectric characteristics, chromatographic analysis of transformer oil, etc.) into integral parameters that characterize the phenomenon of aftereffect of a certain result that does not allow localizing a defect, for example, thermal imaging examination and PD measurement.

Diagnostic parameters must satisfy the principles of measurability, information content, and invariance. The informativeness of a parameter means that it carries significant information about defects, with the ability to quantify them. Invariance means that it should have an acceptable low sensitivity to noise. In experiments, one practically has to make a reasonable compromise on these requirements.

The complex design of TT bushings leads to an increase in electric intensity and the appearance of partial discharge, which destroys the internal insulation. The processes of appearance of PD of the TT bushings are shown in Figs. 2,a and 2,b.



b)

Fig. 2. b) time diagrams of the TT discharge occurrence.

The classification of methods for diagnosing and monitoring the parameters of TT insulating bushings is shown in Fig. 3.

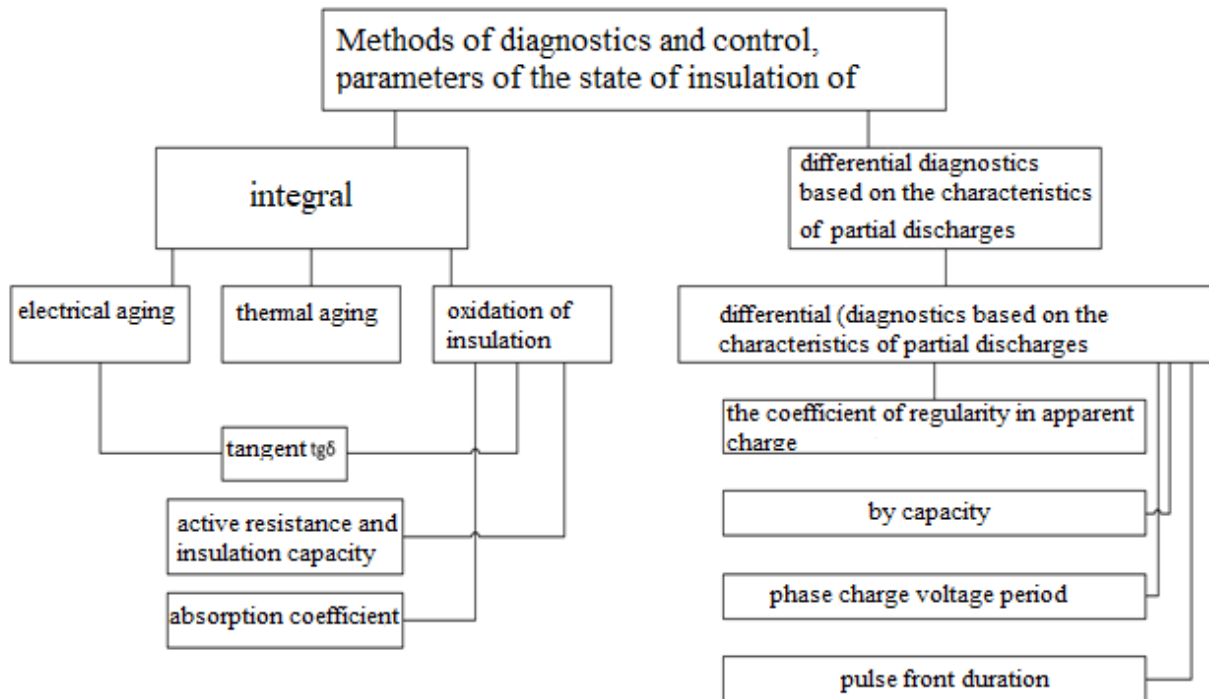


Fig.3. Classification of methods for diagnosing and monitoring the technical condition of TT bushings

Identification of spectral analysis of PD pulses is based on two identical forms of recording the Fourier series: through the coefficients of cosine and sinusoidal components [3, 6, 13]:

$$f(t) = C_0 + \sum_{k=1}^N (a_k \cos \omega_1 t + b_k \sin \omega_1 t), \quad (3)$$

and through the amplitudes and initial phases of harmonics:

$$f(t) = C_0 + \sum_{k=1}^N A_k \cos (k\omega_1 t - \varphi_k), \quad (4)$$

where  $f(t)$  is the function of time;  $C_0$  is the average value of the function over a given interval;  $k$  is the harmonic number;  $\omega_1$  is the circular frequency of the first harmonic;  $t$  is time;  $A_k$  is the amplitude of harmonic with number  $k$ ;  $\varphi_k$  is the initial phase of the harmonic with number  $k$ .

If the experimental data are presented in the form of a table of values of the original function of time, then the numerical expansion of the Fourier series is found as the coefficients of the series using the following expressions [3, 12]:

$$a_k = \frac{2}{N} \sum_{t=1}^{N-1} f_1 \cos \omega_1 k i \Delta t, \quad (5)$$

$$b_k = \frac{2}{N} \sum_{i=1}^{N-1} f_1 \sin \omega_1 k i \Delta t, \quad (6)$$

where  $i$  is the number of the point;  $N$  is the number of points in a given interval;  $f_1$  is the value of the function at point number  $i$ ;  $\Delta t$  is the time interval between points.

Amplitudes and phases are determined using the following analytical formulas [5, 14]:

$$A_k = \sqrt{a_k^2 + b_k^2}, \quad (7)$$

$$\varphi_k = \arctg \frac{b_k}{a_k}. \quad (8)$$

When considering parameters (5) and (6) or (7) and (8), the time and spectral identification of the signal are equal, i.e., the signal spectrum contains complete information about the signal.

The criterion for the accuracy of spectral analysis is the comparison of the original signal with the function obtained during synthesis using the found coefficients  $a_k$  and  $b_k$ , to construct the amplitude spectrum  $A(f)$ .

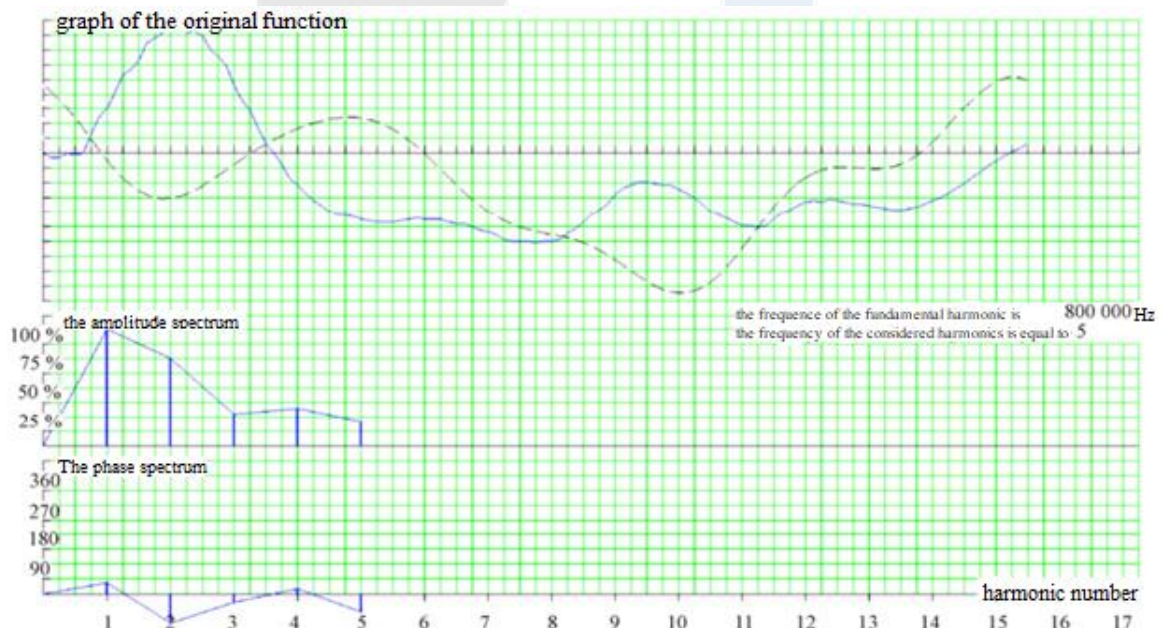


Fig.4. Synthesis of a PD pulse using expression (2) without considering the signs of coefficients  $a$  and  $b$  when determining the initial phases

When constructing the phase spectrum of a PD pulse, it is necessary to pay attention to determining the initial phase of each harmonic. This means that it is necessary to consider not only the values of  $\varphi_k = \arctg \frac{b_k}{a_k}$ , but also the signs of coefficients  $a_k$  and  $b_k$ , i.e.,

$$\begin{aligned} &\text{if } a_k \geq 0, \text{ then } \varphi_k = \arctg \frac{b_k}{a_k}, \\ &\text{if } a < 0, \text{ then } \varphi_k = \pi - \arctg \frac{b_k}{a_k}, \end{aligned} \quad (10)$$

$$\text{if } b_k < 0, \text{ then } \varphi_k = 2\pi + \varphi_k. \quad (11)$$

Without considering expressions (9), (10), and (11), the signal waveform is distorted, and diagnostic information loses its meaning (Fig. 4). To avoid distortion of the signal, it is necessary to expand the PD pulse interval by adding zero values.

A measuring transducer connected to the measuring terminals of high-voltage bushings or the ground circuit of the CT tank could be used to conduct experiments of spectral analysis to diagnose TT bushings. To obtain the above invariant principle when measuring PD parameters, it is necessary to have low sensitivity to electromagnetic discharges inside the CT and discharges from the external circuit [4, 5, 10, 11]. With a simple scheme for connecting a measuring transducer to the grounded circuit, it is necessary to use technical means and methods for shielding negative environmental factors.

When measuring PD parameters of the TT and processing their results for spectral analysis, it is necessary to keep in mind that the spectra of these pulses have minimal attenuation: they have a maximum upper limit of the frequency band compared to other (external) PD pulses:

$$E = E_0 e^{-\alpha_k x - j\beta_k x}, \quad (11)$$

where  $E_0$  is the initial and current intensity of the PD signal, respectively;  $\alpha_k$  is the attenuation coefficient;  $\beta_k$  is the phase attenuation coefficient.

Expression (11) shows that PD in TT bushings differ in the width of the frequency spectrum of the external pulse [6, 7, 9].

**Conclusions.** Failure of a traction transformer of an AC electric locomotive is one of the most severe cases of malfunction, often leading to defects. In each of them, it is necessary to identify the failed unit, find the reason that led to the damage to this element, and determine the guilty party for assigning the costs of eliminating the malfunction: the manufacturer, operational or repair department. High costs of traction transformers lead to high costs for their repair. One of the effective methods of functional diagnostics of electrical machines (power transformers, induction motors, converters, etc.) is spectral analysis based on fast Fourier transform. This method allows for timely diagnostics to locate defects, the presence and development of partial discharges in transformer bushings, short circuits of turns, and other faults. The use of spectral analysis reduces the accident rate of traction transformers, and increases the reliability and uninterrupted motion of electric locomotives. The use of such monitoring systems would significantly reduce the number of failures of traction transformers, preventing the development of faults to an irreversible state.

The study reveals the technical capabilities of the spectral analysis method, its schematic features, based on the ability to measure partial discharges, the availability of information content, and invariant solutions when diagnosing traction transformers.

#### References

1. Guidelines for increasing the reliability and safety of operation of electrical equipment of nuclear power plants by providing the necessary regulatory documentation. // OJSC Rosenergoatom Concern. Moscow No. 126 – uk, 01.12.2009. (1.4 Diagnostics of power transformers, autotransformers, reactors and their bushings 1.33.99.0038-2009 (Appendix 4).
2. U. T. Berdiev, I. K. Kolesnikov, M. N. Tychieva, F. F. Khasanov and U. B. Sulaymonov. Methods of new technological developments of electric motors based on soft



magnetic materials. E3S Web of Conf., 401 (2023) 03038. DOI: <https://doi.org/10.1051/e3sconf/202340103038>

3. Abitkhodja Burkhanhodjaev, Malika Tuychieva, Elena Iksar, Kholjan Kholbutayeva, Bakhtiyor Nurmatov; Investigation of the energy performance of electric locomotives in asymmetric modes. AIP Conf. Proc. 5 January 2023; 2552 (1): 030024. <https://doi.org/10.1063/5.0133920>

4. Usan Berdiev, Abitkhodja Burkhanhodzhaev, Malika Tuychieva, Elena Iksar, Komil Usmonov; Investigation of energy indicators with asymmetry of the voltage of the power source of mainline electric locomotives of alternating current. AIP Conference Proceedings 5 January 2023; 2552 (1): 030018. <https://doi.org/10.1063/5.0131839>

5. GOST 20074-83-Method for measuring the characteristics of partial discharges.

6. I.N. Bronstein, K.A. Semendyaev. Handbook of higher mathematics for higher educational institutions. Moscow: VSh, 1968, 364 p.

7. Grafakos L. Classical and Modern Fourier Analysis.- Prentice – Hall. 2004.-359p.

8. Ravinda Aroca, Wolfgang Mosch. High Voltage and Electrical Insulation Engineering. Quebec, Canada, 371 p. John and Sons, Inc, 2011.pp 340-341, pp 343-345.

9. 10. Demarchan K.S., Neiman L.R., Korovkin N.V., Chechurin V.P. Theoretical foundations of electrical engineering. SPB, "VSh".

10. Sergey Goolak, Viktor Tkachenko, Gintautas Bureika, Gediminas Vaiciunas, "Method of spectral analysis of traction current of AC electric locomotives." Dept. of traction Rolling Stock, State University of Infrastructure and Technologies, Kyiv, Ukraine. TRANSPORT, 2020, pp. 659-668.

11. Yakubov M.S., Nazirkhonov T.M., Sagatova M.A. "Assessing the reliability of control systems for asynchronous electric drives of AC electric locomotives in various operating modes using regression and correlation analysis." Unversum 2023 No. 6(111).

12. Capolino, G.; Antonino-Daviu, J.; Riera-Guasp, M. (2015). Modern Diagnostics Techniques for Electrical Machines, Power Electronics, and Drives. IEEE Transactions on Industrial Electronics, vol 62(3):1738-1745. doi:10.1109/TIE.2015.2391186.

13. Zavidy V.I., Putilova I.V., Starshinov V.A. "Modern methods of monitoring and technical diagnostics of electrical machines." Energy, pp. 38-43.

14. Yakubov M.S., Sagatova M.A. "System analysis and classification of typical defects and malfunctions of AC electric drives with three-phase asynchronous motors in high-speed motion, focused on their diagnostics." Scientific and technical journal MECHANICAL ENGINEERING. No. 1, 2023, pp. 107-103.

15. M. S. Yakubov, K. Kh. Turdibekov, S. A. Norzhitov, and M. A. Sagatova. Improving maintenance system for controlled asynchronous electric drives of electric locomotives based on their diagnosis. E3S Web of Conferences 401, 05019 (2023) CONMECHYDRO – 2023.

**DEVELOPMENT OF FATTY HEPATOSIS IN PATIENTS WITH DIABETES  
MELLITUS**

**Abdiev Ilkhom Allaerovich**

Termez branch of Tashkent medical academy

**Bozorov Umid Madaminovich**

Termez branch of Tashkent medical academy

**Xujanov Xusnitdin Baymuratovich**

Termez University of Economics and Service

**Iskandarova Nilufar**

Termez state university

**SUMMARY:** It was made an organized study of the functional condition of hepato-biliary system beside 200 patients with fatty hepatitis and fatty hepatitis with concomitant sugar diabetes. In verification of the diagnosis were used results of the biochemical blood's study, ultrasonography study, computer and MR tomography. All patients were conducted with duodenal tubing with following biochemical bile study. Breach of the functional condition liver was revealed beside majority sick fatty hepatitis, moreover degree of the breaches becomes above under accompanying sugar diabetes. Unidirectional change in biochemical bile characteristic wasn't noted beside patient fatty hepatitis and fatty hepatitis with accompanying sugar diabetes, corresponding to I stage cholelithiasis.

**Keywords:** fatty hepatitis; sugar diabetes; hepato-biliary system; cholelithiasis.

Non-alcoholic fatty liver disease (NAFLD) includes steatosis, fatty infiltration with inflammation (steatohepatitis), non-alcoholic steatohepatitis with fibrosis progressing to cirrhosis. For a long time it was believed that NAFLD was benign, but in recent years it has been proven that a quarter (27%) of patients develop fibrosis within 9 years, and every fifth (19%) develops cirrhosis of varying severity [1]. With longer observation, progression of fibrosis is detected in 50% of patients with NAFLD, and this process occurs without clinical manifestations [2; 3].

Recently, there has been an assumption about a direct connection between the development of NAFLD and metabolic syndrome (MS) [4; 5; 6; 7; 8]. In fatty hepatitis, a change in the function of hepatocytes, in turn, leads to the formation of defective bile micelles, in which the level of cholesterol (CH) is increased and the content of phospholipids and bile acids (BA) is reduced, which creates the prerequisites for the formation of lithogenic bile [9; 10; eleven].

The purpose of the work was a comparative study of the features of dysfunction of the functional state of the liver and biliary tract in fatty hepatitis and fatty hepatitis with concomitant diabetes mellitus.

**MATERIAL AND METHODS OF RESEARCH**

200 patients with fatty hepatitis were examined. There were 84 (42%) men, 116 (58%) women, aged from 26 to 65 years. The duration of the disease ranged from 1 year to 30 years. The comparison group consisted of 150 patients with fatty hepatitis, the observation group included 50 patients with fatty hepatitis with concomitant diabetes mellitus. All patients had increased body weight (Kettle body mass index was  $32.5 \pm 4.1$ ).

When examining patients, along with general clinical data, a number of modern laboratory, instrumental and biochemical studies were used. To verify the diagnosis of "fatty hepatitis," patients underwent ultrasonographic examination of the hepatobiliary system using an S-DH-500 ultrasound device, computed tomography using a Universal MAX device (USA) and magnetic resonance imaging using a CRT-1010 magnetic resonance tomograph (Kyiv). The protein-forming function of the liver was assessed by the level of total serum protein and albumin using an FP901 (M) analyzer from Labsystems (Finland). Protein fractions of blood serum were determined on a Cormay DS 2 analyzer. The level of prothrombin index (PTI) was determined on a Cormay KG 4 analyzer. Lipid metabolism was assessed by the content of cholesterol,  $\beta$ -lipoproteins, triglycerides, high- and low-density lipoprotein cholesterol in the plasma, as well as the atherogenic index, the level of which was determined on the FP-901 (M) analyzer from Labsystems (Finland). The activity of the following enzymes was determined: alanine aminotransferase - ALT, aspartate aminotransferase - AST, alkaline phosphatase - ALP on a Cormay Livia analyzer. Pigment metabolism was assessed by the content of total bilirubin in the blood serum, determined by the unified Jendrassik-Grof method using Vital kits. Radioimmunological determination of insulin was carried out using a standard test kit from the Minsk Institute of Bioorganic Chemistry.

All patients underwent fractional duodenal intubation according to the generally accepted method, followed by macro- and microscopic, biochemical examination of bile. In portions B and C, the total concentration of bile acids and cholesterol in bile was determined, followed by calculation of the cholate-cholesterol coefficient (CCC) according to the method of V. P. Miroshnichenko et al. (1978) [12]. The results of the study were compared with data from the control group, which consisted of 22 practically healthy people aged 22 to 50 years.

The results obtained were processed using a set of programs for calculating statistical indicators. The Student's test was used in the calculations, confidence limits were determined, and the reliability of the difference between indicators and average values was assessed.

#### RESEARCH RESULTS AND THEIR DISCUSSION

Judging by the data in Table. 1, in patients in the comparison group and the observation group, a significant increase in the level of total protein was found compared to the control. In patients in the observation group, a significant decrease in albumin levels was noted, while in the comparison group it only had a tendency to decrease. The content of total bilirubin was increased in the comparison group (by 17.5%) and the observation group (by 27.9%) compared to the control group. In patients, a significant increase in the level of serum transaminases was noted relative to the control: in the comparison group, ALT indicators increased by 73.14%, AST - by 21.9% and in the observation group ALT - by 124.0%, AST - by 34.7%. Blood cholesterol levels were increased by 19.4% in the comparison group and by 26.1% in the observation group,  $\beta$ -LP by 15.0 and 30%, respectively, triglycerides by 36.2 and 100%, respectively. Compared with the control, fasting blood glucose levels were increased in the comparison group by 32.6% and in the observation group by 104.7%.

A biochemical study of bile (Table 2) in the comparison group revealed a significant increase in the level of cholesterol in bile (in portion B by 398%, in portion C by 332%) and in the observation group (in portion B by 316%, in portion C C - by 369%); on the contrary, the levels of bile acids were reduced in the comparison group by 46.8 and 30.6%, respectively, and

in the observation group - by 54.8 and 19.5%, respectively. As a consequence of this, patients experience a significant decrease in CHC in both portions of bile.

It is important to note that no significant differences in the biochemical composition of bile were detected between patients in the observation group and the comparison group. Consequently, in patients with fatty hepatosis, including those with concomitant diabetes, there is a change in the physicochemical properties of hepatic and cystic bile, corresponding to the first stage of cholelithiasis [13], which is consistent with previously published works [9, 10, 11]. Naturally, in this case, dysfunction of hepatocytes, which are the only place of formation of bile acids, is important, which invariably affects changes in the biochemical properties of bile [14].

When studying the basal level of insulin in the comparison group, there was a tendency for its level in the blood serum to increase to  $15.25 \pm 1.99 \mu\text{U/ml}$  compared to the control -  $11.85 \pm 1.25 \mu\text{U/ml}$ . In the observation group, the insulin content increased significantly to  $29.15 \pm 1.34 \mu\text{U/ml}$  compared to the control. Indeed, as our studies have shown, there is a certain relationship between insulin levels and gallstone formation. A negative relationship was found between the cholesterol content of bile and the level of insulin (in portion B  $r = -0.37$ , in portion C  $r = -0.34$ ), between bile acids and the level of insulin - a negative relationship (in portion B  $r = -0.45$ , in portion C  $r = -0.36$ ), CHC and insulin level - a positive relationship (in portion B  $r = 0.44$ , in portion C  $r = 0.34$ ).

There is evidence in the literature of increased levels of insulin in the blood in patients with cholelithiasis [4]. Against the background of insulin resistance, the liver actively synthesizes triglycerides, which contributes to the development of steatosis and its further progression. On the other hand, the liver is a target organ in the development of metabolic syndrome and plays an important role in the development of insulin resistance. This allows us to consider NAFLD as a component of MS, although there are no direct indications of NAFLD among the official criteria for MS.

#### CONCLUSIONS

1. With NAFLD, the functional state of the liver is impaired, but the degree of impairment increases in patients with concomitant diabetes mellitus.
2. In patients with NAFLD and patients with NAFLD with concomitant diabetes mellitus, a unidirectional change in the physicochemical properties of hepatic and cystic bile is observed, corresponding to the 1st stage of cholelithiasis.
3. In fatty hepatosis, there is a dependence of the formation of lithogenic bile on hyperinsulinemia.

#### LITERATURE

1. Bueverov A. O., Bogomolov P. O., Mayevskaya M. V. Pathogenetic treatment of non-alcoholic steatohepatitis: rationale, effectiveness, safety // Ter. archive, 2007. - No. 8. - P. 88 – 92.
2. Vakhrushev Ya. M. Gallstone disease. - Izhevsk: Expertise, 2004. - 76 p.
3. Ivanchenkova R. A., Sviridov A. V. Modern view on the pathogenesis of cholelithiasis // Klin. Med., 1999. - No. 5. - P. 8 – 11.
4. Ilchenko A. A. Disease of the gallbladder and biliary tract // M.: Anacharsis, 2006. - 448 p.
5. Kobalava Zh. D., Tolkacheva V. V. Metabolic syndrome: principles of treatment // RMJ, 2005. - T. 13. - No. 7. - P. 451 – 458.

6. Korochina I. E. Gastroenterological aspects of metabolic syndrome // Ros. Journal of Gastroenterology, Hepatology, Coloproctology, 2008. - T. 18. - No. 1. - P. 26 – 37.
7. Lazebnik L. B., Zvenigorodskaya L. A., Egorova E. G. Metabolic syndrome from the position of a gastroenterologist // RMJ, 2005. - T. 13. - No. 26. - P. 1706 - 1712.
8. Mansurov Kh. Kh. Prevention of cholelithiasis / Kh. Kh. Mansurov // Klin. Med., 1985. - No. 1. - P. 10 – 16.
9. Miroshnichenko V.P., Gromashevskaya L.L., Kasatkina M.G., Kozachek G.A. Determination of the content of bile acids and cholesterol in bile // Lab. business, 1978. - No. 3. - P. 149 – 153.
10. Ovsyannikova O. N., Zvenigorodskaya L. A., Ilchenko A. A., Samsonova N. G., Melnikova N. V. Steatohepatitis and cholesterosis of the gallbladder in patients with metabolic syndrome // Therapeutic Gastroenterology, 2006. - No. 5 - pp. 35 – 39.
11. Suchkova E. V., Khokhlacheva N. A., Kudrina S. V., Fedotova E. L., Vakhrushev Ya. M. Clinical and laboratory assessment of the course of fatty hepatosis // Ros. Journal of Gastroenterology, Hepatology, Coloproctology: Appendix No. 30. - Materials of the Thirteenth Russian Gastroenterological Week, October 22 - 24, 2007. - T. 17, No. 5. - P. 95.
12. Khazanov A.I. Possibilities of progression of alcoholic and non-alcoholic staeatohepatitis to cirrhosis of the liver // Ros. Journal of Gastroenterology, Hepatology, Coloproctology, 2005. - T. 15, No. 2. - P. 26 – 32.
13. Loria P. Should nonalcoholic fatty liver disease be renamed // Dig. Dis., 2005. - No. 23 (1). — R. 72 – 82.
14. Reynaert H., Geerts A., Henrion J. Treatment of non-alcoholic steatohepatitis with thiazolidinediones // Aliment. pharmacol. ther., 2005. - Vol. 22. - N. 10. - P. 897 – 905.

VOLUME-4, ISSUE-1

ВОЗМОЖНОСТИ РАЗВИТИЯ ПАЛОМНИЧЕСКОГО ТУРИЗМА В  
СУРХАНДАРЬИНСКОЙ ОБЛАСТИ

*Turayev Ziyadulla Norsoatovich,*

Termiz iqtisodiyot va servis universiteti dosenti

Termiz (O'zbekiston)

e-mail: ziyadulla\_turayev@tisu.uz

Tel: +998 91 5813778

*Azamov Saidakbarxon Avazxon o'g'li,*

Toshkent davlat iqtisodiyot universiteti tadqiqotchisi

Toshkent (O'zbekiston)

e-mail: saidakbarbarkhon.azamov@bk.ru

Tel: +99893 514 95 15

**SURXONDARYO VILOYATIDA ZIYORAT TURIZMINI RIVOJLANTIRISH  
IMKONIYATLARI**

*Annotasiya.* Maqolada ziyorat turizmining o'ziga xos xususiyatlari, Surxondaryo viloyatida ziyorat turizmini rivojlantirish resurslari, turli dinlarga tegishli ziyoratgohlari, ularda turizm xizmatlarini tashkil etish holati tahlil qilingan. Buyuk ipak yo'li bo'yida joylashgan hozirgi Surxondaryo viloyatidagi qadimiy sivilizatsiyalardan biri bo'lgan Oks sivilizatsiyasi yodgorliklari, islom olamidagi buyuk hadisshunos olimlar: Hakim at-Termiziy, Iso at-Termiziy ziyoratgohlarining ziyorat turizmini rivojlantirishdagi ahamiyati ochib berilgan.

*Kalit so'zlar:* ichki turizmi, xalqaro turizm, muqaddas ziyoratgohlar, turistik infratuzilma, ziyorat maskanlari joylashgan destinasiyalar, Oks sivilizatsiyasi yodgorliklari.

**ВОЗМОЖНОСТИ РАЗВИТИЯ ПАЛОМНИЧЕСКОГО ТУРИЗМА В  
СУРХАНДАРЬИНСКОЙ ОБЛАСТИ**

*Аннотация.* В статье анализируются особенности паломнического туризма, ресурсы развития паломнического туризма в Сурхандарьинской области, святыни, принадлежащие разным религиям, а также состояние организации туристического обслуживания в них. Раскрыто значение развития паломнического туризма, как одной из древних цивилизаций мира, памятников цивилизации Окса, расположенной вдоль Великого Шелкового пути нынешней Сурхандарьинской области и святынь великих хадисоведов исламского мира: Хакима ат-Термизи, Исо ат-Термизи.

*Ключевые слова:* внутренний туризм, международный туризм, святыне места паломничества, туристская инфраструктура, дестинации с местами паломничества, памятники цивилизации Окса.

**OPPORTUNITIES FOR DEVELOPING PILGRIMAGE TOURISM IN  
SURKHANDARYA REGION**

*Annotation.* The article analyzes the features of pilgrimage tourism, resources for the development of pilgrimage tourism in the Surkhandarya region, shrines belonging to different religions, as well as the state of organizing tourist services in them. The significance in the development of pilgrimage tourism, one of the ancient civilizations of the world, of the monuments of the Oxus civilization, located along the Great Silk Road of the present Surkhandarya region and the shrines of the great hadith scholars of the Islamic world: Hakim at-Termizi, Iso at-Termizi, are revealed.

*Key words.* domestic tourism, international tourism, holy places of pilgrimage, tourist

*infrastructure, destinations with places of pilgrimage, monuments of the Oxus civilization.*

С древнейших времен и до наших дней паломничество занимает важное место в духовной жизни человечества. Паломничество – это путешествие по святым местам и одно из важнейших событий в жизни людей. Паломничество может иметь различные цели и мотивы, например, выполнение религиозных обязанностей, поиск духовных сил и вдохновения, расширение знаний и мировоззрения о культуре и традициях разных народов.

Увеличение количества паломнических посещений требует создания современных инфраструктурных объектов и создания благоприятных условий в странах. Увеличение занятости населения за счет оказания услуг на местах посещения, появление возможности получить существенного дохода создает условия для развития паломнического туризма. Более 90 процентов мировых туристических достопримечательностей прямо или косвенно связаны с поклонением или религией<sup>1</sup>. Паломнический туризм получил развитие в странах Ближневосточного региона на основе направлений религиозного паломничества, и по данным New Research Centre, к 2060 году 3 миллиарда человек начнут считать себя мусульманами, что составляет каждый третий человек на земле<sup>2</sup>.

В Узбекистане имеется огромный ресурсный потенциал для развития паломнического туризма, а количество местных и иностранных посетителей святых мест разных религий, исторических памятников великих мыслителей, известных учёных-мухаддисов в исламском мире увеличивается с каждым годом.

Одной из актуальных задач является превращение святых городов и мест паломничества в центры паломнического туризма, имеющие возможности для активного развития паломнического туризма. В этих центрах разрабатывается и реализуется ряд программ в регионах с целью ускоренного развития внутреннего и паломнического туризма, налаживания современных туристических услуг для местных и иностранных гостей<sup>3</sup>.

Как один из регионов с большим туристическим потенциалом, Сурхандарьинская область отличается древней историей, богатой культурой, священными местами паломничества. Регион был колыбелью цивилизации Окса<sup>4</sup>, развивавшейся с бронзового века (III-II тыс. до н. э.), бактрийской цивилизации, служил колыбелью культурного развития Средней Азии, где зародилась первая городская культура в Центральной Азии<sup>5</sup>.

Цивилизация Окса сформировалась в Бактрии и Маргиёне в конце 3-го тысячелетия до нашей эры, а в течение 2-го тысячелетия распространилась на восточный Афганистан, Белуджистан, восточный Иран и северные районы Индии и стала одним из древнейших центров мировой цивилизации. Некоторые исследователи считают, что эта

<sup>1</sup> Папирян, Г.А. Международные экономические

<sup>2</sup> [www.crescentrating.com \(global-muslim-travel-index-2019\)](http://www.crescentrating.com/global-muslim-travel-index-2019)

<sup>3</sup> O'zbekiston Respublikasi Prezidentining 09.02.2021 yildagi "O'zbekiston respublikasida ichki va ziyorat turizmini yanada rivojlantirish chora-tadbirlari to'g'risida"gi PF-6165-son Farmoni // [lex.uz](http://lex.uz)

<sup>4</sup> Lamberg-Karlovsky, C. (2015). THE OXUS CIVILIZATION. *Cuadernos De Prehistoria Y Arqueología De La Universidad Autónoma De Madrid*, 39. <https://doi.org/10.15366/cupauam2013.39.002>

<sup>5</sup> Anvar Bakiev. (2021). The Problem of Periodization and The Views of Civilization in The History of Uzbekistan. *The American Journal of Social Science and Education Innovations*, 3(04), 158–171. <https://doi.org/10.37547/tajssei/Volume03Issue04-24>

цивилизация распространилась на более обширные территории. Это связано с тем, что внимание народов мира снова обращается на наш регион, страны Центральной Азии становятся важным регионом, который мир не может игнорировать, благодаря своему стратегическому географическому положению на стыке Азии и Европы, регион переживает быстрый экономический рост и политические реформы, видно, что регион становится центром экономического развития, транспортно-коммуникационным мостом, соединяющим Восток и запад, север и юг.

В исследованиях по истории Великого Шелкового пути<sup>6</sup> среди нескольких сухопутных торговых путей из Китая в Рим самые короткие маршруты проходили через Термез, а этот район был одним из центров слияния различных религий и культур.

В регионе насчитывается более 700 объектов культурного наследия, в том числе буддийские храмы, такие как Далварзинтепа, Фаёттепа, Каратепе, Зурмола, Кампиртепа, сооружения, относящиеся к буддийской религии, гробницы Аль-Хаким ат-Термизи, Имам Абу Иса ат-Термизи, комплекс Султана Саадат, замок Кирккиз, Кокилдорота, святыни Суфи Аллаяра, Ходжа Алауддина Аттара, Мавлано Мухаммада Захида –это места паломничества, посещаемые местными и иностранными туристами, исповедующие ислам<sup>7</sup>.

В нашей стране проведен ряд научных исследований по повышению привлекательности объектов паломнического туризма, созданию на их основе кластеров, выдвинуты предложения по развитию бренда и по созданию паломнического кластера на базе святыни «Етти Пир» в Бухарской области<sup>8</sup>.

Изучен потенциал объектов культурного наследия Сурхандарьинской области как туристического направления с использованием метода спектра туристического потенциала (СТП), и по результатам эмпирической оценки мавзолеев Исо Термизи, расположенный в Шерабадском районе, мавзолеев Хакима Термизи, расположенный в Термезском районе, и Комплекс Султан Саадат были отнесены к группе объектов с высоким потенциалом, остальные объекты-к группе объектов со средним потенциалом (табл.1).

Таблица 1

**Результаты оценки туристского потенциала объектов культурного наследия, включенных в туристские маршруты методом СТП<sup>9</sup>**

<sup>6</sup> Тураев З.Н. Буюк ипак йўли ва туризм: ривожланиш имкониятлари ва истикболлари. // Монография. Т.: «Тафаккур» нашриёти, 2019. 32-33-б.; *Nurullo Tursunov*. O‘zbekiston Milliy universiteti xabarлари, 2023, [1/10] В. 20-21.

<sup>7</sup> Тураев З.Н. Сурхондарё минтақасида тарихий-маданий туристик ресурслар ва ундан фойдаланиш имкониятлари. // Biznes-Эксперт журнали. Тошкент. - 2020. № 6 -Б. 48-52.

<sup>8</sup> Навруз-зода З. Б. Организационно-экономические механизмы формирования паломнических кластеров на базе туристических дестинаций. дисс. док. фил. (PhD). У.: С. 60.

<sup>9</sup> Тураев З.Н. Сурхондарё вилоятида туризм соҳасини ривожлантиришнинг устувор йўналишлари. и.ф.ф.д (PhD) дисс. – Т.: 2021. Б. 121.



Объекты культурного наследия	Критерии оценки ресурсов					
	У	МТ	ПОЗ	ВП	СДИ	Средний показатель
Буддийское сооружение Каратепа (Термезский район, I-V вв.)	5	4	5	3	2	3,8
Буддийское сооружение Фаязтепа (Термезский район, I-IV вв.)	5	5	5	4	2	4,2
Мавзолей Абу Исы Ат Термизи (Шерабадский район, XII век)	5	5	5	5	5	5
Дворец Кирккиз (Термезский район, X-XV вв.)	5	4	4	3	3	3,8
Мавзолей Хакима Термизи (Термезский район, IX-XV вв.)	5	5	5	5	5	5
Комплекс Султан Саодат (Термезский район, 17 век)	5	5	5	4	4	4,6
Замок Кокилдорота (Термезский район, 16 век)	5	5	4	3	3	4
Жаркурганская башня (Жаркурганский район, 12 век)	5	5	4	4	3	4,2
Замок Кампиртепа (район Музработ, IV – II века до н. э.)	5	5	5	2	2	3,8
Мавзолей Ак Астанабобо (Узунский район, X-XI вв.)	4	4	4	3	3	3,6
Наскальные рисунки Зараутсой (Шерабадский район, период мезолита)	5	5	5	5	1	4,2
Пещера Тешикташ (Бойсунский район, период Мустье-неолита)	5	5	5	4	1	4
Городище Далварзинтепа (Шурчинский район, II век)	5	5	5	2	2	3,8

Примечание. У-уникальность; МТ–межвидовая типичность; ПОЗ-познавательная и образовательная значимость; ВП-внешняя привлекательность; СДИ-сосостояние дополнительной инфраструктуры.

Городище «Далварзинтепа» в Шурчинском районе был первой столицей Кушанской империи, археологический памятник Оксианский Александрия («Кампиртепа») в Музработском районе, буддийские храмы «Каратепа» и «Фаёзтепа» в Термезском районе занимают свое место в мировой истории как основные религиозные и торговые центры.

Уникальность этих объектов в том, что они входят в число шедевров национальной культуры и истории Узбекистана. Учитывая, что их планируется включить в список объектов всемирного культурного наследия до 2030 года, их необходимо эффективно использовать в сфере туризма.

Большинство из этих объектов должны обеспечиваться удобствами для посетителей посредством реконструктурированием автомобильных дорог, ведущих к объектам, установки указателей и создания дополнительных объектов туристической инфраструктуры, таких как санитарные станции и смотровые площадки и т.д.

Кроме того, в регионе к историко-экологическим объектам относятся памятники природы, имеющие историческое значение, поселения, населенные первобытными людьми, следы динозавров, священные святыни, целебные источники, в том числе:

- в Бойсунском районе: пещеры Тешикташ и Мачай (где жили первобытные люди), Амир Темур, Ходжа Гур-Гур ота, пещеры Байбулок и Вишневская, тропы динозавров, Ходжамайхана, святилища Амонхана с целебными источниками, памятник архитектуры и природы Темирдарваза (Iron gate) и др.;

- в Алтинсайском районе: святыни Ходжаипок Ата, Мавлана Мухаммада Захида Хисария Вахшивария, Суфи Аллаяра, Ходжи Хасана Илгория с целебной водой, расположенные в горных и предгорных районах;

- в Узунском районе: храм Акастанабобо, археологические памятники Кафиркала и Зиндантепа в горных районах;

- в Сариясийском районе: такие святыни, как Ходжа Пирях, храм Писта, Кирккиз (Чил духтаран), Ходжаи Асмин;

- в Шерабадском районе: такие памятники, как Анджиртепа, Жаркутан, Вяткин, соляные пещеры Ходжаикон, святыни источника Горинбулоксой должны активно использоваться в оказании туристических услуг как объекты паломнического туризма.

В целях дальнейшего развития паломнического туризма целесообразно положительно решить следующие вопросы:

- организовать строительства более 100 остановок и других объектов инфраструктуры в рамках проекта «Золотой треугольник», объединяющего основные туристические центры региона, а также организация поездки на каждый туристический объект;

- организовать широкомасштабную реставрацию объектов культурного наследия, используемых на маршрутах паломнического туризма;

- разработка «Дорожной карты» по развитию мер, по приему иностранных туристов из дальнего зарубежья и соседних республик и созданию для них благоприятных условий;

- ускорить развитие паломнического туризма путем покрытия до 50% затрат на создание специализированных точек питания и туристско-развлекательных объектов вблизи этих объектов за счет внебюджетных средств «Фонда поддержки туристической отрасли»;

- широкое внедрение переводов и пропаганды фильмов об ученых и святынях на иностранные языки;

- расширение субсидируемых авиа и железнодорожных маршрутов, авиабилетов и гостиничных услуг

За счет эффективного использования богатой истории и культурного наследия Сурхандарьинской области, уникальных археологических памятников, святых мест паломничества в организации туристических услуг открываются возможности увеличения доли туристических услуг в текущем валовом региональном продукте в несколько раз.

**ANALYTICAL TOOLS USED IN DEVELOPING AN ORGANIZATION'S STRATEGY.****Usmonova Dilfuza Ilhomovna****Associate Professor, Samarkand Institute of Economics and Service, Samarkand, Uzbekistan****Usmanov Shakhzod Shokhrukhovich****2nd year student, group BH-222, Samarkand Institute of Economics and Service**

**Abstract:** This article discusses determining the organization's behavior strategy and implementing this strategy, the internal environment and external environment through strategic management, defining its goals and achieving them.

**Keywords:** Enterprises, strategy, behavior, management, achievement, market.

In modern Uzbekistan, which has firmly taken the path of a market economy, the role of marketing has increased many times over for activities both within the country and in foreign markets. Therefore, at the present stage, marketing is an important component of the practical activities of Uzbek enterprises. Currently, in all organizations without exception is possible only if the environment allows its implementation. The internal environment of an organization is the source of its lifeblood. It contains the potential that enables an organization to function, and, therefore, to exist and survive in a certain period of time. But the internal environment can also be a source of problems and even the death of an organization if it does not provide the necessary functioning of the organization.

The external environment is the source that supplies the organization with the resources necessary to maintain its internal potential at the proper level. The organization is in a state of constant exchange with the external environment, thereby providing itself with the opportunity to survive. But the resources of the external environment are not limitless. And they are claimed by many other organizations located in the same environment. Therefore, there is always the possibility that the organization will not be able to obtain the necessary resources from the external environment. This can weaken its potential and lead to many negative consequences for the organization. The task of strategic management is to ensure that the organization interacts with its environment in a way that allows it to maintain its potential at the level necessary to achieve its goals and thereby enable it to survive in the long term.

In order to determine the organization's behavioral strategy and implement this strategy, management must have an in-depth understanding of both the internal environment of the organization, its potential and development trends, and the external environment, its development trends and the place occupied by the organization in it. At the same time, both the internal environment and the external environment are studied by strategic management primarily in order to reveal those threats and opportunities that the organization must take into account when defining its goals and achieving them.

Strategic management views the environment as a combination of three environments; the macroenvironment, the immediate environment, and the internal environment.

The macroenvironment creates the general conditions in which an enterprise operates, defining for it and other enterprises the boundaries of what is acceptable and what is unacceptable.

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

Just as the atmosphere affects a person differently, the macroenvironment affects an organization to varying degrees depending on its level of "health."

The macroenvironment in relation to the enterprise is:

1. as a reason and condition for limiting (or expanding) activities;
2. as a prerequisite causing the need for changes in the enterprise.

The cornerstone of analyzing the situation in the industry and competition in it is a thorough study of the competition going on in the industry, identifying its sources and assessing the degree of influence of competitive forces. This step of analysis is especially important because it is impossible to develop a full-fledged strategy without a deep understanding of the nature of competition in the industry.

The analysis of buyers, as components of the immediate environment of the organization, primarily aims to compile a profile of those who buy the product sold by the organization. Studying customers allows an organization to better understand which product will be most accepted by customers, what sales volume the organization can expect, to what extent customers are committed to the product of this particular organization, how much the circle of potential buyers can be expanded, what awaits the product in the future, and much more. .

The analysis of suppliers is aimed at identifying those aspects in the activities of entities that supply the organization with various raw materials, semi-finished products, energy and information resources, finance, etc., on which the efficiency of the organization, the cost and quality of the product produced by the organization depend. Suppliers of materials and components, if they have great power, can make the organization very dependent on themselves. Therefore, when choosing suppliers, it is very important to deeply and comprehensively study their activities and their potential in order to be able to build relationships with them that would provide the organization with maximum strength in interaction with suppliers.

The study of competitors, that is, those with whom the organization has to fight for the resources that it seeks to obtain from the external environment in order to ensure its existence, occupies a special and very important place in strategic management. This study is aimed at identifying the strengths and weaknesses of competitors and, on the basis of this, building your competitive strategy. The competitive environment is formed not only by intra-industry competitors producing similar products and selling them on the same market. Subjects of the competitive environment are also those firms that can enter the market, as well as those firms that produce a substitute product. In addition to them, the organization's competitive environment is significantly influenced by its buyers and suppliers, who, having bargaining power, can significantly weaken the organization's position in the competitive field.

Many companies do not pay enough attention to the possible threat from aliens and therefore lose in the competition to those new to their market. It is very important to remember this and create barriers in advance to the entry of potential aliens. Such barriers may be in-depth specialization in the production of a product, low costs due to savings from large production volumes, control over distribution channels, the use of local features that give an advantage in competition, etc. However, any of these measures is effective only when it is a real barrier to the alien. Therefore, it is very important to know well what barriers can stop or prevent a potential newcomer from entering the market and erecting these particular barriers.

Manufacturers of substitute products have very great competitive power. The peculiarity of market transformation in the case of the appearance of a replacement product is that if it has killed

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

the market for the old product, then it usually cannot be restored. Therefore, in order to be able to adequately meet the challenge from firms producing a replacement product, the organization must have sufficient potential to move on to creating a new type of product.

Analysis of the labor market is aimed at identifying its potential in providing the organization with the personnel necessary to solve its problems. The organization must study the labor market both from the point of view of the availability of personnel with the required specialty and qualifications, the required level of education, the required age, gender, etc., and from the point of view of the cost of labor. An important area of studying the labor market is the analysis of the policies of trade unions that have influence in this market, since in some cases they can severely limit access to the labor force necessary for the organization.

It is recommended to end the analysis of the external environment by compiling a list of external dangers and opportunities that the organization faces in this environment. The presentation of this list may vary, but, as a rule, it should include weighing factors to rank them according to the degree of impact on the organization and assess the impact. For clarity and to facilitate the work of managers planning the company's strategy, all factors can be placed in two columns: one - opportunity factors, the other - threat factors, arranged in descending order of importance.

Having analyzed the external environment and obtained data on factors that pose threats or provide new opportunities, management must assess whether the firm has the internal strengths to take advantage of opportunities and what internal weaknesses may complicate future problems associated with external threats. This is done by analyzing the strengths and weaknesses of the organization. The method used to diagnose internal problems is called management survey. It is based on a comprehensive study of various functional areas of the organization and, depending on the task at hand, can be methodologically simple or more complex. For strategic planning purposes, it is recommended to include five functional areas in the survey - marketing, finance (accounting), production, personnel, as well as organizational culture and image of the organization.

When analyzing the functions of marketing, seven important elements of research are identified:

- market share and competitiveness;
- variety and quality of assortment;
- market demographics;
- market research and development;
- pre-sales and after-sales customer service;
- sales, advertising, product promotion;
- profit.

When analyzing the strengths and weaknesses of an organization, it is necessary to determine the key factors for the company's success.

Key success factors are factors specific to a given industry that bring advantages to it.

Identification of CFUs operating in the near future and identification of the most important ones among them constitute a significant part of the work on strategic planning. A company can gain a competitive advantage by focusing on one or more CFUs.

The result of the analysis of the external and internal environment is the preparation of a SWOT analysis, i.e. identification and assessment of internal weaknesses and strengths, as well as threats and opportunities from the external environment. Both the strengths and weaknesses of a company can have different meanings. Some weaknesses can have a fatal impact on the

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

organization, while others will not seriously affect the company or can be easily eliminated. The result of a SWOT analysis should be a predominance of strengths over weaknesses.

The results of this analysis lead to the development of alternative strategies for the operation of the enterprise and a decision on which path the organization's management should direct its activities to achieve the greatest success.

#### References:

1. Decree of the President of the Republic of Uzbekistan "On approval of the strategy for innovative development of the Republic of Uzbekistan for 2019 - 2021" dated September 21, 2018 No. UP-5544.T.2018.
2. Musaeva Sh.A. Integrated marketing communication Study guide "Mahorat" publishing house, Samarkand - 2022
3. Musaeva Sh.A., Usmonova DI Innovative marketing Study guide "TURON EDITION" 2021.
4. S Musayeva [WAYS TO IMPROVE DEMAND FORMATION AND SALES PROMOTION AT GOLDEN OIL LLC](#)  
Science and innovation 1 (A5), 215-220
5. MS Azimovna [Development of innovative marketing strategies in agriculture](#)  
Web of Scientist: International Journal of Scientific Research 3 (02), 538-544
6. MS Azimovna, RN Ulugbekovna [Development Conditions and Modern Trends of Business Tourism Worldwide](#) INTERNATIONAL JOURNAL OF BUSINESS DIPLOMACY AND ECONOMY 2 (2), 63-66
7. Kotler F. i dr. Basic marketing. - M.: LLC "ID Williams", 2013.
8. MS Azimovna [THE MAIN RESULTS OF THE LABOR PRODUCTIVITY OF THE STAFF OF THE HOTEL "BILLURI SITORA" LLC](#)  
Galaxy International Journal of Interdisciplinary Research 11(1), 348-352
9. MS Azimovna [THEORETICAL ASPECTS OF MARKETING TOOLS IN INCREASING THE INTERNATIONAL COMPETITIVENESS OF THE TEXTILE ENTERPRISE](#)  
Science and Innovation 2 (1), 47-53
10. S Musayeva [MECHANISMS OF FUNCTIONING OF LOGISTIC STRUCTURES](#)  
Science and innovation 2 (A2), 196-202
11. S Musayeva [WAYS TO IMPROVE THE POLICY OF DISTRIBUTION OF GOODS IN FURNITURE PRODUCTION ENTERPRISES](#) Science and innovation 2 (A2), 152-156
12. S Musayeva [IN THE CONDITIONS OF MODERNIZATION IN UZBEKISTAN THE NEED TO EVALUATE ENTERPRISES](#) Science and innovation 2 (A2), 35-40
13. MS Azimovna [Ways to Improve the Use of Marketing Information in the Assessment of "Stekloplastik" LLC](#) American Journal of Economics and Business Management 5(11), 338-343
14. MS Azimovna [Efficiency of advertising activities of trading organizations and ways to increase IT](#) Asian Journal of Research in Social Sciences and Humanities 12(3), 93-97
15. Usmanov IA, Musayeva Sh.A. Features of marketing activities in the construction industry of the Republic of Uzbekistan. NOVATEUR PUBLICATIONS JournalNX- A Multidisciplinary Peer Reviewed Journal ISSN No: 2581 - 4230 VOLUME 7, ISSUE 1, Jan. - 2021 <https://repo.journalnx.com/index.php/nx/article/view/793>

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

16. Usmanov IA Musaeva Sh.A. Features of marketing organization in the market of construction services. Service. Scientific journal. - Samarkand. No. 2, 2021 - pp. 86-90.
17. Usmanov IA Study of the Provision of Construction Facilities with Management Personnel. INTERNATIONAL JOURNAL ON ORANGE TECHNOLOGY. Volume: 03 Issue: 9 | Sep 2021. p.31-33 <https://journals.researchparks.org/index.php/IJOT/article/view/2171>
18. Usmanov IA, Jumanov Sh.N. Ways to improve quality control of construction and installation works. Oriental renaissance: innovative, educational, natural and social sciences scientific journal. ISSN 2181-1784. Volume 1, Issue 10. November 2021. – P. 651-658 <https://cyberleninka.ru/article/n/ways-to-improve-quality-control-of-construction-and-installation-works>
19. Usmanov IA Buriev HT A development strategy for the construction industry in Uzbekistan: organizational aspects of implementation. International scientific and technical journal. Real estate: economy, administration. Moscow, MGSU-No. 4/2021
20. Usmanov Ilkhom Achilovich, RESEARCH OF MARKETING ACTIVITIES OF S SHARQ-UNIVERSAL-SMK LLC SCIENCE AND INNOVATION INTERNATIONAL SCIENTIFIC JOURNAL VOLUME 1 ISSUE 6 UIF-2022: 8.2 | ISSN: 2181-3337
21. Usmonova Dilfuza Ilkhomovna, EXAMINATION OF THE INVESTMENT PROJECT OF LEASING COMPANIES SCIENCE AND INNOVATION INTERNATIONAL SCIENTIFIC JOURNAL VOLUME 1 ISSUE 7 UIF-2022: 8.2 | ISSN: 2181-3337
22. Musaeva Sh.A. Marketing research. Textbook "STAR-SEL" LLC publishing and creative department. Samarkand-2023

**ASSESSMENT OF THE STATE OF POST-VACCINATION IMMUNITY TO MEASLES IN CHILDREN WITH POST-CAVID LONG SYNDROME AND OPTIMIZATION OF PREVENTIVE MEASURES TO REDUCE THE INCIDENCE OF MEASLES**

**Kenjayeva Dilorom Toshtemirovna**  
**Termez branch of Tashkent medical academy**

**Abstract:** Patients with juvenile idiopathic arthritis (JIA) may have low protective levels of antibodies to vaccine antigens due to the immunologic features of the disease, disrupted vaccination schedules, and use of immunosuppressive medications. The purpose of the study was to study the state of post-vaccination immunity and determine the factors associated with the preservation of the protective level of antibodies in patients with JIA.

**Key words:** children, juvenile idiopathic arthritis, vaccine prevention, antibody titer, measles, rubella, mumps, hepatitis B, diphtheria, risk factors.

Juvenile idiopathic arthritis (JIA) is one of the most common rheumatic diseases of childhood, with a prevalence of approximately 1 in 1000 children [1]. For the treatment of JIA, drugs that suppress the activity of the immune system are used: methotrexate, cyclosporine A, systemic glucocorticosteroids, genetically engineered biological drugs (GEBPs) [2]. For this reason, as well as due to dysfunction of the immune system associated with the pathogenesis of the disease itself, patients with JIA are highly susceptible to pathogens of infectious diseases [3–5].

Intercurrent infections can cause exacerbations of JIA and require discontinuation of ongoing immunosuppressive therapy, which negatively affects the achievement or maintenance of an inactive disease state [6]. Patients receiving immunosuppressive drugs are characterized by more severe infections, the need for prolonged antibacterial therapy, the use of “reserve” antibiotics and intravenous immunoglobulin [3–5]. For viral infections, such as mumps and measles, there is no specific therapy, and the presence of a background immunosuppressive state leads to an increased risk of complications and death in children with immunopathological diseases [7].

The most effective way to prevent the development of vaccine-preventable infections in patients with JIA is vaccination [8]. However, such patients may have an inadequate immune response to vaccination, including due to a low antibody titer compared to healthy peers or their rapid loss during therapy [9]. In approximately 40% of children with JIA, the onset of the disease occurs in the second year of life [2]. As a result, in such patients, primary vaccination is often not carried out, and not only parents, but also rheumatologists who observe the child refuse revaccination [2].

The purpose of the study was to study the state of post-vaccination immunity and determine the factors associated with the preservation of the protective level of antibodies in patients with JIA.

Eligibility criteria Inclusion criteria:

- patients with JIA aged 2–17 years, routinely vaccinated before the age of 2 years of life (before the development of JIA) against measles, rubella, mumps, hepatitis B and diphtheria.

Non-inclusion criteria: •

- routine vaccination within 6 months prior to inclusion in the study;



- administration of intravenous immunoglobulin or blood plasma preparations during the 12 months preceding inclusion in the study;
- taking cytotoxic drugs (except methotrexate) in the past or at the time of inclusion in the study.

The diagnosis of JIA was made (N.A. Lyubimova, M.M. Kostik) according to the criteria of the International League of Associations for Rheumatology (ILAR) [10]. Information on past routine vaccinations against measles, rubella, mumps, hepatitis B and diphtheria was obtained from vaccination cards (Form 63) stored with each patient's medical records.

Information on vaccination in the last 6 months and the administration of intravenous immunoglobulin or blood plasma preparations in the last 12 months was obtained from preventive vaccination cards, as well as by interviewing the patient's legal representatives. Data on the use of cytotoxic drugs (except methotrexate) were obtained by studying the patient's medical documentation (discharge certificates, child development chart) and by interviewing patients or their parents.

Venous blood samples (4 ml) were taken on an empty stomach on the day the child was admitted to the hospital. Samples were centrifuged at 1200 rpm for 15 min. The serum was collected in separate tubes, frozen at  $-20^{\circ}\text{C}$  and then transported to the laboratory of virological and molecular biological research methods of the Federal State Budgetary Institution "Children's Scientific and Clinical Center for Infectious Diseases of the Federal Medical and Biological Agency" (Moscow) in compliance with the cold chain.

Immunoglobulin (Ig) G levels were determined by enzyme immunoassay [11] using an open-type Lasurit device (Dynex Technologies Inc., USA). For measles, rubella, mumps, and hepatitis B, commercial kits "Vector-Best" (Russia) were used, for diphtheria – IBL International GMBH (Germany). IgG concentrations were determined from calibration curves generated using Dynex Technologies Inc. software. (USA). The minimum protective level of antibodies was established in accordance with the criteria specified in the manufacturer's instructions: for anti-measles IgG - 0.18 IU/ml (coefficient of variation, CV, 8%; analytical sensitivity 0.07 IU/ml), for antibodies to the rubella virus - 10 IU/ml (8%; 2 IU/ml), for hepatitis B (anti-HBs antibodies) - 10 mIU/ml (8%; 2 mIU/ml), for diphtheria toxoid - 0.09 IU/ml (7, 5%; 0.004 IU/ml). The minimum protective concentration of IgG to the mumps virus was established at a positivity rate of  $> 1.0$ . The positivity rate was calculated as the ratio of the optical density (OD) obtained in dual-wavelength (450/620 nm) mode in the well with the patient sample to the critical OD (OPcrit), calculated by the formula:

$$\text{OPcrit} = \text{OPsr(K-)} + 0.3,$$

where OPsr(K-) is the arithmetic mean value of OD in wells with a negative control sample.

Among the predictors of the preservation of post-vaccination immunity (the minimum protective level of antibodies), we considered the characteristics of therapy (use in the past or at the time of inclusion in the study of glucocorticosteroids, methotrexate, biologically active drugs), the number of vaccinations (1 each against measles, rubella and mumps,  $> 1$  against hepatitis B and diphtheria), duration of JIA, age of the child.

The preservation of post-vaccination immunity was studied in three age groups: up to 7 years, 8–12 years and 13–17 years. The choice of age periods is determined by the timing of vaccinations in accordance with the national calendar of preventive vaccinations.

The study sample size was not pre-calculated. The analysis of the obtained data was carried out using the statistical software package STATISTICA, version 10.0 (StatSoft Inc., USA).

The description of quantitative indicators is carried out with the indication of the median (25th; 75th percentile). Comparison of qualitative indicators was carried out using the Pearson test 2. Independent predictors of maintaining the minimum protective level of antibodies were established using binary logistic regression by including in the analysis quantitative and qualitative indicators associated with the dependent variable (patients with a minimum protective level of antibodies to the corresponding infection) according to the results of univariate regression analysis. The multivariate statistical model took into account age at the time of inclusion in the study, the number of vaccinations, the fact of treatment with glucocorticosteroids, methotrexate, biological medications, and the duration of JIA. The results of the regression analysis are described with the indication of the slope ( ) and standard error (SE). The coefficient of determination ( $R^2$ ) was taken into account from the parameters of the multivariate regression model. Differences or relationships were considered statistically significant at  $p < 0.05$ .

The study included 90 patients (64 girls) with JIA at the age of 11.3 (7.5; 14.9) years, 438Original article age of onset of the disease - 6.0 (4.0; 8.0) years, duration of JIA before inclusion in the study - 4.0 (2.0; 7.3) years. Oligoarticular variant of JIA was present in 38 (42%) patients, polyarticular - in 36 (40%), systemic arthritis - in 7 (8%), enthesitis-associated arthritis - in 9 (10%) patients. Uveitis was diagnosed in 11/89 (12%). In 1 patient, data on the results of examination by an ophthalmologist were missing. 24 patients (27%) out of 88 received glucocorticosteroid therapy in the past or at the time of inclusion in the study, 81/88 (92%) received methotrexate, 54/89 (61%) received GEBD, of which 31 (57%) received factor inhibitors. tumor necrosis alpha; 11/54 (20%) people were receiving more than one steroid. 52 (58%) children received revaccination against the measles, rubella, and mumps virus.

Less often (50–54% of children in the study sample), the minimum protective level of antibodies was detected to measles viruses, hepatitis B and diphtheria toxoid, in 2/3 of patients - to the mumps virus, in the majority of children with JIA - to the rubella virus (Table 1). No differences were found in age groups in the frequency of children with minimal protective levels of antibodies.

According to univariate regression analysis, the following predictors of preservation of post-vaccination immunity were identified:

- to the measles virus: duration of JIA, age at the time of inclusion in the study, number of vaccinations, therapy with biologically active drugs;
- to diphtheria toxoid: age at the time of inclusion, use of glucocorticosteroids.

According to the results of multivariate regression analysis, predictors of maintaining the minimum protective level of antibodies to the measles virus were the number of vaccinations against measles, and to diphtheria toxoid - the duration of JIA and glucocorticosteroid therapy (Table 3). No statistically significant predictors of the preservation of post-vaccination immunity against mumps and hepatitis B were identified.

A significant number of patients with JIA (from 32 to 50%) have insufficient protective levels of antibodies to measles, mumps, hepatitis B viruses and diphtheria toxoid. However, the majority of patients with JIA retain post-vaccination immunity to the rubella virus. Predictors of

preservation of post-vaccination immunity were booster vaccinations and shorter disease duration.

The main limitations of the study are related to the small sample size, different ages of the included patients, different duration of the disease, as well as differences in the number of previous vaccinations. The small sample size did not allow risk factor analysis to fully assess immunity against rubella and hepatitis B. It should be noted that the study did not have a control group, which did not allow us to fully assess the dynamics of the decrease in antibody formation in healthy children without risk factors. The presence of a control group would allow us to evaluate whether the studied predictors actually influence the decrease in antibody production or not. Limitations of the study could affect the correctness of determining the predictors of preservation of post-vaccination immunity, i.e. the studied factors could be erroneously regarded as possible predictors (lack of a control group), and the role of other factors, for example, the combination of drugs with the duration of JIA, the age of prescription of certain drugs and duration of therapy that were important could not be identified. How each of the risk factors separately (medicines, number of vaccinations, disease duration, arthritis subtype) could influence it is impossible to determine unambiguously due to the fact that some patients received combination therapy, and the groups were not stratified by age of onset and/or disease duration. Perhaps a larger sample size would have allowed for more detailed subgroup analyses. We also did not take into account factors such as duration of therapy, cumulative doses, and combination of treatment methods. One patient could receive several types of therapy, as well as other concomitant pathology, which could affect the rate of drug elimination and, indirectly, the characteristics of the immune response. An error in the study is allowed due to the accuracy of the measurement methods (CV of the methods used to determine the level of antibodies was in the range of 7.5–8%).

JIA is an immunopathological disease that requires the use of immunosuppressive drugs to achieve remission [2]. The immune mechanisms underlying the genesis of this disease, as well as the use of drugs that affect the function of memory B cells and plasma cells, can lead to the loss of the protective titer of measles post-vaccination antibodies in a shorter period of time than in the population [12, 13]. According to a population study, the protective titer of anti-measles antibodies was determined in 85% of healthy children aged 3–6 and 7–14 years [14]. In another study, the proportion of healthy children who do not have a minimum protective titer of anti-measles antibodies in the period from 2 months to 5 years after a single vaccination is 10-12%, in the period from 4 months to 9 years after revaccination - 13-17% [15]. After vaccination against the mumps virus in the period from 2 months to 5 years, from 5 to 9% of healthy children did not have a minimum protective titer of antibodies; in the period from 4 months to 9 years after revaccination - from 2 to 13%. After vaccination against rubella, 6.9% of healthy children did not have the minimum protective antibody titer [15]. In our sample, the proportion of children who did not have a minimum protective titer of antibodies to these infections was lower than that found in population studies, with the exception of immunity against rubella. The latter can be explained by the high proportion of children who had rubella in an erased form due to primary vaccination.

According to seromonitoring data, the proportion of people with a protective antibody titer against the hepatitis B virus 3 months after vaccination is 99%, and 77% after 7 years. In case of violation of the vaccination schedule, the proportion of healthy people with a minimum

protective antibody titer is 53% [16]. In our study, despite the absence of patients with a disrupted vaccination schedule against hepatitis B, the proportion of children with JIA with a minimal protective titer of antibodies against the hepatitis B virus was 54%. A protective titer of antibodies against diphtheria toxoid was detected in 95–97% of the child population, of which 96% aged 3–4 years, 98% aged 15–17 years, 93% of adults with high immunity (85, 91 and 81%, respectively) [17, 18].

An early age at the onset of JIA, after which vaccine prevention is stopped in real clinical practice, leads to a lower level of antibodies in older children [9]. In our study, only 52% of children received revaccination against measles, while the coverage of revaccination against measles, according to the Moscow Government Health Committee, reaches 99% [14]. An incomplete vaccination complex is an independent predictor of the absence of a protective antibody titer in our sample.

Previously published studies assessed the effect of drugs on the quality of antibody formation after vaccination. It was shown that methotrexate did not have a significant effect on the short-term and long-term effectiveness of antibody formation when administered various vaccines, such as measles, rubella, mumps, tetanus, diphtheria, hepatitis B [9, 19]. Regression models also did not show a significant effect of methotrexate on the protective level of antibodies against measles, rubella, mumps, diphtheria and tetanus toxoid viruses [9]. In our study, when comparing patients who received and did not receive methotrexate therapy, there were also no statistically significant differences in antibody levels. However, given the fact that it is impossible to assess the role of methotrexate alone without taking into account other risk factors, it can be assumed that methotrexate does not have a significant effect on the process of antibody formation.

When studying the effect of biologically active drugs, it was shown that in the majority of patients with JIA who received biologically active drugs, post-vaccination antibodies were preserved. However, a number of studies have shown that the average level of anti-measles antibodies, antibodies to meningococcus type C and pneumococcus in patients using biological drugs was lower or decreased more rapidly over time than in patients not receiving biologic drugs [20–22]. GEBD therapy is usually prescribed to patients with a longer duration of the disease. Our study found that among patients receiving biological therapy, the proportion of patients who had a protective titer of measles antibodies was lower (48%) compared to those who did not receive biological therapy (73%):  $p = 0.013$ ; odds ratio 3.0; 95% confidence interval 1.2–7.3. These differences were not confirmed by the results of multivariate analysis.

Children with JIA treated with systemic glucocorticosteroids generally maintained minimal protective antibody titers after vaccination, but their geometric mean levels may have been lower compared to patients who did not receive such treatment [23]. In general, there was no significant effect of glucocorticosteroids on the levels of post-vaccination antibodies against mumps, measles and rubella, tetanus and diphtheria [9, 24, 25], however, it is important to consider the duration of this therapy and the cumulative doses of drugs. Children with JIA who received therapy with glucocorticosteroids and methotrexate and were vaccinated against hepatitis B had an adequate immune response [9, 19].

JIA is an example of an immunocompromised disease in which the effectiveness of vaccination against childhood infections may be reduced due to the duration and form of JIA, immunosuppressive therapy, and violations of the revaccination schedule. Subsequent studies are

needed to study in more detail the dynamics of the preservation of the specific immune response in patients with JIA in order to develop individual revaccination algorithms.

**Literature:**

1. Ravelli A, Martini A. Juvenile idiopathic arthritis. *Lancet*. 2007; 369(9563):767–778. doi: 10.1016/S0140-6736(07)60363-8.
2. Cassidy JT, Petty RE. Textbook of pediatric rheumatology. Elsevier Saunders; 2005. 792 p.
3. Beukelman T, Xie F, Chen L, et al; SABER Collaboration. Rates of hospitalized bacterial infection associated with juvenile idiopathic arthritis and its treatment. *Arthritis Rheum*. 2012;64(8):2773–2780. doi: 10.1002/art.34458.
4. Salvana EM, Salata RA. Infectious complications associated with monoclonal antibodies and related small molecules. *Clin Microbiol Rev*. 2009;22(2):274–290. doi: 10.1128/CMR.00040-08.
5. Giancane G, Swart J, Bovis F, et al. Risk of infections in juvenile idiopathic arthritis patients treated with biologic agents and/or methotrexate: results from pharmachild registry. Abstract number: 3116. Available from: <https://acrabstracts.org/abstract/risk-of-infections-in-juvenile-idiopathic-arthritis-patients-treated-with-biologic-agents-and-or-methotrexate-results-from-pharmachild-registry/>.
6. Abinun M, Lane JP, Wood M, et al. Infection-related death among persons with refractory juvenile idiopathic arthritis. *Emerg Infect Dis*. 2016;22(10):1720–1727. doi: 10.3201/eid2210.151245.
7. Castillo RD, De la Pena W, Marzan KA. Diagnosis and management of infectious complications of childhood rheumatic diseases. *Curr Rheumatol Rep*. 2013;15(4):322. doi: 10.1007/s11926-013-0322-6.
8. Heijstek MW, Ott de Bruin LM, Bijl M, et al.; EULAR. EULAR recommendations for vaccination in paediatric patients with rheumatic diseases. *Ann Rheum Dis*. 2011;70(10):1704–1712. doi: 10.1136/ard.2011.150193.
9. Heijstek MW, van Gageldonk PG, Berbers GA, et al. Differences in persistence of measles, mumps, rubella, diphtheria and tetanus antibodies between children with rheumatic disease and healthy controls: a retrospective cross-sectional study. *Ann Rheum Dis*. 2012;71(6):948–954. doi: 10.1136/annrheumdis-2011-200637.
10. Petty RE, Southwood TR, Manners P, et al. International League of Associations for Rheumatology classification of juvenile idiopathic arthritis: second revision, Edmonton, 2001. *J Rheumatol*. 2004;31(2):390–392.
11. МУ 3.1.2943-11 Организация и проведение серологического мониторинга состояния коллективного иммунитета к инфекциям, управляемым средствами специфической профилактики (дифтерия, столбняк, коклюш, корь, краснуха, эпидемический паротит, полиомиелит, гепатит В) [интернет]. [МУ 3.1.2943-11 Organizatsiya i provedeniye serologicheskogo monitoringa sostoyaniya kollektivnogo immuniteta k infektsiyam, upravlyayemym sredstvami spetsificheskoy profilaktiki (difteriya, stolbnyak, koklyush, kor', krasnukha, epidemicheskij parotit, poliomyelit, gepatit V). (In Russ).] Доступно по: <http://docs.cntd.ru/document/1200088401>. Ссылка активна на 12.04.2019.

12. Кошчева Ю.В., Харит С.М., Калинина Н.М. Особенности течения дифтерийного вакцинального процесса у детей с ревматическими заболеваниями // Журнал микробиологии, эпидемиологии и иммунобиологии. — 2001. — № 6. — С. 44–49. [Koshcheeva IV, Kharit SM, Kalinina NM. Specific features of diphtheria vaccinal process in children with rheumatic diseases. Journal of microbiology, epidemiology, and immunobiology. 2001;(6): 44–49. (In Russ).]
13. Харит С.М. Вакцинопрофилактика детей с иммунопатологическими заболеваниями // Фарматека. — 2003. — № 2. — С. 33–37. [Kharit SM. Vaksinoprofilaktika detey s immunopatologicheskimi zabolevaniyami. Farmateka. 2003;(2):33–37. (In Russ).]
14. Heijstek MW, Kamphuis S, Armbrust W, et al. Effects of the live attenuated measles-mumps-rubella booster vaccination on disease activity in patients with juvenile idiopathic arthritis: a randomized trial. JAMA. 2013;309(23):2449–2456. doi: 10.1001/jama.2013.6768.
15. Клинико-лабораторная диагностика коревой инфекции. Информационное письмо № 16. — М., 2002. — 15 с. [Klinikolaboratornaya diagnostika korevoy infektsii. Informatsionnoye pis'mo №16. Moscow; 2002. 15 p. (In Russ).]
16. Заргарьянц А.И., Яковлева И.В., Селезнева Т.С., и др. Длительность и напряженность поствакцинального гуморального иммунитета к вирусам кори, паротита и краснухи // Эпидемиология и вакцинопрофилактика. — 2005. — № 5. — С. 15–19. [Zargar'yants AI, Yakovleva IV, Selezneva TS, et al. Dlitel'nost' i napryazhennost' postvaksinal'nogo gumoral'nogo immuniteta k virusam kori, parotita i krasnukhi. Epidemiologiya i vaksinoprofilaktika. 2005;(5):15–19. (In Russ).]
17. Шульгина Н.И., Стасенко В.Л. Оценка длительности и напряженности поствакцинального гуморального иммунитета к гепатиту В у лиц декретированных групп // Эпидемиология и вакцинопрофилактика. — 2011. — № 1. — С. 68–73. [Shulgina NI, Stasenko VL. Assessment of duration and intensity of post-vaccination humoral immunity to hepatitis B patients decreed groups. Epidemiologiya i vaksinoprofilaktika. 2011;(1):68–73. (In Russ).]
18. Якимова Т.Н. Эпидемиологический надзор за дифтерией в России в период регистрации единичных случаев заболевания: Автореф. дис. канд. мед. наук. — М., 2015. — 22 с. [Yakimova TN. Epidemiologicheskii nadzor za difteriyey v Rossii v period registratsii edinichnykh sluchayev zabolevaniya. [dissertation abstract] Moscow; 2015. 22 p. (In Russ).] Доступно по: <https://search.rsl.ru/ru/record/01006646046>. Ссылка активна на 14.06.2019.
19. Kasapcopur O, Cullu F, Kamburoglu-Goksel A, et al. Hepatitis B vaccination in children with juvenile idiopathic arthritis. Ann Rheum Dis. 2004;63(9):1128–1130. doi: 10.1136/ard.2003.013201.
20. Borte S, Liebert UG, Borte M, et al. Efficacy of measles, mumps and rubella revaccination in children with juvenile idiopathic arthritis treated with methotrexate and etanercept. Rheumatology (Oxford). 2009;48(2):144–148. doi: 10.1093/rheumatology/ken436.
21. Stoof SP, Heijstek MW, Sijssens KM, et al. Kinetics of the long-term antibody response after meningococcal C vaccination in patients with juvenile idiopathic arthritis: a retrospective cohort study. Ann Rheum Dis. 2014;73(4):728–734. doi: 10.1136/annrheumdis-2012-202561.
22. Farmaki E, Kanakoudi-Tsakalidou F, Spoulou V, et al. The effect of anti-TNF treatment on the immunogenicity and safety of the 7-valent conjugate pneumococcal vaccine in

children with juvenile idiopathic arthritis. *Vaccine*. 2010;28(31):5109–5113. doi: 10.1016/j.vaccine.2010.03.080.

23. Groot N, Heijstek MW, Wulfraat NM. Vaccinations in paediatric rheumatology: an update on current developments. *Curr Rheumatol Rep*. 2015;17(7):46. doi: 10.1007/s11926-015-0519-y.

24. Miyamoto M, Ono E, Barbosa C, et al. Vaccine antibodies and T- and B-cell interaction in juvenile systemic lupus erythematosus. *Lupus*. 2011;20(7):736–744. doi: 10.1177/0961203310397409.

25. Ogimi C, Tanaka R, Saitoh A, Oh-Ishi T. Immunogenicity of influenza vaccine in children with pediatric rheumatic diseases receiving immunosuppressive agents. *Pediatr Infect Dis J*. 2011;30(3): 208–211. doi: 10.1097/INF.0b013e3181f7ce44.



УДК: 664.8.03+664.854

**AGROBIOLOGICAL CHARACTERISTICS OF APPLE VARIETIES SUITABLE FOR DRYING**

**Islamov Sohob Yaxshibekovich , Karimova Dilnoza Zafarjon qizi**

1. Professor of Tashkent State Agrarian University
2. Urganch State University assistant professor

***Abstract.** This article describes the results of studies on the agrobiological characteristics of apple varieties suitable for drying. Here, the main indicators of the apple varieties selected for the experiments were analyzed. As a result of the research, scientifically based conclusions were made.*

***Keywords.** Apples, productivity, quality, autumn and winter varieties,*

**Enter.** The climatic changes observed in recent years and the year-by-year increase in population demand the introduction of varieties of medicinal plants that are resistant to external factors and have food value in all countries. According to the information provided by FAO, 44% of orchards on earth correspond to the share of introduced plants. Currently, the scientists of countries such as the USA, Poland, Turkey and Japan, which are the leaders in the cultivation and export of apples around the world, are conducting scientific research on the quality and shelf life of apple fruits. In the same way, it is necessary to develop effective elements of preservation of apples grown in our republic. In recent years, in this regard, measures have been taken in our republic to increase the shelf life of apple varieties suitable for storage, to improve quality indicators while preserving their biochemical composition.

The purpose and specific issues of the research. It consists in improving the technological processes in order to increase the quality of the finished product in drying apples.

Material and methods. Researches were conducted on the following varieties of apples: Borovenka Tashkentskaya, Golden Delishes, Jonathan, Kamola, Kizil taram apple, Gozal, Mantet, Aydin, Pervenets Samarkanda, Renet Simerenko, Rozmarin Bely, Saratoni, Farangiz, Feruza.

According to the method of conducting research:

- a) Carrying out observations on the vegetative periods of apple fruits;
- b) determination of productivity indicators of apple fruits;
- c) determination of technical maturity indicators of apple fruits

**RESEARCH RESULT AND DISCUSSION**

Research was conducted in Khiva district of Khorezm region during 2021-2023. Observations were carried out on a 10-ha field for all varieties selected in this farm. There are many apple orchards in this district on large areas of land. Observations were made on the basis of autumn and winter varieties of apples at the "DAVRON" farm of Gandimyon district, which was selected for the experiment. Agrobiological indicators were studied according to the data on observations made on autumn varieties (see Table 1).



Table 1

Agrobiological characteristics of apple autumn varieties (2021-2023)

	Varietal name	Years	From flowering to ripening, days	Productivity, t/ha	A crop suitable for drying		Invalid crop	
					t/ra	%	t/ra	%
.	Red Delishes	2021	145±2	40,1±1	39,1±3	97,5	1,0	2,5
		2022	147±3	42,3±3	41,2±2	97,4	1,1	2,6
		2023	149±3	43,1±2	41,9±3	97,2	1,2	2,8
		Average	147	41,8	40,7	97,4	1,1	2,6
.	Golden Delishes	2021	140±2	48,3±4	47,5±4	98,3	0,8	1,7
		2022	145±2	49,6±3	48,7±3	98,2	0,9	1,8
		2023	143±4	50,8±2	50,0±3	98,4	0,8	1,6
		Average	143	49,6	48,7	98,3	0,8	1,7
.	Mantet	2021	139±3	39,2±2	38,1±2	97,2	1,1	2,8
		2022	141±2	41,1±3	39,9±1	97,1	1,2	2,9
		2023	140±2	42,4±2	41,1±2	96,9	1,3	3,1
		Average	140	40,9	39,7	97,1	1,2	2,9
.	Red apple	2021	115±2	45,2±2	44,2±2	97,8	1,0	2,2
		2022	120±3	48,6±3	47,5±3	97,7	1,1	2,3
		2023	118±1	44,1±1	43,2±2	98,0	0,9	2,0
		Average	118	46,0	45,0	97,8	1,0	2,2

Observations were made on the agrobiological characteristics of the studied autumn varieties from flowering to ripening. According to the results of observation, the ripening period of the autumn varieties is the shortest in the Kizy Taram apple variety from 115 to 120 days, in the Mantet variety in 139-140 days, and in the Golden Delishes variety, these periods are 140-143 days. From the same autumn varieties, it was shown that the Red Delishes variety ripened in 145-149 days. It was also observed in the Kizy Taram apple variety, which is distinguished by the shortest ripening period among the autumn varieties suitable for storage. Due to the early ripening of the Kyzyl Taram apple variety, it was observed that the size of the fruits is also small compared to other varieties.

When analyzing the yield indicators of autumn varieties, the highest average yield was Golden Delishes, and an average yield of 49.6 tons per hectare was obtained. At the same time, the Kyzyl Taram apple variety showed a high productivity index, and an average yield of 46.0 tons per hectare was obtained.

Among edible and drying autumn apple varieties, Red delicacies and Mantet varieties have the highest number of unusable apples in terms of yield. In particular, the productivity of the Red deliciouses variety was 41.8 tons, correspondingly, apples not suitable for processing and consumption were 1.1 tons, which is 2.6% of the total harvest. Similarly, in the Mantet variety, the yield was 40.9 tons, but it can be seen that 1.2 tons or 2.9% of the yield was separated into poor quality products.

If it is analyzed in terms of years, it is shown that the non-storable crop grown in the last year 2021 has increased up to 3.1%. Due to the improper use of these cultivation, soil and climatic conditions, such a poor quality product is grown and storage problems arise.

So, in our research, it is possible to obtain high-quality, storable apples from autumn varieties in the Golden Delishes variety. The lowest indicator was recorded in this variety, the total yield was 49.6 tons, and the low-quality yield was 0.8 kg, which was 1.7% of the total yield.

Observations were made to study the agrobiological characteristics of the winter varieties selected for the experiment, including the processes from flowering to ripening. According to the results of observation, among the experimental winter varieties, the ripening period of Rosemary Belly variety is 168 to 170 days, the Pink Lady variety ripens in 226-227 days, and the Fuji variety ripens in 172-180 days. From the same winter varieties, the Jeromin variety ripened in 149-150 days. It was also observed in the Rosmarin bely variety, which is distinguished by the shortest ripening period among the winter varieties suitable for consumption and processing. Due to the early ripening of Renet Simirenko and Farangiz apple varieties, it was observed that the size of the fruits is smaller than the total number of the harvest compared to other varieties.

Analyzing the yield indicators of winter varieties, the highest average yield was in the Pink Lady variety, with an average yield of 52.6 tons per hectare. At the same time, the Rosemary Bely variety showed a high yield, and an average yield of 51.9 tons per hectare was obtained.

Farangiz and Jeromin varieties of winter apples, which showed low productivity compared to other varieties, had the most unfit for storage and processing apples in relation to the total yield. In particular, the yield of the Renet Simerenko variety was 44.4 tons, correspondingly, 1.3 tons of apples unsuitable for storage and processing were 2.9% of the total harvest. Similarly, in the Jeromin variety, the yield was 46.2 tons, and 1.5 tons or 3.3% of apples were unfit for storage and processing.

Table 2

Agrobiological characteristics of apple winter varieties (2021-2023)

	Varietal name	Years	From flowering to ripening, days	Productivity, t/ha	A crop suitable for drying		Invalid crop	
					т/га	%	т/га	%
.	Renet Simirenko	2021	168±3	44,6±3	43,3±2	97,1	1,3	2,9
		2022	169±2	43,3±3	42,1±2	97,2	1,2	2,8
		2023	167±3	45,2±2	43,8±3	96,9	1,4	3,1
		Ўртача	168,0	44,4	43,1	97,1	1,3	2,9
.	Rosemary bely	2021	169±4	50,1±2	49,4±3	98,6	0,7	1,4
		2022	168±2	51,4±4	50,8±2	98,8	0,6	1,2
		2023	170±3	54,2±3	53,4±3	98,5	0,8	1,5
		Ўртача	169,0	51,9	51,2	98,7	0,7	1,3
.	Pink Lady	2021	225±4	50,6±2	49,9±4	98,6	0,7	1,4
		2022	228±3	52,4±4	51,6±3	98,5	0,8	1,5
		2023	226±4	54,9±3	54,0±4	98,4	0,9	1,6
		Ўртача	227,0	52,6	51,8	98,5	0,8	1,5

.	Fuji	2021	171±3	43,6±3	42,5±3	97,5	1,1	2,5
		2022	172±3	45,7±3	44,5±2	97,4	1,2	2,6
		2023	180±2	47,1±2	45,8±2	97,2	1,3	2,8
		Ўртача	174,0	45,5	44,3	97,4	1,2	2,6
.	Farangiz	2021	145±3	40,2±2	39,2±4	97,5	1	2,5
		2022	146±2	41,1±4	39,9±2	97,1	1,2	2,9
		2023	148±3	40,3±3	39,1±3	97,0	1,2	3,0
		Ўртача	146,0	40,5	39,4	97,2	1,1	2,8
.	Jerome	2021	150±2	45,1±3	43,7±3	96,9	1,4	3,1
		2022	152±2	46,8±4	45,1±2	96,4	1,7	3,6
		2023	149±3	46,8±3	45,3±2	96,8	1,5	3,2
		Ўртача	150,3	46,2	44,7	96,7	1,5	3,3

If we analyze it in terms of years, it can be seen that the last year 2021 unfit for storage crop has increased up to 3.1% in Renet Simerenko variety, 3.0% in Farangiz variety, and 3.2% in Jeromin variety. Due to the improper use of these cultivation, soil and climatic conditions, such a poor quality product is grown and storage problems arise.

As a result of the research and analysis of the agrobiological characteristics of apple varieties suitable for drying, it can be concluded as follows:

From the winter varieties, you can get high-quality apple fruits, suitable for storage and processing, in the Pink Lady and Rosemary bely varieties. The lowest indicator was recorded in this variety, and the total yield was 51-52 tons, while the low-quality yield was 0.7-0.8 kg, which is 1.3-1.5% of the total yield.

#### LIST OF REFERENCES

1. Islamov S., Namazov I. Determination of Apple Harvesting Time in Intensive Gardens // International Journal of Biological Engineering and Agriculture (Sep, 2023). – USA, 2023. – Volume 2. – Issue 9. – P. 48-50 (ISSN: 2833-5376; IF (Impact Factor) 9.51/2023)
2. Umidov Sh. E., Berdiev J. N. Varieties of Quince (Cydonia Oblonga Mill.) Grown In Uzbekistan and The Importance of Their Storage and Processing //Texas Journal of Agriculture and Biological Sciences 23, 44-48
3. Polegaev V.I. Method otsenki quality of fruits and vegetables (Metodicheskie razrabotki). M.: - 1978.- 66 p
4. Khaitov B., Karimov A.A., Toderich K., Sultanova Z., Mamadrahimov A., Allanov Kh., Islamov S. Adaptation, grain yield and nutritional characteristics of quinoa (Chenopodium quinoa) genotypes in marginal environments of the Aral Sea basin // Journal of Plant Nutrition 21 Dec 2020). – London, 2020. – P. 1365-1379 (doi.org/10.1080/01904167.2020.1862200)

**Medical and social aspects of the prevalence of road traffic injuries among children.**

**A.S. Omanova,**

Urgench branch of the Tashkent Medical Academy

**Relevance of the topic**

In recent years, road traffic accidents involving children and the resulting injuries, disabilities, and death rates have been growing, especially in middle and low-income countries [9], including our country, among the important medical, social, and organizational issues. One is counted. The seriousness of the problem is that injuries sustained in more than 10% of traffic accidents are a combination of many types of injuries. If 1.2 million people die in road traffic accidents every year, 20-50 million people are injured and disabled. It is noteworthy that more than half of those who died are aged 15-44. Road traffic accidents are the second leading cause of death among 5-14-year-olds and 15-29-year-olds. It is noted that traffic accidents among boys are 1.5 times higher than among girls. According to the WHO European Regional Bureau, death among children under the age of 20 due to traffic accidents is 5.24 per 100 car accidents in Belarus and ranks 9th among 47 countries. According to WHO, by 2030, traffic accidents are expected to become the fifth cause of death among children [1,2].

**Research purpose**

The current research focuses on studying, analyzing, and evaluating the literature and other scientific sources dedicated to the study of the causes of injuries, disabilities, and death among children in the countries of the world and also in our republic.

**Methodology**

Literature and other statistical materials and reports focused on the medical, social and organizational aspects of the causes of injury, disability and death among children due to marital injuries in the next 15-20 years in the world and in our country were taken as material for the research, and the descriptive method was widely used in the analysis of the literature. .

**Results and discussion:**

In recent years, domestic injuries and accidents among children have become one of the major medical, social and economic factors that threaten their lives and health. These conditions are the leading cause of death, especially among children over 3 years of age, even higher than those caused by infectious diseases, and in many cases cause disability and limit children's future career opportunities. It is noted that in many cases it directly depends on the architecture of the territory, settlement, types of transport and the level of organization of preventive measures. It should be noted that most children's injuries are injuries in marriage (55-60%). Half of all injuries to children occur when they are left unattended by an adult. The second place was occupied by school injuries (7-12%), and 3/4 of them occurred outside of school hours, and 1/3 of them occurred during the educational process. The third place is street injuries (3-4%), of which death is 8.4%, disability is 42.5%. Injuries in sports games make up -3-4%, in pre-school educational institutions -3-5%, it is noted that injuries are -2-2.5 times higher in boys aged 10-14 than in girls. It is noteworthy that 96% of injuries among preschoolers are domestic injuries, and they are mostly received at home. Domestic injuries in children under 3 years of age are 80%, and the number of street injuries in children after 7 years has increased [3,4].

S.G. Suvorov (2010) and T.M. According to the scientific conclusions of Andreeva et al. (2007), in Russia today, injuries due to road traffic accidents are considered a national tragedy and it is increasing. In 2009-2013, more than 226,000 people died and 1,430,000 people were

injured due to traffic accidents. [5,6] The main cause of traffic accidents in children in 40% of cases is non-observance of traffic rules, in 22% of cases - caused by alcohol consumption. The main part of children's injuries, i.e. 32.3% - on the street, in the courtyards of houses, 27% - at the crossings of the street, 17.9% - at home, 10.4% - at school, 6.1% - in auxiliary rooms, that is, it was found that they got it in fields, palaces, underground corridors, 3.5% - in forests, parks. Children received 3.9% of injuries at night, 9.6% in the morning, 34.1% in the afternoon, and 40.6% in the evening. The most dangerous period of children's injuries is considered to be in the evening, that is, from 17.00 to 21.00 (41.5%) [7]. According to the conclusion of A.A. Antonov (2019), in Russia, in 2016, compared to 2012, there was a slight decrease in traffic accidents among children. The author says that in 2012, 20,879 traffic accidents were recorded, resulting in 970 children's deaths and 22016 children's injuries. In 2016, this figure was 19,269, 710 and 20,621, respectively. According to the author, this situation is related to the introduction of serious changes to the traffic rules related to carrying children in cars at the state level [8]. More than 700,000 people die in car accidents in the WHO European region. At least 2,000 people die a day. More than 6,000 people will be hospitalized. More than 600,000 people seek emergency medical care due to injuries. Especially in middle and low-income countries, every 5/6 deaths are due to traffic accidents. In Kyrgyzstan, 90,000 people are admitted to hospitals each year due to injuries (per 100,000/876), more than 10,000 of which are children. According to the authors' data, 1041.8 cases per 100,000 children were recorded in Kyrgyzstan in 2014, of which 550.3 were domestic accidents, 258.1 were street accidents, 40.9 were traffic accidents, 61.9 - school, 35.1 - in sports, 95.5 - other various injuries, among which death was equal to -5.6 per 100,000 children. It is noteworthy that the number of traffic accidents, the number of injured people, and the number of deaths have been increasing in Kyrgyzstan during 2011-2015. [9]. It can be seen that over the next 15 years, the Russian Federation will take one of the leading places in terms of death from accidents among children and will be 20.0-29.9 per 100,000 children, which is 3-4 times higher than the Scandinavian countries (5.0-9, 9 / 100 00 children) [10]. According to the results of scientific studies carried out in Khabarovsk in 2018, most of the injuries recorded in children were recorded in boys, and it was found that it was high mainly in children aged 1-2 and 11-14. Types of reported cases 40.3% of children's injuries - on the street (ages 4-5 and 10-11), 30.5% - at home (ages 1-2), 14.5% - at schools (ages 11-14), 10,9% - in sports games, 1.6% - due to mutual quarrels, 2.1% - road traffic incidents [11].

In Russia, 12,000 injuries and poisonings are recorded per year, and 93% of them are injuries. This means that there are 120-130 injuries per 1000 inhabitants. This indicator is 100-110 in children, 160-170 among teenagers. It is noteworthy that all types of injuries, especially among children, have different indicators in different regions of the Russian Federation. For example, in 2018, injuries due to car accidents in the Chilabinsky region were every 100 142.8 cases per 000 inhabitants, in the Republic of Kalmyk it was equal to 258.5 cases, which was 76.7% higher than the average of the Russian Federation. According to the authors, similar peculiarities were observed in the rate of death from injuries, in Chilabinsk region it was equal to 14 4.7 per 100,000 population, while this indicator was equal to 116.6 on average for the country. [12].

According to the conclusion of V.N. Farafanova (2017) [13.14.], the main causes of injuries that occur among children in physical education classes are the organizational

deficiencies of these classes, the lack of technical safety indicators, the incorrect structure of training programs, the incorrect placement of equipment in halls and fields, the requirements of corridors not taking into account the age and gender characteristics of children, the absence of a teacher during the course of the lesson, incorrect situations in the teaching methodology, non-compliance with didactic principles, lack of individual approach to students during the course of the lesson, classes without taking into account their health, physical and technical preparation.

In many countries of the world, injury is the second leading cause of morbidity and mortality. It is especially alarming that this condition is common among growing young people and is increasing year by year. Every year, millions of children die due to injuries, and 13,000 of them occur in Russia. It causes 18-20% disability. [14]. The scientific conclusions of S.K. Nazarova and others (2016) indicate that all types of injuries are recorded more among boys (2/3). It is noted that four out of five occur during school breaks. According to the authors, the rate of injuries among children in Tashkent city has increased relatively (by 3.0%) and is 2.1 times higher than the average indicator of the Republic. In 2010-2014, injuries among children under 14 years of age in the Republic increased by 3.8% [15,16].

It is noted that 35-40% of injuries among school children are related to physical education classes: athletics, basketball, volleyball, football games. The causes of school injuries are divided into two groups: methodological and organizational. [16]. According to WHO data, more than 80 million accidents (injuries, falls, poisoning, burns, drowning) occur in European countries every year, and more than 500,000 people die. [17]. K.S. Soloveva, M.V. Martinova (2016) [18] According to the results of the scientific research carried out in the Nevsky district, a total of 23,420 cases were referred to the trauma department of the district polyclinic in 2014-2015. increased, 36.8% of them are on the street, 25.7% at home, 18% at school, 19.1% during sports games, 0.4% in vehicles and 10% in various other 52.3% of them were recorded in children aged 8-14 and 15-17, 40.0% of them were sprains, 15.2% were sprains, 9.1% were injuries, 3% - surface injuries, 5.7% - head injuries and concussions, 15.5% - bone fractures, 6.5% - leg fractures, 2.4% - spine and body injuries, 0, 1% were facial injuries and 4.5% were various other injuries.

According to Yu.N. Sosnovskaya (2018) [19], the most effective way to prevent injuries related to railway transport among children is the cooperation between the employees of the railway service and the employees of internal affairs, and it is scientifically based that it will give good results if it is implemented in the following ways: Determining the legal basis of mutual cooperation, establishing a joint coordinating body, developing a comprehensive program, exchanging information, ensuring the safety of each person, organizing joint events, making joint decisions, joint use of opportunities, joint meetings, organizing seminars and finally This includes discussing each incident together [19]. According to WHO's forward-looking estimates, by 2030, road traffic deaths will reach 2.4 million people and will rise from the ninth (2004) to the fifth leading cause of death. According to the report of the European region of WHO, Kazakhstan ranks first in terms of death from road traffic accidents. (30.6 per 100,000 population). It is noted that the Russian Federation takes the second place (25.2 per 100,000 inhabitants). In 2012, in the Shymkent region of Kazakhstan, it took the third place in terms of injuries in road traffic accidents, and it took the first place in terms of the cause of death among

the working population. As a result, the average life expectancy in the region decreased by -3.1-4.8 years for men and -1.2 years for women[20].

Traffic accidents account for a significant proportion of injuries among children, and children account for 5% of all road traffic deaths. Children's injuries account for 0.5-12.2% of all injuries. It is noted that the main injuries among children occur between 14:00 and 19:00. Injuries are typically higher among boys in most countries [21,22,23,25]. The main index of child health is injury and disability among children. In 2010, among children aged 0-14 in Russia, there were 10,705.2 injuries per 100,000 children. According to WHO, injuries are the leading cause of death among children worldwide. 950,000 children under the age of 18 die each year. This means that 100 children die every hour. According to the results of scientific research conducted in the Orenburg region, 47.5% of 107,857 treated children were injured on the street, 36.3% at home, 13.8% outside of school, and 2.1% at educational institutions. 44.2% of them fell from above, 18.7% - in living conditions and 1.4% - during sports games. [24]. Although injury among the population, especially among children, is a very serious problem of public health, society does not pay enough attention to this situation. Its causes require a multifaceted and complex approach. The positive solution of this problem requires the cooperation of dozens of institutions and organizations [26]. According to the scientific conclusions of E.G. Skryabin, A.G. Smirnikhs (2012) [27], 13.78% of injured persons are musculoskeletal system, 0.55% are spinal cord injuries. Spinal cord injuries mainly in 8-12-year-old children - 39.25%. Fracture of the vertebral body was 15.66%. Based on the information presented in the literature and scientific sources analyzed above, the following can be concluded.

1. From the literature and scientific sources on various types of injuries among children, it became known that among the total number of injuries among children, marital injuries take the leading place in almost many countries in terms of their prevalence;
2. Almost all identified and studied literature and scientific sources were mainly carried out abroad, including nomadic scientific research carried out in the Russian Federation and the Republic of Kazakhstan in separate regions. In our country, there were no scientific researches directed at marital injuries among children and carried out in the cross-section of separate regions together with its complex socio-hygienic, medical-social and organizational aspects;
3. Based on the study, it can be concluded that, taking into account the relative increase of various types of injuries among children, some specific characteristics of the population in terms of social, economic, and ethnic aspects, in the case of Khorezm region, marital injuries among children and its medical and social consequences and organizational aspects from a complex socio-hygienic point of view study and evaluation will have a good effect in improving the prevention of injuries among children.

**References:**

1. Beletsky A.V., Lomat L.N. and others. Children's road traffic injuries in the Republic of Belarus: risk assessment // Russian Bulletin 2012.-vol. II.-No. 3.-p.61-67.
2. Global Road Safety Report. Time to act. - Geneva: WHO, 2009. - 287 p.
3. Eseev M.M. Current issues of childhood traumatism // Bulletin of Surgery of Kazakhstan, 2012.-No. 3. P.32.
4. Kupakova T.V. et al. Childhood injuries and its prevention in the Russian Federation. Sat. Proceedings of LNIDIO named after. G.I. Turner.-SPb.-2003.-157 p.
5. Suvorov S.G., Lekmanov A.U., Rozinov V.M. Epidemiology of children's road traffic injuries in Russia // Medical alphabet, 2010.
6. Andreeva T.M. et al. Traumatism in the Russian Federation at the beginning of the new millennium // Bulletin of Traumatology and Orthopedics named after N.N. Priorov: - 2007. - No. 2. - p. 59-63.
7. Anin E.A., Efimov L.A., Chizhevskaya L.L. Childhood injuries in Grodno // Journal of the State Medical University, 2003.-№2.-p.81-82.
8. Antonov A.A. "Road safety: the problem of childhood injuries" // Police activities, 2019.-No. 1.-pp.23-27.
9. Dzhumabekova S.A., Anarkulov B.S., Sulaimanov Zh.D. Analysis of childhood injuries in the Kyrgyz Republic// Issyk-Kul, Kyrgyzstan, 2016.-p.310.
10. Vyazmin A.M., Sannikov A.L. Characteristics of childhood injuries in the Arkhangelsk region // Human Ecology, 2009.-08.-p.31-34.
11. Marega L.A., Senkevich O.A., et al. Causes and structure of childhood injuries in Khabarovsk/ Pediatrics -2019-No.4-P.13-19.
12. Shepin V.O., Shishkin E.V. Modern problems of injuries in the Russian Federation // Problems of social hygiene, health care and history of medicine, 2020 No. 28 (5) - S-877-882.
13. Farafonova N.V. Features of sports injuries//Journal Young Scientist, 2017 No. 32 (166) p-112-116.
14. Kozitsyn I.N. Tolpova R.S. Ways to improve the prevention of injuries at school // Young Scientist -2016 No. 5 (109) – P 694-696.
15. Nazarova S.K., Tukhtaeva D.M. and other co-authors. Dynamics of childhood injuries and prevention of early disability in the Republic of Uzbekistan // Young scientist -2016. No. 8 (112) – C 417-421.
16. Solodovnik E.M. Injuries in physical education lessons: features, causes, prevention. // International Journal of Humanities and Natural Sciences, vol. 2-1.2019 C-165-167.
17. Deryabkina L.V., Tolstov S.N., Karaseva T.V., Traumatic factors of the lifestyle of the rural population // Problems of social hygiene, health care and history of medicine, 2018. No. 26(2). P-91-93.
18. Solovyova K.S., Martynova M.V., et al. co-author. Injuries in children affected by physical violence // Ortopedics, traumatology and reconstructive surgery of childhood, 2016-No. 3. P-47-51.



19. Sosnovskaya Yu.N, Markina E.V. Interaction between police officers and railway transport employees in the prevention of child injuries on railway transport // Bulletin of the Moscow University of the Ministry of Internal Affairs of Russia, 2019-No. 2.C-215-218.
20. Buleshova A.M., Buleshov M.A., Kudryavtsev A.V., et al. Epidemiology of injuries in the city. Shymkent, South Kazakhstan region of the Republic of Kazakhstan: justification for the need to create a municipal register of injuries.// Human Ecology 2016.-No. 6.C-55-60.
21. Mysaev A.O., Seilkhanov K.E., et al. Road traffic injuries. Part 1: Epidemiology. Literary review. // Science and healthcare, 2013, No. 6.C-16-21.
22. Andreev T.M., Injuries in the Russian Federation based on statistical data // Social aspects of population health. 2010 T-4. No. 16. P-12-14.
23. Bektasov Zh.K. Analysis of the state of childhood injuries in Astana and ways of its prevention // Traumatology and Orthopedics, 2010 T-2, P-4-13.
24. Golovko O.V., The structure of childhood injuries and assessment of sanitary and educational work on its prevention // Orenburg Medical Bulletin, volume VIII, No. 1. (29). P-73-76.
25. Romashikhina.E.S. Activities of internal affairs bodies to implement victimological prevention of child road traffic injuries // Bulletin of Moscow University of the Ministry of Internal Affairs of Russia, 2014.-No. 11.C-140-142.
26. Danilenko O.V., Korneva I.N., Etiology of childhood traumatism and its prevention // Eurasian Union of Scientists (ESU). 2016.-No. 2(23).-S-26-28.
27. Skryabin E.G. Smirnykh A.G. Fractures of vertebral bodies in the structure of childhood traumatism// Traumatology and Orthopedics of Russia, 2012.-№3.- (65).-C-106-110.
28. Sultanovna O. A. Traumatism Among The Population and Children, Medical and Social Aspects //Scholastic: Journal of Natural and Medical Education. – 2023. – Т. 2. – №. 6. – С. 24-30.
29. Omanova, A., & Abdullaev, I. (2022). INJURIES AMONG CHILDREN AND SOME PECULIARITIES OF ITS SPREAD. Евразийский журнал медицинских и естественных наук, 2(6), 217–222. извлечено от <https://www.incademy.uz/index.php/EJMNS/article/view/2532>
30. AS Omanova . [Domestic Traumatism Among the Population and Children, Medical and Social Aspects](#). Texas Journal of Medical Science. №15. 2022/12/20. P-160-165

**Samariddin Eshkoraev**

Termez institute of Engineering and Technology, Termez, Uzbekistan

E-mail: [samariddineshqorayev@gmail.com](mailto:samariddineshqorayev@gmail.com)

Orcid: [Samariddin Eshkoraev \(0000-0001-9404-7974\)](https://orcid.org/0000-0001-9404-7974)

### **Abstract.**

Portland cement, a fundamental building material in construction, plays a pivotal role in shaping the modern infrastructure. This abstract delves into the comprehensive understanding of Portland cement, exploring its composition, properties, and versatile applications. The composition involves a meticulous blend of clinker, gypsum, and supplementary materials, showcasing a delicate balance to achieve optimal performance. Examining the properties reveals the material's strength, durability, and workability, crucial factors in determining its suitability for diverse construction projects. Furthermore, the abstract explores the myriad applications of Portland cement, ranging from traditional applications in concrete production to innovative uses in specialized construction and infrastructure projects. This investigation aims to provide a holistic perspective on Portland cement, offering valuable insights for engineers, researchers, and industry professionals involved in the construction sector.

**Keywords:** Portland cement, Clinker, Gypsum, Supplementary materials, Composition, Properties, Strength, Durability, Workability, Concrete production, Construction, Infrastructure, Applications, Building material, Cementitious blends.

### **Аннотация.**

Портландцемент, основной строительный материал в строительстве, играет ключевую роль в формировании современной инфраструктуры. Этот реферат углубляет всестороннее понимание портландцемента, исследуя его состав, свойства и универсальное применение. Композиция включает в себя тщательно продуманную смесь клинкера, гипса и дополнительных материалов, демонстрируя тонкий баланс для достижения оптимальных характеристик. Изучение свойств показывает прочность, долговечность и технологичность материала, что является решающими факторами, определяющими его пригодность для различных строительных проектов. Кроме того, в реферате исследуются многочисленные применения портландцемента, начиная от традиционного применения в производстве бетона и заканчивая инновационным использованием в специализированных строительных и инфраструктурных проектах. Целью данного исследования является предоставление целостного взгляда на портландцемент и предоставление ценной информации инженерам, исследователям и специалистам отрасли, работающим в строительном секторе.

**Ключевые слова:** Портландцемент, Клинкер, Гипс, Вспомогательные материалы, Состав, Свойства, Прочность, Долговечность, Технологичность, Производство бетона, Строительство, Инфраструктура, Применение, Строительный материал, Цементные смеси.

### **Introduction.**

# THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

## VOLUME-4, ISSUE-1

Portland cement and its varieties are modern in construction the most widespread cement type is considered Portland cement - hydraulic binder is Portland cement clinker gypsum with, also special additions with small grind through is taken. Portland cement clinker gypsum with small grind the way with is taken; to the mixture active mineral supplements to input permission is given Portland cement clinker - limestone and from clay or some materials (marl, high furnace slags, and others) consists of thinly dispersed one character raw material mixture from sintering before to burn product. Raw the item frying circulation in furnaces at a temperature of 1450 - 1500 °C is increased. Burn in the process in clinker high justified calcium of silicates superiority is provided. Portland cement features clinker to the composition and its grinding level depends on Portland cement the most important feature water with mutually when exposed hardening is the ability. It is wet in conditions of 28 days from hardening after cement-sand of limes standard of samples compression and bending overpower with of defined Portland cement brand with is described. Portland cement is hard to stay the time in order put for cement SO<sub>3</sub> in the composition the amount which provides amount grinding during to clinker gypsum dihydrate is added. Content separate Stands: Portland cement without additions; mineral supplements with Portland cement; slag portland cement and others From ordinary Portland cement except his composition, properties, and application fields according to difference doer varieties work released: fast hardened, plasticized, hydrophobic, to sulfate resistant, white Portland cement - asbestos-cement products work release for.[1]

### Main body.

Work release ready Portland cement product clinker based on common construction for intended cement.

Cement to the requirements of GOST 31108 according to work is issued.

**Table 1.**  
**Portland cement structural parts.**

Content	Marked in quantity (%)	least (%)
Lime ( CaO )	60-67	63-65
Silicon oxide (SiO <sub>2</sub> )	17-25	19-23
Aluminum oxide (Al <sub>2</sub> O <sub>3</sub> ) smell	3-8	3-8
Iron oxide (Fe <sub>2</sub> O <sub>3</sub> )	0.5-6	0.5-6
Magnesium ( MgO )	0.1-4	0.1-4
Sulfur trioxide (SO <sub>3</sub> )	1-3	1-3
Alkalis (Na <sub>2</sub> O and K <sub>2</sub> O)	0.3-1.2	0.3-1.2
Other	< 1	< 1

Cement - hydraulic properties have was, clinker, and gypsum or his derivatives and need when from additions consists of has been powdery construction connector. Water or other liquids with mutually when exposed, cement plastic mass ( cement paste ) yield does, when it hardens strong and durable cement to the stone becomes

of cement color gray, but used raw to the item depending on, it is different to the shadows have to be possible: from gray-green to gray-brown.

of cement real density 3000 - 3200 kg / m<sup>3</sup> organize does: of cement public density 1000 - 1300 kg / m<sup>3</sup>.

Materials to the composition according to cement the following to species divided into:

- Portland cement (without mineral additives );
- additions with Portland cement ( active mineral additives with it's not more than 20% ;
- Portland slag cement ( more than 20%). granulated slag the addition of with).

28 days age pressure power according to cement is divided into brands for:

- Portland cement - 400, 500, 550 and 600;
- Portland slag cement - 300, 400 and 500;
- fast hard standing Portland cement - 400 and 500;
- fast hard standing Portland slag cement - 400.

Cement work in release the following applies to:

- technological to the regulation suitable coming chemical composition according to clinker. In clinker magnesium oxide (MgO) mass the share does not exceed 5% need

- GOST 4013 or another belongs to documents according to gypsum stone. Appropriate regulatory and technical documents according to phosphogypsum, boro gypsum and, fluoro gypsum to use permission is given ; [2]

— according to GOST 3476 grainy pieces or electrothermophosphorous slag belongs to regulatory and technical documents according to other active mineral additives;

- of cement main features in order puter additions and belongs to regulatory and technical to documents according to technological additions.

M 400 cement brand in construction the widest spread Make it in release special from additions use him to water resistance to cold durability, strength, and durability increases. The price-quality ratio is based on his considering the price as optimal However, different work of producers' cost of additions quantity and quality looking different to can Portland cement brand M 400 reinforced concrete items and constructions work release for wide is used.

M 500 brand from cement used without lime quickly hardens different extraordinary work is used because the main features hard the rest from the time starting from appear will be the cold resistance to moisture endurance and strength such as to indicators, which is especially important reinforced concrete constructions work release for special requirements placed q is also used in cases. Do not collect concrete, beams, and ceilings work release for is used. M 500 brand of cement two type there is:

- mixtures and additions non- M 500 DO brand Portland cement; to the cold resistance to moisture endurance and of products strength provide necessary has been an industry in construction is used;

- cement in the composition of brand M 500 D 20 to corrosion against features 20% enhancement supplements there is.

Portland cement-prepared products and structures land top, ground under, and water under conditions wide used. Residential, industrial, hydraulic engineering, road construction, etc monolithic and don't collect concrete, and reinforced concrete work in the release is used. Its tough and light concrete, cellular concrete, high variety of lime, heat insulating materials, and

others work releases Portland cement to the sea, mineralized and even clean water flowing or strong pressure under has been to structures non-applicability need.

### Conclusion

In conclusion, the exploration of Portland cement, encompassing its composition, properties, and applications, underscores its indispensable role in the construction industry. The careful balance of clinker, gypsum, and supplementary materials in its composition contributes to its unique properties, including strength, durability, and workability. The versatility of Portland cement is evident in its broad spectrum of applications, ranging from traditional uses in concrete production to innovative applications in specialized construction and infrastructure projects.

Understanding the intricacies of Portland cement is crucial for engineers, researchers, and industry professionals seeking to optimize its use in diverse projects. As we strive for sustainable and resilient construction practices, the knowledge gained from studying Portland cement can pave the way for advancements in materials science and engineering.

In the ever-evolving landscape of construction, Portland cement remains a cornerstone, continually adapting to meet the demands of modern infrastructure. By harnessing its properties and exploring new applications, we can contribute to the development of robust, environmentally friendly, and efficient construction practices. As we move forward, the ongoing research and application of Portland cement will play a pivotal role in shaping the sustainable future of the construction industry.

### References:

- Banit F.G. Sement zavodlarining mexanik jihozlari. M., Mashinostroenie, 2008 yil.  
Muxlev I.P. Umumiy kimyoviy texnologiya. M., Oliy maktab, 2010 yil.  
Kantorovich Z.B. Kimyo sanoati uchun mashinalar. M., 2012 yil.  
Portland sement ishlab chiqarish bo'yicha texnologik reglament, 2013 yil.  
Egorov A.P. Noorganik moddalarning umumiy kimyoviy texnologiyasi. M., Kimyo, 2009 yil.  
Furmer I.E., Zaitsev V.N. Umumiy kimyoviy texnologiya, Moskva, Oliy maktab, 2009 yil.  
Bunit Yu.N. Birlashtiruvchi moddalarning kimyoviy texnologiyasi. M., Oliy maktab, 2008 yil.  
Alekseev B.V. Sement ishlab chiqarish, Belgorod, 2010 yil.  
Samaryanova L.B., Layner A.I. Sement ishlab chiqarishda texnologik hisoblar, M., 2012 yil.  
Абдулхамидова, Х., & Эшқораев, С. (2022). НОВЫЕ ЦЕМЕНТНЫЕ ТЕХНОЛОГИИ. *Theoretical aspects in the formation of pedagogical sciences*, 1(4), 28-31.  
Eshqorayev, S., Abdulhamidova, H., & Abdulhamidov, J. (2022). SEMENT KLINKER TO'PLAMLARINI ISHLAB CHIQRISH: CaO-SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub>-SO<sub>3</sub>-CaCl<sub>2</sub>-MgO. *Eurasian Journal of Academic Research*, 2(12), 955-958.  
Эшқараев, С. Ч., Тураев, Х. Х., & Эшқораев, С. С. (2021). ВЛИЯНИЕ ГЕКСАХЛОРЦИКЛОГЕКСАНА НА ПОВЫШЕНИЕ РАДИОАКТИВНОСТИ В ПОЧВАХ СУРХАНДАРЬИНСКОЙ ОБЛАСТИ РЕСПУБЛИКИ УЗБЕКИСТАН. In *СОВРЕМЕННАЯ ХИМИЧЕСКАЯ ФИЗИКА НА СТЫКЕ ФИЗИКИ, ХИМИИ И БИОЛОГИИ* (pp. 399-400).

Эшқараев, С. Ч., Тураев, Х. Х., & Бабамуратов, Б. Э. (2021). РАДИОЛОГИЧЕСКАЯ ОЦЕНКА РАДИОНУКЛИДОВ В ПОЧВАХ ЮЖНЫХ РЕГИОНОВ РЕСПУБЛИКИ УЗБЕКИСТАН. In *ИННОВАЦИОННОЕ РАЗВИТИЕ НАУКИ И ОБРАЗОВАНИЯ* (pp. 290-319).

Abdulhamidova, H., Eshkoraev, S., & Javgashev, Y. (2022). TECHNOLOGY OF SILICATE BRICK PRODUCTION. *Solution of social problems in management and economy*, 1(4), 8-11.

Eshqorayev, S. S., & Ro'zimurodov, B. I. (2022). AHOLI YASHASH XONADONLARIDA IS GAZIDAN HIMOYALOVCHI FILTRLAR TAYYORLASH. *Eurasian Journal of Medical and Natural Sciences*, 2(6), 209-212.

Xaydarova, M. D., Eshqorayev, S. S., & Ro'Zimurodov, B. I. (2022). Kaliy ma'danlarining dunyo bo'yicha uchrashi. *Science and Education*, 3(6), 149-151.

Eshqorayev, S. S., Ro'zimurodov, B. I., & Choriyeva, M. S. (2022). YOSHLARNI ILM-FAN VA INNOVATSIYALARGA QIZIQTIRISHNING NOAN'ANAVIY USULI. *Eurasian Journal of Academic Research*, 2(6), 308-310.

Xaydarova, M. D., Eshqorayev, S. S., & Ro'zimurodov, B. I. (2022). TYUBEGATAN KONINING SILVINITLARINI ERITISH JARAYONINI O'RGANISH. *O'ZBEKISTONDA FANLARARO INNOVATSIYALAR VA ILMIY TADQIQOTLAR JURNALI*, 1(9), 37-39.

Eshqorayev, S. S., & Choriyeva, M. S. (2022). Tog'-kon sanoatida texnologiya va uning ishga ta'sirini tushunish. *Miasto Przyszłości*, 24, 237-239.

Eshkoraev, S., Turaev, K., & Eshkoraev, S. (2021). Influence of Pesticides on Increasing Soil Radioactivity. *World*, 6(4), 49-54.

Davronovna, K. M., Sadridinovich, E. S., & Yigitali Jo'ra o'g, J. (2022). Dependence of Karst Processes on Physico-Chemical Properties of Salts. *American Journal of Social and Humanitarian Research*, 3(9), 25-28.

Eshkoraev, S., Abdulhamidova, H., & Javgashev, Y. (2022). INGREDIENT OF PORTLAND CEMENT. *International Bulletin of Applied Science and Technology*, 2(9), 21-23.

Choriyeva, M. S., & Eshkoraev, S. S. (2022). The interaction of energy with climate change. *ISJ Theoretical & Applied Science*, 04 (108), 60-63.

Uralov, N. B., Turaev, H. Kh., Eshkarayev, S. Ch., & Eshqorayev, S.S. (2021). Analysis of graphene properties, production and application. *ISJ Theoretical & Applied Science*, 11 (103), 726-728.

SURXONDARYO VILOYATI TUPROQLARIDAGI SEZIY-137 RADIONUKLIDI BETA NURLANISH AKTIVLIGINI RADIOMETRIK-SPEKTROMETRIK USULDA ANIQLASH 1 Eshkoraev S.Ch., 2To'rayev X.X., 2Umbarov I.A., 2 Babamuratov B.E., 1 Eshqorayev S.S. 1 *Islom Karimov nomidagi Toshkent davlat texnika universiteti Termiz filiali.* 2 *Termiz davlat universiteti*

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

S. Eshkaraev, S. Eshqorayev, H. Abdulhamidova, & J. Abdulhamidov (2022). VODOROD ISHLAB CHIQRISH: ELEKTROLIZ. *Science and innovation*, 1 (A8), 360-365. doi: 10.5281/zenodo.7391172

Akhatov, A. A., Eshkaraev, S. Ch., Normurodova, Kh. D., & Eshkoraev, S. S. (2021). Study of the influence of graphene nanofillers on the properties of composites based on polypropylene. *ISJ Theoretical & Applied Science*, 10 (102), 816-818.

Sadriddin o'g'li, E. S., Soatmurod o'g'li, A. A., & Soatmurodovna, S. R. N. (2023). IONITLAR (SORBENTLAR) YORDAMIDA ERITMADAN OLTINNI SORBSIYALASH USULIDA AJRATIB OLISH. *Journal of Universal Science Research*, 1(1), 6-11.

Choriyeva, M. S. qizi, & Eshqorayev, S. S. o'g'li. (2022). MILLATLARARO TOTUVLIK VA DINIY BAG'RIKENGLIK O'ZBEK XALQINING YUKSAK QADRIYATIDIR. INTERNATIONAL CONFERENCE ON LEARNING AND TEACHING, 1(3), 46-51. Retrieved from <https://researchedu.org/index.php/iclt/article/view/2879>

Eshqorayev, S., & Abdulhamidova, H. (2023). UNCONVENTIONAL METHOD OF CEMENT PRODUCTION BY ADDING NEW SUBSTANCES TO CLINKER IN PORTLAND CEMENT PRODUCTION. *International Bulletin of Engineering and Technology*, 3(4), 136-142. Retrieved from <https://internationalbulletins.com/intjour/index.php/ibet/article/view/542>

Abdulhamidova, H., Eshkoraev, S., & Choriyeva, M. (2022). MINERAL RESOURCES. *International Bulletin of Engineering and Technology*, 2(9), 21-23. Retrieved from <https://internationalbulletins.com/intjour/index.php/ibet/article/view/39>

Sadriddin o'g'li, E. S., & Sherzod qizi, A. H. (2023). Development of a Solar Panel-Based Electrolysis Device for Hydrogen Production. *Spanish Journal of Innovation and Integrity*, 17, 94-98. Retrieved from <http://sjii.indexedresearch.org/index.php/sjii/article/view/801>

Sadriddin o'g'li, E. S., Soatmurodovna, S. R. N., & Soatmurod o'g'li, A. A. IONITLAR (SORBENTLAR) YORDAMIDA ERITMADAN OLTINNI SORBSIYALASH USULIDA AJRATIB OLISH.

Khaydarova munira davronovna, eshqorayev samariddin sadriddin o'g'li, boltayeva iroda yusuf qizi & allazov rustam yo'ldosho'g'li. *journal of engineering and technology (jet)* issn(p):2250-2394; issn(e): applied vol. 13, issue 1, jun 2023, 139-142 tjprc pvt. ltd. study of the melting process of sylvinites of tubegatan mine.

Eshqorayev Samariddin Sadriddin o'g'li, & Abdulhamidova Hilola Sherzod qizi. (2023). FORMING A SENSE OF TOLERANCE IN PRIMARY SCHOOL STUDENTS. XXI ASRDA INNOVATION TEXNOLOGIYALAR, FAN VA TA'LIM TARAQQIYOTIDAGI DOLZARB MUAMMOLAR, 1(5), 167-181. Retrieved from <https://universalpublishings.com/index.php/itftdm/article/view/1299>

Эшқараев Садриддин Чориевич, Абдулхамидова Хилола Шерзод қизи, & Эшқораев Самариддин Садриддин ўғли. (2022). Радиохимия: всесторонний обзор ключевых концепций и приложений. *Multidisciplinary Journal of Science and Technology*, 2(1), 10-13. Retrieved from <http://mjstjournal.com/index.php/mjst/article/view/11>

Эшқараев Садриддин Чориевич, Абдулхамидова Хилола Шерзод қизи, & Эшқораев Самариддин Садриддин ўғли. (2023). СИЛИКОНЫ: ХИМИЯ И ТЕХНОЛОГИЯ

УНИВЕРСАЛЬНЫХ ПОЛИМЕРОВ. International Conference on Multidisciplinary Science, 1(1), 4–6. Retrieved from <http://mjstjournal.com/index.php/icms/article/view/2>

Abdulhamidova Hilola Sherzod qizi, & Eshqorayev Samariddin Sadridin o'g'li. (2023). Innovative Methods of Ammonia Production: A Review. *Web of Semantics : Journal of Interdisciplinary Science*, 1(1), 18–24. Retrieved from <http://web.semanticjournals.org/index.php/wos/article/view/5>

Shaymanova, R. S., Urazov, M. K., Samariddin, E., Yuldosheva, D. N., & Shaymanova, N. X. (2022). IMPROVEMENT OF DRILLING FLUID FOR CONSTRUCTION OF WELLS IN ARCTIC SHELF WATER. *Multidisciplinary Journal of Science and Technology*, 2(2), 8-11.

Rakhmankulov, J. E., & Eshkoraev, S. S. (2023). STUDY OF CELLULOSE EXTRACTION PROCESSES SUITABLE FOR OBTAINING LOW-QUANTITY PRODUCTS FROM THE STEM PART OF THE LOCAL SAFLOR PLANT. *Journal of Universal Science Research*, 1(10), 717-723.

Rakhmankulov, J. E., & Eshkoraev, S. S. (2023). INVESTIGATION OF SEVERAL BRANDS OF CELLULOSE SUITABLE FOR OBTAINING ORGANIC COMPOSITE MATERIALS FROM CANNABIS PLANT STEM. *Multidisciplinary Journal of Science and Technology*, 3(3), 198-203.

KHOLMURODOV, M. P., TURAEV, K. K., & ESHKARAEV, S. C. (2021). RADIOMETRIC DETERMINATION OF THORIUM-232 RADIONUCLIDE IN THE WATERS OF THE SHERABAD RIVER IN SURKHANDARYA REGION. *THEORETICAL & APPLIED SCIENCE Учредители: Теоретическая и прикладная наука*, (9), 350-354.

TILLAEV, K. R., ESHKARAEV, S. C., & BABAMURATOV, B. E. (2021). SPECTROPHOTOMETRIC ANALYSIS OF THE WATERS OF THE SURKHANDARYA RIVER OF THE REPUBLIC OF UZBEKISTAN FOR DETERMINATION OF HEAVY TOXIC METALS. *THEORETICAL & APPLIED SCIENCE Учредители: Теоретическая и прикладная наука*, (9), 471-475.

Khayit, T., Makhmatkarim, K., Shavkat, A., & Sadridin, E. (2020). Radiometric determination of radon-222 in the atmospheric air of the city of termeza, republic of uzbekistan. *European journal of molecular & clinical medicine*, 7(11), 397-403.

Eshkaraev, S., Turaev, K., & Eshkoraev, S. (2021). Influence of Pesticides on Increasing Soil Radioactivity. *World*, 6(4), 49-54.

Uralov, N. B., Turaev, H. Kh., Eshkarayev, S. Ch., & Eshqorayev, S.S. (2021). Analysis of graphene properties, production and application. *ISJ Theoretical & Applied Science*, 11 (103), 726-728.

SURXONDARYO VILOYATI TUPROQLARIDAGI SEZIY-137 RADIONUKLIDI BETA NURLANISH AKTIVLIGINI RADIOMETRIK-SPEKTROMETRIK USULDA ANIQLASH 1 Eshkaraev S.Ch., 2To'rayev X.X., 2Umbarov I.A., 2 Babamuratov B.E., 1 Eshqorayev S.S. 1 *Islom Karimov nomidagi Toshkent davlat texnika universiteti Termiz filiali*. 2 *Termiz davlat universiteti*

S. Eshkaraev, S. Eshqorayev, H. Abdulhamidova, & J. Abdulhamidov (2022). VODOROD ISHLAB CHIQRISH: ELEKTROLIZ. *Science and innovation*, 1 (A8), 360-365. doi: 10.5281/zenodo.7391172



Akhatov, A. A., Eshkaraev, S. Ch., Normurodova, Kh. D., & Eshkoraev, S. S. (2021). Study of the influence of graphene nanofillers on the properties of composites based on polypropylene. *ISJ Theoretical & Applied Science*, 10 (102), 816-818.

Эшкараев, С. Ч., Тураев, Х. Х., & Бабамуратов, Б. Э. (2021). РАДИОЛОГИЧЕСКАЯ ОЦЕНКА РАДИОНУКЛИДОВ В ПОЧВАХ ЮЖНЫХ РЕГИОНОВ РЕСПУБЛИКИ УЗБЕКИСТАН. In *ИННОВАЦИОННОЕ РАЗВИТИЕ НАУКИ И ОБРАЗОВАНИЯ* (pp. 290-319).

Eshkaraev S.Ch., Turaev X.X. Radiometricheskoe opredelenie s-137 v pochvax Surxandarinskoy oblasti Respubliki Uzbekistan s pomoshyu beta-i gamma-izlucheniya //M. Universum. – 2020. - №. 6. - S. 124-129.

Turaev X.X., Eshkaraev S.Ch. Radiometricheskoe opredelenie strontsiya-90 v pochvax Surxandar`inskoy oblasti s pomoshyu beta-i gamma-izlucheniya //T. NamDU. – 2020. - №. 6.

Turaev X.X., Eshkaraev S.Ch. Radiometricheskoe opredelenie tseziya-137 i strontsiya v pochvax Surxandarinskoy oblasti s pomoshyu bloka detektora BDEG-80 //T. SamDU. – 2020. - №. 9.

Inoyatova Nazokat Qahramon qizi, & Eshkaraev Sadridin Choriyevich. (2023). ICHIMLIK SUVIDA RADIOFAOL ELEMENTLARNING PAYDO BO`LISHI VA INSON SALOMATLIGIGA TA`SIRI. *Journal of Universal Science Research*, 1(3), 72–79. Retrieved from <http://universalpublishings.com/index.php/jusr/article/view/308>

Umirqulova Feruza Abdisamatovna, & Eshkaraev Sadridin Choriyevich. (2023). YO`VVOYI O`SIMLIKLAR TARKIBIDAN DORIVOR MODDALARNI EKSTRAKTSIYON AJRATIB OLISH USULLARI. *Journal of Universal Science Research*, 1(4), 86–92. Retrieved from <http://universalpublishings.com/index.php/jusr/article/view/413>

Pardayev Anvar Misirovich, & Eshkaraev Sadridin Choriyevich. (2023). STOMATOLOGIYADA YADROVIY TIBBIYOTNI QO`LLASH ISTIQBOLLARI. *Journal of Universal Science Research*, 1(4), 69–75. Retrieved from <http://universalpublishings.com/index.php/jusr/article/view/410>

Amonov, N. A., Ch, E. S., & Abduraimova, G. N. (2022). Analysis of Research on the Properties, Production and Use of Carbon Nanoparticles. *Miasto Przyszłości*, 28, 136-138.

Akromov, A. A., & Mehridinovna, A. G. (2022). TECHNOLOGIES FOR IMPROVING THE FORMATION OF PROFESSIONAL COMPETENCE OF STUDENTS ON THE BASIS OF A CREATIVE APPROACH. *Galaxy International Interdisciplinary Research Journal*, 10(5), 639-642.

Mexridinovna, A. G. (2021). INTEGRATIVE APPROACH TO INCREASING THE EFFECTIVENESS OF FINE ARTS CLASSES. *Galaxy International Interdisciplinary Research Journal*, 9(12), 351-354.

Sheraliyevna, S. S. (2023). ABDURAUFI FITRATNING “OILA” ASARIDAGI MA`NAVIY-AXLOQIY QARASHLARI. *Journal of Universal Science Research*, 1(5), 352-362.

Abdulloyevna, M. Z. (2023). SHARQ MUTAFAKKIRLARINING MA`NAVIY TARBIYA HAQIDAGI TA`LIMOTLARI. *Journal of Universal Science Research*, 1(5), 340-351.

Baxtiyor O`g`li, Q. J. (2023). ZAMONAVIY O`QITUVCHIGA QO`YILADIGAN TALABLAR. *Journal of Universal Science Research*, 1(5), 1256-1263.

Yunusovich, A. V., Ahmedov, F., Norboyev, K., & Zakirov, F. (2022). Analysis of Experimental Research Results Focused on Improving Student Psychological Health. *International Journal of Modern Education & Computer Science*, 14(2).

Yunusovich, A. V. The Research Results Analysis of Higher Educational Institutions on Students' Psychological Health. *International Journal on Integrated Education*, 4(1), 169-176.

TA, O. V. O. R. M., & VAZIRLIGI, L. SOTSIAL PSIXOLOGIYA: MENEJMENT VA MARKETING PSIXOLOGIYASI FANIDAN O'QUV-USLUBIYMAJMUA.

TA, O. V. O. R. M., & VAZIRLIGI, L. SOTSIAL PSIXOLOGIYA FANIDAN O'QUV-USLUBIYMAJMUA.

Xalbayeva, G. (2023). MAKTABGACHA YOSHDAGI BOLALARNI MAKTABGA TAYYORLASHDA PSIXOLOGIK TRENINGLARDAN FOYDALANISH. *Журнал Педагогика и психологии в современном образовании*, (1).

Arshidinovna K. G. . (2023). Scientific and Methodological Foundations of Preparing Children for School. *Miasto Przyszłości*, 34, 85–95. Retrieved from <https://miastoprzyszlosci.com.pl/index.php/mp/article/view/1259>

Xalbayeva Gulnoza. (2022). MAKTABGACHA YOSHDAGI BOLALAR BILISH JARAYONLARINI RIVOJLANTIRISHDA SENSOR TARBIYANING O'RNI. *RESEARCH AND EDUCATION*, 1(7), 163–172. Retrieved from <https://researchedu.org/index.php/re/article/view/418>

Arshidinova, X. G. (2022). BOLALARNI MAKTABNING BOSHLANGICH TA'LIM BOSQICHIGA TAYYORLASHDA INNOVATSION YONDASHISHNING DOLZARBLIGI. *FAN, TA'LIM VA AMALIYOTNING INTEGRASIYASI*, 379-382.

Калинина, О. Н. РОЛЬ РЕЧЕВЫХ СИТУАЦИЙ В ОБУЧЕНИИ РУССКОМУ ЯЗЫКУ СТУДЕНТОВ УЗБЕКСКИХ ГРУПП.

Mirzayeva, F. O., & Abulova, M. K. (2023). PREPARING FUTURE TEACHERS FOR EDUCATIONAL ACTIVITY BASED ON INNOVATIVE TECHNOLOGIES. *Galaxy International Interdisciplinary Research Journal*, 11(12), 548-552.

Abulova, M. K. (2023). The Concept of the Family in Modern Society and its Main Tasks in the Republic of Uzbekistan. *Journal of Pedagogical Inventions and Practices*, 20, 47-51.

Abulova, M. K. (2023). THE ROLE OF LEGAL EDUCATION IN REFORMING THE EDUCATION SYSTEM. *World Bulletin of Social Sciences*, 22, 39-40.

Тилеумуратова, Б. А. (2015). Ресурсоведческая характеристика некоторых видов лекарственных растений в Каракалпакстане. *Austrian Journal of Technical and Natural Sciences*, (5-6), 21-23.

Халмуратов, П., Кутлымуратова, Г. А., & Романова, Л. К. (2017). Биоэкологические особенности атропелладонна. При интродукции в условиях Каракалпакстана. *Вестник науки и образования*, 1(3 (27)), 30-32.

Кутлымуратова, Г. А. (2013). К вопросу интродукции лекарственных растений в условиях Республики Каракалпакстан. *Аспирант и соискатель*, (4), 88-90.

Косназаров, К. А., Кутлымуратова, Г. А., & Романова, Л. К. (2013). АНТРОПОГЕННОЕ ВЛИЯНИЕ НА ЭКОЛОГИЧЕСКОЕ СОСТОЯНИЕ РАСТЕНИЙ MATRICARIA L. И ИХ ФИТОЦЕНОЗОВ В УСЛОВИЯХ РЕСПУБЛИКИ КАРАКАЛПАКСТАН. *SCIENCE AND WORLD*, 59.

Sobirovna, S. Y. (2023). O 'YIN ORQALI BOLA TAFAKKURI VA NUTQINI OSTIRISH. *SAMARALI TA'LIM VA BARQAROR INNOVATSIYALAR*, 1(3), 93-99.

Yulduz, S. (2023). KREATIV YONDASHUVLAR ASOSIDA BOLALAR NUTQI VA TAFAKKURINI RIVOJLANTIRISH. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, 23(2), 87-92.

Yulduz, S. (2023). MAKTABGACHA YOSHDAGI BOLALARDA EKOLOGIK TA'LIM BERISHNING O'ZIGA XOSLIGI. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, 21(3), 124-129.

Sobirovna, S. Y. (2022). PEDAGOGNING KREATIVLIGI BOLALAR IJODIY RIVOJLANISHINING ZARUR SHARTI. *PEDAGOGS jurnali*, 1(1), 219-220.

Sobirovna, S. Y. (2022). KICHIK MAKTAB YOSHDAGI O 'QUVCHILAR BILISH FAOLIYATINI RIVOJLANTIRISHNING PEDAGOGIK PSIXOLOGIK XUSUSIYATLARI. *PEDAGOGS jurnali*, 1(1), 158-160.

Sobirovna, Y. S. (2023). Methods and Tools of Economic Education in Preschool Children. *American Journal of Public Diplomacy and International Studies (2993-2157)*, 1(9), 109-115.

Sobirovna, S. Y. (2023). METODIST FAOLIYATI ASOSLARI. *SAMARALI TA'LIM VA BARQAROR INNOVATSIYALAR*, 1(5), 108-114.

Sobirovna, S. Y. (2023). Creativity in the work of an educator. *American Journal of Public Diplomacy and International Studies (2993-2157)*, 1(10), 361-367.

Sidiqova Yulduz. (2024). SYUJETLI-ROLI O'YINLARNING BOLA FAOLIYATIDAGI AHAMIYATI. *TECHNICAL SCIENCE RESEARCH IN UZBEKISTAN*, 2(1), 44-51.

Sidiqova Yulduz Sobirovna. (2024). MAKTABGACHA TA'LIMDA NUTQ, MULOQOT O'QISH VA YOZISH MALAKALARINING SOHALARI. *TECHNICAL SCIENCE RESEARCH IN UZBEKISTAN*, 2(1), 52-62.

Ochildiyevna, Y. M., & Bozorovna, C. S. (2023). TABIAT BILAN TANISHTIRISH ORQALI BOLALAR NUTQINI O'STIRISH. *Journal of Universal Science Research*, 1(12), 621-624.

Ochildiyevna, Y. M. (2023). Pedagogical skill of the educator. *Eurasian Journal of Learning and Academic Teaching*, 20, 5-7.

Ochildiyevna, Y. M. (2023). MAKTABGACHA TA'LIM YOSHDAGI BOLALARNI TABIAT BILAN TANISHTIRISH. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, 17(1), 160-164.

Ochildiyevna, Y. M. (2023). MAKTABGACHA TA'LIM TASHKILOTIDA SAHNALASHTIRISH FAOLIYATINING AHAMIYATI. *JOURNAL OF INNOVATIONS IN SCIENTIFIC AND EDUCATIONAL RESEARCH*, 6(2), 295-298.

Ochildiyevna, Y. M., & Achildiyevna, S. F. (2023). MODERN TECHNOLOGIES FOR INTRODUCING SCHOOL-AGE CHILDREN TO NATURE.

Акрамова, Ф. Д., Шакарбаев, У. А., Акбаров, А. А., Уббиниязова, Ж. К., Торемуратов, М. Ш., Сапаров, К. А., & Азимов, Д. А. (2023). ГЕЛЬМИНТОФАУНА ПОЛОРОГИХ (ARTIODACTYLA: BOVIDAE) СЕВЕРО-ЗАПАДНОГО УЗБЕКИСТАНА. *Теория и практика борьбы с паразитарными болезнями*, (24), 40-45.

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

Tojialievna, E. L. (2023). METHODOLOGY AND TASKS OF SPEECH CULTIVATION. *Uzbek Scholar Journal*, 14, 26-27.

Tojialievna, E. L. (2022). METHODS OF DEVELOPING INNOVATIVE PEDAGOGY IN ENTREPRENEURSHIP. *American Journal of Interdisciplinary Research and Development*, 8, 168-171.

Tojialiyevna, E. L. (2022, January). DEVELOPMENT OF SPEECH IN PRESCHOOL CHILDREN USING PEDAGOGICAL TECHNOLOGIES IN TEACHING. In *Conference Zone* (pp. 64-65).

Tojialievna, E. L., & Munisa, R. (2021). Opinions of Eastern thinkers on child rearing. *Eurasian Journal of Humanities and Social Sciences*, 2, 38-41.

Usmanovna, A. G., & Elmurodova, L. T. (2021). RAISING GENDER AWARENESS OR ELIMINATING GENDER STEREOTYPES IN EDUCATION. *Galaxy International Interdisciplinary Research Journal*, 9(6), 120-123.

Elmurodova, L. T., & Ergashova, Z. I. (2021). Mental Education of Children in the Process of Work. *European Scholar Journal*, 2(6), 82-83.

Элмуродова, Л. Т. (2019). СОТРУДНИЧЕСТВО ДОШКОЛЬНОЙ ОБРАЗОВАТЕЛЬНОЙ ОРГАНИЗАЦИИ С СЕМЬЕЙ КАК УСЛОВИЕ ФОРМИРОВАНИЯ ПЕДАГОГИЧЕСКОЙ КОМПЕТЕНТНОСТИ РОДИТЕЛЕЙ. *Интернаука*, (44-1), 40-42.

Элмуродова, Л. Т. (2014). ПСИХОЛОГО-ПЕДАГОГИЧЕСКИЙ ПОДХОД К ФОЛЬКЛОРУ КАК ОТРАЖЕНИЕ КОЛЛЕКТИВНОГО МИРОВОЗЗРЕНИЯ. *The Way of Science*, 66.

Sarvinoz, E. (2022). THE ESSENCE OF THE DEGREE ONY OF SYNONYMS FROM THE STANDPOINT OF THE FUNCTIONAL-SEMANTIC APPROACH. *Conferencea*, 186-188.

Nazarovna, X. D., & Uktamovna, E. S. (2023). THE PECULIARITY OF GAMES IN EXPANDING CHILDREN'S THINKING RELAY. *Galaxy International Interdisciplinary Research Journal*, 11(5), 620-621.

Uktamovna, E. S., Nasiba, X., Dilafruz, I., & Saodat, S. (2023). MTT VA OILA BILAN HAMKORLIK. *Finland International Scientific Journal of Education, Social Science & Humanities*, 11(5), 400-407.

Sarvinoz U'ktamovna, E. S., & Nozimaxon Shavkat qizi, M. (2022). МАКТАБГАЧА YOSHDAGI BOLALARDA IJTIMOY-HISSIY KOMPETENTSIYANI RIVOJLANTIRISH. *Новости образования: исследование в XXI веке*, 1(5), 1111-1113. извлечено от <http://nauchniyimpuls.ru/index.php/noiv/article/view/2570>

Intizor, X., Gulhayo, X., & Nafisa, N. (2022). МАКТАБГАЧА ТА'ЛИМ MUASSALARIDA XALQ OG'ZAKI IJODINING O'RNI. *Новости образования: исследование в XXI веке*, 1(4), 623-625. извлечено от <http://nauchniyimpuls.ru/index.php/noiv/article/view/1446> (Original work published 1 ноябрь 2022 г.)

Sarvinoz, E., Intizor, X., & Gulhayo, X. (2022). МАКТАБГАЧА ТА'ЛИМNING USTUVOR VAZIFALARI. *O'ZBEKISTONDA FANLARARO INNOVATSIYALAR VA ILMIY TADQIQOTLAR JURNALI*, 2(13), 556-561.

- Sarvinoz, E. (2022). SYNONIMICAL DEGREE NYM AS A STYLISTIC PHENOMENON IN ENGLISH AND UZBEK LITERATURE DISCOURSE. *Conferencea*, 189-191.
- Berdiyoyrov, B. S. (2022). Scientific and Theoretical Basis of Providing Employment of the Population in the Conditions of a Market Economy. *Journal of Pharmaceutical Negative Results*, 6321-6325.
- Berdiyoyrov, B. S. (2022). PROSPECTS OF EFFECTIVE USE OF DIGITAL BIG DATA ANALYTICS IN THE FIELD OF TOURISM. *International Journal of Pedagogics*, 2(12), 121-125.
- Berdiyoyrov, B. S. (2021). USING THE CLUSTER DEVELOPMENT MODEL TOURIST SECTOR. *CURRENT RESEARCH JOURNAL OF PEDAGOGICS*, 2(12), 13-15.
- Abdusalomova, S. (2022). PRACTICAL FOUNDATIONS OF PROMOTION OF LEGAL CULTURE IN PROTECTION OF WOMEN'S INTERESTS. *Science and Innovation*, 1(4), 221-224.
- Shonazarovna, M. V., & Olamide, O. M. (2022). About Methods of Language Teaching. *Innovative Society: Problems, Analysis and Development Prospects (Spain)*, 161-163.
- Mamadayupova, V., & Yormatov, A. (2022). DEFINITIONS OF INFORMATION: ANALYSIS OF ACADEMIC WORKS. *World Bulletin of Management and Law*, 7, 92-94.
- Shonazarovna, M. V. (2022). OILA, OTALIK, ONALIK, BOLALIKNING DAVLAT MUHOFAZASI–YANGI KONSTITUTSIYADA MUSTAHKAM KAFOLATLAR. *Science and innovation*, 1(C4), 7-10.
- Mamadayupova, Vasila Shonazarovna (2022). O'ZBEKISTON RESPUBLIKASI KONSTITUTSIYASINING YARATILISH TARIXI VA AHAMIYATI. *Oriental renaissance: Innovative, educational, natural and social sciences*, 2 (11), 540-544.
- Shonazarovna, M. V. (2021). KONSTITUTSIYA BAXTIMIZ QOMUSI. *Евразийский журнал академических исследований*, 1(9), 79-81.
- Muqaddas Tursunaliyevna Abdurahmonova, & Nigina Sherzod Qizi Muxtorova (2021). ALIFBO XUSUSIDA BA'ZI MULOHAZALAR. *Central Asian Academic Journal of Scientific Research*, 1 (1), 12-14.
- Mamadayupova, V. S. (2021). ONA TILIM–MILLATIM FAXRI. *Scientific progress*, 2(7), 397-399.
- Ахунбаев, А. А., Ражабова, Н. Р., & Вохидова, Н. Х. (2020). Исследование гидродинамики роторной сушилки с быстровращающимся ротором. *Экономика и социум*, (12 (79)), 392-396.
- Абдуллаева, Б. С., Уразова, М. Б., & Вохидова, Н. Х. (2017). Общая педагогика. *Учебное пособие. «Sano-standart», Ташкент–2017. С.-262.*
- Вохидова, Н. Х., & Абдуллаева, М. А. (2019). Экологическое воспитание как направление духовно-нравственного развития обучающихся младших классов. In *ПОДГОТОВКА УЧИТЕЛЯ НАЧАЛЬНЫХ КЛАССОВ: ПРОБЛЕМЫ И ПЕРСПЕКТИВЫ* (pp. 119-122).
- Уразова, М. Б., & Вахидова, Н. Х. (2018). Семейное чтение как фактор духовно-нравственного развития личности ребенка. *Актуальные проблемы гуманитарных и естественных наук*, (3), 98-100.

Уразова, М. Б., & Вахидова, Н. Х. (2018). Теоретические аспекты формирования подготовленности учителя к развитию творческих способностей учащихся начальных классов. *Вестник науки и образования*, 1(5 (41)), 93-95.

Вохидова, Н. Х. (2018). Шарк мутафаккирларининг таълимий-ахлоқий қарашлари. *Современное образование (Узбекистан)*, (8), 15-19.

Вахидова, Н. Х. (2011). Педагогические условия нравственного воспитания учащихся младших классов Узбекистана. *Мир образования-образование в мире*, (4), 55-59.

Вахидова, Н. Х., & Халикова, З. М. (2015). **ВООБРАЖЕНИЕ КАК ФАКТОР ТВОРЧЕСТВА**. *Журнал научных публикаций аспирантов и докторантов*, (3), 86-88.

Mavlonova, R. A., & Vohidova, N. H. (2009). *Ijtimoiy pedagogika. O 'quv qo 'lanma. T.: Noshir*, 8.

Mavlonova, R. A., & Vohidova, N. H. (2009). *Social pedagogy. Tashkent: Istiklol*.

Уразова, М. Б., Вахидова, Н. Х., Абдулхаева, М., & Абдувалиева, Ю. (2010). Педагогическая аксиология и современный учебно-воспитательный процесс. *Педагогические науки*, (2), 16-17.

Серекеева, Г. А., Жумабаева, Г. Р., & Султанбаева, Ж. А. (2019). **РОЛЬ ГАЗОНА В УЛУЧШЕНИИ ЭКОЛОГИЧЕСКИХ УСЛОВИЙ ГОРОДСКОЙ СРЕДЫ**. *Теория и практика современной науки*, (6 (48)), 446-448.

Серекеева, Г., Айтбаева, Г. К., & Жумабаева, Г. Р. (2019). **ОСНОВНЫЕ АСПЕКТЫ И ТРЕБОВАНИЯ ОЗЕЛЕНЕНИЕ ГОРОДСКОЙ СРЕДЫ**. *Экономика и социум*, (6 (61)), 806-808.

Серекеева, Г. А., & Досжанова, Г. (2019). **НЕКОТОРЫЕ БИОЛОГИЧЕСКИЕ ОСОБЕННОСТИ ИНТРУДИЦИРОВАННЫХ ВИДОВ КАТАЛЬПЫ SATALPA SPECIOSA В УСЛОВИЯХ ГОРОДА НУКУСА**. *Экономика и социум*, (5 (60)), 1118-1120.

Серекеева, Г. А., Жумабайева, Г. Р., & Турганбаева, Г. Р. (2018). **РОЛЬ ГАЗОНА В ОЗЕЛЕНЕНИИ ГОРОДСКОЙ СРЕДЫ**. *Теория и практика современной науки*, (5 (35)), 755-758.

Серекеева, Г. А., Урзумова, Б. У., & Боранбаева, М. Б. (2018). **РОЛЬ ДЕКОРАТИВНЫХ РАСТЕНИЙ В ОЗЕЛЕНИИ ГОРОДА НУКУСА**. *Экономика и социум*, (5 (48)), 1066-1068.

Серекеева, Г. А., Турсынбекова, М. Б., & Жумабаева, Г. Р. (2017). **РЕГИОНАЛЬНЫЕ ПРОБЛЕМЫ ЭКОЛОГИЧЕСКОЙ ОЦЕНКИ РАСТИТЕЛЬНОГО СЫРЬЯ В РЕГИОНЕ ПРИАРАЛЬЯ**. *Форум молодых ученых*, (6 (10)), 1578-1580.

Серекеева, Г. А. (2017). **ПРОБЛЕМА СОХРАНЕНИЯ БИОРАЗНООБРАЗИЯ РАСТИТЕЛЬНОГО МИРА В РЕГИОНЕ ПРИАРАЛЬЯ**. *Теория и практика современной науки*, (2 (20)), 525-528.

Серекеева, Г. А., Мамбетуллаева, С. М., Давлетмуратова, В. Б., Каипов, К. П., & Сейтназаров, С. К. (2015). К вопросу охраны животного и растительного мира Южного Приаралья. *Austrian Journal of Technical and Natural Sciences*, (3-4), 13-16.

Хасанов, Ф. О., Эсанкулов, А. С., Серекеева, Г. А., & Кодыров, У. Х. (1984). **КОНСПЕКТ СЕМЕЙСТВА РОАСЕАЕ ВО ФЛОРЕ УЗБЕКИСТАНА**. *СТАТИСТИК ҚОНУНИЯТЛАР ВА УЛАРНИНГ ФИЗИКА ФАНИ РИВОЖЛАНИШИДА ТУТГАН ЎРНИ ВА РОЛИ*, 95(473), 27.

Серекеева, Г. А., & Досжанова, Г. (2019). РОЛЬ БОТАНИЧЕСКОГО САДА ПРИ ПОДГОТОВКЕ БИОЛОГОВ В ВЫСШИХ УЧЕБНЫХ ЗАВЕДЕНИЯХ. *Мировая наука*, (5), 623-625.

Mukumova, D. (2023). THE INFLUENCE OF ISMAT BUKHARI FROM THE GAZELS OF SHEIKH KAMALA KHUJANDI. *Scientific Journal of the Fergana State University*, (3), 205. [https://doi.org/10.56292/SJFSU/vol\\_iss3/a205](https://doi.org/10.56292/SJFSU/vol_iss3/a205)

Mukumova, D. (2023). ISMAT BUKHARI'S IMPRESSION FROM THE GAZELS OF SHEIKH KAMALA KHUJANDI. *Scientific Journal of the Fergana State University*, (3), 133. [https://doi.org/10.56292/SJFSU/vol\\_iss3/a133](https://doi.org/10.56292/SJFSU/vol_iss3/a133)

Мукумова, Д. З. (2020). ISMATI BUKHOROI-FOLLOWER OF THE SHAIKH KAMOL KHUJANDI LITERARY SCHOOL. *Вестник Таджикского национального университета. Серия филологических наук*, (6), 239-243.

Mukumova, D. Z. (2020). ВЛИЯНИЕ КАМОЛА ХУДЖАНДИ НА СТАНОВЛЕНИЕ ЖАНРА ГАЗЕЛИ В ПОЭЗИИ XV-XVI ВЕКОВ (НА ПРИМЕРЕ ПОЭТИЧЕСКОГО КРУГА БУХАРЫ). *Theoretical & Applied Science*, (7), 414-419.

Mukumova, D. Z. (2020). Influence of Kamol Khujandi on the formation of the Genre of the Gazel in the poetry of the XV-XVI centuries (On the example of the poetic circle of Bukhara). *ISJ Theoretical & Applied Science*, 07 (87), 414-419.

Мукумова Дилафруз Зиёдуллаевна (2019). ВЛИЯНИИ ТВОРЧЕСТВА КАМОЛА ХУЖАНДИ НА ТВОРЧЕСТВО БИСОТИ САМАРКАНДИ. *Вестник Педагогического университета*, (4 (81)), 170-175.

Мукумова, Д. З. (2019). INFLUENCE OF KAMOL KHUJANDI'S CREATIVE WORKS ON BISOT SAMARKANDI'S CREATIVE WORKS. *Вестник Педагогического университета*, (4), 170-175.

Kurbonalieva, M. S. (2020). THE STRUCTURE AND THE FEATURES OF "TAZKIRAT-USH-SHUARA" MUTRIBI SAMARKANDI. *Theoretical & Applied Science*, (6), 581-585.

COMMUNICATIVE ASPECTS OF MEDICAL COMMUNICATION BETWEEN  
A DOCTOR AND A PATIENT

**Ibragimova Dilbar Sadullaevna**

*Assistant teacher of the department of Languages, Samarkand State Medical University*

**Mukhamadieva Malika Tokhirovna**

*2nd year student Faculty of Medicine-1 of Samarkand State Medical University*

**Abstract.** This article explains about communication another socio-cultural types like medical speech is also a speaker and listener in the presence of face to give and linguistically units with together gesture such as unscientific of means important structural part as participation with is characterized. However, communication this verbal and non-verbal tools doctor - patient attitude, colleagues communication, medicine in universities student and teacher, pharmacist and client in communication active application.

**Keywords:** communication, doctor, patient, medical, languages, competence.

**Introduction**

Communication another in the fields result of interlocutors material and intangible benefit to see or not seeing with if prescribed, medical of communication result health storage or loss with is measured . This is controversial the result medical activity and of communication deanthological norms and of bioethics paternalistic model priority by doing to be determined reason was.

This the norm and requirements according to the doctor the patient with to communicate enter since, his efficient to pass neither only responsible, perhaps is forced International and national level official in the documents set placed this responsibilities future specialists in memory of directly placing it won't be. For this education foundation for necessary has been conditions creation it is necessary in England such conditions certain level to the road placed even in our country this about research continue is doing That's it one in the circumstances medical our discourse each of the field network, situation and positions with depends without analysis do to them of the world the most advanced experiences to evaluate in comparison medical deanthology more improvement with together, English language industry in directions teaching for necessary has been materials reserve and analysis experiences formation enable creates. On such a scale reserves and both \_ the field improvement in order to take going of research efficiency in providing important importance occupation is enough Doctor-patient communication social agreement from relevance intended main the goal of participants from communication satisfaction harvest to do through is determined. Satisfaction conditions much complicated is LS Beilinson by recommendation done or "Calgary-Cambridge in the model note



done discursive to situations strictly action to do such the result to the hand input for scarcity does Therefore, this situations from the classification intended term Ye.F. Tarasov status, subjective point of view look and communication situations special in positions mean caught pragmatic of goals performance is to provide.

Doctor-patient "medical" attitude to the episode "problem". about conversations analysis communication of participants social , professional and communicative competencies about knowledge communication situation, environment and instead of monad without used without, information of the interlocutor fast and easy to digest to do". reach for understand explanation method compliance to do that it is necessary shows.

Difficulties in interaction between doctor and patient are reflected in:

- in the distortion of perception (each person is characterized by selectivity of attention, which means a subconscious selection of exactly the information that is interesting to him, perception of information through his own evaluative criteria; information that does not cause either an intellectual or emotional response is not perceived by a person; at the same time all perceived information is distorted by a person, taking into account his psychological attitudes, emotional assessment and personal experience; thus, the patient involuntarily distorts the information received from the doctor, taking into account trust/distrust of the doctor, understanding/misunderstanding of what the doctor is talking about);

- in the absence of understanding and evaluation of information (in this situation, the doctor must be able to speak with the patient in his language and have the skill of receiving feedback from the patient);

- in competitive interaction between the doctor and the patient, up to confrontation (to prevent such a situation, it is always necessary to let the patient speak out, express his point of view, agree with his statement, but in the future take the initiative to make a decision into his own hands).

The professionalism of a doctor consists of three main components:

- Knowledge is a theoretical paradigm that determines what to do and why.
- Skill – gives an idea of how to do it.
- Desire is motivation: I want to do it.

To develop professional skills, you need a combination of Knowledge, Skill and Desire.

For a doctor as a professional, such key points are important as correct diagnosis, prescribing adequate treatment and obtaining a certain result, as well as the presence of clinical thinking (allows the doctor to build a collaborative relationship with the patient).

Success in medical practice is also determined by the following psychological characteristics:

I. High level of communicative competence:

- Affiliation is a person's need to be in the company of other people, a lively, interested attitude towards patients, the desire to help them, protection from professional deformation.
- Emotional stability - control over emotional reactions.
- Empathy is psychological "involvement" in the world of the patient's experiences.
- Sensitivity to rejection - the ability to perceive the negative attitude of others.

II. Independence and autonomy, combined with self-confidence.

III. Flexibility and plasticity of behavior in changing non-standard professional situations.

IV. High degree of resistance to stress, information and emotional overload.

In addition, communicative competence is important, which implies the presence of certain psychological knowledge (for example, about personality types, about the ways of experiencing and responding to stress in different people depending on the type of temperament, about the specifics of the connection between body types and the characteristics of a person's mental make-up, etc. ). In other words, this is the formation of special skills: the ability to establish contact, listen, "read" the non-verbal language of communication, build a conversation, formulate questions; the doctor's mastery of his own emotions, the ability to remain confident, control his reactions and behavior in general, correctly understand the patient and respond appropriately to his behavior; communicative tolerance and the ability not only to psychologically correctly build relationships with the patient, but also the ability to remain within the professional role during these relationships.

Medical of communication another from fields distinguishable main from the signs one, his health storage responsibility with depending on manifestation will be This responsibility medicine of employees institutional and intercontextual natural communicative competencies deanthological in the norms politeness priority criterion by doing determination through to the eye thrown away Other in the fields this the norm of society common done and education in the process promote, recommend to be done communication of culture criterion as manifestation if so, medical in communication this category of doctors responsibility and obligation is considered I. Jumaev this responsibility and commitment medical manners and the essence of culture organize to do confession reached without , his historical roots from Alisher Navoi the following example as says: "The doctor is himself of science skillful scholar be , to patients compassion with treatment to do, to the original science of medicine nature agreement, sages to the word compliance to them follower, gentle , patient his heart uplifting, caring, cheerful to be need. If

the doctor owns to the profession skillful however, he himself wicked, careless, rude if, how much the patient treatment it does not matter if you do his in the client change appear cannot".

### Conclusion

Communication social agreement relevance special such the result to the hand in input of doctors professional and communicative potential with together, of the people medical literacy and culture also separate to cultivation attention to give it is necessary.

Thus, a high level of communicative competence of a doctor makes it possible to make a more accurate diagnosis, especially if it concerns the patient's psychological problems, teach the patient to control his condition and ensure better treatment results.

### Literature:

1. Karimovna, Y. S., & Zara, A. (2023). EXPLORING THE LATIN ROOTS OF CHEMICAL TERMINOLOGY: NAMES OF CHEMICAL ELEMENTS, ACIDS, AND OXIDES. *Yangi O'zbekistonda Tabiiy va Ijtimoiy-gumanitar fanlar respublika ilmiy amaliy konferensiyasi*, 1(7), 8-13.
2. Yorova, S., & Nasimova, S. ELECTRONIC COLLECTED MATERIALS OF XI JUNIOR RESEARCHERS' CONFERENCE 2019 Linguistics, literature, philology 7 UDC 372.881 THE WAYS OF TEACHING LANGUAGES AT MEDICAL INSTITUTIONS Samarkand State Medical Institute.
3. Karimovna, Y. S., & Zulkarnain, S. (2023, November). DEGREES OF COMPARISON OF ADJECTIVES AND COORDINATION WITH NOUNS OF FIFTH DECLENSION. In *Konferensiyalar/ Conferences* (Vol. 1, No. 1, pp. 80-82).
4. Karimovna, Y. S. (2022). The linguistic environment in the field of medical communications. *Евразийский журнал академических исследований*, 2(2), 143-147.
5. Karimovna, Y. S. Social-cultural Characteristics of Uzbek and English Medical Speech. *International Journal on Integrated Education*, 4(5), 294-298.
6. Karimovna, Y. S. Medicine and Education faculty Samarkand State Medical Institute.
7. Karimovna, Y. S., & Farxodovna, R. K. VISION. THE MAIN VISUAL IMPAIRMENT IN ADOLESCENTS. *Zbiór artykułów naukowych recenzowanych.*, 45.
8. Ученых, Е. С. 12 (69), 2019 LEARNING FOREIGN LANGUAGES FOR MEDICAL INSTITUTIONS Nuritdinova Zulkhumor Shamsievna Head of Chair in Samarkand State Medical Institute. *Yorova Sayora Karimovna English teacher of Samarkand State Medical Institute*, 9, 26.
9. Karimovna, Y. S., Erkinovna, T. N., & Agwan, A. (2023). MODERN EDUCATION AND CULTURAL DEVELOPMENT NURTURING GLOBAL CITIZENS IN THE 21ST CENTURY. *EPRA International Journal of Multidisciplinary Research (IJMR)*, 9(11), 292-294.
10. Ahmadjonovna, R. S., Genjibaevna, A. P., Saydullaevna, N. N., Atakulovna, R. N., & Sadulayevna, I. D. (2021). The Teacher's Role in the Effective Organization of the Lesson Process in Foreign Language. *Annals of the Romanian Society for Cell Biology*, 3072-3078.
11. Shamsiyev, K., Olimzoda, P., Saidova, K., & Ibragimova, D. (2023, February). APPROACHES TO TEACHING ACADEMIC WRITING. In *Международная конференция академических наук* (Vol. 2, No. 2, pp. 31-34).
12. Dilbar, I., & Kamola, S. (2022). TEACHING ENGLISH METHODS. *Thematics*

*Journal of Education*, 7(5).

13. Saidova, K., Ibragimova, D., Olimzoda, P., & Shamsiyev, K. (2023). INFLUENCE OF USING GAMES ON ENGLISH LESSONS. *Theoretical aspects in the formation of pedagogical sciences*, 2(4), 54-58.
14. Sadullayevna, I. D. (2022). PEDAGOGIK MAHORAT QOBILIYATLARINI SHAKLLANTIRISH. *Евразийский журнал академических исследований*, 2(2), 129-133.
15. Kakhramon, S., Dilbar, I., & Kamola, S. (2023). TERMINOLOGY AS A SPECIAL BRANCH OF LANGUAGE. *Journal of new century innovations*, 22(4), 46-49.
16. Ibragimova, D. S., Saidova, K. I., & Olimzoda, P. THE EFFICACY OF PROFICIENT READING STRATEGIES IN ENHANCING READING COMPETENCIES.
17. Saydullaevna, I. D., & Abbas, H. (2023, November). PRESCRIPTION, STRUCTURE OF PRESCRIPTION, USE OF GENDER SINGULAR AND PLURAL IN PRESCRIPTION. In *International conference on multidisciplinary science* (Vol. 1, No. 5, pp. 222-225).
18. Umida, A. (2023). THE CONCEPT OF DISCOURSE IN MODERN LINGUISTICS. *Ethiopian International Journal of Multidisciplinary Research*, 10(10), 195-197.
19. Alisherovna, A. U., & Uves, S. (2023, November). CLINICAL TERMINOLOGY: UNDERSTANDING WORD-FORMATION, GREEK ROOTS, SUFFIXES, AND PREFIXES. In *International conference on multidisciplinary science* (Vol. 1, No. 5, pp. 206-209).
20. Alisherovna, A. U., & Hassan, M. (2023). LENGTH AND LETTER COMBINATION. VOCABULARY OF FIRST DECLENSION NOUNS. *Yangi O'zbekistonda Tabiiy va Ijtimoiy-gumanitar fanlar respublika ilmiy amaliy konferensiyasi*, 1(7), 86-90.
21. Alisherovna, A. U. (2023). DISCOURSE IN MODERN LINGUISTICS. *Journal of new century innovations*, 26(5), 123-128.
22. Alisherovna, A. U. (2023). VOCABULARY FEATURES OF SPECIALIZED SPORT PUBLICATIONS. *International journal of advanced research in education, technology and management*, 2(4).
23. Yorova, S. K., & Khakberdiyeva, V. J. K. (2021). DOCTOR AND PATIENT. *Scientific progress*, 2(1), 1478-1480.
24. Yorova, S. (2023). TO STUDY MEDICAL TERMS IN LATIN AND GREEK LANGUAGES. *International Bulletin of Engineering and Technology*, 3(3), 166-170.
25. Aitmuratova, P., Yorova, S., & Esanova, M. (2023). THE ROLE OF FOREIGN LANGUAGES IN OUR LIFE. *Theoretical aspects in the formation of pedagogical sciences*, 2(4), 161-164.
26. Yorova, S., Aytmuratova, P., Esanova, M., & Normurodova, S. (2023). PHRASEOLOGICAL UNITS IN THE MEDICAL FIELD OF ENGLISH AND UZBEK CULTURES. *Development and innovations in science*, 2(2), 10-13.
27. Yorova, S. K., & Iqbal, I. (2023). HISTORY OF MEDICAL TERMINOLOGY. *Journal of Universal Science Research*, 1(9), 158-164.
28. Normurodova, S. M., & Yorova, S. K. (2023). Nemis tili frazeologik birikmalari va tilning lug'at boyligi. *Science and Education*, 4(2), 1672-1675.
29. Yorova, S. K. (2017). The concept "health" in the English lingual culture. In *Humanities and Social Sciences in Europe: Achievements and Perspectives* (pp. 58-60).
30. Askarovich, B. S., Karimovna, Y. S., Sobirovich, X. Y., & Bakhodirovna, E. M. (2022). TEACHING MATH IN ENGLISH TO UNIVERSITIES AND INSTITUTIONS'STUDENTS FOR TAKING GMAT CERTIFICATE. *Journal of Positive School Psychology*, 1600-1604.

31. Yorova, S., & Nasirkhan, A. (2023). MODERN APPROACHES TO THE TREATMENT OF TRAUMATOLOGICAL, ORTHOPEDICS AND NEUROSURGICAL DISEASES. *Theoretical aspects in the formation of pedagogical sciences*, 2(11), 149-152.
32. Karimovna, Y. S., & Holalkere, V. S. (2023). DEMYSTIFYING PHARMACEUTICAL TERMINOLOGY: UNDERSTANDING MEDICINAL FORMS AND FREQUENTLY USED SEGMENTS. *Multidisciplinary Journal of Science and Technology*, 3(4), 10-13.
33. Yorova, S. A. Y. O. R. A., & Nasimova, S. O. H. I. B. A. (2019). The ways of teaching languages at medical institutions.
34. Karimovna, Y. S. (2023). AN INTRODUCTION TO ANATOMICAL HISTOLOGICAL TERMINOLOGY: NOUNS AND THEIR GRAMMAR CATEGORIES. "XXI ASRDA INNOVATSION TEXNOLOGIYALAR, FAN VA TA'LIM TARAQQIYOTIDAGI DOLZARB MUAMMOLAR" nomli respublika ilmiy-amaliy konferensiyasi, 1(9), 19-22.
35. Abduvasievna, G. S., Habibdjanovna, B. D., Karimovna, Y. S., Ugli, K. Y. S., Ugli, B. S. A., & Shukhratovna, N. F. (2021). Foreign Language Teachers in the System of Public Education. *Annals of the Romanian Society for Cell Biology*, 7001-7010.
36. Karimovna, Y. S. (2022). STRATEGIC METHODS OF ENGLISH AND UZBEK MEDICAL DISCOURSES. *Thematics Journal of Education*, 7(5).
37. Karimovna, Y. S. (2023). SPECIAL TYPE OF MEDICAL SPEECH IN THE COMMUNICATION PROCESS. *Research Focus International Scientific Journal*, 2(4), 115-120.
38. Karimovna, Y. S., & Rashid, A. (2023, November). ANATOMICAL TERMINOLOGY. In *Konferensiyalar/ Conferences* (Vol. 1, No. 1, pp. 101-104).
39. Karimovna, Y. S., & Zara, A. (2023). EXPLORING THE LATIN ROOTS OF CHEMICAL TERMINOLOGY: NAMES OF CHEMICAL ELEMENTS, ACIDS, AND OXIDES. *Yangi O'zbekistonda Tabiiy va Ijtimoiy-gumanitar fanlar respublika ilmiy amaliy konferensiyasi*, 1(7), 8-13.
40. Yorova, S., & Nasimova, S. ELECTRONIC COLLECTED MATERIALS OF XI JUNIOR RESEARCHERS' CONFERENCE 2019 Linguistics, literature, philology 7 UDC 372.881 THE WAYS OF TEACHING LANGUAGES AT MEDICAL INSTITUTIONS Samarkand State Medical Institute.

INTRODUCTION. Latin is considered an international language from the point of view of medical terminology. It is used to study clinical diseases such as physical symptoms, disturbances or changes. In this we are going to look at few examples of clinical terminologies. There is hardly any other aspect of medicine that is so discouraging for the beginning student as medical terminology. Although medical terms have been drawn from many languages, a large majority are from Greek and Latin. Some familiarity with the meaning of the most frequently used roots, prefixes, and suffixes will clarify the whole field. With a little study, it will be found that the long and formidable sounding medical terms are a combination of words, which describe parts of the body, a function, or a condition. The basic terms occur repeatedly in various combinations. A knowledge of the meaning of the roots, prefixes, and suffixes enables the student to analyse the medical terms into component parts. This is of the greatest aid in learning to understand the vocabulary of medicine. Some names of diseases given by the ancients and still used to-day are, in many instances, simply descriptions of the outstanding symptoms; for example, hydro-phobia-fear of water-for rabies, because the inability to drink is an early, characteristic sign of the disease.

**Greek and Latin Origins.** As a language, English is historically and culturally linked with Latin. Long before English became the *lingua franca* of science and medicine, it was Latin that dominated. Before the 3rd century, medical students also received instructions in Greek. In fact, both Greek and Latin shaped the conventions of medical as well as scientific writing for over 2,000 years.

Ancient Greek society valued and encouraged literary pursuits as much as mathematical and scientific studies. So, it should come as no surprise that Greek doctors particularly excelled at diagnostics—the field that, no doubt, benefits from one’s imaginative depth and penchant for figurative thinking.

For example, the Greek term *diabetes mellitus* literally means “flowing through/sweet as honey,” which, most probably, initially referred to the sweet odor of the urine of a person with diabetes. The terminology for medical conditions that was developed by Greek doctors continues to be the basis of our classifications of diseases.

Prefixation, i.e. the addition of a prefixal morpheme (prefix) to the root, does not change its meaning, but only adds to this meaning some component indicating localization (above, below, in front, behind), direction (approaching, moving away), flow in time (before something, after something), on the absence or denial of something.

Prefixes developed primarily from prepositions, so their direct meanings coincide with the meanings of the corresponding prepositions.

Some prefixes, based on direct meanings, have developed secondary, figurative ones. Thus, the Greek preposition-prefix *para-* (“near, nearby”) developed a figurative meaning “retreat, deviation from something, discrepancy between the external manifestations of the essence of a given phenomenon”: for example, *para-nasalis* - paranasal, but *para-mnesia* (Greek

mnesis – “memory”) – paramnesia – a general name for distortions of memories and memory deceptions.

Romans happily inherited Greeks’ treasure-trove of medical knowledge, which they carefully preserved through translation into Latin and propagated among their numerous vassals. A huge medical encyclopedia called *De Medicina* (About Medicine), written by the Roman nobleman Cornelius Celsus, recorded all that was then known about Greek and Roman medicine.

Word Formation. As mentioned before, Greek doctors were particularly skillful diagnosticians. For this reason, Greek terms often occur in clinical terminology, e.g., cardiology, nephropathy, gastritis, whereas Latin words make up most anatomical terms: e.g., cor, ren, or ventriculus. Greek is a great source of specialized terminology thanks to its linguistic malleability, namely, its amazing suitability for building compound words. When the rapid expansion of medical science during the last two centuries required a stock of new terms for the newly discovered diseases and the invented medical tools, Greek words, often in their Latinized forms, became the way to go.

In fact, almost a half of the widely used medical terminology, although based on Greek and Latin, is less than one-century-old. Table 1 below shows some words for organs or parts of human body in Greek paired with the common medical conditions and human organs in plain English: Table 1. Organs or parts of human body associated with nominal terms

Prefixes of position describe a place, location, or position in the body. Prefixes of number and measurement describe an amount, size, or degree of involvement. Prefixes of direction indicate a pathway or route. Here are few examples

*Anti: against*

*Epi : above*

*Dys: disturbance of function*

*Dia: across*

*Endo : inside*

*Hypo: below normal or below*

*Peri: covering*

*Syn : joining , adhesion*

Scores of simple Gr. root words are used in our every-day English without our realizing their origin. To quote just a few: acme, basis, chaos, character, criterion, dogma, drama, echo, enigma, horizon, phantasia, stigma, thema, etc. aden-gland aorta-bronchos-gullet chole-bile derma-skin gastEr-belly haima-blood hepar-liver hygieia-health hymen-membrane kardia-heart kephal&-head. kranion-skull larynx-voice box mania-madness, frenzy nausea-seasickness neuron-tendon, nerve osteon-bone ophthalmos-eye pepsis-digestion pharmakon-drug pharynx-throat pleura-side, rib.

Suffixation is the addition of a suffix to a generating (motivating) stem. The derivative obtained in this way is called suffixal. Suffixes perform an important classifying function.

Thanks to them, words are correlated with the corresponding classes of concepts: for example, all nouns with the suffixes -ul(-cul-), -ol belong to the class of so-called deminutives - words with a diminutive meaning (lobulus - “lobule”, tuberculum - “tubercle” , foveola - “dimple”).

Verbal (derived from the verb stem) nouns with the suffix -io express the general categorical meaning of “process”, “action” (flexio – “bending”, rotatio – “rotation”, curatio – “treatment”). Verbal nouns with the suffix -or have a general categorical meaning of “a tool, an instrument with which an action is performed” or “a person who performs an action” (m. flexor -

flexor muscle, i.e. rotator - rotating muscle, prosector - prosector - "one who cuts ": the person performing the autopsy).

It is difficult to overestimate the classifying function of the term element-suffix, which correlates words with a specific terminological concept. Thus, all nouns with the suffix -itis express the general terminological concept of "inflammatory disease, inflammation."

A suffix always exists only in a bound form, that is, as part of a derivative. For example, the suffix -itis only in combination with a productive stem acquires the above meaning, while the Latin inflammatio is an independent word meaning "inflammation".

Suffixes generally categorized as (i) surgical, (ii) diagnostic, pathological, and related, and (iii) grammatical (adjectival, noun, plural) suffixes terms *cardiorrhexis* (above) and *cardiorrhaphy* (below) have different suffixes: -*rrhexis* is a diagnostic suffix and -*rrhaphy* is a surgical suffix:

Grouping the surgical, diagnostic, pathological, related, and grammatical suffixes makes them easier to remember them. *Surgical* suffixes describe a type of invasive procedure performed on a body part. *Diagnostic* suffixes describe a procedure performed to identify the cause and nature of an illness. *Pathological* suffixes describe an abnormal condition or disease.

Exercises related to clinical terminologies:

Typhilitis: inflammation of cecum

Cervicitis: inflammation of cervix

Hysterocelectomy: surgical removal of uterus and cervix .

Haemolysis: breakdown of rbc

Azotaemia: increase level of nitrogen in blood

Gastrocele: a herniation or protrusion of meninges

Toxaemia : presence of toxins in blood

Omphalitis: inflammation of umbilical cord

Anaesthesia : loss of sensation or feeling

Dermographia : condition where rubbing causes redness of skin.

Phlebosclerosis : enlargement of veins

Conclusion. In the end it's necessary to remember all the rules required to study and understand the clinical terminologies. It's important to study suffixes , prefixes , compound characters.

#### Literature:

1. Yorova, S. K., & Khakberdiyeva, V. J. K. (2021). DOCTOR AND PATIENT. *Scientific progress*, 2(1), 1478-1480.
2. Yorova, S. (2023). TO STUDY MEDICAL TERMS IN LATIN AND GREEK LANGUAGES. *International Bulletin of Engineering and Technology*, 3(3), 166-170.
3. Aitmuratova, P., Yorova, S., & Esanova, M. (2023). THE ROLE OF FOREIGN LANGUAGES IN OUR LIFE. *Theoretical aspects in the formation of pedagogical sciences*, 2(4), 161-164.
4. Yorova, S., Aitmuratova, P., Esanova, M., & Normurodova, S. (2023). PHRASEOLOGICAL UNITS IN THE MEDICAL FIELD OF ENGLISH AND UZBEK CULTURES. *Development and innovations in science*, 2(2), 10-13.
5. Yorova, S. K., & Iqbal, I. (2023). HISTORY OF MEDICAL TERMINOLOGY. *Journal of Universal Science Research*, 1(9), 158-164.



6. Normurodova, S. M., & Yorova, S. K. (2023). Nemis tili frazeologik birikmalari va tilning lug'at boyligi. *Science and Education*, 4(2), 1672-1675.
7. Yorova, S. K. (2017). The concept "health" in the English lingual culture. In *Humanities and Social Sciences in Europe: Achievements and Perspectives* (pp. 58-60).
8. Askarovich, B. S., Karimovna, Y. S., Sobirovich, X. Y., & Bakhodirovna, E. M. (2022). TEACHING MATH IN ENGLISH TO UNIVERSITIES AND INSTITUTIONS'STUDENTS FOR TAKING GMAT CERTIFICATE. *Journal of Positive School Psychology*, 1600-1604.
9. Yorova, S., & Nasirkhan, A. (2023). MODERN APPROACHES TO THE TREATMENT OF TRAUMATOLOGICAL, ORTHOPEDICS AND NEUROSURGICAL DISEASES. *Theoretical aspects in the formation of pedagogical sciences*, 2(11), 149-152.
10. Karimovna, Y. S., & Holalkere, V. S. (2023). DEMYSTIFYING PHARMACEUTICAL TERMINOLOGY: UNDERSTANDING MEDICINAL FORMS AND FREQUENTLY USED SEGMENTS. *Multidisciplinary Journal of Science and Technology*, 3(4), 10-13.
11. Yorova, S. A. Y. O. R. A., & Nasimova, S. O. H. I. B. A. (2019). The ways of teaching languages at medical institutions.
12. Karimovna, Y. S. (2023). AN INTRODUCTION TO ANATOMICAL HISTOLOGICAL TERMINOLOGY: NOUNS AND THEIR GRAMMAR CATEGORIES. "XXI ASRDA INNOVATSION TEXNOLOGIYALAR, FAN VA TA'LIM TARAQQIYOTIDAGI DOLZARB MUAMMOLAR" nomli respublika ilmiy-amaliy konferensiyasi, 1(9), 19-22.
13. Abduvasievna, G. S., Habibdjanovna, B. D., Karimovna, Y. S., Ugli, K. Y. S., Ugli, B. S. A., & Shukhratovna, N. F. (2021). Foreign Language Teachers in the System of Public Education. *Annals of the Romanian Society for Cell Biology*, 7001-7010.
14. Karimovna, Y. S. (2022). STRATEGIC METHODS OF ENGLISH AND UZBEK MEDICAL DISCOURSES. *Thematics Journal of Education*, 7(5).
15. Karimovna, Y. S. (2023). SPECIAL TYPE OF MEDICAL SPEECH IN THE COMMUNICATION PROCESS. *Research Focus International Scientific Journal*, 2(4), 115-120.
16. Karimovna, Y. S., & Rashid, A. (2023, November). ANATOMICAL TERMINOLOGY. In *Konferensiyalar/ Conferences* (Vol. 1, No. 1, pp. 101-104).
17. Karimovna, Y. S., & Zara, A. (2023). EXPLORING THE LATIN ROOTS OF CHEMICAL TERMINOLOGY: NAMES OF CHEMICAL ELEMENTS, ACIDS, AND OXIDES. *Yangi O'zbekistonda Tabiiy va Ijtimoiy-gumanitar fanlar respublika ilmiy amaliy konferensiyasi*, 1(7), 8-13.
18. Yorova, S., & Nasimova, S. ELECTRONIC COLLECTED MATERIALS OF XI JUNIOR RESEARCHERS'CONFERENCE 2019 Linguistics, literature, philology 7 UDC 372.881 THE WAYS OF TEACHING LANGUAGES AT MEDICAL INSTITUTIONS Samarkand State Medical Institute.
19. Karimovna, Y. S., & Zulkarnain, S. (2023, November). DEGREES OF COMPARISON OF ADJECTIVES AND COORDINATION WITH NOUNS OF FIFTH DECLENSION. In *Konferensiyalar/ Conferences* (Vol. 1, No. 1, pp. 80-82).
20. Karimovna, Y. S. (2022). The linguistic environment in the field of medical communications. *Евразийский журнал академических исследований*, 2(2), 143-147.

21. Karimovna, Y. S. Social-cultural Characteristics of Uzbek and English Medical Speech. *International Journal on Integrated Education*, 4(5), 294-298.
22. Karimovna, Y. S. Medicine and Education faculty Samarkand State Medical Institute.
23. Karimovna, Y. S., & Farxodovna, R. K. VISION. THE MAIN VISUAL IMPAIRMENT IN ADOLESCENTS. *Zbiór artykułów naukowych recenzowanych.*, 45.
24. Ученых, Е. С. 12 (69), 2019 LEARNING FOREIGN LANGUAGES FOR MEDICAL INSTITUTIONS Nuritdinova Zulkhumor Shamsievna Head of Chair in Samarkand State Medical Institute. *Yorova Sayora Karimovna English teacher of Samarkand State Medical Institute*, 9, 26.
25. Karimovna, Y. S., Erkinovna, T. N., & Agwan, A. (2023). MODERN EDUCATION AND CULTURAL DEVELOPMENT NURTURING GLOBAL CITIZENS IN THE 21ST CENTURY. *EPRA International Journal of Multidisciplinary Research (IJMR)*, 9(11), 292-294.
26. Saydullaevna, N. N., & Karimovna, Y. S. COMMUNICATIVE LANGUAGE TEACHING”, “ADVANTAGES OF THE TECHNIQUE WHAT/HOW/WHY OUTLINES IN DEVELOPING PRODUCTIVE SKILLS OF THE MEDICAL STUDENTS. In *Контактная информация организационного комитета конференции* (p. 135).
27. Saydullaevna, N. N., & Karimovna, Y. S. COMMUNICATIVE LANGUAGE TEACHING”, “ADVANTAGES OF THE TECHNIQUE WHAT/HOW/WHY OUTLINES IN DEVELOPING PRODUCTIVE SKILLS OF THE MEDICAL STUDENTS. In *Контактная информация организационного комитета конференции* (p. 135).
28. Karimovna, Y. S. (2020). COMMUNICATIVE COMPETENCE OF A SPECIALIST. *European Journal of Research and Reflection in Educational Sciences Vol*, 8(4).
29. Karimovna, Y. S., & Sachdeva, L. (2023). DIFFERENT APPROACHES AND ISSUES OF TEACHING FOREIGN LANGUAGE IN CONTEXT OF GLOBALIZATION. *TA'LIM VA RIVOJLANISH TAHLILI ONLAYN ILMIY JURNALI*, 3(5), 226-229.
30. Karimovna, Y. S., & Farxodovna, R. K. THE EFFECT OF SLEEP ON STUDENT PERFORMANCE. *Zbiór artykułów naukowych recenzowanych.*, 26.
31. Shamsievna, N. Z., & Karimovna, Y. S. LEARNING FOREIGN LANGUAGES FOR MEDICAL INSTITUTIONS. *ЕВРАЗИЙСКИЙ СОЮЗ УЧЕНЫХ (ЕСУ)*, 32.
32. Karimovna, Y. S., Kenjabaevna, A. P., Bakhodirovna, E. M., & Mallaevna, N. S. (2023). PHRASEOLOGICAL UNITS IN THE MEDICAL FIELD OF ENGLISH AND UZBEK CULTURES. DEVELOPMENT AND INNOVATIONS IN SCIENCE, 2 (2), 10–13.
33. Karimovna, Y. S. (2020). English and Uzbek medical conversation between doctor and patient (Analysis from a linguistic point of view). *Journal of Critical Reviews*, 7(5), 292-294.
34. Ерова, С. (2023). Коммуникатив хатти-ҳаракатлар прагмалингвистика, маданиятлараро прагматика. *Общество и инновации*, 4(7/S), 276-282.
35. Ёрова, С. (2023). ТИББИЙ НУТҚНИНГ ИЖТИМОЙ-МАДАНИЙ АСОСЛАРИ. *Общественные науки в современном мире: теоретические и практические исследования*, 2(1), 35-38.

36. Ёрова, С. К. (2022). Бевосита тиббиётнинг касб компетенцияси ва унинг деонтологик асослари. *Science and Education*, 3(12), 212-218.
37. Ёрова, С. К. (2023). ТИББИЙ НУТҚНИНГ КОГНИТИВ, МАДАНИЙ ВА ПРАГМАТИК ХУСУСИЯТЛАРИ. *IJTIMOIIY FANLARDA INNOVASIYA ONLAYN ILMIY JURNALI*, 3(2), 219-223.
38. Shodikulova, A. Z. (2021, December). The theory of an integrative approach to the analysis of the phenomenon of metonymy. In *Archive of Conferences* (pp. 56-57).
39. Shodikulova, A. (2023). COHESIONS FORMED BY MEANS OF HYPONYMS. *Евразийский журнал социальных наук, философии и культуры*, 3(9), 40-43.
40. Shodikulova, A. Z. (2021). The text is about the phenomenon of cohesion. *Academicia Globe*, 2(05), 229-232.



USE OF LATIN TERMINOLOGY IN THE PROFESSIONAL ACTIVITY OF A  
DOCTOR (BASED ON THE MATERIAL OF AN OUTPATIENT'S MEDICAL CARD)

Shodmonov Diyorbek Obid ugli

*2nd year student Faculty of Medicine-1 of Samarkand State Medical University*

Sharipov Bobur Salimovich

Scientific supervisor: *Assistant teacher, Department of Languages, Samarkand State  
Medical University*

<https://orcid.org/0009-0005-9787-8753>

**Abstract.** This article discusses ways of explicating special medical concepts in the texts of medical records of outpatients. A correlation is made between the way a term is written and its belonging to the anatomical-histological nomenclature and the system of clinical terminology.

**Key words:** medical terminology, outpatient medical record, medical discourse, natural written speech.

Currently, researchers identify a paradigm of medical communication, which is ordinary professional medical discourse, ordinary non-professional medical discourse, professional medical discourse, pseudo-medical discourse [4, p. 131]. Currently, texts that can be attributed to different components of this paradigm are being actively studied (in this case, we used the concept of “text” in its broadest sense: “text is the basic unit of communication” [6, p. 193]). They are analyzed from the perspective of a variety of research strategies, since they vary significantly in genre, functional, pragmatic, discursive, narratological, and stylistic terms. In particular, the everyday understanding of medical terms [4, 13], definitional modeling [8, 12], various aspects of medical discourse [1, 5], and medical metaphor [9] are described. We took as an object of study a text intended for professional communication, that is, a text included in professional medical discourse—the medical record of an outpatient.

We analyzed this genre formation from the standpoint of the Barnaul-Kemerovo school of natural written speech, based on the developed system for describing objects of natural written speech [7]. As a result of the study, genre-relevant and genre-irrelevant, but frequent, features of the natural written speech of a doctor filling out an outpatient medical record were identified, which allowed us to conclude that these texts are on the periphery of the genres of natural written speech [3]. Although the entries in the medical record are on the periphery of professional medical texts, such as an article, monograph, etc. (on the periphery from the point of view of his preparedness), they represent part of professional medical discourse. This material allows us to trace exactly how medical terminology is presented in the natural (spontaneous) written speech of a practicing doctor.

According to reviews from doctors, very often the text of a medical record is not orthologically correct. “An analysis of a large number of outpatient medical records showed that to date the problem of proper management has not been solved” [11, p. 123]. Sometimes this is due to the combination of the patient’s oral, spoken discourse with the written medical discourse of the doctor filling out the chart [see 3].

The purpose of this work is to describe ways of explicating medical terminology of Greek-Latin origin in the medical record of an outpatient. As researchers note, “terminological space is a necessary condition for the formation, development and improvement of a medical specialist” [8, p. 94]. Due to the fact that medical terminology is based on Latin and Greek, and for many centuries Latin was the official language of medicine, medical students not only memorize terms during their training, but also learn anatomical, clinical and pharmaceutical terminology. We tried to identify the extent to which the acquired knowledge is then used professionally in spontaneously produced speech, which is an indirect confirmation of the internalization of the term.

When producing the text of a medical record, the doctor is in a situation of linguistic choice, determined by several aspects. One of them is the synonymy of terms. “Modern medical terminology is one of the most extensive and conceptually and substantively complex systems of terms” [10]. The phenomenon of synonymy is one of the characteristic features of medical terminology itself. Researchers have different views on this problem; types of synonyms have been identified [2]. G. N. Aksenova concludes that in medical terminology, “partial synonyms mainly function” [2]. In this work, we will not dwell on this issue, since it is not within the scope of our research; we will only stipulate that we did not distinguish between partial and complete synonymy. The doctor, recording complaints, symptoms and making a diagnosis, chooses between the Latin and Cyrillic written systems (for example, dacryocystitis and dacryocystitis), between terms of Latin and Russian origin (runny nose and rhinitis), transliterated terms, in addition, he can choose from a group of synonymous designations choose an eponym for the same disease or anatomical formation.

As the analysis of the material shows, in the process of recording patient complaints, doctors most often use standard formulations that have Latin (“vesicular breathing”) or Russian origin “headaches.” At the same time, as a rule, even when writing down terms of Greek-Latin origin, doctors give preference to the Cyrillic system. Terms written in Latin letters make up about 5% of the analyzed records. It should be noted that switching from one system to another occurs immediately, as for example in the following diagnosis: “Flat feet of both feet I-II degree Halluxvalgus” (approx. spelling and punctuation preserved - S.G.). In some entries there is a

tendency to record common words, as seen in the following examples: “slurred speech” and “dysarthria”, “tremor of limbs” and “tremor of limbs”. Moreover, when describing the course of the disease, the doctor can directly record the vocabulary of the patient (or his representative, if we are talking about the pediatrician’s notes): “I got sick yesterday, runny nose, coughing...”. Sometimes the writer uses quotation marks: the patient’s speech is recorded as such, “someone else’s word”: “Complaints about ‘wheezing’.” Accordingly, in texts of this type it is possible to record the intersection of non-professional and professional medical discourses.

Greco-Latin terms written in Latin usually refer to anatomical and histological nomenclature, for example, "Coretpulm b/o". In this case, it would be more correct to even talk not about a term, but about a truncated term element, since the word “pulm” is written without the ending required by the rules of Latin grammar. Abbreviations adopted in anatomical atlases (such as A. basilaris) or general medical terms are also used: St. localis.

Words related to clinical terminology are transliterated and written in Cyrillic in 99% of cases, for example, “periartthritis” or “Ds: congenital internal hydrocephalus” (emphasis added).

Thus, the following conclusions can be drawn. Firstly, in the written speech of doctors, Greek-Latin, Russian terminology and neutral vocabulary are actively used. Latin terms related to clinical terminology are usually transliterated and written in Cyrillic. The Latin alphabet is used for the most part to write terms that, firstly, cannot be transliterated, and secondly, relate to anatomical and histological terminology.

#### Literature:

1. Karimovna, Y. S., & Farxodovna, R. K. THE EFFECT OF SLEEP ON STUDENT PERFORMANCE. *Zbiór artykułów naukowych recenzowanych.*, 26.
2. Shamsievna, N. Z., & Karimovna, Y. S. LEARNING FOREIGN LANGUAGES FOR MEDICAL INSTITUTIONS. *ЕВРАЗИЙСКИЙ СОЮЗ УЧЕНЫХ (ЕСУ)*, 32.
3. Karimovna, Y. S., Kenjabaeвна, A. P., Bakhodirovna, E. M., & Mallaevna, N. S. (2023). PHRASEOLOGICAL UNITS IN THE MEDICAL FIELD OF ENGLISH AND UZBEK CULTURES. *DEVELOPMENT AND INNOVATIONS IN SCIENCE*, 2 (2), 10–13.
4. Karimovna, Y. S. (2020). English and Uzbek medical conversation between doctor and patient (Analysis from a linguistic point of view). *Journal of Critical Reviews*, 7(5), 292-294.
5. Ерова, С. (2023). Коммуникатив хатти-ҳаракатлар прагмалингвистика, маданиятлараро прагматика. *Общество и инновации*, 4(7/8), 276-282.
6. Ёрова, С. (2023). ТИББИЙ НУТҚНИНГ ИЖТИМОЙ-МАДАНИЙ АСОСЛАРИ. *Общественные науки в современном мире: теоретические и практические исследования*, 2(1), 35-38.
7. Ёрова, С. К. (2022). Бевосита тиббиётнинг касб компетенцияси ва унинг деонтологик асослари. *Science and Education*, 3(12), 212-218.

8. Ёрова, С. К. (2023). ТИББИЙ НУТҚНИНГ КОГНИТИВ, МАДАНИЙ ВА ПРАГМАТИК ХУСУСИЯТЛАРИ. *IJTIMOIIY FANLARDA INNOVASIYA ONLAYN ILMIY JURNALI*, 3(2), 219-223.
9. Yorova, S. K., & Khakberdiyeva, V. J. K. (2021). DOCTOR AND PATIENT. *Scientific progress*, 2(1), 1478-1480.
10. Yorova, S. (2023). TO STUDY MEDICAL TERMS IN LATIN AND GREEK LANGUAGES. *International Bulletin of Engineering and Technology*, 3(3), 166-170.
11. Mardanovich, M. Z., Aliaskarovna, S. U., Kenjaevna, B. M., Genjebaevna, A. P., & Salimovich, S. B. (2021). Some Considerations about Legal Solutions and Practices of Certain Problems Writing Recipes. *Annals of the Romanian Society for Cell Biology*, 5341-5352.
12. Mukhamadiyeva, M., & Sharipov, B. (2022). LATIN AS THE MAIN LANGUAGE OF MEDICINE. *Theoretical aspects in the formation of pedagogical sciences*, 1(7), 337-339.
13. ZAFAR, M., BOBUR, S., & DILMUROD, B. R. (2021). Scientific and pedagogical basis of teaching the theory of decisions in school chemistry. *International Journal of Philosophical Studies and Social Sciences*, 1(3), 192-196.
14. Mardanovich, M. Z., Salimovich, S. B., & Arzimurodovich, B. D. (2021). Developing Students Attitudes Towards the Environment When Teaching a Foreign Languages. *Texas Journal of Multidisciplinary Studies*, 1(1), 199-201.
15. Salimovich, S. B. (2022). Studies of Reciprocity in Linguistics. *Eurasian Scientific Herald*, 8, 221-224.
16. Шарипов, Б. С. (2022). ТИЛ БИРЛИКЛАРИНИНГ НУТҚДА FAOLLASHUVI HAQIDA. *МЕЖДУНАРОДНЫЙ ЖУРНАЛ ИСКУССТВО СЛОВА*, 5(1).
17. Sharipov, B., Makhmudov, Z., & Buriyev, D. (2023). The role of teaching latin in the course of subject training of future foreign language teachers. *Science and innovation in the education system*, 2(1), 11-14.
18. Makhmudov, Z. M., & Sharipov, B. S. LOTIN TILI VA TIBBIY TERMINOLOGIYA FANINI O'QITISHDA INNOVATSION TEXNOLOGIYALARDAN FOYDALANISHNING DIDAKTIK TAMOYILLARI VA UNING ASOSI HAQIDA FIKRLAR.
19. Sharipov, B., Makhmudov, Z., & Buriyev, D. (2023). Influence of the latin language on the formation of medical terminology. *Theoretical aspects in the formation of pedagogical sciences*, 2(1), 16-20.
20. Sharipov, B., Makhmudov, Z., & Buriyev, D. (2023). Features of teaching latin to students medical universities studying in english. *Theoretical aspects in the formation of pedagogical sciences*, 2(1), 21-25.
21. Makhmudov, Z., Sharipov, B., & Bo'riyev, D. (2023). Tibbiyot universitetlarida lotin tili va tibbiy terminologiya fanini o'qitishning o'ziga xos xususiyatlari. *Science and innovation in the education system*, 2(1), 5-10.
22. Mardanovich, M. Z., Salimovich, S. B., & Arzimurodovich, B. D. (2021). Modern Methods of Teaching Latin and Medical Terminology in Uzbekistan. *International Journal of Development and Public Policy*, 1(5), 190-192.
23. Mardanovich, M. Z., Salimovich, S. B., & Arzimurodovich, B. D. (2021). Reviews of effective use of educational methods in teaching latin and medical

terminology. *ACADEMICIA: An International Multidisciplinary Research Journal*, 11(4), 381-386.

24. Sharipov, B. (2023). SOME CONSIDERATIONS ON THE FORMATION OF CLINICAL TERMS IN LATIN. *International Bulletin of Applied Science and Technology*, 3(6), 477-479.

25. Salimovich, S. B. (2022). RECIPROCAL SYMMETRY AND ITS GRAMMATICAL INDICATIONS. *EPRA International Journal of Research and Development (IJRD)*, 7(12), 129-131.

26. Sharipov, B. (2022). RETSIPROKLIK XUSUSIDA MULOHAZALAR. *Общественные науки в современном мире: теоретические и практические исследования*, 1(19), 63-66.

27. Salimovich, S. B. (2022, January). FUNCTIONS OF LANGUAGE UNITS. In *Conference Zone* (pp. 62-63).

28. Mardanovich, M. Z., & Salimovich, S. B. Auditoriyadan tashqari ta'lim-tarbiyaga maqsadli, tizimli yondashish. In *Конференция состоялась 5 марта 2022 года на базе Ташкентского государственного стоматологического института по адресу: Республика Узбекистан, 100047, г. Ташкент, ул. Махтумкули, 103. Цель конференции—знакомство и обмен опытом в обучении и в работе с цифровыми данными, технологиями их применения в гуманитарных* (p. 455).

29. Nasimjanovna, K. F., & Salimovich, S. B. (2023). NAMES OF DISEASES AND THEIR USE IN CLINICAL TERMINOLOGY. *Journal of Universal Science Research*, 1(6), 469-474.

30. Isroilova, M., & Sharipov, B. (2023). SOME OBSERVATIONS ON LATIN PRONUNCIATION AND SPELLING. *Science and innovation in the education system*, 2(7), 127-129.

31. Sharipov, B. (2023). SOME CONSIDERATIONS ON THE FORMATION OF CLINICAL TERMS IN LATIN. *International Bulletin of Applied Science and Technology*, 3(6), 477-479.

32. Salimovich, S. B. (2023). TRANSLATION OF CLINICAL TERMS IN LATIN AND BASIC MEDICAL TERMINOLOGY CLASSES. *Multidisciplinary Journal of Science and Technology*, 3(3), 100-103.

33. Махмудов, З. М., & Шарипов, Б. С. Талабаларнинг фанни яхши ўрганишлари учун психо-эмоционал таъсир этишда халқ мақол ва маталларидан тўғри фойдаланиш (лотин тили ва тиббий терминология фани мисолида). *Zbiór artykułów naukowych recenzowanych*, 112.

34. Bektosheva, E. D., & Salimovich, S. B. (2023). LATIN AND GREC TERMINOLOGY IN THE PROCESS OF STUDY OF OPERATIVE SURGERY. *Yangi O'zbekistonda Tabiiy va Ijtimoiy-gumanitar fanlar respublika ilmiy amaliy konferensiyasi*, 1(6), 66-72.

35. Sharipov Bobur Salimovich. (2023). ESSENTIAL COMMENTS ON THE CHARACTERISTICS DUE TO THE ORIGIN OF CLINICAL TERMS AND FEATURES OF CLINICAL TERMINOLOGY. *Research Focus International Scientific Journal*, 2(6), 144–148. Retrieved from <https://refocus.uz/index.php/1/article/view/296>



36. Salimovich, S. B. (2023). SOME THOUGHTS ON THE IMPORTANCE AND HISTORY OF THE LATIN LANGUAGE IN WORLD LANGUAGES. *Research Focus*, 2(10), 49-53.
37. Mardanovich, M. Z., & Salimovich, S. B. Auditoriyadan tashqari ta'lim-tarbiyaga maqsadli, tizimli yondashish. In *Конференция состоялась 5 марта 2022 года на базе Ташкентского государственного стоматологического института по адресу: Республика Узбекистан, 100047, г. Ташкент, ул. Махтумкули, 103. Цель конференции—знакомство и обмен опытом в обучении и в работе с цифровыми данными, технологиями их применения в гуманитарных* (p. 455).
38. Ithomovna, I. S., & Zikiriyayevna, S. A. (2023). LEARNING ENGLISH LANGUAGE AS A SECOND LANGUAGE. *Yangi O'zbekistonda Tabiiy va Ijtimoiy-gumanitar fanlar respublika ilmiy amaliy konferensiyasi*, 1(7), 37-43.
39. Zikiriyayevna, S. A. (2022). Cognitive Interpretation Of The Phenomenon Of Metonymy. *Eurasian Medical Research Periodical*, 5, 102-104.
40. Zikiriyayevna, S. A. (2023). THE ENCOUNTER OF MODERNISM IN ENGLISH LITERATURE. *Ethiopian International Journal of Multidisciplinary Research*, 10(12), 6-8.
41. METONYMY, O. a teacher of department of languages, Medicine and Education faculty Samarkand State Medical Institute. *SCIENTIFIC REPORTS OF BUKHARA STATE UNIVERSITY*, 136(17), 49-52.
42. Шодикулова, А. З. (2023). ГИПОНИМЛАР ҚЎЛЛАНИШИДА КОГЕЗИЯНИНГ НАМОЁН БЎЛИШИ. " XXI ASRDA INNOVATSION TEXNOLOGIYALAR, FAN VA TA'LIM TARAQQIYOTIDAGI DOLZARB MUAMMOLAR" nomli respublika ilmiy-amaliy konferensiyasi, 1(11), 111-117.

ЭЛЕКТРОННО-КОЛЕБАТЕЛЬНЫЕ ИССЛЕДОВАНИЯ СПЕКТРОВ  
КОМПОЗИЦИОННЫХ ПОЛИМЕРНЫХ МАТЕРИАЛОВ

*Марданова Юлдуз Уктам кизи*

*Преподаватель кафедры «Общая физика», НавГГТУ*

*Кувватова Мохинур Асатилло кизи*

*Преподаватель кафедры «Общая физика», НавГГТУ*

*Камалова Дилнавоз Ихтиёровна*

*Профессор кафедры «Физика и астрономия», НавГПИ*

**Аннотация.** В статье рассматривается и исследуется электронно-колебательные спектры композитов на основе полистирола и каолина. Результаты исследований велись с помощью ИК спектра.

**Ключевые слова:** полистирол, каолин, ИК спектроскопия, спектр, длина волн, полоса, композит, соединения.

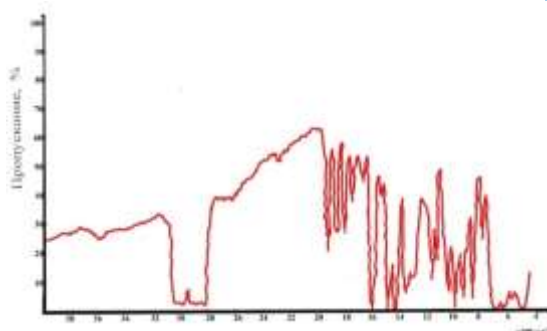
**Annotation.** In article it is considered and investigated electronic-vibration ranges of composites on the basis of polystyrene and a kaolin. Results of researches were conducted by means of IR spectrum.

**Keywords:** polystyrene, kaolin, IR spectroscopy, range, length of waves, strip, composite, connections.

На сегодняшний день в мире разработка простых, недефицитных, долговечных дешевых полуметаллов, металлических стекол, магнетиты и другие унифицированных металлов, датчики и различные приборы на их основе, применяемых в приборостроении и микроэлектронике, представляет собой особое значение. В связи с этим разработка эффективных композиционных полимерных материалов со специальными свойствами и установления оптимальных технологических параметров изготовления из них датчиков и приборов различного назначения для приборостроения и микроэлектронной промышленности является актуальным и востребованным.

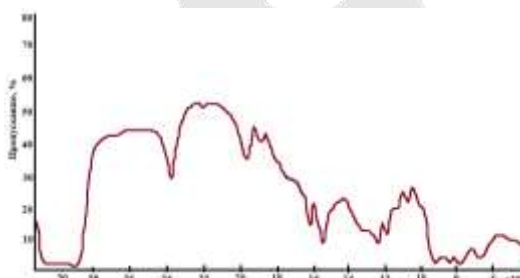
Целью исследований является изучение роли межфазных слоев, саже-каолино-наполненных полистироловых пленок методами ИК и ЭПР спектроскопии и разработка модифицированных составов композиционных полимерных пленочных материалов и приборов на их основе для применения в микроэлектронике и приборостроении.

Экспериментальные данные по спектроскопии ИК всех исследованных композитов представлены на рис.2-5. Если сравнить ИК спектр ненаполненного ПС (рис.1) с тем, что представлено на рис. 2-5, то можно убедиться, что процесс наполнителя полистирола (ПС) каолином приводит к резкому ослаблению или вообще к исчезновению многих полос в районе длин волн от 2000 до 750 см<sup>-1</sup> т.е. в районе, где наиболее характерно в более общих случаях проявление валентных колебаний С-С и С=C, а в частности, где дают о себе знать многие ароматические и алифатические соединения.

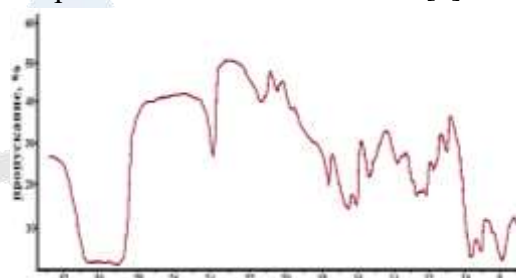


**Рис.1. ИК спектр чистого полистирола**

Важно также еще и то, что именно в этом районе более всего проявляют себя смешанные соединения, неорганические соли и их производные. Различные силикаты обычно проявляют себя в районе от 900 до 1100  $\text{см}^{-1}$ , но некоторые соединения с кремнием могут выходить за эти пределы. Так, вместо исчезнувшей слабой полосы 1512  $\text{см}^{-1}$  ( $\text{C}=\text{C}$  колебания бензольного кольца) в случае каолин (К) (0,02) появляется полоса 1575,3  $\text{см}^{-1}$ , которая характерна для  $^{27}\text{AlH}$ . В место сильной полосы валентных колебаний  $\text{C}-\text{C}$  в ПС 1030  $\text{см}^{-1}$  в композите появляется очень слабая 1018  $\text{см}^{-1}$ , которая может касаться  $^{26}\text{Si}^{12}\text{C}$  [2].



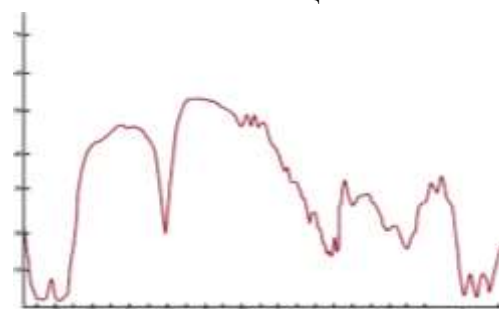
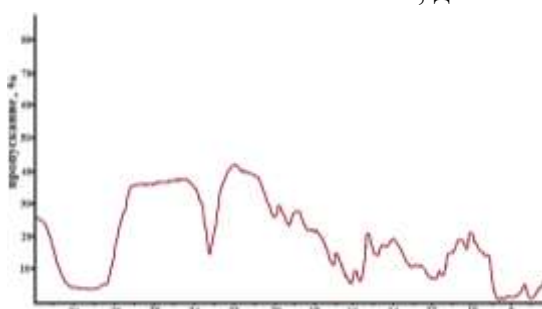
**Рис.2. ИК спектр композита ПС каолин (0,02)**



**Рис.3. ИК спектр композита ПС каолин (0,04)**

Наблюдаемую для композита ПС+К (0,02) полосу 819,6  $\text{см}^{-1}$  можно было бы рассматривать как смещение 800  $\text{см}^{-1}$  от маятникового колебания  $\text{CH}_2$  ненаполненного ПС, однако, более правдоподобно было бы отнесение ее к соединению  $^{27}\text{Al}^{16}\text{O}$ . Интерпретируемые для ПС+К (0,02) появившиеся новые полосы, характерны для таких соединений, как  $\text{AlH}$ ,  $\text{SiC}$  и  $\text{AlO}$  наблюдаются и для композитов ПС с более высоким содержанием наполнителя (рис.3-5).

При интерпретации полос поглощения композитов вне интервала 2000-750  $\text{см}^{-1}$  следует остановиться на двух очень существенных на наш взгляд фактах, которые можно будет использовать в пользу образования в межфазные соединения композита вышеизложенной комбинации координационного соединения. Факт первый заключается в том, что практически во всех ИК спектрах композитов возле 2375  $\text{см}^{-1}$  в отличие от ненаполненного ПС появляется новая, достаточно отчетливая полоса поглощения.



**Рис. 4. ИК спектр композита ПС  
каолин (0,06)**

Согласно Я.Рабеку, это находится в районе проявления валентных колебаний  $C=X$ , однако, согласно Г.Герцбергу, экспериментальная  $2375\text{ см}^{-1}$  не может быть от таких групп, как  $=C-H$  или  $-C=C-$ , так как валентные колебания последних проявляются при  $3300\text{ см}^{-1}$  и  $2050\text{ см}^{-1}$ , соответственно.

**Рис. 5. ИК спектр композита ПС  
каолин (0,08)**

**Список использованных литератур:**

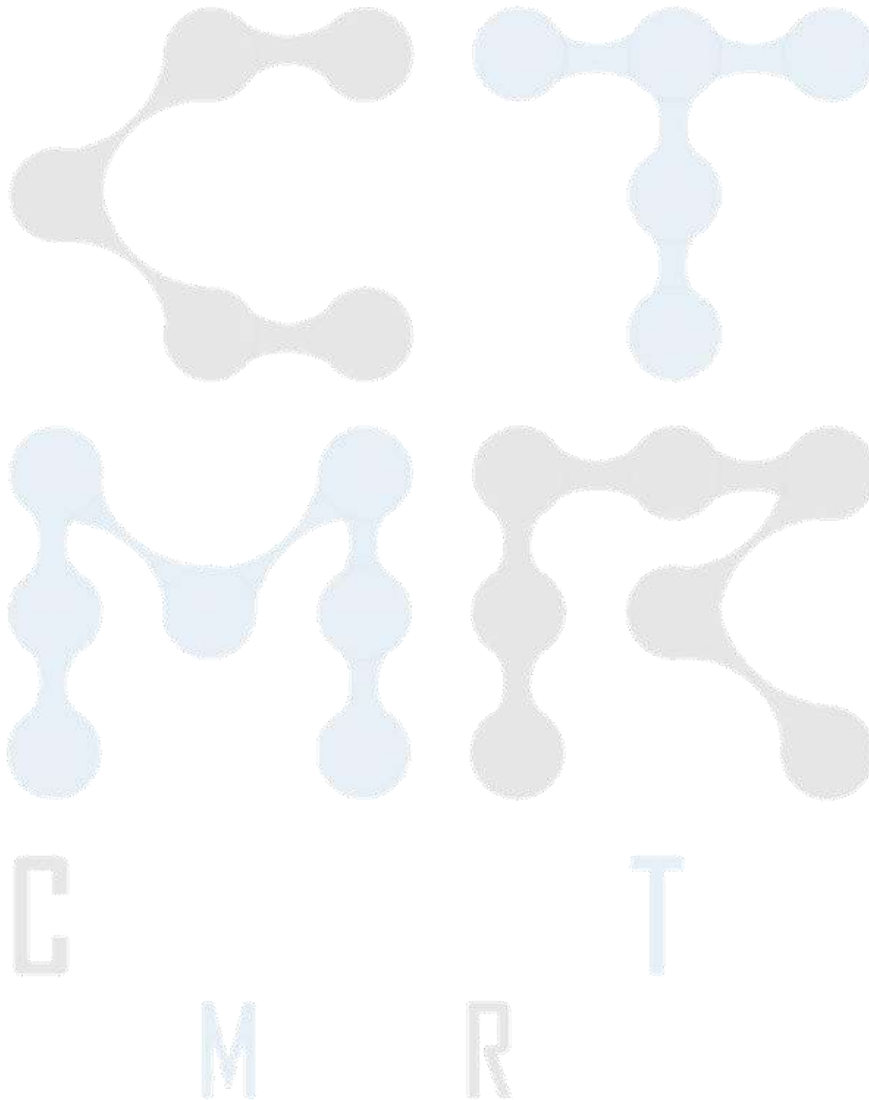
1. Рабек Я. Экспериментальные методы в химии полимеров. Пер. с англ. под ред. Коршова В.В. М. Мир. 1383. Т. 2. Стр. 473.
2. Герцберг Г. Электронные спектры и строение многоатомных молекул. М. Мир. 1868.
3. Герцберг Г. Спектры и строение простых свободных радикалов. М. Мир. 1874. Стр. 208.
4. Камалова Д.И. и др. Влияние термообработки и толщины оксидного слоя на характеристики полупроводниковых материалов. "Universum: технические науки". Россия. Декабрь, 2016. №12(33). 38-41 стр.
5. Камалова Д.И. и др. Перспективы применения полупроводникового материала на основе фосфида индия в отраслях приборостроения. "Universum: технические науки". Россия. Январь, 2017. №1(34). 43-46 стр.
6. Камалова Д.И. и др. Электронно-микроскопическое и ИК, ЭПР спектроскопическое исследование структуры системы ПВДФ+сажа (0,02). "Universum: технические науки". Россия. 2017. №11(44). 49-52 стр.
7. Kamalova D.I. and oth. Research of characteristics of the signal of EPR of composites. "Advanced materials research". Switzerland. 2017. Volume 1145. pp 230-233.
8. Камалова Д.И., Негматов С.С., Умаров А.В., Абед Н.С. ЭПР спектроскопическое исследование структуры композитов на основе полистирола и каолина. "Universum: технические науки". Россия. 2018. №5(50). 56-58 стр.
9. Kamalova D.I. and oth. Thermal conductivity of soot filled compositions based on polystyrene. IJARSET. International journal advanced research in science, engineering and technology. India. September. 2018. Volume 5. Issue 9. pp 6963-6968.
10. Kamalova D.I. and oth. Research of structure and physical and chemical properties polystyrene compositions it is filled with the Angren secondary kaolin. X International correspondence scientific specialized conference "International scientific review of the problems of natural sciences and medicine". USA, Boston. April 2-3. 2019. pp 6-9.
11. Kamalova D.I. and oth. Study of the characteristic features of the strongest broadening of the EPR signal in polystyrene-based polymer compositions. SCIREA. Journal of Chemistry. March 9, 2020. Volume 5. Issue 1. February. 2020. pp. 1-11. SCOPUS.
12. Kamalova D.I. and oth. Research of electro physical and physicochemical properties of fillers for production of composite polymer materials. Solid State Technology. November 27. 2020. Volume 63, Issue 6. pp 9771-9777. SCOPUS.
13. Kamalova D.I., Umarov A.V. Investigation of ultrafine expansion in epr studies of a polymer composition based on polystyrene. Applied physics letters. AIP Conference Proceedings. 2308. 030019. 2020. SCOPUS.

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-4, ISSUE-1

14. Kamalova D.I. and oth. Electron-paramagnetic resonance and infrared spectroscopic research of the structure of a south field polyvinylidene difluoride near the percolation threshold. E3S Web of Conferences. International Scientific Conference "Construction Mechanics, Hydraulics and Water Resources Engineering" (CONMECHYDRO). Volume 264. **Tashkent, Uzbekistan. April 1-3, 2021. SCOPUS.**

15. Kamalova D.I. Study of thermal conductivity of soft-filled compositions based on polystyrene and polyvinylidenfluoride. "Web of scientist: International Scientific research Journal". Volume 2. Issue 5. May. 2021. pp. 855-860. ISSN: 2776-0979. Impact factor: 7.565.



**ФАКТОРЫ, ВЛИЯЮЩИЕ НА ВЫБОР МЕСТА РАЗМЕЩЕНИЯ МАЛЫХ  
ПРОМЫШЛЕННЫХ ЗОН И ЭКОНОМИКО-МАТЕМАТИЧЕСКАЯ МОДЕЛЬ ЕГО  
ОПТИМИЗАЦИИ**

**Сакиева О.Б., ТерГУ**

**Аннотация:** В статье представлены факторы, влияющие на выбор места размещения малых промышленных зон и экономико-математическая модель его оптимизации.

**Ключевые слова:** малые промышленные зоны (МПЗ), свободные земельные участки, иерархический метод, метод «шаг в шаг», альтернативы, критерии, коэффициент важности,

**Abstract:** The article presents factors influencing the choice of location for small industrial zones and an economic and mathematical model for its optimization.

**Key words:** small industrial zones (SIZ), vacant land plots, hierarchical method, “step by step” method, alternatives, criteria, importance coefficient

Сурхандарьинская область, южный регион нашей республики, занимает важное место в жизни нашей страны благодаря своим огромным экономическим возможностям, географическому и транспортному потенциалу. Проводимые работы по эффективному использованию подземных и поверхностных ресурсов региона повышают промышленный потенциал региона и служат производству готовой продукции на экспорт. Решение Президента Республики Узбекистан «О мерах по созданию малых промышленных зон в Сурхандарьинской области» направлено на создание новых рабочих мест в сфере производства в регионе, повышение уровня занятости и благосостояния населения [1].

Управленческая деятельность малых промышленных зон всегда связана с принятием решений различной сложности, в которых сконцентрирован большой объем экономических, социальных, политических, юридических и духовных факторов, что приводит к постановке вопроса о многокритериальной оптимизации с привлечением экспертов или лиц, принимающих решения. Для повышения качества и уровня объективности принятия решений необходимо учитывать мнение экспертной группы. В процессе принятия решений возникает состояние неопределенности, выраженное в форме качественных и количественных оценок, обусловленное отсутствием у лиц, принимающих решения, знаний об особенностях объекта, степени достоверности экспертной оценки, ошибочностью представления информации и т.д. Поэтому при решении вопросов принятия решений в условиях неопределенности необходимо обеспечить сравнение факторов, не имеющих количественного описания, или сопоставить их качественное и количественное описание в совокупности. Для решения таких задач удобно использовать метод иерархического анализа [3].

Создание индустриальных парков на территории Российской Федерации, территориально-пространственное расположение и процесс развития должны учитывать несколько принципов. Следует отметить, что принципы неоднократно упоминались в работах многих ученых: близость производства к источникам сырья, энергии, топлива и местам, где есть спрос на готовую продукцию; равное распределение производства на территории страны; в целях максимально эффективного использования регионального

распределения труда, специализации отдельных хозяйств района, комплексного развития экономики региона и совершенствования сетевой структуры, специализации и интеграции производства, расчета региональных балансов производства и потребления, межрайонных по важным видам продукции в транспортных балансах подчеркивалось требование минимальных издержек производства, необходимость избегать чрезмерной концентрации в крупных городах и развития средних и малых городов.

В формировании малых промышленных зон и увеличении производственных мощностей особое место занимает их географическое положение, влияющее на затраты на транспорт и сырье. Производственная сеть каждой малой промышленной зоны имеет свои факторы и особенности географического расположения производственных объектов.

Расположение малых промышленных зон с точки зрения системы транспортной логистики является для них одним из важнейших требований, поскольку транспортные затраты занимают большую долю в цепочке добавленной стоимости, кроме того, современные малые промышленные зоны включают в себя места проживания сотрудников, социально-культурные объекты и др. включены. В этом отношении индустриальные зоны являются экономическим и инвестиционным инструментом, а инвестиции позволяют снизить стоимость товаропроводящей цепочки. Уже более века существует тенденция размещения промышленных предприятий вместе с продуманной транспортной логистикой, кооперацией, общим капиталом и рациональным использованием рабочей силы, что отсутствуют четкие критерии отбора проектов для размещения на территориях МПЗ, существуют недостатки по обеспечению строительства необходимых инженерных коммуникаций и инфраструктуры в соответствии с проектами, не ведется системная работа по предоставленным льготам и благоустройству, электроснабжению, газоснабжению и питьевой воды в МПЗ, и есть проблемы, в состояниях дорог, ведущих в этот район [2].

С помощью метода иерархического анализа рассмотрен вопрос отбора пустующих земельных участков для МПЗ с помощью местных или иностранных предпринимателей на аукционе, организованном дирекцией управления МПЗ Сурхандарьинской области. Требуется выбрать среди них наиболее оптимальный. Решение проблемы состоит из следующих шагов:

Этап 1. В данном случае определяется цель (шаг 1), то есть цель: «Выбор свободных земельных участков с помощью местных или иностранных предпринимателей». Определены критерии (уровень 2): 7 критериев ( $V_1$ = земельная площадь (га),  $V_2$ = население,  $V_3$ = созданные рабочие места,  $V_4$ = электроснабжение,  $V_5$ = природный газ,  $V_6$ = водоснабжение,  $V_7$  = снабжение дорожной). В качестве альтернативного решения (шаг 3) даны свободные земельные участки на территории 22 МПЗ, каждый вариант выбирается на основе выбранных критериев. По выбранным критериям создается иерархический график количественных или качественных показателей альтернатив (1-таблица).

## Информация о свободных земельных участках КСЗ в Сурхандарьинской области

№	Название района или города	Название МПЗ	Площадь земли (га)	Население	Количество создаваемых рабочих мест	Электроснабжение	Природный газ	Водоснабжение	Дорога
1	Джаркурганский район	"Янгиобод"	0,7	227,0	36	1	1	1	1
2	Джаркурганский район	"Янгиобод" янги	1,6	227,0	63	0	0	1	0
3	Джаркурганский район	"Куштпепа"	0,42	227,0	16	0	0	1	0
4	Музработский район	"Шаффоф"	0,5	147,0	19	1	1	1	1
5	Музработский район	"Янгидиёр"	1,0	147,0	41	0	0	1	0
6	Алтинсойский район	"Окарбулок"	0,3	184,0	11	1	0	1	1
7	Термезский район	"Бунёдкор"	0,5	81,0	20	1	1	1	1
8	Термезский район	"Нурафшон"	3,0	81,0	120	0	0	1	0
9	Узунский район	"Навруз"	0,4	180,0	14	1	0	1	1
10	Узунский район	"Истиклол" 1	2,8	180,0	112	0	0	1	0
11	Узунский район	"Истиклол" 2	1,8	180,0	70	0	0	0	0
12	Шурчинский район	"Жойилма"	0,1	218,0	4	1	1	1	1
13	Шурчинский район	"Қораарик"	0,783	218,0	31	0	0	1	0
14	Бандиханский район	"Бектепа"	1,67	79,0	66	1	1	1	1
15	Байсунский район	"Мустақиллик"	0,1	120,0	3	1	1	1	1
16	Кызырикский район	"Рабатак"	1,2	119,0	48	1	1	1	1
17	Кызырикский район	"Кунчиқиш"	0,9	119,0	37	0	0	1	1
18	Кызырикский район	"Зарбдор"	1,0	119,0	39	0	0	1	0
19	Шерабадский район	"Тарокли"	1,7	202,0	66	0	0	1	0



20	Шерабадский район	"Қорабоғ"	10,2	202,0	408	0	0	0	0
21	Байсунский район	"Инкобат"	3,3	120,0	132	0	0	0	0
22	Бандиханский район	Бектепа	16,7	79,0	668	0	0	1	0

На 2-этапе на каждом уровне иерархии, сформированной на картинке, вводится матрица парного сравнения и на основе элементов этих матриц определяется коэффициент важности (КВ) [4].

2-таблица

Сравнительная таблица критериев и коэффициента важности (КВ)

Важность критериев	Площадь земли (га)	На селение	Количество создаваемых рабочих мест	Электро снабжение	Природный газ	Водоснабжение	Дорога	КВ
Площадь земли (га)	1,00	2,00	5,00	7,00	3,00	4,00	9,00	0,364
Население	0,50	1,00	4,00	5,00	2,00	3,00	7,00	0,241
Кол. создаваемых рабочих мест	0,20	0,25	1,00	2,00	0,33	0,50	3,00	0,066
Электроснабжение	0,14	0,20	0,50	1,00	0,25	0,33	2,00	0,043
Природный газ	0,33	0,50	3,00	4,00	1,00	2,00	5,00	0,156
Водоснабжение	0,25	0,33	2,00	3,00	0,50	1,00	4,00	0,102
Дорога	0,11	0,14	0,33	0,50	0,20	0,25	1,00	0,028

По 2-таблице определены коэффициенты важности критериев, причем наибольшая значимость имеет  $V_1$  = площадь земли, за ней следуют  $V_2$  = население,  $V_5$  = обеспечение природным газом,  $V_6$  = водоснабжение,  $V_3$  = создаваемые рабочие места,  $V_4$  = обеспечение электроэнергией, а последнее место занял  $V_7$  = критерий обеспечения дорогами.

Теперь для определения коэффициентов важности альтернатив (МПЗ) по каждому критерию сначала воспользуемся методом «шаг в шаг».

По расчетам иерархического анализа, воспользуемым методом «шаг в шаг», МПЗ Янгибад Джаркурганского района с коэффициентом 0,441, МПЗ Шаффоф Музробадского района с коэффициентом 0,471, МПЗ Нурафшон Термезского района с коэффициентом 0,591, МПЗ Истиклол\_1 Узунского района с коэффициентом 0,401, МПЗ Караарик с коэффициентом значимости 0,638, МПЗ Бектепа\_3 в Бандиханском районе с коэффициентом значимости 0,701, МПЗ Инкобод в Байсунском районе с коэффициентом значимости 0,599, МПЗ Рабатак в Кызырикском районе с коэффициентом значимости 0,550, МПЗ Карабог в Шерабадском районе с коэффициентом значимости 0,489 и МПЗ

имени Окарбулок в Алтынсойском районе (альтернативный вариант) примут участие (3-таблица).

3-таблица

Информация о МПЗ (альтернативном), участвующем в 3 этапе

№	Название района или города	Название МПЗ	Площадь земли (га)	Население	Количество создаваемых рабочих мест	Электроснабжение	Природный газ	Водоснабжение	Дорога
1	Джаркурганский район	"Янгиобод"	0,7	227,0	36	1	1	1	1
2	Музработский район	"Шаффоф"	0,5	147,0	19	1	1	1	1
3	Алтынсойский район	"Окарбулок"	0,3	184,0	11	1	0	1	1
4	Термезский район	"Нурафшон"	3,0	81,0	120	0	0	1	0
5	Узунский район	"Истиклол"1	2,8	180,0	112	0	0	1	0
6	Шурчинский район	"Қораарик"	0,783	218,0	31	0	0	1	0
7	Кызирикский район	"Рабатак"	1,2	119,0	48	1	1	1	1
8	Шерабадский район	"Қорабоғ"	10,2	202,0	408	0	0	0	0
9	Байсунский район	"Инкобат"	3,3	120,0	132	0	0	0	0
10	Бандиханский район	Бектепа	16,7	79,0	668	0	0	1	0

На этом этапе по каждому критерию сравнивается каждая альтернатива (МПЗ) попарно и рассчитываются коэффициенты важности (4-таблица).

Таблица коэффициентов важности (КВ) МПЗ (альтернативный вариант).

Критерии	Площадь земли (га)	Население	Количество создаваемых рабочих мест	Электроснабжение	Природный газ	Водоснабжение	Дорога	КВ
КВ критериев	0,364	0,241	0,066	0,043	0,156	0,102	0,028	
Янгиобод	0,029	0,291	0,034	0,214	0,268	0,122	0,214	0,152
Шаффоф	0,020	0,053	0,023	0,214	0,268	0,122	0,214	0,090
Окарбулок	0,015	0,109	0,017	0,214	0,030	0,122	0,214	0,065
Нурафшон	0,108	0,018	0,100	0,024	0,030	0,122	0,024	0,070
Истиклол 1	0,084	0,076	0,083	0,024	0,030	0,122	0,024	0,074
Кораарик	0,031	0,216	0,033	0,024	0,030	0,122	0,024	0,085
Бектепа 3	0,283	0,018	0,298	0,024	0,024	0,122	0,024	0,145
Инкобат	0,170	0,037	0,149	0,024	0,024	0,014	0,024	0,088
Рабатак	0,048	0,026	0,050	0,214	0,268	0,122	0,214	0,097
Қорабоғ	0,212	0,155	0,214	0,024	0,030	0,014	0,024	0,135

Существует несколько подходов к повышению эффективности организованных в регионах малых промышленных зон, оптимизации их управления, которые в основном учитывают эффективность экономической деятельности региона и показатели экономической системы, качество производимой продукции, и качественные аспекты их соответствия международным стандартам. На основе многокритериального подхода экономическая система региона требует комплексной разработки показателей эффективности процесса управления и достигаемых в нем практических результатов, а также большего учета внутренних факторов.

Иерархизация методом иерархического анализа приводит к распространению целей на последовательно более низкие уровни, что способствует внесению тактических изменений в управленческие решения, а также активизации региональной экономической системы [5]. В ходе исследования были сделаны следующие основные выводы:

МПЗ в 10 районах области были приняты в качестве альтернативного варианта при выборе местных или иностранных покупателей земельных участков, выставяемых на аукционы в регионах. По критерию земельной площади (B1) МПЗ имени Бектепа\_3 в Бандихонском районе занимает первое место с 0,283 КВ, МПЗ имени Карабог в Шерабадском районе находится на 2-м месте с 0,212 КВ, а МПЗ Окарбулок в

Алтынсайском районе на последнем месте с 0,015 КВ. По критерию численности населения (B2) Янгибадский МПЗ Жаркурганского района занимает первое место с 0,291 КВ. МПЗ имени Караарик в Шурчинском районе находится на 2 месте с 0,216 КВ, а Нурафшон в Термезском районе и МПЗ Бектепа\_3 в Бандиханском районе находятся на последнем месте с 0,018 КВ. По критерию созданных рабочих мест (B3) МПЗ имени Бектепа\_3 в Бандиханском районе занимает первое место с коэффициентом преимущества 0,298, МПЗ имени Карабог в Шерабадском районе находится на 2 месте с 0,214 КВ, а МПЗ Окарбулок в Алтынсайского района на последнем месте с 0,017 КВ.

В целях определения приоритета альтернатив путем умножения коэффициентов критериальной важности для каждой отдельной альтернативы на коэффициенты важности альтернативы и суммирования результатов Янгибадский МПЗ Джаркурганского района занимает 1 место с коэффициентом приоритетности 0,152. , а МПЗ Бектепа\_3 в Бандиханском районе занимает 2-е место с МК 0,145, а МПЗ Шерабадского района Карабахский МПЗ занял третье место с коэффициентом преимущества 0,135. МПЗ имени Окарбулок Алтынсойского района занял самое низкое место с 0,065 КВ

Существует несколько подходов к повышению эффективности организованных в регионах малых промышленных зон, оптимизации их управления, которые в основном учитывают эффективность экономической деятельности региона и показатели экономической системы, качество производимой продукции, и качественные аспекты их соответствия международным стандартам. На основе многокритериального подхода экономическая система региона требует комплексной разработки показателей эффективности процесса управления и достигаемых в нем практических результатов, а также большего учета внутренних факторов.

Иерархизация методом иерархического анализа приводит к распределению целей на последовательно более низкие уровни, что способствует внесению тактических изменений в управленческие решения, а также активизации региональной экономической системы. Таким образом, данный метод может широко использоваться при оценке качества процесса управления, производственном планировании, оптимизации рыночных и коммерческих операций, оптимизации размещения свободных экономических и индустриальных зон.

#### Литература:

1. «О мерах по созданию малых промышленных зон в Сурхандарьинской области» Постановление Президента Республики Узбекистан, от 29.03.2018 г. № ПП-3636
2. Сакиева, О. Б. (2023). КИЧИК САНОАТ ЗОНАЛАРИ ФАОЛИЯТИ САМАРАДОРЛИГИ МОНИТОРИНГИНИ ТАШКИЛ ҚИЛИШ ВА УЛАРНИ БАҲОЛАШ КЎРСАТКИЧЛАР ТИЗИМИ. *Gospodarka i Innowacje.*, 35, 608-614.
3. Т. Л. Саати. Принятие решений. Метод анализа иерархий. — М.: Радио и связь, 1989. — 316 с.
4. Sakieva, O. B. (2019). PRACTICE AND APPLICATION OF HIERARCHICAL ANALYSIS. *Theoretical & Applied Science*, (12), 544-549.
5. Г.Л Бродецкий, П.А.Терентьев “Применение метода аналитической иерархии для оптимизации места расположения регионального распределительного центра” 2005 г.26-34 стр

ROLE OF IOT TECHNOLOGY FOR DEVELOPING SMART ENVIRONMENTS: CHALLENGES AND PERSPECTIVES

Gayratov Zafarjon Kamoliddinovich<sup>1</sup>, Kilichov Jasur Ruzikulovich<sup>1</sup>,  
Najmiyev Mirjalol Makhmudjonovich<sup>2</sup>, Almardonov Asliddin Faxriddin o'g'li<sup>2</sup>,

<sup>1</sup>The Samarkand branch of TUIT named after Muhammad al-Khwarizmi, teachers of department "Telecommunication engineering", Uzbekistan.

<sup>2</sup>The Samarkand branch of TUIT named after Muhammad al-Khwarizmi, students of faculty "Telecommunication Technologies and Professional Education", Uzbekistan.

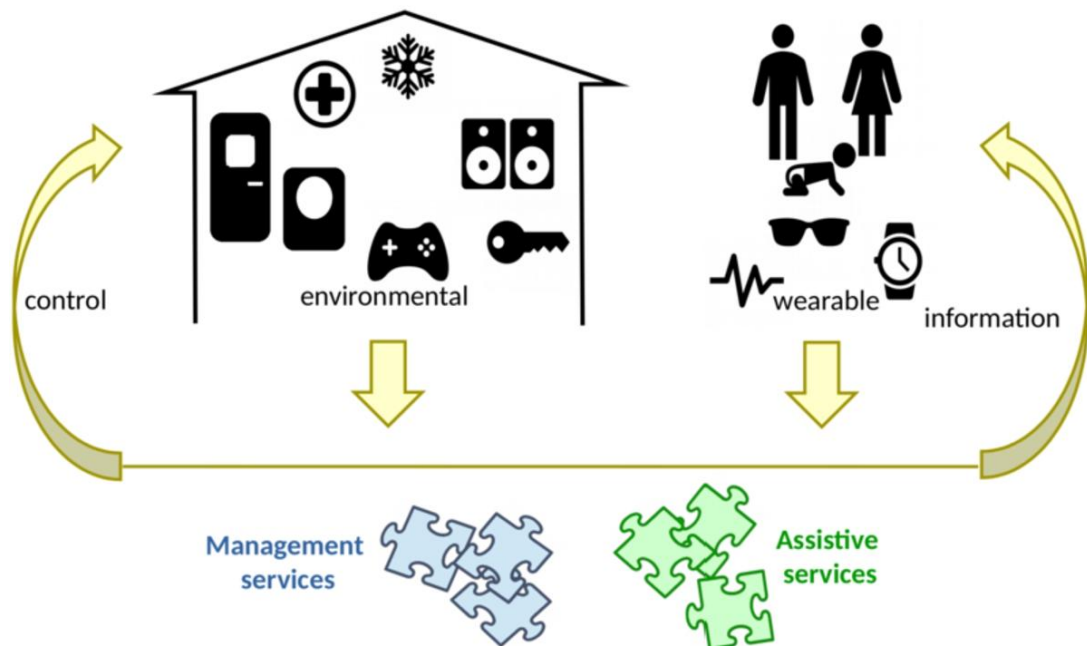
**Abstract** - The Internet of Things (IoT) represents a transformative technology that is redefining the boundaries of computation, networking, and physical objects. This paper presents a technology-centric perspective on how IoT is enabling smart environments, focusing on the convergence of various technologies and their implications for future smart ecosystems. We discuss the foundational technologies driving IoT advancements, the integration of IoT in smart environments, and the challenges and future trends in this dynamic field. Nevertheless, the current IoT ecosystem offers many alternative communication solutions with diverse performance characteristics. This situation presents a major challenge to identifying the most suitable IoT communication solution(s) for a particular smart environment.

**Keywords:** *Internet of Things (IoT), Smart Environments, IoT Technologies, Sensor Networks, Smart Homes, Smart Cities, Industrial IoT (IIoT), Connectivity Protocols, Edge Computing, Data Analytics, Machine Learning in IoT, IoT Security, Privacy in IoT, IoT Interoperability, IoT Standards, IoT Scalability, IoT Management.*

**Introduction.** The Internet of Things (IoT) is an emerging paradigm that connects everyday objects to the Internet, enabling them to collect and exchange data. This technological revolution is paving the way for the creation of intelligent environments where objects can interact and cooperate with each other to provide advanced services and improve the quality of life. In this article, we explore the role of IoT in enabling smart environments from a technology-centric perspective, highlighting its impact, challenges, and future trends[1].

Advances in many technical areas are making the IoT and smart environments possible, including multiple communication solutions for IoT devices, which we categorize into two main families: i) Radio Frequency Identification (RFID), intended mainly for object and device identification, and ii) general-purpose Constrained-Node Network (CNN) technologies and architectures. The numerous and highly heterogeneous solutions available provide different features and performance trade-offs, a fact that makes identifying the most suitable IoT communication technologies and solutions for a particular smart environment challenging. While all smart environments collect, process and act upon information, different specific smart environments do so at different scales. Moreover, different vertical domains (e.g. smart home/health/city/factory) come with diverse requirements, and hence technology choices, which also influences the tactics of how and where data is processed and how to act upon the information within a specific context. Furthermore, different types of smart environments evolve at a different pace: Some vertical domains can evaluate and adopt new technologies much faster (e.g. smart home and smart health), while in others (e.g. smart factories and smart cities) changes cannot be adopted expediently due to the fact that such environments must deal with legacy

systems. This requirement further complicates the choice of communication technologies and solution availability for particular smart environments[2].



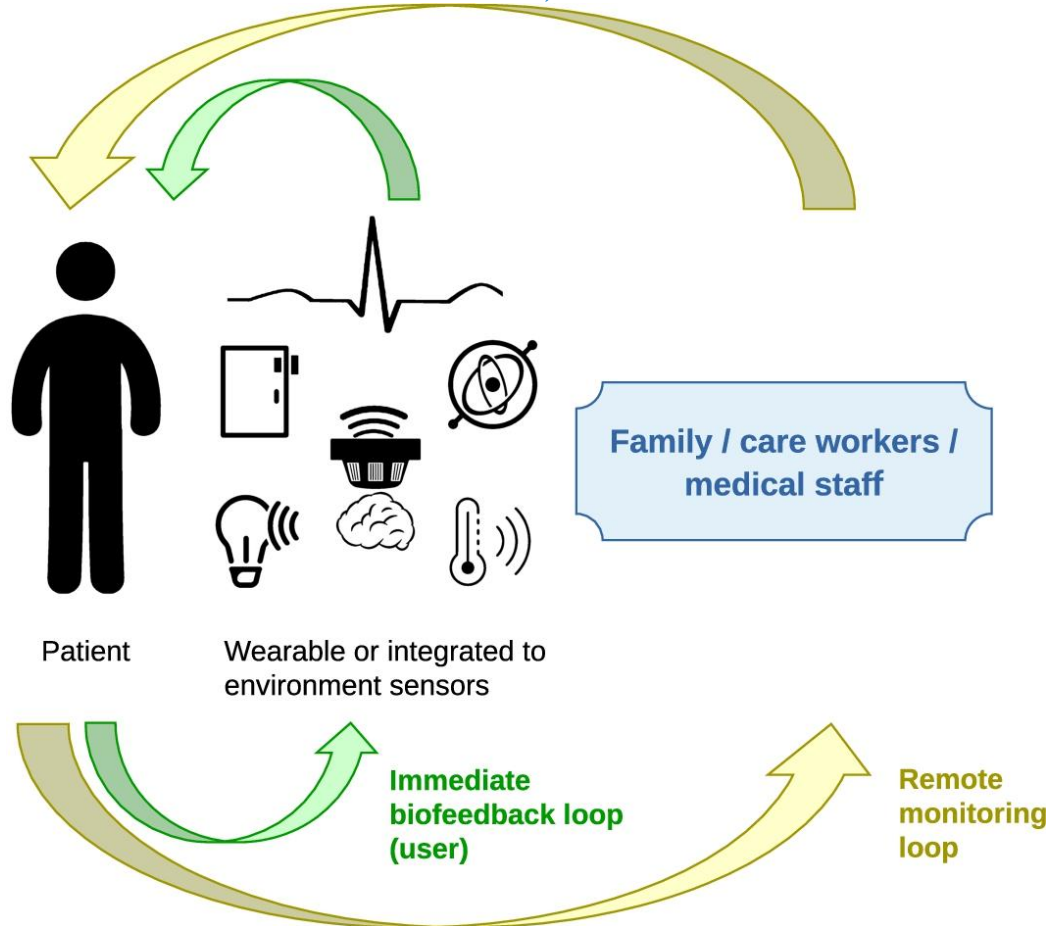
**Figure 1.** Main components in smart home systems.

**Foundational Technologies of IoT.** At the crux of this transformation is a technology-centric perspective that sees IoT not merely as a network of interconnected devices but as a sophisticated ecosystem that leverages a combination of advanced technologies. These technologies include, but are not limited to, sensors, actuators, communication protocols, data analytics, cloud and edge computing, and artificial intelligence (AI). Together, they create a robust framework that underpins smart environments, ranging from homes and offices to cities and industrial complexes.

**Sensors and Actuators.** At the heart of IoT are sensors and actuators, which provide the necessary interface between the physical and digital worlds. Sensors gather data from the environment, while actuators allow physical actions to be taken based on digital decisions. Advances in microelectronics have led to smaller, more efficient, and cost-effective sensors, widening IoT applications.

**Connectivity and Communication Protocols.** Reliable and ubiquitous connectivity is crucial for IoT. This section reviews various wireless communication technologies (e.g., Wi-Fi, Bluetooth, Zigbee, 5G) and protocols (e.g., MQTT, CoAP) that facilitate the seamless transfer of data among IoT devices.

**Data Processing and Analytics.** IoT generates vast amounts of data that require effective processing and analytics. We discuss edge computing, cloud computing, and the role of AI and machine learning in analyzing and extracting meaningful insights from IoT data.



**Figure 2.** General description of IoT or smart environments for health.

Another aspect of IoT that has been confined so far to research, concerns the adaptation and personalization of services offered by smart homes. Adaptation and personalization consider the ability of a smart home to automatically tailor its services to the individual user's needs. This is often achieved by building on generic services designed for a specific group of users such as children or the elderly, and then by adapting the behavior of the service to the habits of the user. This implies the ability to detect habits as well as to discover deviations from these habits while at the same time, to automatically reconfigure the business logic of the service or application. Such mechanisms usually require a strong convergence among sensors and activity recognition, anomaly detection and cognitive capabilities, especially in those cases in which at least part of these capabilities are integrated within the sensors themselves. Significant preliminary experiences with this approach which is often referred to as the Internet of Intelligent Things [3], has been obtained by EU projects RUBICON [4] and OPPORTUNITY [6].

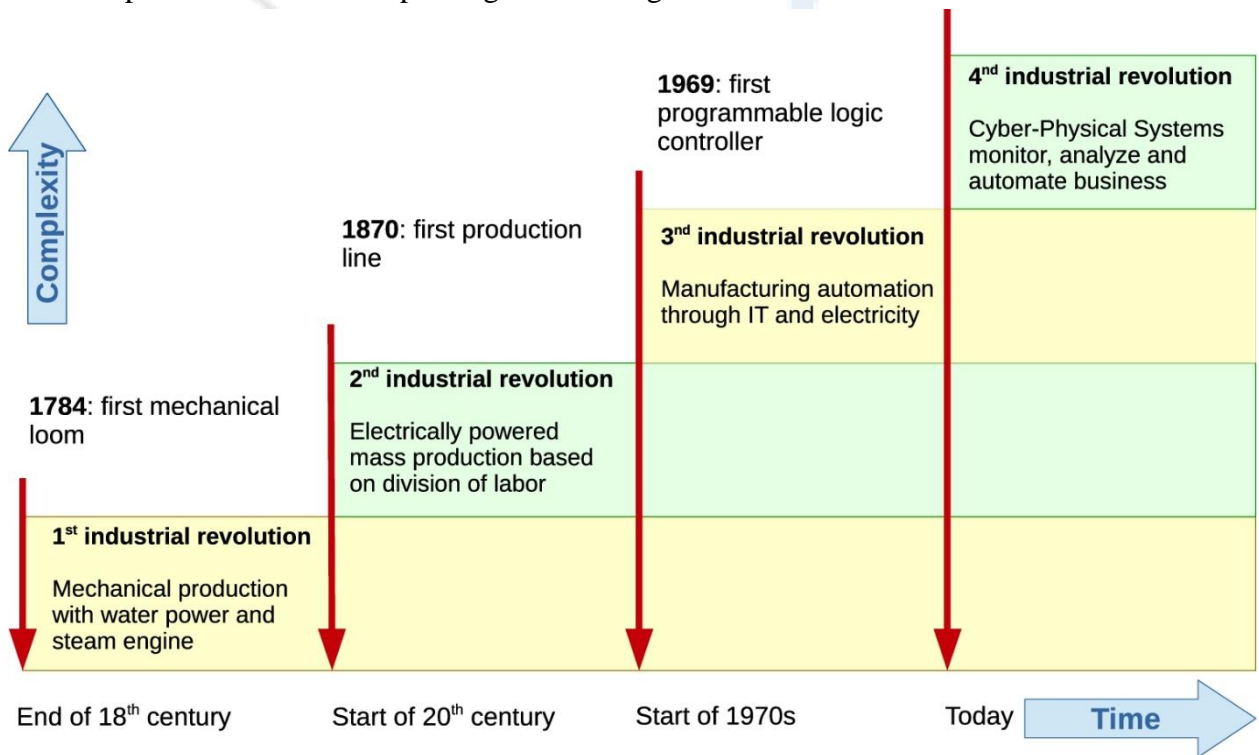
**IoT in Smart Environments.** Smart Homes. IoT technologies in smart homes provide enhanced comfort, security, and energy efficiency. This section explores how IoT devices like smart thermostats, security cameras, and home assistants contribute to intelligent living spaces.

Smart Cities. IoT plays a pivotal role in transforming urban areas into smart cities. We examine IoT applications in urban planning, traffic management, waste management, and energy distribution.

Industrial IoT (IIoT). The integration of IoT in industrial settings (IIoT) is revolutionizing manufacturing and logistics. We discuss how IIoT improves operational efficiency, predictive maintenance, and supply chain management.

The integration of the Internet of Things (IoT) in various environments is revolutionizing how we interact with our surroundings, driving the transition towards more intelligent and responsive spaces. In this section, we explore the deployment of IoT in smart environments, focusing on three primary areas: Smart Homes, Smart Cities, and the Industrial Internet of Things (IIoT).

When it comes to urban development, IoT stands as a critical component in the creation of smart cities. In this context, IoT applications are diverse, ranging from traffic management systems that reduce congestion and pollution to smart grids that optimize energy use. IoT sensors can monitor various aspects of the urban environment, such as air quality, noise levels, and waste management, facilitating more informed decision-making by city officials. Smart streetlights that adjust brightness based on movement and traffic signals that adapt to real-time traffic conditions are examples of how IoT is improving urban living.



**Figure 3.** The 4 industrial revolutions leading to the smart factory of the future and cyber-physical production systems.

Industry 4.0 is an emerging business paradigm that is reaping the benefits of enabling technologies driving intelligent systems and environments [4]. While acquiring, processing and acting upon various kinds of relevant context information is common in application areas such as smart homes and offices, smart automated manufacturing systems can benefit from these capabilities as well. For example, smart manufacturing systems can make well-informed decisions to adapt and optimize their production processes at runtime or adapt to a customer’s personal preferences without any delay on the production process. The proliferation of smart enabling technologies has sparked a digital transformation in the manufacturing world. This



paradigm shift is often referred to as the 4th Generation Industrial Revolution (Industry 4.0), as depicted in Fig. 3.

**Challenges and Considerations.** Security and Privacy. IoT introduces new challenges in terms of security and privacy. This section delves into the vulnerabilities of IoT devices and the importance of robust security protocols to protect sensitive data.

Interoperability and Standards. The lack of standardization in IoT can hinder the interoperability of devices from different manufacturers. We discuss the need for universal standards and protocols to ensure seamless integration of IoT devices.

Scalability and Management. As IoT networks grow, managing and scaling these networks becomes increasingly complex. This section addresses the challenges in scaling IoT solutions and the management of large-scale IoT deployments.

As IoT networks grow in size and complexity, ensuring their scalability and efficient management becomes increasingly challenging. The architecture must be capable of handling a large number of connections and the vast amount of data generated. This requires robust network infrastructure, efficient data processing capabilities, and scalable cloud or edge computing solutions. Effective management tools are also necessary to monitor, update, and maintain a growing network of IoT devices.

The environmental impact of manufacturing, deploying, and disposing of millions of IoT devices is a growing concern. Energy-efficient design, sustainable manufacturing practices, and recycling and disposal mechanisms are necessary to minimize the ecological footprint of IoT systems.

The rapid development of IoT technologies often outpaces regulatory frameworks. Ensuring compliance with existing laws and regulations, particularly concerning data protection and privacy, is critical. Moreover, there are ethical considerations regarding the use and potential misuse of IoT data, which must be addressed to maintain public trust and acceptance.

**Future Trends and Conclusion.** IoT is continually evolving, and its future is shaped by emerging technologies such as 5G, edge AI, and blockchain. This final section predicts future trends in IoT and their potential impact on smart environments. In conclusion, while IoT presents numerous opportunities for creating intelligent and responsive environments, addressing its challenges is crucial for realizing its full potential.

As we look toward the future of the Internet of Things (IoT), several emerging trends are poised to further revolutionize the concept of smart environments. These developments not only promise to enhance the capabilities of IoT systems but also address some of the challenges currently faced. Understanding these trends is essential for anticipating the direction in which the IoT landscape is moving.

The integration of Artificial Intelligence (AI) and Machine Learning (ML) with IoT is set to become more profound. AI and ML can provide more advanced data analytics, enabling IoT devices to make more intelligent decisions and predictions. This integration will lead to more autonomous systems capable of adaptive learning and improved efficiency.

The rollout of 5G networks will significantly impact IoT, offering higher speeds, reduced latency, and increased connectivity. This enhancement in network performance will enable more robust and responsive IoT applications, particularly in areas requiring real-time data processing, such as autonomous vehicles and advanced robotics.

Edge computing, which involves processing data near the source of data generation rather than in a centralized cloud-based system, is becoming increasingly important. This approach can reduce latency, decrease bandwidth usage, and improve response times, making IoT systems more efficient, particularly in time-sensitive applications.

Blockchain technology has the potential to add a layer of security and trust to IoT. By providing a decentralized and tamper-proof ledger, blockchain can secure IoT transactions and data exchanges, making the systems more resilient to attacks and fraud.

There is a growing focus on developing sustainable IoT solutions. This involves creating energy-efficient devices, utilizing green energy sources, and ensuring that devices are recyclable or biodegradable, thus reducing the environmental impact of IoT.

Future IoT developments are likely to adopt a more human-centric approach, focusing on enhancing human well-being, productivity, and health. This trend will see IoT solutions that are more tailored to individual needs and more seamlessly integrated into daily life.

**Conclusion.** The Internet of Things (IoT) is undeniably transforming our world, creating smart environments that are more responsive, efficient, and connected. While IoT presents tremendous opportunities, it also brings significant challenges, particularly in areas like security, privacy, interoperability, and sustainability. The future of IoT lies in the convergence of various technologies such as AI, 5G, edge computing, and blockchain, which will address some of these challenges and open up new possibilities.

As we advance, it is crucial for stakeholders across industries to collaborate in addressing the technical, ethical, and regulatory challenges. Embracing innovation responsibly and sustainably will be key to realizing the full potential of IoT. In doing so, we can look forward to a future where smart environments not only enhance the quality of life but also contribute to a more sustainable and connected world.

### **References**

- [1]. S. Aguilar, R. Vidal and C. Gomez, Opportunistic sensor data collection with bluetooth low energy, *Sensors* 17: (1) ((2017) ), 159. doi:10.3390/s17010159.
- [2]. A. Akl, B. Chikhaoui, N. Mattek, J. Kaye, D. Austin and A. Mihailidis, Clustering home activity distributions for automatic detection of mild cognitive impairment in older adults 1, *Journal of Ambient Intelligence and Smart Environments* 8: (4) ((2016) ), 437–451. doi:10.3233/AIS-160385.
- [3]. A. Al-Fuqaha, M. Guizani, M. Mohammadi, M. Aledhari and M. Ayyash, Internet of Things: A survey on enabling technologies, protocols, and applications, *IEEE Communications Surveys & Tutorials* 17: (4) ((2015) ), 2347–2376. doi:10.1109/COMST.2015.2444095.
- [4]. G. Amato, D. Bacciu, M. Broxvall, S. Chessa, S. Coleman, M. Di Rocco, M. Dragone, C. Gallicchio, C. Gennaro, H. Lozano, H. McGinnity, A. Micheli, A.K. Ray, A. Renteria, A. Saffiotti, D. Swords, C. Vairo and P. Vance, Robotic ubiquitous cognitive ecology for smart homes, *Journal of Intelligent & Robotic Systems* 80: (1) ((2015) ), 57–81. doi:10.1007/s10846-015-0178-2.
- [5]. A.A. Aziz, M.C. Klein and J. Treur, An integrative ambient agent model for unipolar depression relapse prevention, *Journal of Ambient Intelligence and Smart Environments* 2: (1) ((2010) ), 5–20.

- [6]. D. Bacciu, S. Chessa, C. Gallicchio and A. Micheli, On the need of machine learning as a service for the Internet of Things, in: ACM International Conference Proceedings Series, ACM, (2017) .
- [7]. G. Baldewijns, V. Claes, G. Debar, M. Mertens, E. Devriendt, K. Milisen, J. Tournoy, T. Croonenborghs and B. Vanrumste, Automated in-home gait transfer time analysis using video cameras, *Journal of Ambient Intelligence and Smart Environments* 8: (3) ((2016) ), 273–286. doi:10.3233/AIS-160379.
- [8]. V. Baños-Gonzalez, M.S. Afaqui, E. Lopez-Aguilera and E. Garcia-Villegas, IEEE 802.11 ah: A technology to face the IoT challenge, *Sensors* 16: (11) ((2016) ), 1960.
- [9]. P. Baronti, P. Pillai, V.W. Chook, S. Chessa, A. Gotta and Y.F. Hu, Wireless sensor networks: A survey on the state of the art and the 802.15. 4 and ZigBee standards, *Computer Communications* 30: (7) ((2007) ), 1655–1695. doi:10.1016/j.comcom.2006.12.020.
- [10]. P. Bellavista, S. Chessa, L. Foschini, L. Gioia and M. Girolami, Human-enabled edge computing: Exploiting the crowd as a dynamic extension of mobile edge computing, *IEEE Communications Magazine* 56: (1) ((2018) ), 145–155. doi:10.1109/MCOM.2017.1700385.
- [11]. S. Bernardino, J. Freitas Santos and J. Cadima Ribeiro, The legacy of European capitals of culture to the “smartness” of cities: The case of Guimarães 2012, in: *Journal of Convention & Event Tourism*, Vol. 19: , Taylor & Francis, (2018) , pp. 138–166.
- [12]. G. Bleser, D. Steffen, M. Weber, G. Hendeb, D. Stricker, L. Fradet, F. Marin, N. Ville and F. Carré, A personalized exercise trainer for the elderly, *Journal of Ambient Intelligence and Smart Environments* 5: (6) ((2013) ), 547–562.
- [13]. C. Bormann, A.P. Castellani and Z. Shelby, CoAP: An application protocol for billions of tiny Internet nodes, *IEEE Internet Computing* 16: (2) ((2012) ), 62–67. doi:10.1109/MIC.2012.29.
- [14]. C. Bormann, M. Ersue, A. Keranen and C. Gomez, Terminology for Constrained-Node Networks. RFC 7228, Internet Draft (Work in Progress), Draft Name: draft-bormann-lwig-7228-bis-02. Retrieved from <http://www.rfc-editor.org/info/rfc7228>, 2017.
- [15]. Keldiyorova, G. S., Qurbonova, N. N., Fatxullaxodjaev, M. Z., & Rixsiyeva, L. A. (2022). Didactic Functions and types of Role-Playing Games that Contribute to the Development of Communicative Foreign Language Speech Skills. *Specialusis Ugdymas*, 1(43), 10577-10582.
- [16]. V. Callaghan and H. Hagra, Preface, Thematic issue: Smart homes, *Journal of Ambient Intelligence and Smart Environments* 2: (1) ((2010) ), 207–209. doi:10.3233/AIS-2010-0078.

**THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY****OUTLINE  
VOLUME-4, ISSUE-1, JANUARY**

1	<b>General concepts of the laws of thermodynamics</b> Shukrullayeva Ezoza, Shukrullayeva Dilnoza, Obloqulova Sitora, Kurbonova Dilafruz Sobirovna	6-9
2	<b>The relationship of anecdotes with other oral epic and humor-based genres</b> N.O.Safarova	10-14
3	<b>THERAPY OF BRONCHIAL ASTHMA IN CHILDREN</b> Sayfiddinova Muhayyo Saidaxmatovna, Xolboyev Norbek	15-22
4	<b>INTERPRETATION ON IBN SINA'S WORKS</b> Begimkulova Shohsanam	23-27
5	<b>Digital medical image as an object of processing and analysis</b> Amer Abu-Jassar, Diana Rudenko, Hitham Abdalla	28-35
6	<b>Выводы к изучению диалектов карлукского диалекта (На примере узбекских диалектов Самаркандской области)</b> Тиллабаева Зилола Рахматиллаевна	36-38
7	<b>SYSTEM OF LINEAR ALGEBRAIC EQUATIONS AND METHODS OF THEIR SOLUTION</b> Xaydarov Iqboljon	39-44
8	<b>EVIDENCE-BASED PHYSIOTHERAPY IN GYNECOLOGY</b> Razzokov Binokul Khojakulovich	45-48
9	Probability distributions of interest rates on loans and deposits in a study of banking activities Oleg Vasiurenko, Valeria Baranova, Vyacheslav Lyashenko	49-56
10	<b>STUDYING THE WET ABSORPTION KINETICS OF THE DRY EXTRACT OF "HYPOSEDAF"</b> Safarova Diyora Tolibovna, Nazarova Zarifa Alimjanovna, Maksudova Firuza Khurshidovna	57-61
11	<b>ANALYSIS OF LOW CARBON AND RENEWABLE ENERGY RESOURCES IN CENTRAL ASIAN COUNTRIES</b> Khotamov Ibodulla, Najmiddinov Yakhyo	62-76
12	<b>ENGLISH LANGUAGE TEACHING METHODOLOGY</b> Mirzabekova Nargiza Rakhmatovna	77-80
13	<b>About the finance and auditing activities of the states in Uzbekistan in the early periods and its legal foundations.</b> Xo'jabekova Ulug'oy Ilhom qizi	81-85
14	<b>CHEMICAL AND BIOLOGICAL PROPERTIES OF IRRIGATED SIEROZEM-MEADOW SOILS</b> Olimaxon Ergasheva, Nargiza Paxradinova, Lazizakhon Gafurova	86-91
15	<b>A STUDY OF SOLAR ACTIVITY AND SUNSPOTS</b> Shaimardonova Sabokhat Ziedullo kizi	92-94
16	<b>AUTOMATION AND ROBOTICS FIELD PLANNING, MANAGEMENT SYSTEM</b> Qahhorova Nargiza Hayit qizi	95-100
17	<b>ИССЛЕДОВАНИЕ ПРОЦЕССА РАСТВОРЕНИЯ ФОСФОРНОКИСЛЫХ ПЛАВОВ НАТРИЯ ДЛЯ</b>	101-105

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

	<b>РЕЦИРКУЛЯЦИИ НА СТАДИЮ ОБЕСФТОРИВАНИЯ ЭКСТРАКЦИОННОЙ ФОСФОРНОЙ КИСЛОТЫ</b> Ходжамкулов Сахomidдин Зоирович, Зоиров Сироджиддин Сахomidдин угли, Мирзакулов Холтура Чориевич	
18	<b>LENDING RISKS AS REFLECTED BY INDIVIDUAL BANKING INDICATORS</b> Irina Bitner, Nadiia Viadrova, Samer Mehyar	106-113
19	<b>THE COMMONALITY AND UNIQUENESS OF MOTIVES IN THE EPIC PLOT</b> Arabova Gulsanam Saburovna	114-115
20	<b>SIMILARITIES AND DIFFERENCES BETWEEN UZBEK AND ENGLISH PROVERBS</b> Mirzaeva Maftuna Shovkat qizi	116-119
21	<b>ПОСАДКА СЕМЯН ЛУКА В РЯДОК РЕЗУЛЬТАТЫ ЭКСПЕРИМЕНТАЛЬНЫХ ИССЛЕДОВАНИЙ НА ПРЕДМЕТНОМ ОСНОВАНИИ</b> Эшдавлатов Акмал Эшпулатович, Юсупов Фузайл Фарход ўғли	120-122
22	<b>ENERGY MARKET DYNAMICS AS REFLECTED IN SELECTED EUROPEAN GLOBAL INDICES</b> Mykhailo Bril, Oleksiy Petrukhnov, Samer Mehyar	123-131
23	<b>RATIONAL THERAPY OF KIDNEY COLIC, KIDNEY DYSFUNCTION SYNDROMES</b> Qarshiyev Bekzod O'ktam o'g'li, Otamurodov Ramziddin Zokirovich, Chariev Muzaffar Yuldashevich	132-134
24	<b>CLINICAL PHARMACOLOGY OF PSYCHOTROPIC DRUGS</b> Pirmatov Shohrux Xolto'rayevich, Xojiyev bahrom abduraxmon o'gli, Chariev Muzaffar Yuldashevich	135-137
25	<b>CLINICAL PHARMACOLOGY OF HYPOGLYCEMIC DRUGS</b> Rayimnazarov Shaxzot Muhiddin o'g'li, Abduraxmonov Alijon Shodmon o'g'li, Chariev Muzaffar Yuldashevich	138-140
26	<b>CLINICAL PHARMACOLOGY OF ANTIVIRAL DRUGS</b> Ergashev Asilbek Qudrat o'g'li, Abdunazarov Azimjon Alisher o'g'li, Chariev Muzaffar Yuldashevich	141-143
27	<b>RATIONAL THERAPY OF LIVER COLIC, JAUNDICE SYNDROME, LIVER DYSFUNCTION SYNDROMES</b> Ishmurodov Sherzod Parida o'g'li, Raupov Asadbek Yoqub o'g'li, Chariev Muzaffar Yuldashevich	144-148
28	<b>RATIONAL USE OF NARCOTIC ANALGESICS, ANESTHETICS AND LOCAL ANESTHETICS IN PAIN SYNDROME.</b> Raupov Asliddin Yoqub o'g'li, Qosimov Shohrux Sa'dulla o'g'li, Chariev Muzaffar Yuldashevich	149-153
29	<b>ВСПОМОГАТЕЛЬНЫЙ ЭЛЕКТРОПРИВОД С АСИНХРОННЫМИ ДВИГАТЕЛЯМИ НА ОСНОВЕ КОМПОЗИЦИОННЫХ МАТЕРИАЛОВ</b> Хасанов Ф.Ф.	154-162

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

30	<b>Effect and use of cardiac glycosides on the body</b> Mahmaraimov Shavkat Tuxtashovich, Jurayev Lochinbek Omonovich, Shukurov Urol Abduqaxxor o'g'li, Ibragimov Turg'un Ikromjon o'g'li	163-166
31	<b>FORENSIC CHEMICAL LABORATORY EXAMINATION OF DRUG SUBSTANCES</b> Navbatova Gulnora Xodjimuratovna	167-169
32	<b>CLINICAL PHARMACOLOGY OF VITAMINS, COENZYMES AND IRON PREPARATIONS</b> Ibodullayeva Qurbonoy Rahmatullo qizi, Qurbonova Iroda Shuxrat qizi, Normurodova Nafisa Doniyor qizi, Chutboyev Bunyod Rustamovich	170-173
33	<b>CLINICAL PHARMACOLOGY OF ANTIVIRAL DRUGS</b> Nuriddinova Nigora Sadriddinovna, Zokirova Maftuna Zokirovna, Chariev Muzaffar Yuldashevich	174-178
34	<b>О СУДЕБНО-БИОЛОГИЧЕСКИХ ДОКАЗАТЕЛЬСТВАХ И ПОНЯТИЯХ О БИОЛОГИЧЕСКИХ ВЕЩЕСТВАХ</b> Суюнова Саодат Абдикодировна	179-181
35	<b>CLINICAL PHARMACOLOGY OF HYPOGLYCEMIC DRUGS</b> Mamanorova Ulug'oy, Turaeva Muxayyo, Amirkulov Sherbek	182-185
36	<b>FORMATION PROCESSES OF THE NATIONAL POLITICAL ELITE IN TURKESTAN</b> Jalilov Alisher Khudoyberdievich	186-190
37	<b>THE USE OF ARTIFICIAL INTELLIGENCE IN COMPUTER SCIENCE LESSONS</b> Kodirova Elena Vladimirovna	191-194
38	<b>POSITIONAL BASED ON THEORETICAL KNOWLEDGE AND METRIC ISSUES WORK</b> Jabbarov Anvar Egamovich, Akhmedov Nurali Odilovich	195-201
39	<b>THE RANGE OF EFFECTS OF ANTIBIOTIC DRUGS ON THE HUMAN BODY.</b> Akramov Farrukh Kahramonovich, Umarov Shokhrukh Kholmurod, Jumaeva Nilufar	202-204
40	<b>Development of a marketing strategy for the enterprise "Farovon-uz"</b> Musayeva Shoirazimovna	205-210
41	<b>FUNCTIONAL DIAGNOSTICS OF TRACTION TRANSFORMER OF AC ELECTRIC LOCOMOTIVE USING SPECTRAL ANALYSIS METHOD</b> M.S. Yakubov, M.A. Sagatova, M.N. Tuychieva	211-217
42	<b>DEVELOPMENT OF FATTY HEPATOSIS IN PATIENTS WITH DIABETES MELLITUS</b> Abdiev Ilkhom Allaerovich, Bozorov Umid Madaminovich, Xujanov Xusnitdin Baymuratovich, Iskandarova Nilufar	218-221
43	<b>ВОЗМОЖНОСТИ РАЗВИТИЯ ПАЛОМНИЧЕСКОГО ТУРИЗМА В СУРХАНДАРЬИНСКОЙ ОБЛАСТИ</b> Turayev Ziyadulla Norsoatovich, Azamov Saidakbarxon Avazxon o'g'li	222-226
44	<b>ANALYTICAL TOOLS USED IN DEVELOPING AN ORGANIZATION'S STRATEGY.</b> Usmonova Dilfuza Ilhomovna, Usmanov Shakhzod Shokhrukhovich	227-231

**THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY**

45	<b>ASSESSMENT OF THE STATE OF POST-VACCINATION IMMUNITY TO MEASLES IN CHILDREN WITH POST-CAVID LONG SYNDROME AND OPTIMIZATION OF PREVENTIVE MEASURES TO REDUCE THE INCIDENCE OF MEASLES</b> Kenjayeva Dilorom Toshtemirovna	232-239
46	<b>AGROBIOLOGICAL CHARACTERISTICS OF APPLE VARIETIES SUITABLE FOR DRYING</b> Islamov Sohib Yaxshibekovich, Karimova Dilnoza Zafarjon qizi	240-243
47	<b>Medical and social aspects of the prevalence of road traffic injuries among children.</b> A.S. Omanova Samariddin	244-249
48	<b>PORTLAND CEMENT COMPOSITION, PROPERTIES, AND APPLICATION</b> Samariddin Eshkoraev	250-263
49	<b>COMMUNICATIVE ASPECTS OF MEDICAL COMMUNICATION BETWEEN A DOCTOR AND A PATIENT</b> Ibragimova Dilbar Sadullaevna, Mukhamadieva Malika Tokhirovna	264-269
50	<b>GENERAL IDEA, WORD FORMATION, GREEK SUFFIXES AND PREFIXES</b> Yorova Sayora Karimovna, Zohaib Shahbaz	270-275
51	<b>USE OF LATIN TERMINOLOGY IN THE PROFESSIONAL ACTIVITY OF A DOCTOR (BASED ON THE MATERIAL OF AN OUTPATIENT'S MEDICAL CARD)</b> Shodmonov Diyorbek Obid ugli, Sharipov Bobur Salimovich	276-281
52	<b>ЭЛЕКТРОННО-КОЛЕБАТЕЛЬНЫЕ ИССЛЕДОВАНИЯ СПЕКТРОВ КОМПОЗИЦИОННЫХ ПОЛИМЕРНЫХ МАТЕРИАЛОВ</b> Марданова Юлдуз Уктам кизи, Кувватова Мохинур Асатилло кизи, Камалова Дилнавоз Ихтиёровна	282-285
53	<b>ФАКТОРЫ, ВЛИЯЮЩИЕ НА ВЫБОР МЕСТА РАЗМЕЩЕНИЯ МАЛЫХ ПРОМЫШЛЕННЫХ ЗОН И ЭКОНОМИКО-МАТЕМАТИЧЕСКАЯ МОДЕЛЬ ЕГО ОПТИМИЗАЦИИ</b> Сакиева О.Б	286-292
54	<b>ROLE OF IOT TECHNOLOGY FOR DEVELOPING SMART ENVIRONMENTS: CHALLENGES AND PERSPECTIVES</b> Gayratov Zafarjon Kamoliddinovich, Kilichov Jasur Ruzikulovich, Najmiyev Mirjalol Makhmudjonovich, Almardonov Asliddin Faxriddin o'g'li	293-299
	<b>OUTLINE</b>	300-303