

**Ministry of Science and Higher Education of Republic of Kazakhstan
Karaganda University of the name of academician E.A. Buketov**

«APPROVED»

By the decision of the Board
NLC «Karagandy University of the name of
academician E.A. Buketov»

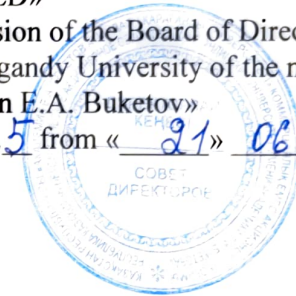
Protocol no. 1 from «27» 05 2024 y.
_____ prof. N.O.Dulatbekov.



«APPROVED»

By the decision of the Board of Directors of
NLC «Karagandy University of the name of
academician E.A. Buketov»

Protocol no. 5 from «21» 06 2024 y.



EDUCATIONAL PROGRAM

7M07101 - Chemical technology of inorganic substances

Level: Master's

Karaganda
2024

APPROVAL FORM

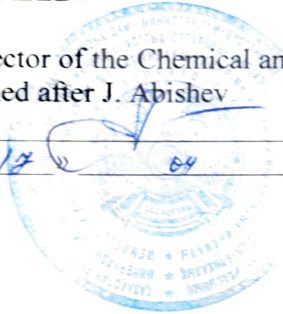
EDUCATIONAL PROGRAM "7M071- Engineering and Engineering trades"

«AGREED»

Director of the Chemical and Metallurgical Institute
named after J. Abishev

Baysanov S.O.

« 17 » 04 2024 г.



«AGREED»

General Director of
LLC «Azimut Geology»
"АзимуТ Геология" Adambekov M.M.

« 1 » 04 2024 г.



The educational program in the direction of preparation «7M071- Chemical technology of inorganic substances» is developed on the basis of:

- Law of the Republic of Kazakhstan dated July 27, 2007 No. 319-III "On Education"
- Law of the Republic of Kazakhstan dated July 11, 1997 No. 151-I. "About languages in the Republic of Kazakhstan"
- The State compulsory standard of postgraduate education of the Republic of Kazakhstan, approved by the Order of the Ministry of Education and Science of the Republic of Kazakhstan dated July 20, 2022 No. 2
- The National Qualifications Framework dated March 16, 2016 by the Republican Tripartite Commission on Social Partnership and Regulation of Social and Labor Relations.
- Order of the Ministry of Education and Science of the Republic of Kazakhstan "On approval of the Rules for the organization of the educational process in credit technology" dated April 20, 2011 No. 152
- Order of the Ministry of Education and Science of the Republic of Kazakhstan No. 569 dated October 13, 2018 "On approval of the Classifier of areas of training with higher and postgraduate education"
- the Professional standard "Teacher", approved by Order of the Ministry of Education and Science of the Republic of Kazakhstan No. 500 dated December 15, 2022.
- Professional standard for teachers (teaching staff) of the organization of higher and (or) postgraduate education, approved by Order of the Minister of Science and Higher Education of the Republic of Kazakhstan No. 591 dated November 20, 2023.

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1. **Code and name of the educational program:** «7M07101- Chemical technology of inorganic substances»
2. **Code and classification of the field of education, area of education:** 7M07 Engineering, manufacturing and construction industries, 7M071 Engineering and Engineering work
3. **Group of educational programs:** «M097 Chemical engineering and processes»
4. **Volume of the credits:** 120
5. **Education form:** full time
6. **Language of education:** Kazakh, Russian
7. **Academic degree:** Master of Technical Sciences in the educational program «7M071- Engineering and Engineering»
8. **EP type:** Acting EP
9. **Level on ISCE:** 7
10. **Level on NQF:** 7
11. **Level on SQF:** 7
12. **EP distinctive features:**
 - University partner (JEP):
 - University partner (DDEP):
13. **Appendix to the state license to class educational activities:** No.016 KZ83LAA00018495 from 28.07.2020.
14. **The name of the accreditation body and the validity period of the accreditation EP:** IAQAE 05/28/2022-05/27/2027 years.
15. **The purpose of the educational program:** Training of highly qualified specialists capable of performing research work in the field of production of inorganic substances and the implementation of innovative technologies for the production of inorganic materials.
 - a) **List of graduate positions of the graduate.** A graduate of a master's degree is awarded the degree "Master of Technical Sciences" in the educational program «7M071- Engineering and Engineering». A graduate of the educational program «7M071- Engineering and Engineering» receives the following positions: «Researcher», «Research Chemist».
 - b) **Scope and objects of professional activity of the graduate.** The sphere of professional activity of graduates in the educational program "7M071- Chemical Technology of Inorganic Substances" are: educational organizations, scientific institutions. The objects of professional activity of masters in the educational program "7M071- Engineering and Engineering " are: higher education institutions, scientific institutions, regardless of ownership and departmental subordination.
 - c) **Types of professional activity of the graduate:**
 - educational (pedagogical, educative);
 - science-research;
 - organizational and managerial ("subject-subject" interaction, management in education).
 - d) **Functions of the graduate's professional activity:**
 - educational;
 - educating;
 - research;
 - socio-communicative.

17. Formulation of learning outcomes based on competencies

Type of competencies	Learning outcomes code	Outcomes
Behavioural skills and personal qualities: (Soft skills)	LO1	Assess the philosophical and historical aspects of social and humanitarian knowledge: the principles of democracy, justice, honesty, respect for the personality of the student, his rights and freedoms; describe the modern paradigm of higher education, its content; determine the driving forces and principles of the learning process in higher education.
	LO2	Show professional and leadership qualities in the implementation and organization of research and production processes; analyze, systematize and evaluate the available scientific and technical information about the objects and technologies of inorganic substances, interpret modern achievements within the research context.
Digital competencies: (Digital skills):	LO3	Know the theoretical foundations of inorganic chemistry to master the methods of synthesis of substances and materials. Develop new technologies for the processing of mineral raw materials and the production of inorganic substances and materials in accordance with the development trends of the world and Kazakhstan industry. Is able to participate in the performance of research and development work.
Professional competencies: (Hard skills)	LO4	Know the structure of chemical-technological systems to analyze the interaction of technologies and the environment; to improve methods of analytical control of the quality of raw materials. Is able to increase scientific efficiency and publication activity; to take part in the performance of research and development works, including interdisciplinary, international (with subsequent commercialisation of research results).
	LO5	Possess a system of knowledge about fundamental chemical laws and theories, the chemical essence of phenomena and processes in nature and technology, skills of independent work. Uses practice-oriented teaching methods and technologies in acquiring knowledge.
	LO6	Be able to evaluate the latest achievements in the theory and practice of chemical technology for implementation in production; apply modern information and communication technologies and resources in the field of chemical technology of inorganic substances to solve practical and research problems.
	LO7	To be able to optimize the main technological schemes for obtaining modern materials; solve scientific and engineering problems of the chemical technology of inorganic substances in priority areas of industry in Kazakhstan, using modern methods of research, analysis, diagnostics and modeling.
	LO8	Be able to analyse the structure, physico-mechanical and rheological properties of inorganic polymers for their practical application; effectively manage chemical and technological processes to obtain competitive products and minimize associated environmental risks.
	LO9	Present creative and research work, effectively and efficiently organize their activities, show the possibilities of commercializing the results of their research work. Be able to

		use the acquired knowledge in their research work.
	LO10	Demonstrate knowledge in the field of modern educational technologies; be fluent in foreign languages at a level that allows conducting scientific research in an international context and teaching special disciplines in universities.

18. Determination of modules of disciplines in accordance with the results of training

Learning outcomes code	Name of the module	Name of disciplines	Volume (ECTS)
LO1, LO2	Philosophical and historical aspects of social and humanitarian knowledge	History and philosophy of science	4
LO1, LO2		Higher school pedagogy	4
LO1, LO2		Psychology of management	4
LO1, LO2		Pedagogical practice	4
LO1, LO2	Professional languages	Foreign language (professional)	4
LO1, LO2		Theory and practice of translation in chemical technology of inorganic substances	5
LO1, LO2		Professional foreign terminology in the chemical technology of inorganic substances	
LO3, LO4	Fundamentals of scientific research	Commercialization of the results of scientific and technical activities	5
LO3, LO4		Organization and planning of scientific research in the field of chemical sciences	
LO3, LO4		Innovation in the chemical technology of inorganic substances	5
LO3, LO4		Current issues in chemistry	
LO5, LO6	Fundamentals of modern technologies for processing mineral raw materials	Modern technologies for processing mineral raw materials	4
LO5, LO6		Chemical technology of natural fuel processing (in English)	4
LO5, LO6		Chemistry of functional materials	6
LO7, LO8	Fundamentals of technology of inorganic substances and materials	Technology of polymer inorganic substances and materials	4
LO7, LO8		Inorganic high molecular weight compounds	
LO7, LO8		Technology of inorganic nanomaterials	4
LO7, LO8		Technology of binders and composite materials	
LO7, LO8		The fundamentals of nanochemistry and nanotechnology inorganic substances	6

LO7, PO8		Industrial chemical processes of inorganic substances	
LO9, LO10	Fundamentals of modern chemistry	Physical methods of materials analysis (in English)	4
LO9, LO10		Molecular Spectroscopy (in English)	
LO9, LO10		Polycondensation (in English)	4
LO9, LO10		Modern trends in organic Chemistry (in English)	
LO9, LO10		Supramolecular chemistry	
LO9, LO10		Chemistry of supramolecular compounds	5
LO9, LO10		Research practice	
		Research work	Research work of a master's student, including internship and completion of a master's thesis (NIRM)
	Final attestation	Preparation and defence of a master's thesis	8

19. Matrix of achievability of educational outcomes

	Name of discipline	Brief description of the discipline (30-40 words)	Quantity of credits	The formed educational outcomes (codes)									
				LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10
Cycle of basic disciplines University component													
D1	History and philosophy of science	It is studied with the aim of forming knowledge about the significance of scientific knowledge in its tendency to development and sociocultural profile. Questions about the philosophy, methodology of science, science as a cognitive activity and tradition are considered	4	+	+								
D2	Higher school pedagogy	Studied to form ideas about the modern paradigm of higher education and the theory of scientific activity in higher education. The issues of pedagogy, education of professionals-specialists, professional skills of teaching in educational organizations, pedagogical control and evaluation of knowledge in higher education are considered	4	+	+								

D3	Psychology of management	It is studied with the aim of forming knowledge about the psychological laws of managerial activity, skills in analysis of socio-psychological principles, the characteristics of the psychology of management, the personal characteristics of the leader.	4	+	+								
D4	Foreign language (professional)	The course is taken for developing intercultural and communicative competence in the process of foreign language education at the level of basic sufficiency of Common European competence. The course is de-signed to study vocabulary and foreign language features; formation of the ability for intercultural communication, skills of argumentation in a foreign language and understanding of linguistic and cultural characteristics of their target language country.	4	+	+								
Cycle of basic disciplines Component of choice													
D5	Professional foreign terminology in the chemical technology of inorganic substances	The primary goal of the course is to learn chemical and technological terminology in English, gain knowledge of basic concepts and definitions, and use practical skills in communicating in English in chemical manufacturing. The course is designed to train engineers who understand the fundamental principles, terminologies of inorganic chemical technology, and subject-language material.	5	+	+								
	Theory and practice of translation in chemical technology of inorganic substances	The course's main goals are to explore the linguistic features of interlanguage speech activity, as well as the main challenges of the communicative model of translation in inorganic chemical technology. This course focuses on the fundamental translation procedures used in the chemical technology of inorganic compounds. After finishing the course, the master's student must be able to apply a basic understanding of the principles of inorganic chemical technology in practice while		+	+								

		translating, as well as use methods of mathematical analysis, and theoretical and experimental research.												
D6	Commercialization of the results of scientific and scientific-technical activities	It is studied in order to form skills for the commercial application of intellectual activity results and the introduction of scientific developments and technologies into production, the preparation of scientific projects for funding, as well as for interaction in the knowledge-intensive high-tech sector.	5			+	+							
	Organization and planning of scientific research in the field of chemical sciences	It is studied in order to form the stages of research work, the foundations of scientific knowledge, the accumulation and processing of scientific and technical information, the organization of work in scientific libraries and libraries of research institutes, the processing of the data obtained using modern research methods. The design of the results of scientific work, the writing of a scientific article or a brief information message is considered.				+	+							
D7	Innovation in the chemical technology of inorganic substances	The discipline examines the basic terms and concepts of chemical innovation, innovation in basic chemistry and petrochemistry. It studies innovative ideas in the field of industrial waste disposal, innovative methods in organic chemistry, innovative technologies in the synthesis of inorganic substances.	5			+	+							
	Current issues in chemistry	The discipline is the basis for the study of a new approach to chemistry as a science capable of ensuring the production and consumption of chemical products in such a way as to reduce the maximum damage caused to nature at all stages of the chemical process, from energy consumption to waste disposal. The course examines the main strategic directions of modern chemistry.				+	+							
D8	Modern technologies of mineral processing	The discipline considers the system of content and construction of higher education (tasks, model of a specialist). She studies the system-	4					+	+					

		structural approach in teaching general and inorganic chemistry, the principles of university didactics, research methods in the field of methods of general and inorganic chemistry.											
D9	Chemical technology of processing of natural fuel (in English)	It is studied in order to form the basic principles of the technology of processing solid, liquid and gaseous fuels; thermodynamic and kinetic laws of the processes of thermal degradation of carbon-containing substances. Familiarization with the scientific foundations of methods for processing solid, liquid and gaseous fuels is considered.	4					+	+				
D10	Chemistry of functional materials	It is studied in order to form knowledge about functional materials for organic electronics, general information about semiconductors; classification of semiconductors, intrinsic conductivity of semiconductors; impurity conductivity of semiconductors. Organic functional materials are considered: characteristics of individual groups of organic semiconductors; electrical conductivity of organic semiconductors; electrical conductivity of low molecular weight organic semiconductors; the mechanism of electrical conductivity.	4					+	+				
Cycle of profile disciplines Component of choice													
D11	Technology of polymer inorganic substances and materials	The course examines the basic principles of the technology of processing solid, liquid and gaseous fuels; thermodynamic and kinetic laws of the processes of thermal degradation of carbon-containing substances. Familiarization with the scientific foundations of methods for processing solid, liquid and gaseous fuels.	4							+	+		
	Inorganic high molecular weight compounds	Studies the features of the polymer state of a substance and the associated differences in physical, mechanical and chemical properties compared to the usual properties of low-molecular compounds. Considers the								+	+		

		development of methods for the synthesis of inorganic high-molecular compounds, and establishes a connection between the structure of the polymer and chemical, physical, and mechanical properties.											
D12	Technology of inorganic nanomaterials	The discipline examines the fundamental foundations that determine the physical, mechanical and operational properties of sintered nanostructured materials created using ceramic technology, related to their structure. The physicochemical concepts of the connection of the fine structure of matter with the technological, physico-chemical and operational properties of raw materials, semi-finished products and finished products are studied.	6							+	+		
	Technology of binders and composite materials	The course is aimed at developing skills in developing optimal compositions of raw flour and clinker and ensuring their homogenization and adjustment; developing technological parameters for obtaining highly active clinkers to obtain high-quality cements; developing options for modernization and reconstruction of technological lines.								+	+		
D13	The fundamentals of nanochemistry and nanotechnology inorganic substances	The discipline is studied in order to form students' knowledge of research and teaching activities related to solving problems when conducting research in the field of nanochemistry and nanotechnology. The course is aimed at learning about modern concepts of nanochemistry and nanotechnology. The course deals with the prospects for the development of nanochemistry and nanotechnology in the field of materials science, inorganic synthesis and nanostructured materials	6							+	+		
	Industrial chemical processes of inorganic substances	The discipline is studied to give the student an understanding of the foundations, practical possibilities and limitations of the most important physical methods of analysis of								+	+		

		materials, familiarity with the instrumentation and conditions of the experiment, the ability to interpret and competently evaluate experimental data. Consideration is given to: UV, IR, Raman spectroscopy, NMR, EPR, mass spectrometry, and gas chromatography.												
D14	Physical methods of materials analysis (in English)	It is studied in order to form an understanding of the basics, practical possibilities and limitations of the most important physical methods of material analysis, familiarity with the instrumentation and experimental conditions, the ability to interpret and competently evaluate experimental data. UV, IR, Raman spectroscopy, NMR, EPR, mass spectrometry and gas chromatography are considered.	4										+	+
	Molecular Spectroscopy (in English)	The discipline is studied to master the theoretical foundations of molecular spectroscopy and the physical principles of the study of molecular systems; master the methods of calculating the basic spectroscopic characteristics of simple and organic liquids. X-ray spectra; types of motion in a molecule and types of molecular spectra, molecular rotation and rotational spectra are covered.												+
D15	Polycondensation (in English)	It is studied in order to explain the relationship between the structure of polycondensation polymers and their behavior during processing and under operating conditions. A fundamental basis is being created for further study of the basics of engineering and polymer processing. The main directions of the modern development of the chemistry of the processes of step polymerization, its use in various industries are explained.	4										+	+
	Modern direction of organic chemistry (in English)	In order to form a theoretical concept of the mechanisms of complex reactions with the use of modern research methods and equipment, the problems of synthesis of new materials used in												+

		electronics, namely liquid crystal systems, supramolecular systems in medicine, various bio-, electrochemical sensors, biologically active materials and supplements are studied.												
D16	Supramolecular chemistry	It is studied in order to form the current state and trends in the development of supramolecular chemistry. The main types of non-covalent interactions are considered: ion-ion interactions, ion-dipole interactions, hydrogen bonding, cation- π interactions, π - π -stacking interactions, Van der Waals interactions.	5										+	+
	Chemistry of supramolecular compounds	It is studied in order to consider the current conditions and trends in the development of the chemistry of supramolecular compounds. The basic concepts and terms of supramolecular compounds are formed: "host-guest", "receptor-substrate", "chelate and macrocyclic effects", "pre-organization and complementarity", ion-ion interactions, ion-dipole interactions, hydrogen bonding, cation- π interactions, π - π stacking interactions, Van der Waals interactions, dense packaging in a solid state, hydrophobic interactions.												+

20. Coordination of the planned educational outcomes with the methods of teaching and evaluation within the module

Learning outcomes	Planned learning outcomes for the module	Teaching methods	Assessment methods
LO1	Evaluates the philosophical and historical aspects of social and humanitarian knowledge: the principles of democracy, justice, honesty, respect for the student's personality, his rights and freedoms; describes the modern paradigm of higher education, and its content; defines the driving forces and principles of the learning process in higher education.	interactive lectures and seminars	Test, colloquium, preparation of speeches and writing of reports
LO2	Demonstrates knowledge in the field of modern educational technologies; is fluent in foreign languages at a level that allows conducting scientific research in an international context and teaching special	interactive lectures and seminars, project method	Project defense, test, colloquium, report

	disciplines in universities.		
LO3	Represents creative and research work, and efficiently and efficiently organizes its activities, to show the possibilities of commercialization of the results of its research work. He can use the acquired knowledge in his research work.	Discussion, case methods, dispute	Presentations, essay writing
LO4	Possesses a system of knowledge about fundamental chemical laws and theories, the chemical essence of phenomena and processes in nature and technology.	Practical classes, seminars, training games	Test, program development, preparation of information on specific issues.
LO5	Knows the structure of chemical and technological systems for analyzing the interaction of technologies and the environment.	Practical classes, seminars, trainings, project method	Test, program development, preparation of information on specific issues, presentations
LO6	He is able to optimize the main technological schemes for obtaining modern materials.	interactive lectures, practical lessons, seminars, training, project	Project protection, written work
LO7	Knows the theoretical foundations of inorganic chemistry for mastering the methods of synthesis of substances and materials.	Practical classes, seminars, training games	Presentations, essay writing
LO8	He is able to analyze the structure, physico-mechanical and rheological properties of inorganic polymers for their practical application.	interactive lectures and seminars, experimental workshops	Test, colloquium, laboratory journals
LO9	Knows and is able to analyze gases, liquids, films, ceramics, single crystals, nanoscale structures and composites.	practical classes, seminars, trainings, research practice	Projectprotection, report on research practice practice
LO10	He is able to explain the behavior of the properties of solvents, materials and composites based on theoretical knowledge of organic chemistry.	practical classes, seminars, trainings, research practice	Projectprotection, report on research practice practice

21. Criteria for assessing the achievability of learning outcomes

LO codes	Criteria
LO1	Knows modern problems of the history and philosophy of science, current modern problems of the development of higher education, modern achievements of science and advanced technology in scientific research.
	Is able to apply the basic principles of the organization of training and education; choose and apply methods of teaching and upbringing in various pedagogical situations, and apply pedagogical technologies for conducting all forms of the educational process at the university
	Possesses an integral system of scientific knowledge about the world, the ability to navigate the basic values of being, life, and culture and the willingness to rely on them in professional activities. He has the conceptual and methodological apparatus of modern history and philosophy of science; the basics of skills for analyzing educational situations; methods for diagnosing learning and upbringing; methods for organizing and planning a scientific and pedagogical experiment.
LO2	Knows the basic phonetic, lexical and grammatical concepts of a foreign language necessary for communication, reading and translation of foreign texts of professional orientation, allowing effective interaction in the scientific environment
	Is able to review foreign literary sources, use foreign terms when preparing a scientific report, and present the results of his research orally and in writing at a professional level.
	Possesses a culture of thinking, methods of searching, analyzing and processing English-language scientific and technical information in the study and development of technological processes, and the use of new equipment.
LO3	Knows: the peculiarities of the system of legal relations in the field of intellectual property protection and the regularities of the transfer and commercialization of the results of scientific research.
	Is able to: analyze the processes taking place in the field of technological exchange, predict their possible transformations in the short and long term; collect and analyze data necessary to solve economic tasks
	Possesses: methodology of economic research; modern methods of calculation and analysis of socio-economic indicators characterizing economic processes in the field of transfer and implementation of high-tech developments; modern methods of collection, processing and analysis of scientific and technical data.
LO4	Knows: the main mechanisms of technology transfer implementation; approaches to studying the attractiveness of participation in a high-tech project for a strategic investor and technology partner; specifics of technology support at all stages of technology transfer.
	Is able to: analyze the initial data necessary for calculating economic and socio-economic indicators characterizing the state and prospects of technology market development; build theoretical and econometric models, analyze and interpret the results obtained based on the description of economic processes and phenomena;
	Possesses: skills in independent work, self-organization and organization of research activities; manages the mechanism of interaction between developers and implementers of innovative developments; applies innovative methods of managing the process of transfer and commercialization of research results
LO5	Knows: current state and prospects of technical and technological development of processing and metallurgical processes, features of the activities of institutions, organizations, enterprises and related industries;
	Is able to: develop technological processes for obtaining conditioned concentrates from ore, as well as metals from concentrates, processing of metals and alloys, schemes of processing and metallurgical processes, substantiate operating parameters and indicators; make a business plan for a technological project;

	Possesses: practical skills in the field of independent organization and management of research works.
LO6	Knows: features of the chemical, phase composition and structure of materials that affect their macroscopic functions; functional (by type) properties that determine their scope of application; methods for obtaining materials with specified structure and properties.
	Is able to: use knowledge about the composition, structure and functional ability of known types of materials to obtain systems with specified properties; predict the physical and chemical properties and reactivity of materials based on knowledge of their chemical, phase composition, structure and features of the manifestation of certain properties.
	Possesses: skills in applying modern concepts and views, as well as methods of chemistry in practical and experimental work; modern research methods and methods of synthesis and analysis of materials of various phase composition.
LO7	Knows: regularities of obtaining products of basic inorganic synthesis, mineral fertilizers, salts, alkalis; modern methods of control of technological operations.
	Is able to: choose methods of theoretical and experimental study of physico-chemical properties; control the quality of raw materials and finished products; plan and predict the technological process of the production of inorganic substances, taking into account the quality of the raw materials and the requirements for the final product.
	Possesses: methods of experimental research of the basic physical, chemical and technological properties of raw materials and finished products; assessment of the quality of natural raw materials; analysis of raw materials sources and determination of the quality of final products.
LO8	Knows: the fundamental foundations that determine the physico-mechanical and operational properties of sintered nanostructured materials created using ceramic technology, related to their structure; physico-chemical ideas about the relationship of the fine structure of matter with the technological, physico-chemical and operational properties of raw materials, semi-finished products and finished products.
	Is able to: based on the knowledge of the hierarchical relationship and subordination of the structural levels of nanomaterials of various chemical nature created by consolidating dispersed single- and multiphase systems, see the causal relationship between the properties of the created nanomaterials, their structure and manufacturing technology; successfully solve the problem of creating nanomaterials with regulated properties.
	Possessions: ideas about the fundamental physical foundations that determine the most important properties of composite nanomaterials.
LO9	Knows: basic laws describing IR and RAMAN spectra and luminescence spectra; methods of preparation and chemical properties of the most important classes of inorganic and organic compounds;
	Is able to: use laws to study problems of molecular physics and biophysics (descriptions of the structure of molecules and properties of liquids and gases)
	Possesses: spectroscopic methods for determining the structure and properties of molecules.
LO10	Knows: the relationship of physical and chemical properties of substances with their chemical structure; - basic physical methods for studying the structure and properties of chemical compounds;
	Is able to: identify the main diagnostic characteristics of physical research methods; analyze analytical and graphical dependencies; summarize the results of the study of composition, structure and properties and establish a relationship between them; solve typical interpretative chemical problems;
	Possesses: methods of decoding graphical dependencies; individual methods of sample preparation in relation to various

physical research methods; theoretical foundations of research methods and determination of the composition, structure and properties of substances.
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22. The graduate model of the educational program


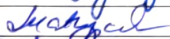

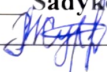
Graduate Attributes:

- High professionalism in the field of education and chemistry
- Emotional intelligence
- Adaptability to global challenges
- Leadership
- Entrepreneurial thinking
- Global citizenship
- Understanding the importance of the principles and culture of academic integrity

Types of competencies	Description of competencies
1. Behavioral skills and personal qualities (Softskills)	Knows the principles of democracy, justice, and honesty; respect for the student's personality, rights and freedoms; makes judgments and makes decisions to achieve specific goals; Understands the values of personality, language and communication; cooperation skills, ability to resolve conflicts; is ready to be responsible for the results of his professional activity.
2. Digital competencies (Digital skills):	Uses theoretical concepts of inorganic chemistry, knowledge about the composition, structure and properties of inorganic substances – representations of the main classes of inorganic compounds, the basics of organic synthesis to explain the behavior of the properties of solvents, materials and composites.
3. Professional competencies (Hardskills)	He knows the conceptual and theoretical foundations of chemistry and chemical technology of inorganic substances, their place in the general system of sciences and values, the history of development and the current state. Possesses a system of knowledge about fundamental chemical laws and theories, the chemical essence of phenomena and processes in nature and technology. Uses general ideas about the structure of chemical-technological systems and typical chemical-technological processes and productions to analyze the interaction of technologies and the environment. Optimizes and implements the main technologies for obtaining modern materials. Applies the theoretical foundations of inorganic chemistry, composition-structure-properties correlations, principles of the structure of matter, and hierarchical structural organization of materials to master the methods of synthesis of substances and materials. Applies theoretical concepts about the synthesis, structure, physico-mechanical, rheological properties and areas of the practical application of inorganic high-molecular compounds as one of the most important classes of compounds that distinguish them from the properties of low-molecular compounds. Uses in materials science the basic provisions of analytical chemistry, metrological foundations of chemical analysis, classical and modern

complex methods of analysis of gases, liquids, films, ceramics, single crystals, nanoscale structures and composites.

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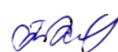
Candidate of chemical sciences, Associate Professor, Head of the Department  Mukusheva G.K.
Candidate of Chemical Sciences, Professor of the Department  Nurmaganbetova M.S.
PhD doctor, Assistant Professor of the Department  Sadykov T.M.
1nd year graduate student of the OP "Chemical technology of inorganic substances "  Zhurgarayeva D.K.

Notes.

The educational program was reviewed by the Faculty Council from 24.04.2024 protocol No. 10
The educational program was reviewed at the meeting of the Academic Council from 29.04.2024 protocol No. 5
The educational program was reviewed and approved at a meeting of the University's Management Board from 24.05.2024, protocol No. 8

Member of the Board -Vice-Rector for Academic Affairs
Director of the Department for Academic Work
Dean of the Faculty







M.M.Umurkulova
T.M.Hasenova
M.K.Ibraev

EDUCATIONAL PROGRAM DEVELOPMENT PLAN
«7M07101- Chemical technology of inorganic substances»

The purpose of the Plan is to contribute to improving the quality of the conditions for the implementation of the educational program, taking into account the current requirements of the labor market and the achievements of modern science.

Target indicators

№	Indicators	Unit of measurement	2024 (infact)	2024-2025 (plan)	2025-2026 (plan)	2026-2027 (plan)
1	Human resources development					
1.1	Increase in the number of teachers with academic degrees	Number of people	3	1	1	1
1.2	Advanced training in the teaching profile	Number of people	3	2	2	3
1.3	Involvement of practitioners in teaching	Number of people	4	2	2	2
2	Promotion of the EP in the ratings					
2.1	IQAA	Position	2	2	1	1
2.2	IAAR	Position	4	3	2	2
2.3	Atameken	Position	3	3	2	2
3.	Development of educational and scientific-methodical literature, electronic resources					
3.1	Textbooks	Number			1	
3.2	Training manuals	Number	3	1	2	1
3.3	Methodological recommendations/instructions	Number				
3.4	Electronic textbook	Number	1		2	
3.5	Video/audio lectures	Number	2	1	1	1
4.	Development of educational and laboratory facilities	Number				
4.1	Purchase of software products	Number				1
4.2	Purchase of equipment	Number		1	1	1
5.	Updating the content of the EP					
5.1	Updating the learning outcomes and the list of disciplines taking into account the requirements	Year			+	

	of the labor market, scientific achievements, professional standards					
5.2	Introduction to the EP of academic disciplines in foreign languages*	Year	+	+	+	+
5.3	Introduction of new teaching methods	Year	+	+	+	+
5.4	Opening of joint/two-degree program on the basis of the EP	Year				

Head of the Department of Inorganic and Technical Chemistry

G.K. Mukusheva