

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC KAZAKHSTAN

KARAGANDA UNIVERSITY NAMED AFTER ACADEMICIAN E.A.BUKETOV



Director «NIS» AEO
Yakupov R.

2023

ACREED
Director SBSI «IT»

Manapova A.A.

2023



Rector
Dulatbekov N.O

2023

EDUCATIONAL PROGRAM
on the direction of preparation «7M015- Training of teachers in natural science subjects»

Level: Master-degree

Karaganda, 2023

The educational program in the direction of preparation "7M015-Chemistry" 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 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)

Content

№	The passport of the educational program	Pages
1	Code and name of the educational program	
2	Code and classification of the field of education, area of education	
3	Group of educational programs	
4	Volume of the credits	
5	Education form	
6	Language of education	
7	Academic degree	
8	EP type	
9	Level on ISCE	
10	Level on NQF	
11	Level on SQF	
12	EP distinctive features	
	University partner (JEP):	
	University partner (DDEP):	
13	Appendix to the state license to class educational activities	
14	The name of the accreditation body and the validity period of the accreditation EP	
15	The purpose of the educational program	
16	Qualification characteristics of the graduate	
a)	List of graduate positions of the graduate	
b)	Scope and objects of professional activity of the graduate	
c)	Types of professional activity of the graduate	
d)	Functions of the graduate's professional activity	
17	Formulation of learning outcomes based on competencies	
18	Determination of modules of disciplines in accordance with the results of training	
19	Matrix of achievability of educational outcomes	
20	Coordination of the planned educational outcomes with the methods of teaching and evaluation within the module	
21	Criteria for assessing the achievability of learning outcomes	
22	The graduate model	

- 1. Code and name of the educational program:** «7M01504-Chemistry»
- 2. Code and classification of the field of education, area of education:** 7M01 Pedagogical sciences, 7M015 Preparation teachers in sciences subjects
- 3. Group of educational programs:** «M013 Teacher training in chemistry
- 4. Volume of the credits:** 120
- 5. Education form:** full time
- 6. Language of education:** Russian
- 7. Academic degree:** Master of Education in the educational program «7M01504-Chemistry»
- 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:** KZ83LAA00018495 No.016 from 28.07.2020
- 14. The name of the accreditation body and the validity period of the accreditation EP:** IAQAE. 29.05.2017-27.06.2022 years.
- 15. The purpose of the educational program:** Preparation of a qualified chemistry teacher with knowledge of the English language, possessing 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 magistracy is awarded the degree "Master of Education" in the educational program "7M015-Chemistry". A graduate of the educational program "7M015-Chemistry" receives the following positions: "Teacher. University lecturer", researcher, "Teacher. College Teacher", "Teacher. Secondary school teacher" Chemistry" is: educational organizations, scientific institutions. The objects of professional activity of masters in the educational program "7M015-Chemistry" are: higher education institutions, scientific institutions, secondary schools, grammar schools, lyceums, colleges, regardless of ownership and departmental subordination.
 - b) Types of professional activity of the graduate:**
 - educational (pedagogical, educative);
 - science-research;
 - organizational and managerial ("subject-subject" interaction, management in education).
 - r) 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 student's personality, 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	Understands the values of personality, language and communication, applies cooperation skills, the ability to resolve conflicts; identifies the features of modern didactic concepts in higher education; demonstrates knowledge in the field of modern educational technologies; is fluent in foreign languages at a level that allows effective interaction in professional and scientific environments
Digital competencies: (Digital skills)	LO3	knows the conceptual and theoretical foundations of chemistry, its place in the general system of sciences and values, the history of development and the current state
Professional competencies: (Hard skills)	LO4	Possesses a system of knowledge about fundamental chemical laws and theories, the chemical essence of phenomena and processes in nature and technology
	LO5	Applies knowledge of the theoretical and experimental foundations of chemistry and chemistry teaching technologies, knows the methods of formation of subject skills and abilities of students, knows the techniques of forming interest in chemistry and using knowledge in chemistry in everyday life
	LO6	Has the skills of organizing and staging a chemical experiment (laboratory, demonstration, computer)
	LO7	Applies knowledge of general and theoretical chemistry, fundamental, applied mathematics and information technology to analyse and synthesize phenomena and processes
	LO8	Knows the current state and development trends in the chemistry of supramolecular compounds, acyclic and cyclic conjugated systems. Basic concepts and terms of supramolecular compounds, acyclic and cyclic conjugated systems.
	LO9	Implements analytical and technological solutions in the field of experimental and theoretical chemistry.
	LO10	Knows the main factors of the impact of industrial facilities and environmental monitoring

18. Determination of modules of disciplines in accordance with the outcomes of learning

Learning outcomes 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 chemistry	5
LO1, LO2		Foreign language (professional)	4
LO3, LO4	Basics of scientific research and commercialization	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 Chemistry	5
LO3, LO4		Current issues in chemistry	
LO5, LO6	Methodology and modern technologies of teaching chemistry	Modern methodological foundations of teaching general and inorganic chemistry	6
LO5, LO6		Modern technologies of teaching chemistry in universities	5
LO5, LO6		Methodology natural-science research	5
LO7, LO8	Actual problems of modern chemistry	Chemistry of conjugated systems	4
LO7, LO8		Chemistry of acyclic and cyclic conjugated systems	
LO7, LO8		Chemistry of supramolecular compounds	4
LO7, LO8		Supramolecular chemistry	
LO7, LO8		Polycondensation (in English)	4
LO7, LO8		Modern direction of organic chemistry (in English)	
LO7, LO8		Research practice	12
LO9, LO10	Actual problems of physical chemistry and ecology	Statistical thermodynamics (in English)	4
LO9, LO10		Computational methods in chemistry (in English)	
LO9, LO10		Aspects of study environmental issues (in English)	4

LO9, LO10		The circulation of substances in the ecosystem and biosphere (in English)	
LO9, LO10		Chemistry of semiconductor materials	5
LO9, LO10		Chemistry of functional materials	
	Research work	Research work of a master's student, including internship and completion of a master's thesis (NIRM)	24
	Final attestation	Preparation and defence of a master's thesis	8

19. Matrix of achievability of educational outcomes

NN	Name of discipline	Brief description of the discipline (30-40 words)	Quantity of credits	The formed educational outcomes (codes)										
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	
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	The subject and methodological foundations of pedagogy. Personal development, upbringing and socialization. The education system in the Republic of Kazakhstan. The essence of the pedagogical process at school, its patterns and principles. Theory of education. Patterns and principles of education. Means, forms and methods of education. The collective as a means of education. The general concept of didactics and its main categories. Laws, patterns and principles of learning.	4	+	+									
D3	Psychology of management	It is studied to form knowledge about the psychological patterns of managerial activity,	4	+	+									

		the specifics of the use of socio-psychological knowledge in the structure of the manager's activity, the skills of analyzing the socio-psychological principles underlying effective management, theoretical positions and current problems of management psychology; features of management psychology; personal characteristics of the head.												
D4	Foreign language (professional)	It is studied to form the skills of speaking, reading, writing and auditing for effective communication in situations of professional communication, writing texts in a speciality, oral bilateral translation in situations of professional communication	4	+	+									
Cycle of basic disciplines Component of choice														
D5	Professional foreign terminology in chemistry	The main objectives of this course are the study of terminology in English of the chemical direction, the possession of basic concepts and definitions, the application of practical skills in communication in English as part of teaching chemistry. The course is designed to prepare students who understand the fundamental principles, terminologies of inorganic chemical technology, and subject-language content.	5	+	+									
	Theory and practice of translation in chemistry	The primary goals of the course are to investigate linguistic characteristics of speech activity and various models of translation of chemical texts in English. This course looks at the fundamental translation techniques used in chemistry. Following completion of the course, the master's student must demonstrate their abilities to apply basic chemistry knowledge in practice while translating, solving issues, and passing future disciplines of the chemical profile in professional activity.		+	+									
D6	Commercialization of the results of scientific and technical activities	It is studied in order to form skills to use the results of scientific and scientific and technical activities, including the results of intellectual	5			+	+							

		activity in order to withdraw new or improved goods aimed at extracting income to the market.												
	Organization and planning of scientific research in the field of chemical sciences	Studies the stages of research work, the basics 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 data obtained using modern methods, modern experimental research methods, registration of the results of scientific work, writing a scientific article or a brief information message				+	+							
D7	Innovation in Chemistry	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, and 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				+	+							
Cycle of profile disciplines University component														
D8	Modern methodological foundations of teaching general and inorganic chemistry	The discipline considers the system of content and construction of higher education (tasks, model of a specialist). She studies the system-structural approach in teaching general and inorganic chemistry, the principles of university didactics, and research methods in the field of methods of general and inorganic chemistry.	6					+	+					
D9	Modern technologies of teaching chemistry	The subject provides future teachers with the necessary knowledge and skills to work in	5					+	+					

	in universities	higher educational institutions and vocational schools. The purpose of the course: to create conditions for mastering all knowledge about pedagogical technologies. Objectives of the course: - to define the concepts of "technology", and "pedagogical technology"; - disclosure of the meaning of pedagogical technologies of traditional and new learning; - description of modern pedagogical technologies. Ways to integrate new pedagogical technologies in chemistry classes. Creating models of classes based on new pedagogical technology, testing in practice.											
D10	Methodology natural-science research	Examines the methods and techniques of natural science research, the basics of the methodology of scientific research, and various levels of scientific knowledge. He studies methods of cognition of the world using natural sciences, the concept of methodology and method, and modern means of natural science research.	5					+	+				
Cycle of profile disciplines Component of choice													
D11	Chemistry of conjugated systems	The discipline deals with conjugate systems. The concept of conjugations. The nature of the delocalized chemical bond of conjugated systems. Types of conjugate systems: π , π - and p , π -conjugate systems; hyperconjugation. Resonance rules; resonant effect; steric hindrance of resonance. Aromaticity. The concept of the induced ring current. Aromaticity criterion. Conjugated systems containing an aromatic sextet. Conjugated systems that do not contain an aromatic sextet. Antiaromaticity. Alternative and non-alternant hydrocarbons, etc.	4							+	+		
	Chemistry of acyclic and cyclic conjugated	The discipline deals with acyclic and cyclic conjugated systems. The nature of the								+	+		

	systems	delocalized chemical bond of acyclic and cyclic conjugated systems. Types of conjugated systems. Resonance rules; resonant effect; steric obstruction of resonance in conjugated systems. Aromaticity of cyclic conjugated systems. Conjugated systems containing an aromatic sextet. Conjugated systems that do not contain an aromatic sextet. Antiaromaticity in cyclic compounds.											
D12	Chemistry of supramolecular compounds	The subject deals with the current state and development trends in the chemistry of supramolecular compounds. Basic concepts and terms of supramolecular compounds. Concepts: "host-guest", "receptor-substrate", "chelate and macrocyclic effects", "preorganization and complementarity". Main types of non-covalent interactions: ion-ion interactions, ion-dipole interactions, hydrogen bonding, cation- π -interactions, π - π -stacking interactions, van der Waals interactions. Main classes of organic supramolecular structures, etc.	4							+	+		
	Supramolecular chemistry	The subject considers the main types of non-covalent interactions: ion-ion interactions, ion-dipole interactions, hydrogen bonding, cation- π interactions, π - π -stacking interactions, Van der Waals interactions. The discipline studies the current state and trends in the development of supramolecular chemistry. Basic concepts and terms of supramolecular chemistry. Concepts: "host-guest", "receptor-substrate", "chelate and macrocyclic effects", "pre-organization and complementarity".								+	+		
D13	Polycondensation (in English)	The discipline establishes a connection between the structure of polycondensation polymers and their behaviour in the course of processing and under operating conditions. The discipline should create a fundamental base for the subsequent Master's masters' studying of	4							+	+		

		<p>principles of engineering and processing of polymers.</p> <p>The purpose of the discipline consists of an explanation to masters of the basic directions of the modern development of the chemistry of step-growth polymerization processes, and its use in various branches of industry.</p>												
	Modern direction of organic chemistry (in English)	The discipline studies theoretical questions about complex reactions mechanisms using modern research methods and equipment, problems of synthesizing new materials used in electronics, liquid crystal systems, in medicine - supramolecular systems, various bio-, electrochemical sensors, biologically active materials and bio-additives									+	+		
D14	Statistical Thermodynamics (in English)	<p>The course is aimed at developing students' knowledge of statistical thermodynamics, and the use of statistical methods in various fields of chemistry, physics and engineering.</p> <p>The discipline considers the macroscopic properties of condensed systems - solids, liquids and solutions, polymer systems, gas plasma, the presentation of hydrodynamics, wave propagation and scattering in condensed media, and the study of surface phenomena.</p>	4										+	+
	Computational methods in chemistry (in English)	The course is aimed at conducting quantum chemical calculations of the electronic structure of molecules and calculating geometric and spectral parameters of molecules and physicochemical properties of substances, such as molecular orbitals, electronic and infrared spectra, etc. Some theoretical aspects of quantum chemical calculations are considered and examples are analyzed that allow you to quickly get used to the appropriate computational methods and programs.											+	+
D15	The aspects of study environmental issues (in English)	The discipline studies the basic problems of the environment. Atmosphere, hydrosphere, troposphere, stratosphere. Their chemical	4										+	+

		composition. The chemistry of acid rain. Greenhouse effect. Stratospheric and atmospheric ozone. Their function. Mechanisms of occurrence of chemical and photochemical smog. Problems of pollution of the world ocean. Methods for cleaning the hydrosphere and atmosphere from anthropogenic pollution.												
	The circulation of substances in the ecosystem and biosphere (in English)	The cycle of matter is one of the most important aspects of the existence of life on Earth. Biogeochemical cycles. Basic biogenic chemical elements. Organic and inorganic phases of biogeochemical processes in the environment. Cycle of nitrogen, carbon and other elements. Nitrification and denitrification. Incomplete closure of cycles on the scale of geological time. The origin of minerals.											+	+
D16	Chemistry of semiconductor materials	The subject deals with semiconductor materials: general information about semiconductors; semiconductor classification; intrinsic conductivity of semiconductors; impurity conductivity of semiconductors. Organic semiconductors: characteristics of individual groups of organic semiconductors; electrical conductivity of organic semiconductors; electrical conductivity of low molecular weight organic semiconductors; electrical conductivity mechanism. Practical application of organic semiconductors. Materials: polymers with conjugated bonds. OLED and OPV technologies. Technology for obtaining OLED displays and organic solar cells, etc.	5										+	+
	Chemistry of functional materials	The subject deals with functional materials for organic electronics: general information about semiconductors; semiconductor classification; intrinsic conductivity of semiconductors;											+	+

	<p>impurity conductivity of semiconductors. Organic functional materials: 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. Practical application of functional materials. Functional materials: oligomers and polymers with conjugated bonds. Application in OLED and OPV technologies, etc.</p>												
--	--	--	--	--	--	--	--	--	--	--	--	--	--

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 student's personality, 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	Understands the values of personality, language and communication, applies cooperation skills, and the ability to resolve conflicts; identifies the features of modern didactic concepts in higher education; demonstrates knowledge in the field of modern educational technologies; is fluent in foreign languages at a level that allows effective interaction in professional and scientific environments.	interactive lectures and seminars, project method	Project defense, test, colloquium, report
LO3	Knows the conceptual and theoretical foundations of chemistry, 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	Possesses a system of knowledge about fundamental chemical laws and theories, the chemical essence of phenomena and processes in nature and technology	Practical lessons, seminars, training games	Test, program development, preparation of information on specific issues.
LO5	Applies knowledge of the theoretical and experimental foundations of chemistry and chemistry teaching	Practical lessons, seminars, trainings, project method	Test, program development, preparation of information on specific issues, presentations

	technologies, knows the methods of formation of subject skills and abilities of students, knows the techniques of forming an interest in chemistry and using knowledge in chemistry in everyday life		
LO6	Possesses the skills of organizing and staging a chemical experiment (laboratory, demonstration, computer)	interactive lectures, practical lessons seminars, training, project	Project protection, written work
LO7	Applies knowledge of general and theoretical chemistry, fundamental, applied mathematics and information technology to analyze and synthesize phenomena and processes	Practical lessons, seminars, trainings	Project protection, written work
LO8	Knows the current state and development trends in the chemistry of supramolecular compounds, acyclic and cyclic conjugated systems. Basic concepts and terms of supramolecular compounds, acyclic and cyclic conjugated systems.	interactive lectures, seminars, experimental workshops	Test, colloquium, laboratory journals
LO9	Implements analytical and technological solutions in the field of experimental and theoretical chemistry.	practical lessons, seminars, trainings, pedagogical practice	Development of training lessons, report on pedagogical practice
LO10	Knows the main factors of the impact of industrial facilities and environmental monitoring	practical lessons, seminars, training pedagogical, practice	Written work, development of evaluation criteria for specific topics of the school course in chemistry, tests

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.

	<i>Possesses</i> 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: the main modern means of evaluating learning outcomes, the methodological foundations of their application; the main methods of scientific research; the modern educational model of teaching BL, including online; methods and techniques of conducting classes using elements of research work
	Is able to: effectively organize the educational process in BL format in English, including online; independently, determine the effectiveness and methodology of the use of learning outcomes assessment tools in structuring the educational process; apply research planning methods and data processing techniques
	Possesses: skills to apply methods of organizing work related to research and project activities of students, discussions and other problematic teaching methods; modern information and communication technologies in the educational process
LO6	Knows: basic concepts, basic laws and theoretical foundations for teaching inorganic chemistry in high school and university.
	Is able to: apply modern methods of teaching chemistry in research and professional activity
	Possesses the skills of organizing and staging a chemical experiment (laboratory, demonstration, computer)
LO7	Knows: phenomena, basic concepts, basic laws and their experimental and theoretical basis from various fields of chemistry
	Is able to: apply in research and professional activity the basic mathematical methods used for modelling and analysis of chemical processes; achievements and problems of modern chemistry
	Possesses to carry out scientific work and observations on chemical processes, to use an apparatus for collecting experimental data and to work using physico-chemical equipment
LO8	Knows: the current state and development trends in the chemistry of supramolecular compounds, acyclic and cyclic conjugated systems. Basic concepts and terms of supramolecular compounds, acyclic and cyclic conjugated systems.
	Is able to: apply in the practices of conjugated systems: resonance rules; resonant effect; steric obstruction of resonance in

	conjugated systems.
	Possesses to carry out scientific work and observations with main classes of organic supramolecular structures, etc.
LO9	Knows: the basic concepts of statistical thermodynamics and its place in science; the basic laws (principles) of static thermodynamics; the relationship of statistical physics with thermodynamics; conditions of thermodynamic stability of the system
	Is able to: use the mathematical apparatus of static thermodynamics; analyze the behavior of the simplest systems; use the studied methods in fluctuation phenomena
	Possesses: skills in the mathematical apparatus of thermodynamics and statistical physics; the use of knowledge for the analysis of the simplest systems
LO10	Knows: the main factors of the impact of industrial facilities and environmental monitoring
	Is able to: analyze the effects of industrial facilities and environmental monitoring
	Possesses: the skills to monitor the state of the environment

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, 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):	Conducts classes using optimal means, forms, methods and techniques of education and training, as well as modern educational technologies, including ICT, stimulating interest in knowledge and cooperation, including e-learning.
3. Professional competencies(Hard skills)	Knows the conceptual and theoretical foundations of chemistry, 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; Applies knowledge of theoretical and experimental foundations of chemistry and chemistry teaching technologies, owns methods of formation of subject skills and skills of students, knows the techniques of forming interest in chemistry and using knowledge in the field of chemistry in everyday life; Possesses the skills of organizing and staging a chemical experiment (laboratory, demonstration, computer); Applies knowledge of general and theoretical chemistry, fundamental, applied mathematics and information technology to analyze and synthesize phenomena and processes; Implements analytical and technological solutions in the field of experimental and

2023
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.

Compiled by:

Candidate of chemical sciences, Associate Professor, Head of the Department *Mukusheva* Mukusheva G.K.
Candidate of Chemical Sciences, Professor of the Department *Nurmaganbetova* Nurmaganbetova M.S.
PhD doctor, Assistant Professor of the Department *Sadykov* Sadykov T.M.
2nd year graduate student of the OP " Chemical technology of inorganic substances " *Pashaeva* Pashaeva A.B.

Notes.

The educational program was reviewed by the Faculty Council from 26.04.2023 protocol No. 10
The educational program was reviewed at the meeting of the Academic Council from 18.04.2023 protocol No. 5
The educational program was reviewed and approved at a meeting of the University's Management Board from 30.05.2023 protocol No. 12

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

T.Z. Zhusipbek
S.A. Smailova
M.K. Ibraev

EDUCATIONAL PROGRAM DEVELOPMENT PLAN
«7M01504-Chemistry»

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	2023 (in fact)	2023-2024 (plan)	2024-2025 (plan)	2025-2026 (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/audilectures	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 of the labor market, scientific achievements, professional standards	Year			+	
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