

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC KAZAKHSTAN

KARAGANDA UNIVERSITY NAMED AFTER ACADEMICIAN E.A.BUKETOV



AGREED
Director of the Chemical-Metallurgical
Institute named after J. Abisheva
Baysanov S.O.
« 15 » 03 2022



«APPROVED»
Rector Dilatbekov N.O.
2022



General Director of
LLC «Azimut Geology»
Inkin D.A.
25 03 2022 г.

EDUCATIONAL PROGRAM
on the direction of preparation «7M071- Engineering and Engineering»

Level: Master-degree

Karaganda, 2022

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

- The Law of the Republic of Kazakhstan dated July 27, 2007 No. 319-III “On Education”
- The Law of the Republic of Kazakhstan dated July 11, 1997 No. 151-I. “On languages in the Republic of Kazakhstan”
- The state compulsory standard of postgraduate education dated August 31, 2018 No. 604
- National Qualifications Framework of March 16, 2016 by the Republican Tripartite Commission for Social Partnership and the 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 on credit technology” dated October 2, 2018 No. 152
- Classifier of training areas with higher and postgraduate education from October 13, 2018. No. 569.

– The state compulsory standard of primary education. Approved by Resolution of the Government of the Republic of

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Kazakhstan dated August 23, 2012 No. 1080. Resolution of the Government of the Republic of Kazakhstan dated August 15, 2017 No. 484.

– Professional standard “Teacher” (Appendix to the order of the Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan “Atameken” dated June 8, 2017 No. 133)

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Content

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: russian

7. Academic degree: Master of Technical Sciences in the educational program «7M07101-Chemical Technology of Inorganic Substances»

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

15. The purpose of the educational program: Preparation of a qualified teacher of chemistry and chemical technology with knowledge of the English language, with fundamental and applied knowledge, research skills for the implementation of scientific, pedagogical and professional-practical activities.

16. Qualification characteristics of the graduate

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-Chemical Technology of Inorganic Substances". A graduate of the educational program "7M071-Chemical Technology of Inorganic Substances" receives the following positions: "Researcher", "Research Chemist", "University Lecturer", "College Lecturer"

б) 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-Chemical Technology of Inorganic Substances" are: higher education institutions, scientific institutions, comprehensive schools, gymnasiums, lyceums, colleges, regardless of ownership and departmental subordination.

в) Types of professional activity of the graduate:

- educational (pedagogical, educative);
- science-research;
- organizational and managerial ("subject-subject" interaction, management in education).

г) 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
Behavioral skills and personal qualities: (Soft skills)	LO1	Knows and understands the principles of democracy, justice, honesty, respect for the personality of the student, his rights and freedoms; substantiates the modern paradigm of higher education, its content; determines the driving forces and principles of the learning process in higher education.
	LO2	He understands the values of personality, language and communication, applies the skills of cooperation, the ability to resolve conflicts; reveals the features of modern didactic concepts in higher education; demonstrates knowledge in the field of modern educational technologies; Fluent in foreign languages at a level that allows for effective interaction in the professional and scientific environment.
Digital competencies: (Digital skills)	LO3	He knows the conceptual and theoretical foundations of chemistry and chemical technology, its place in the general system of sciences and values, the history of development and the current state.
Professional competencies: (Hard skills)	LO4	He owns a system of knowledge about fundamental chemical laws and theories, the chemical essence of phenomena and processes in nature and technology.
	LO5	He knows the structure of chemical-technological systems for the analysis of the interaction of technologies and the environment.
	LO6	Able to optimize the basic technological schemes for producing modern materials.
	LO7	He knows the theoretical foundations of inorganic chemistry for mastering the methods of synthesis of substances and materials.
	LO8	Able to analyze the structure, physico-mechanical and rheological properties of inorganic polymers for their practical application.
	LO9	Knows and knows how to analyze gases, liquids, films, ceramics, single crystals, nanoscale structures and composites.
	LO10	Able to explain the behavior of the properties of solvents, materials and composites based on theoretical knowledge of organic chemistry.

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

Learning result Code	Name of module	Name of discipline	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		Professional foreign terminology in chemical technology of inorganic substances	5
LO1, LO2		Theory and practice of translation in chemical technology of inorganic substances	
LO3, LO4	Basics 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 chemical technology of inorganic substances	5
LO3, LO4		Current issues in chemistry	
LO5, LO6	The foundations of modern technologies of processing of mineral raw materials	Modern technologies of mineral processing	4
LO5, LO6		Chemical technology of processing of natural fuel (in English)	4
LO5, LO6		Chemistry of functional materials	4
LO7, LO8	Fundamentals of technology of inorganic substances and materials	Technology of polymeric inorganic substances and materials	4
LO7, LO8		Inorganic high molecular 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	4
LO7, LO8		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 direction of organic chemistry (in English)	
LO9, LO10		Supramolecular chemistry	5
LO9, LO10		Chemistry of supramolecular compounds	
LO9, LO10		Research practice	12
	Science-research work	Science-research work of a student, including the internship and fulfillment of the master	24
	Final attestation	Formulation and defense of master's project	12

19. Matrix of achievability of educational outcomes

NN п/п	Name of discipline	Brief description of the discipline (30-40 words)	Quantity of credits	The formed educational outcomes (codes)										
				PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
Cycle of basic disciplines University component														
D1	History and philosophy of science	History and philosophy of science as the study of the general patterns of scientific knowledge in its historical development and changing socio-cultural context. Philosophy of science and methodology of science. Features of scientific knowledge. Historical development of institutional forms of scientific activity. Scientific communities and their historical types. Training of scientific personnel. Changing the place and role of science in the life of society.	4	+	+									
D2	Higher school pedagogy	The subject and methodological foundations of pedagogy. Development, education and socialization of the individual. Education system in the Republic of Kazakhstan. The essence of the pedagogical process at school, its laws and principles. Theory of education. Patterns and principles of education. Means, forms and methods of education. The team as a means of education. General concept of didactics and its main categories. Laws, patterns and principles of learning.	4	+	+									
D3	Psychology of management	Subject and object of management psychology. Psychology of the object and the object of control. Fundamentals of management psychology. Control functions. Staff motivation and management efficiency. Classification of approaches to making managerial decisions in controlling. Business communication and management conflicts. Psychological features of activity on development of administrative decisions. Psychology of anti-crisis management.	4	+	+									
D4	Foreign language (professional)	Fluent in foreign languages at a level that allows you to effectively interact in a professional and scientific	4	+	+									

		environment; possesses skills that allow to carry out further education and development of a linguistic personality with a high degree of independence and self-regulation.												
Cycle of basic disciplines Component of choice														
D5	Professional foreign terminology in chemical technology of inorganic substances	Chemical language as a goal and means of teaching in higher education. Symbolism and terminology of the chemical language. Nomenclature of the chemical language. Methods of studying chemical terminology. Methods of working on chemical terms and names of foreign origin. Names of prefixes of Latin and Greek numerals in complex word formations. Foreign elements of terms and names encountered in the course of higher school chemistry. Dictionary of chemical terms.	5	+	+									
	Theory and practice of translation in chemical technology of inorganic substances	Among the numerous complex problems that modern linguistics studies, an important place is occupied by the study of the linguistic aspects of interlingual speech activity, which is called "translation" or "translation activity".		+	+									
D6	Commercialization of the results of scientific and technical activities	Acquire basic knowledge in the field of project management in relation to the specifics of the activities of small and medium-sized businesses in conditions of economic instability. Get practical skills in the formation and implementation of the company's strategic goals using project management, the ability to analyze the quality of existing business processes in the company, etc.	5			+	+							
	Organization and planning of scientific research in the field of chemical sciences	Stages of research work, the foundations of scientific knowledge and creativity, the accumulation and processing of scientific and technical information, the organization of work in scientific libraries and libraries of research institutes; processing of the obtained data using modern methods, modern experimental methods of research, presentation of the results of scientific work, writing a scientific article or a brief informational message.				+	+							
D7	Innovation in chemical technology of inorganic	Subject, content and objectives of the discipline "Innovation in chemical technology of inorganic sub-	5			+	+							

	substances	stances ". Basic terms and concepts of chemical innovation. Innovative ideas in the field of industrial waste disposal. Innovation in organic chemistry. Innovation in the synthesis of inorganic substances. Innovation in the production of mineral fertilizers. Innovation in basic chemistry and petrochemistry. Innovative ideas in the production of organic substances.											
	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 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.			+	+							
Cycle of profile disciplines University component													
D8	Modern technologies of mineral processing	Raw material base of the mining and metallurgical complex in the world and in the Republic of Kazakhstan; use of mineral raw materials and organization of waste-free technology; study of the theoretical foundations and features of the practical use of leaching processes, extraction and ion-exchange processes of separation and separation of metals; study of the basics of pyrometallurgical, hydrometallurgical and electrometallurgical processes of processing mineral raw materials and the choice of optimal conditions for their implementation.	4					+	+				
D9	Chemical technology of processing of natural fuel (in English)	Scientific bases of oil and gas processing. Scientific bases of oil and gas processing. Structural design and key performance indicators for oil and gas refineries. Technological bases and schemes of oil and gas processing. Production of petroleum products. Composition and properties of solid fuel.	4					+	+				
D10	Chemistry of functional materials	The structure of the main types of organic semiconductors. Electronic structure of undoped organic semiconductors. Band structure of doped organic semiconductors. Vibrational degrees of freedom and phonons. Electrons, holes, polarons and solitons in	4					+	+				

		organic semiconductors. Band transfer of electrons and holes in organic semiconductors. Hopping charge transfer in undoped and doped organic semiconductors.												
Cycle of profile disciplines Component of choice														
D11	Technology of polymeric inorganic substances and materials	Basic concepts of inorganic polymeric materials, their classification. Classification of materials: mono- and polycrystals, glasses and glass-ceramics, composites. Technology of carbon polymers. Technology of silicate polymers and mineral fibers. Ceramic materials of oxide, carbide and other chemical nature.	4									+	+	
	Inorganic high molecular compounds	Polymers are macromolecular compounds that are made up of many monomers. Polymers should be distinguished from such a concept as oligomers, in contrast to which, when one more numbered unit is added, the properties of the polymer do not change.											+	+
D12	Technology of inorganic nanomaterials	Fundamentals of science about nanomaterials. Morphology of nanomaterials: nanoparticles and nanopowders, coatings and films, filamentous materials, porous materials. Chemical, physical and other properties of nanomaterials. Physical and chemical methods for obtaining nanomaterials. Alternative methods for obtaining nanomaterials. Methods for obtaining basic and promising inorganic nanomaterials of different chemical groups.	4										+	+
	Technology of binders and composite materials	The discipline is the formation of skills to develop optimal compositions of raw meal and clinker and ensure their homogenization and adjustment; development of technological parameters for the production of highly active clinkers for the production of high-quality cements; development of options for modernization and reconstruction of technological lines for the production of silicate materials with improved properties.											+	+
D13	The fundamentals of nanochemistry and nanotechnology inorganic substances	Synthesis of nanomaterials. Methods for the synthesis of nanopowders. Methods for obtaining unstructured objects. Methods for studying nanoscale systems. Energy state of the surface. Physico-chemistry	4										+	+

		of nanoturquoise materials. Basic problems of nanochemistry. Physical properties of nanoobjects. Nanotechnologies. Areas of use and development prospects.												
	Industrial chemical processes of inorganic substances	The discipline is the formation of ideas about the problems facing the silicate industry in connection with the depletion of traditional raw materials for the production of cement and the involvement in the production of non-traditional raw materials and industrial waste, as well as to form an understanding of the fundamental problems of chemistry and chemical technology in relation to the modern production of silicate materials.								+	+			
D14	Physical methods of materials analysis (in English)	Physical research methods allow one to gain basic knowledge about atoms and molecules, in particular, about their structure and interaction with radio, infrared, visible and ultraviolet radiation. Various methods for studying absorption and emission are being explored in terms of experimental principles as well as their use to provide molecular understanding. Methods include: microwave spectroscopy, ultraviolet and visible spectroscopy, IR and Raman spectroscopy, NMR spectroscopy	4										+	+
	Molecular spectroscopy (in English)	A technique for determining the structure of a substance based on the analysis of the absorption and/or emission spectra of light interacting with a substance and causing electron transitions from one energy level to another.											+	+
D15	Polycondensation (in English)	The discipline considers current trends in the development of the chemistry of stepwise polymerization processes, studies their main patterns in order to control macromolecular growth reactions that regulate the size and structure of the polymer chain. Particular attention is paid to the study of the physicochemical and mechanical properties of new polycondensation polymers, thermosetting and thermoplastic materials based on them.	4										+	+
	Modern direction of organic chemistry (in English)	This course will cover the mechanistic, theoretical and synthetic aspects of a wide range of reactions used in organic chemistry. Classical reactions as											+	+

		well as recently developed reactions will be discussed with examples from the literature. Students will define classes of organic compounds and typical reactions, distinguish intermediate states of stability, postulate reaction mechanisms, plan multi-step synthesis, and analyze/interpret.												
D16	Supramolecular chemistry	Supramolecular chemistry is an interdisciplinary field of science that includes the chemical, physical, and biological aspects of considering chemical systems that are more complex than molecules and linked into a single whole through intermolecular (non-covalent) interactions.	5										+	+
	Chemistry of supramolecular compounds	The concept of chemistry of supramolecular solid compounds. Ideas about chemical-information synthesis, which makes it possible to create any supramolecular objects (both structured structural products, and electronic and optoelectronic devices, new generation devices based on quantum size effects), etc.												+

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	Knows and understands the principles of democracy, justice, honesty, respect for the personality of the student, his rights and freedoms; substantiates the modern paradigm of higher education, its content; determines the driving forces and principles of the learning process in higher education.	interactive lectures and seminars	Test, colloquium, preparation of speeches and writing of abstracts
LO2	He understands the values of personality, language and communication, applies the skills of cooperation, the ability to resolve conflicts; reveals the features of modern didactic concepts in higher education; demonstrates knowledge in the field of modern educational technologies; Fluent in foreign languages at a level that allows for effective interaction in the professional and scientific environment.	interactive lectures and seminars, project training	Project defense, test, colloquium, report
LO3	He knows the conceptual and theoretical foundations of chemistry and chemical technology, its place in the general system of sciences and values, the history of development and the current state.	Discussion, case methods, dispute	Presentations, essay writing
LO4	He owns 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	He knows the structure of chemical-technological systems for the analysis of the interaction of technologies and the environment.	Practical classes, seminars, trainings, project method	Test, program development, preparation of information on specific issues, presentations
LO6	Able to optimize the basic technological schemes for producing modern materials.	Interactive lectures, practical classes, seminars, training, project	Project protection, written work
LO7	He knows the theoretical foundations of inorganic chemistry for mastering the methods of synthesis of substances and materials.	Practical classes, seminars, trainings	Prepared tasks for distance learning
LO8	Able to analyze the structure, physico-mechanical and rheological properties of inorganic polymers for their practical application.	interactive lectures, seminars, experimental workshops	Test, colloquium, laboratory journals
LO9	Knows and knows how to analyze gases, liquids, films, ceramics, single crystals, nanoscale structures and composites.	practical classes, seminars, trainings pedagogical practice	Development of training lessons, report on pedagogical practice
LO10	Able to explain the behavior of the properties of solvents, materials and composites based on theoretical knowledge of organic chemistry.	practical classes, seminars, trainings pedagogical practice	Written work, development of evaluation criteria for specific topics of the school course in chemistry and biology, tests

21. Criteria for assessing the achievability of learning outcomes

Codes of LO	Criteria
LO1	Knows: current modern problems and strategies for the development of higher education in the modern world educational space; modern achievements of science and advanced technology in research; the main phonetic, lexical and grammatical phenomena of the English language, allowing it to be used as a means of communication.
	Can: design pedagogical technologies for conducting all forms of the educational process at the university (lecture, seminar, elective, etc.); plan and solve problems of his own professional and personal development; understand the content of various types of texts in a foreign language.
	Owns: an integral system of scientific knowledge about the surrounding world, the ability to navigate the basic values of being, life, culture and the willingness to rely on them in the process of self-knowledge and professional activity; the ability to use the basics of philosophical knowledge to form a worldview position; the main foreign language terminology of the speciality; systematic scientific knowledge about the theory and technology of learning, development, education with taking into account their interrelation and interdependence, monitoring their quality; speaks English at a level that allows you to carry out the main types of speech activity.
LO2	Knows: new principles, approaches, and theories in the chemical technology of inorganic substances, including modern teaching methods, following methodology and philosophy of scientific cognition based on advanced English-language scientific literature;
	Can: develop new technologies for the processing of mineral raw materials and the production of inorganic substances, materials in accordance with the development trends of the world and Kazakhstan industry;
	Owns: the ability to solve scientific and engineering problems of chemical technology of inorganic substances in priority areas of Kazakhstan's industry in new and unfamiliar contexts using modern methods of research, analysis, diagnostics and modelling.
LO3	Knows: the specifics of the system of legal relations in the field of intellectual property protection, the regularities of the transfer and commercialization of the results of scientific research;
	Can: to analyse the processes taking place in the field of technological exchange, predict their possible transformations in the short and long term; collect and analyse data necessary to solve economic tasks;
	Owns: the 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 a technology partner; specifics of technology support at all stages of technology transfer;
	Can: analyse the initial data necessary for calculating economic and socio-economic indicators characterizing the state and prospects of the technology market development; to build theoretical and econometric models, analyse and interpret the results obtained based on a description of economic processes and phenomena;
	Owns: the skills of independent work, self-organization and organization of research activities; manage the mechanism of interaction between developers and implementers of innovative developments; apply innovative methods of managing the process of transfer and commercialization of research results.
LO5	Knows: the current state and prospects of technical and technological development of processing and metallurgical processes, the specifics of the activities of institutions, organizations, enterprises and related industries;
	Can: 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;
	Owns: practical skills in the field of independent organization and management of research works.
LO6	Knows: the 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 a given structure and properties;
	Can: 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;

	Owens: the skills of 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: the laws of obtaining products of basic inorganic synthesis, mineral fertilizers, salts, alkalis and soda products; modern methods of control of technological operations;
	Can: 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 production of inorganic substances, taking into account the quality of raw materials and requirements for the final product;
	Owens: owns methods of experimental research of the basic physico-chemical and technological properties of raw materials and finished products; evaluation of the quality of natural raw materials; analysis of raw materials sources and determination of the quality of final products.
LO8	Knows: the fundamental principles 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 connection of the fine structure of matter with the technological, physico-chemical and operational properties of raw materials, semi-finished products and finished products;
	Can: 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; to 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;
	Owens: ideas about the fundamental physical foundations that determine the most important properties of composite nanomaterials.
LO9	Knows: the basic laws describing Infrared and Raman scattering spectra and luminescence spectra; methods of preparation and chemical properties of the most important classes of inorganic and organic compounds;
	Can: use laws to study problems of molecular physics and biophysics (descriptions of the structure of molecules and properties of liquids and gases);
	Owens: spectroscopic methods for determining the structure and properties of molecules.
LO10	Knows: the relationship between the physical and chemical properties of substances with their chemical structure; basic physical methods for studying the structure and properties of chemical compounds;
	Can: to identify the main diagnostic characteristics of physical research methods; analyse 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;
	Owens: the technique of deciphering graphical dependencies; individual methods of sample preparation about various physical research methods; theoretical foundations of research methods and determination of the composition, structure and properties of substances.

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: (Soft skills)	Knows the principles of democracy, justice, honesty; respect for the personality of the student, his rights and freedoms; makes judgments and makes decisions to achieve specific goals; Understands the values of personal-ity, language and communication; cooperation skills, ability to resolve conflicts; ready to take responsibility for the results of their professional activities;
2. Digital competencies: (Digital skills)	Uses theoretical concepts of organic chemistry, knowledge about the composition, structure and properties of organic substances - representations of the main classes of organic compounds, the basics of organic synthesis to explain the behavior of the properties of solvents, materials and composites.
3. Professional competencies: (Hard skills)	Knows the conceptual and theoretical foundations of chemistry and chemical technology, its place in the general system of sciences and values, the history of development and the current state. Owns 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 industries to analyze the interaction between technologies and the environment. Optimizes and implements the main technologies for obtaining modern materials. Applies the theoretical foundations of inorganic chemistry, "composition-structure-property" correlations, the principles of the structure of matter, the hierarchical structural organization of materials to master the methods of synthesis of substances and materials. Applies theoretical ideas about the synthesis, structure, physico-mechanical, rheological properties and areas of practical application of inorganic high molecular weight compounds as one of the most important classes of compounds that distinguish them from the properties of low molecular weight compounds. In materials science, he uses the basic provisions of analytical chemistry, metrological foundations of chemical analysis, classical and modern complex methods for the analysis of gases, liquids, films, ceramics, single crystals, nanoscale structures and composites.

Compiled by:

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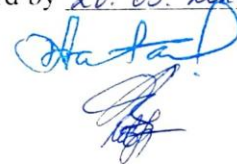
Примечания.

Educational program reviewed to of faculty board by 25.03.2022 protocol No. 8

Educational program discussed at the meeting of the Academic Council by 28.04.2022 protocol No. 5

The educational program is considered and approved at a meeting of the University Board by 26.05.2022 protocol No. 12

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



T.Z.Zhussipbek
G.S.Akybayeva
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