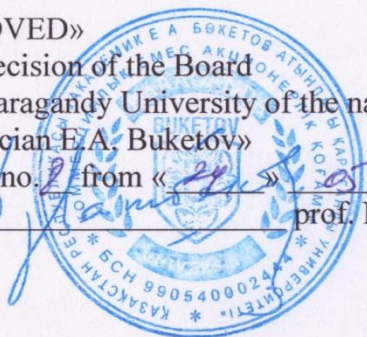


Ministry of Science and Higher Education of Republic of Kazakhstan
Karaganda University of the name of academician E.A. Buketov

«APPROVED»

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

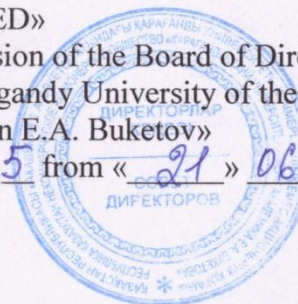
Protocol no. 2 from « 21 » 05 2024 y.
prof. N.O.Dulatbekov.



«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

7M05301 - Chemistry

Level: Master's

Karaganda
2024

APPROVAL SHEET

EDUCATIONAL PROGRAM «7M05301-Chemistry»

«AGREED»

Director of Chemical and Metallurgical
Institute named after Zh. Abishev
Baysanov S.O.



APPROVAL SHEET

EDUCATIONAL PROGRAM «7M05301-Chemistry»

«AGREED»

General Director of JSC "Shubarkol Komir"

Sergey Kim

«10»

09 2014



This educational program «7M05301-Chemistry» was developed on the basis of:

- The Law of the Republic of Kazakhstan dated 27 July, 2007 No. 319-III «On Education»;
- State compulsory standard of postgraduate education from 20.07.2022 No. 2;
- The National Qualifications Framework, approved by the Republican Tripartite Commission on Social Partnership and the Regulation of Social and Labor Relations on 16 March, 2016;
- The 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 20.04.2011 No. 152 (with changes and additions from 11.08.2023);
- Classifier of training with higher and postgraduate education of 13 October, 2018 No. 569 (with changes and additions from 12.08.2023);
- Standard “Teacher”, approved by order No. 500 of December 15, 2022.
- Professional standard for teachers (faculty) of organizations 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.
- Professional standard «Science (scientific, scientific and technical activity)», «Higher and postgraduate education (pedagogical and methodological activity)» (Approved by the Ministry of Health on the 10 July, 2015. No. 10-3-16 / 14215);
- Sectoral Qualifications Framework «Chemical Production» (Approved by Protocol No. 1 of the meetings of sectoral commissions on social partnership and the regulation of social and labor relations for the mining and metallurgical, chemical, construction industries and woodworking, light industry and mechanical engineering.

Content

№	Passport of the educational program	
1	Code and name of the educational program	4
2	Code and classification of the field of education, direction of training	4
3	Group of educational programs	4
4	Volume of credits	4
5	Form of education	4
6	Language of instruction	4
7	Degree awarded	4
8	Type of educational program	4
9	Level according to the International Standard Classification of Education	4
10	Level according to the National Qualifications Framework	4
11	Level according to the Industry Qualification Framework	4
12	Distinctive features of the Educational program	4
	Partner University (joint educational program)	
	Partner University (two-degree educational program)	
13	The number of the appendix to the license for the direction of training	4
14	The name of the accreditation body and the validity period of the accreditation of the educational program	4
15	The purpose of the Educational program	4
16	Qualification characteristics of the graduate	4
a)	List of graduate positions	
б)	Scope and objects of professional activity of the graduate	
в)	Types of professional activity of the graduate	
г)	Functions of the graduate's professional activity	
17	Formulation of learning outcomes based on competencies	6
18	Determination of modules of disciplines in accordance with the results of training	7
19	Matrix of achievability of learning outcomes	8
20	Coordination of the planned learning outcomes with the methods of teaching and evaluation within the module	12
21	Criteria for assessing the achievability of learning outcomes	13
22	Graduate Model	15

Passport of the educational program

1. Code and name of the educational program–7M05301-Chemistry
 2. Code and classification of the field of education, direction of training- 7M05 Science, Mathematics and Statistics, 7M053 Physical and Chemical Sciences
 3. Group of educational programs - Chemistry
 4. Volume of credits - 120
 5. Form of education - full-time
 6. Language of instruction - Kazakh, Russian
 7. Degree awarded - Master of Natural Sciences in the educational program "7M05301-Chemistry"
 8. Type of educational program - current
 9. Level according to the International Standard Classification of Education -7
 10. Level according to the National Qualifications Framework-7
 11. Level according to the Industry Qualification Framework-7
 12. Distinctive features of the Educational program- no
- Partner University (joint educational program) - no
Partner University (two-degree educational program) - no
13. The number of the appendix to the license for the direction of training - KZ83LAA00018495 from July 28, 2020
 14. The name of the accreditation body and the validity period of the accreditation of the educational program–IQAA agency, certificate IS-A №0053/3 28.05.2022-27.05.2027
 15. The purpose of the educational program is to train highly qualified specialists for the development of the economy, industry, education and science of the Republic of Kazakhstan, to provide conditions for obtaining a full-fledged education, professional competence in the field of chemistry and chemical technology.
 16. Qualification characteristics of the graduate
 - a) List of graduate positions–Junior Researcher; Researcher; Chief Researcher; Leading Researcher; Senior Researcher; engineer; laboratory assistant; Senior Assistant; teacher (assistant); methodologist of the structural unit.
 - b) Scope and objects of professional activity of the graduate - The sphere of professional activity of graduates of the "7M05301-Chemistry" educational program are branches of the chemical, metallurgical, petrochemical and pharmaceutical industries; education, science and ecology. The objects of professional master's educational program "7M05301-Chemistry" are:
 - institutions of higher education;
 - governments in the field of education, the chemical industry;
 - the establishment of control and analytical services, standardization and certification centers;

- natural resource agencies and environmental protection.

c) Types of professional activity of the graduate:

- organizational and managerial activities. The graduate should have the skills for skilled work in the enterprises of chemical, environmental, pharmaceutical, metallurgical, petrochemical, gas and coal profile; Central factory laboratory of chemical, pharmaceutical, environmental, metallurgical, petrochemical, gas and coal industries;

- industrial and technological activities are the prerogative of the graduates of this specialty, since the educational process requires them to a thorough study of all issues related to the chemical and chemical-technological production;

- experimental and research work of masters can be conducted in a variety of organizational forms, alone or in conjunction with external objects (in the framework of research programs of higher education institutions, international scientific cooperation programs, research institutions and other business entities).

- Education (teaching) activity in this specialty disciplines associated with teaching functions in chemistry in secondary, secondary vocational schools and institutions of higher education.

d) Functions of the graduate's professional activity

- implementation of the organization of production and technological processes in the chemical industries, and industry;

- implementation of development methodologies, organizing and conducting a variety of chemical analyzes, research chemicals and the characteristics of their composition;

- planning and organization of research programs;

- Manual industrial, scientific and teaching staff, laboratory;

- planning and organization of educational work in the field of education.

Formulation of learning outcomes based on competencies

Type of competencies	Learning result code	Learning result (according to Bloom's taxonomy)
1. Behavioral skills and personal qualities: (Softskills)	LO 1	Carries out independent research activities in the relevant professional field using modern research methods and information and communication technologies.
	LO 2	Demonstrates readiness to organize educational activities and implement the teaching of chemical disciplines in the context of modern requirements of pedagogy and psychology of higher education.
	LO 5	Plans and solves the problems of his own professional and personal development.
2. Digitalcompetencies: (Digitalskills):	LO3	Owns modern computer technologies used in processing the results of scientific experiments and collecting, processing, storing and transmitting information when conducting independent scientific research.
3. Professional competencies: (Hardskills)	LO4	Uses modern methods and technologies of scientific and pedagogical communication in their native and foreign languages in the field of professional activity at a level that allows conducting scientific research and teaching special disciplines in educational institutions.
	LO 6	Has knowledge of the basic stages and patterns of development of chemical science, an understanding of the objective need for the emergence of new directions, possession of ideas about the system of fundamental chemical concepts and methodological aspects of chemistry, forms and methods of scientific knowledge, their role in the general educational professional training of chemists.
	LO 7	Understands the principles of work and is able to work on modern scientific equipment when conducting scientific research.
	LO 8	Uses normative documents on metrology, quality, standardization in practice; applies the rules of safety, industrial sanitation, fire safety and labor protection standards.
	LO 9	Analyzes the scientific literature in order to choose the direction of research on the topic proposed by the supervisor and independently draws up a research plan; possession the theory and practical skills in the chosen field of chemistry; demonstrates the ability to analyze the results obtained, draw the necessary conclusions and formulate proposals.
	LO 10	Is able to critically analyze modern problems of innovation in the field of chemistry, set goals and develop research programs, interpret, present and apply the results.

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

Learning result code	Name of the module	Name of disciplines	Volume (ECTS)
LO 1, LO 2, LO 4, LO 5, LO 6	Aspects of Socio-Humanitarian Knowledge	History and Philosophy of Science Pedagogy of higher education Psychology of management Pedagogical practice	4 4 4 4
LO 1, LO 2, LO 4, LO 9, LO 10	Professional Languages	Foreign Language (professional) Chemistry English for Scientific Purposes (in English) English in the field of professional communication (in English)	4 5
LO 1, LO 2, LO 3, LO 4, LO 5, LO 6, LO 7, LO 9, LO 10	Commercialization and innovation in chemistry	Commercialization of the results of scientific and scientific and technical activities Implementation of research and development results Innovatics in Chemistry Introduction to chemometrics	5 5
LO 1, LO 2, LO 3, LO 6, LO 7, LO 8, LO 9, LO 10	Modern Problems of Chemistry	Theory and Problems of Physical Chemistry Contemporary Problems of Organic Chemistry (in English) Selected Chapters of Analytical Chemistry (in English)	5 4 4
LO 1, LO 2, LO 3, LO 4, LO 6, LO 7, LO 9, LO 10	Structure and Properties of Chemical Compounds	Computer Modeling of Molecular Systems Molecular modeling and docking Chemistry of Conjugated Compounds (in English) Chemistry of acyclic and cyclic conjugated systems (in English) Quantum Basis of Statistical Thermodynamics (in English) Modern Methods of Computational Chemistry (in English)	5 5 5
LO 1, LO 3, LO 6, LO 7, LO 8, LO 10	Ecology and control of chemical products quality	Analysis and Quality Management of Chemical Products Standardization, certification and technical regulation of chemical products Ecology in Chemical Industry Environment protection Research practice	6 5 14
LO 1, LO 3, LO 7, LO 8, LO 9, LO 10	Research work	Postgraduate Research work, including an internship and a master's thesis	24
	Final examination	Formulation and defense of master's project	8

Matrix of achievability of learning outcomes

NN	Name of disciplines	Brief description of the discipline	Number of credits	Generated learning 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	Pedagogy of higher education	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 the skills and abilities of foreign language speech activity in the subject area for effective communication in situations of professional interaction. The course is designed to teach how to work with specialized literature, to practice of oral and written bilingual translation. There are considered the issues of a foreign language for specific purposes and norms of professional speech.	4	+	+		+	+					
Cycle of basic disciplines Elective component													
D5	Chemistry English for Scientific Purposes (in English)	It is studied in order to form and develop speech skills in a foreign language in the subject area of chemistry, improve the technique of translating scientific articles. The course covers topics related to the history of chemistry,	5	+	+		+					+	+

		the technique of chemical analysis, acid-base interactions, polymer research, enzymatic and catalytic processes.											
	English in the field of professional communication (in English)	It is studied with the aim of developing and improving foreign language communicative competence in the professional field, which will allow the use of a foreign language in professional activities, provide an opportunity to carry out intercultural communication to solve professional problems, implement scientific and practical exchange with foreign partners as part of their activities.		+	+		+	+					
D6	Commercialization of the results of scientific and 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 activity in order to withdraw new or improved goods aimed at extracting income to the market.	5	+			+	+			+	+	+
	Implementation of research and development results	The subject examines the concept of the implementation of the results of scientific research and development. Formation and development of legislation in the field of implementation of the results of scientific research and development in the Republic of Kazakhstan. Considers scientific projects ready for implementation; preparation of grant projects for scientific research, etc.		+			+	+			+	+	+
D7	Innovatics in Chemistry	It is studied in order to form knowledge about the sources and factors of economic growth, about the concepts of innovation and innovative development, the structure of the innovation process; on the form of implementation of innovations, on organizational processes in the creation and implementation of innovations; about methods and tools of state support for the development of innovations.	5	+			+	+	+		+	+	+
	Introduction to chemometrics	It is studied in order to form ideas about the chemometric approach to data analysis for solving various problems. Development of skills in using mathematical methods in chemistry, analyzing large amounts of data and searching for patterns, organizing effective storage and retrieval of chemical information, developing models.		+		+			+	+		+	+
Cycle of profile disciplines University component													
D8	Theory and Problems of Physical Chemistry	It is studied with the aim of forming knowledge about the theoretical foundations and mathematical apparatus of modern physical chemistry, methods of their application for solving theoretical and applied problems. Skills are acquired in using the quantitative characteristics of compounds for thermodynamic analysis; selection of mathematical apparatus, evaluation of physical and chemical	5	+	+				+	+		+	

		parameters of objects.											
D9	Contemporary Problems of Organic Chemistry (in English)	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, biological active materials and bio additives.	4	+	+		+		+	+		+	+
D10	Selected Chapters of Analytical Chemistry (in English)	It is studied in order to form knowledge about the principles of choosing analytical methods and skills in their application in chemical analysis. Topics covered include the analytical process, types and sources of errors, calibration, mass spectrometry, spectroscopic methods, chromatography, as well as the most popular modern analytical methods.	4	+	+		+		+	+	+	+	
Cycle of profile disciplines Elective component													
D11	Computer Modeling of Molecular Systems	It is studied in order to form in-depth ideas about the use of computer methods for studying molecular systems, acquiring computer modeling skills as a means of studying the structural and dynamic properties of molecular compounds. Issues related to the main approaches to computer modeling and analysis of the relationship between the structure and properties of chemical compounds are considered.	5	+		+			+			+	
	Molecular modeling and docking	It is studied with the aim of developing knowledge about molecular docking and acquiring skills in modeling legend-receptor molecular systems, which makes it possible to predict the most favorable types of orientation and conformation for the formation of stable molecular complexes, and to determine the forces of intermolecular interaction by determining the evaluation functions.		+		+			+			+	+
D12	Chemistry of Conjugated Compounds (in English)	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 induced ring current. <u>Conjugated systems containing an aromatic sextet.</u>	5	+			+		+	+		+	
	Chemistry of acyclic and cyclic conjugated systems (in English)	The discipline deals with acyclic and cyclic conjugated systems. The nature of the delocalized chemical bond of acyclic and cyclic conjugated systems. Types of conjugated systems. Aromaticity of cyclic conjugated systems. <u>Conjugated systems that do not contain an aromatic sex-</u>		+	+		+		+	+		+	

		tet. Antiaromaticity in cyclic compounds. Alternate and non-alternant cyclic hydrocarbons, etc.											
D13	Quantum Basis of Statistical Thermodynamics (in English)	It is studied with the aim of forming knowledge of the fundamentals of quantum statistical mechanics, developed and used to clarify the behavior of the gaseous and condensed phase, as well as to establish a microscopic derivation of the postulates of thermodynamics. Issues such as the formation of statistical ensembles, Fermi, Bose, Boltzmann statistics, density matrices are considered.	5	+		+	+		+			+	+
	Modern Methods of Computational Chemistry (in English)	It is studied in order to form ideas about the theoretical foundations of modern methods of computational chemistry, their application in solving problems of theoretical and applied chemistry, knowledge about the strengths and weaknesses of computational methods. Acquisition of skills in the development and application of computational methods for the study of chemical systems.		+		+	+		+			+	+
D14	Analysis and Quality Management of Chemical Products	It is studied with the aim of acquiring knowledge of the methodology and terminology of quality management of chemical products; recommendations of domestic and international standards to ensure product quality. Formation of management skills and quality assurance of the production process, the use of modern methods of analysis to determine the quality of products.	6			+			+	+	+		
	Standardization, certification and technical regulation of chemical products	It is studied with the aim of developing knowledge of standardization and certification of chemical laboratories, declaring manufactured products, varieties of regulatory documents (standards, technical regulations, specifications, etc.), criteria for chemical and environmental safety of manufactured products. Ability to apply acquired knowledge in practical activities.		+		+			+	+	+		
D15	Ecology in Chemical Industry	It is studied in order to form ideas about harmful substances in the chemical industry, pollution of the atmosphere, hydrosphere, lithosphere. Issues of cleaning emissions into the atmosphere, wastewater treatment, disposal of solid waste are considered. Practical problems of industrial ecology.	5						+	+	+		+
	Environment protection	It is studied in order to familiarize with environmental pollutants, the main ways to protect atmospheric air, water resources and soil cover from anthropogenic impact. Skills and abilities to analyze production technology from an environmental point of view are being formed. The course is designed to study the methods of environmental protection.		+					+	+	+		+

Coordination of the planned learning outcomes with the methods of teaching and evaluation within the module

Learning outcomes	Planned learning outcomes for the module	Teaching methods	Assessment methods
LO 1	Ability to independently carry out research activities in the relevant professional field using modern research methods and information and communication technologies	interactive lecture, round table, discussion, project training	Project, test
LO 2	Willingness to teach in the field of chemistry and chemical technology in general education, secondary vocational schools and organizations of higher education	interactive lecture, project training	Presentation, test
LO 3	Demonstrates possession of modern computer technologies used in processing the results of scientific experiments and collecting, processing, storing and transmitting information when conducting independent scientific research.	interactive lecture, presentation, project training	Project, test
LO 4	Willingness to use modern methods and technologies of scientific and pedagogical communication in their native and foreign languages in the field of professional activity at a level that allows conducting research and teaching special subjects in educational institutions	interactive lecture, round table, discussion	Colloquium, test
LO 5	Ability to plan and solve problems of their own professional and personal development	interactive lecture, discussion	Presentation, test
LO 6	Demonstrates knowledge of the basic stages and patterns of development of chemical science, an understanding of the objective need for new directions, knowledge of the system of fundamental chemical concepts and methodological aspects of chemistry, forms and methods of scientific knowledge, their role in the general educational professional training of chemists	interactive lecture, round table, discussion	Colloquium, presentation, test
LO 7	Demonstrates an understanding of the principles of work and the ability to work on modern scientific equipment when conducting research	interactive lecture, discussion	Colloquium, test
LO 8	Demonstrates the ability to use regulatory documents on metrology, quality, standardization in practice; the ability to apply safety regulations, occupational health, fire safety and labor protection standards	interactive lecture, discussion	Colloquium, test
LO 9	Demonstrates the ability to analyze the scientific literature in order to select the direction of research on the topic proposed by the supervisor and independently draw up a research plan; possession of theory and practical skills in the chosen field of chemistry; the ability to analyze the results, draw the necessary conclusions and formulate proposals	interactive lecture, discussion	Colloquium, test
LO 10	Demonstrates the ability to critically analyze modern problems of innovation in the field of chemistry, set goals and develop research programs, interpret, present and apply the results	interactive lecture, presentation	Presentation, test

Criteria for assessing the achievability of learning outcomes

Codes of LO	Criteria
LO 1	<p>Knows: theoretical and methodological foundations of research areas of scientific research; Actual problems and consideration of the development of the scientific field and the field of professional activity; studies of interdisciplinary relationships and the possibility of using economic tools in serious research in the field of science, the laws of rhetoric and the requirements for public speaking.</p> <p>Can: independently plan and study research activities in a special professional field using modern research methods and information and communication technologies; an evolving literary search for recent developments; determination of the possibility of commercialization of income</p> <p>Owens: methods, methods and forms of addressing scientific discussion, the basics of substantiating scientific and professional communication, develops his own point of view in professional activities and requires it in the course of discussion with specific and non-specialists; apply methods of planning scientific research, taking into account innovations.</p>
LO 2	<p>Knows: the history of the formation and development of the main scientific schools, regular interdisciplinary relationships, classical and innovative teaching methods, the development of the design of the educational process, legal documents, systemic ideas about deviations in the assessments of managerial activity.</p> <p>Can: plan and train teaching activities in the field of chemistry and chemical technology in general education, secondary vocational schools and higher education organizations; to take educational programs in correlation with public trends in this area, to design the educational process taking into account the structure of educational institutions.</p> <p>Owens: innovative methods and techniques for teaching chemistry and chemical technology in general education, secondary vocational schools and higher education institutions, strives for design, provides for and manages the educational process.</p>
LO 3	<p>Knows: modern information technologies, features of the use of general and professional software in their subject area in the field of science and education; tools and methods for processing research results.</p> <p>Can: it is possible to choose equipment, software and technologies for solving scientific, pedagogical and managerial tasks; tasks of developing and using information resources and program-methodical educational process, tasks of processing managerial information and research results.</p> <p>Owens: theoretical knowledge and practical skills in the use of information, communication and advanced technologies in educational and scientific work; state computer technologies, applications in processing the results of scientific experiments and collections, processing, storing and transmitting information in a number of independent scientific research.</p>
LO 4	<p>Knows: methods and technologies of scientific and pedagogical communication; stylistic features of the presentation of scientific activity in oral and written form in native and foreign languages; communication norms.</p> <p>Can: follow the norm adopted in scientific communication in native and foreign languages; use methods and technologies of scientific communication in native and foreign languages in the course of professional activities in native and foreign languages, analyze scientific texts.</p> <p>Owens: skills of analysis of scientific texts; modern methods and technologies of scientific and pedagogical communication in the native and foreign languages become in the field of professional activity at the level, allow conducting scientific research and studying the teaching of special disciplines in educational institutions.</p>
LO 5	<p>Knows: the content of the goal-setting process of his personal and professional development, features and implementation in solving professional problems based on the search for growth and ensuring the labor market.</p> <p>Can: Ability to plan and solve problems of professional and personal development.</p> <p>Owens: methods and technologies of goal-setting, target designation and evaluation of the results of activities in solving professional problems; the presence and evaluation of individual, personal, professionally significant qualities and ways to achieve a higher level of their development.</p>
LO 6	<p>Knows: the main stages and patterns of development of chemical science, ideas about the system of fundamental chemical concepts and methodological aspects of chemistry, forms and methods of scientific knowledge, their role in the general educational professional training of chemists, the current state of science, trends, problems, theories and methods of research activities in the subject area.</p> <p>Can: describe the theoretical and methodological foundations of the chosen field of chemistry, choose new promising areas; apply experimental and computational-theoretical research methods in professional activities; to select and use the best methods of teaching and assessing the progress of students.</p>

	Owens: technology of designing the educational process; methods and technologies of teaching and assessing the progress of students, methods of designing educational programs based on a competency-based approach, a modular principle, a system of credits.
LO 7	Knows: analytical process, types and sources of errors, calibration, basic methods of experimental research, principles of operation on specialized equipment, physicochemical and physical methods of analysis, mass spectrometry, spectroscopic methods, chromatography, programs for quantum chemical research. Can: select and apply experimental and computational methods, taking into account their sensitivity and resolution, interpret the results obtained, work on research equipment. Owens: methods of selecting hardware and software for conducting chemical experiments, methods of calibrating instruments, methods of conducting experiments on modern equipment in scientific research, determining and minimizing experimental errors, measurement errors.
LO 8	Knows: legislative and regulatory acts on metrology, standardization and certification, industrial sanitation rules, safety and labor protection; control systems for standards and uniformity of measurements; theory of reproduction of units of physical quantities and transfer of their sizes, rules for testing and acceptance of products. Can: use regulatory documents on metrology, quality, standardization in practice; apply the rules of safety, industrial sanitation, fire safety and labor protection standards. Owens: methods of processing measurement results, determination of measurement uncertainty, metrological characteristics; methods of control over standards and measuring instruments, the skills of conducting an experiment in accordance with regulatory documents.
LO 9	Knows: methods of planning scientific research, taking into account the latest innovations in science and technology, the possibility of carrying out scientific research, methods for conducting a critical analysis of available information on the topic of a scientific project. Can: analyze scientific literature in order to choose the direction of research on the topic proposed by the supervisor and independently draw up a research plan; carry out a critical analysis of information on the subject of ongoing research, analyze the results and formulate conclusions. Owens: methods of planning scientific research, analysis of scientific information; skills of practical work in the chosen field of chemistry; the ability to analyze the results obtained, draw the necessary conclusions and formulate proposals.
LO 10	Knows: the latest innovative developments in the field of chemistry and chemical technology, methods for commercializing the results and all types of scientific and technical documentation, including scientific reports, reviews, reports and articles. Can: critically analyze modern problems of innovation in the field of chemistry, set tasks and develop research programs, interpret, present and apply the results obtained, professionally draw up and present the results of chemical research, research and production and technological work according to approved forms. Owens: the skills of evaluating the prospects of innovative developments, the main methods of formalizing and presenting the results of chemical research, research and production and technological work according to approved forms, methods of implementing research results.

The graduate model of the educational program

Graduate Attributes:

Deep and comprehensive knowledge of their specialization.

Intellectual development, curiosity, creativity.

Goal-oriented, self-organized, quick adaptability.

Communication and mobility.

Tolerance and education.

Type of competencies	Description of competencies
1. Behavioral skills and personal qualities: (Softskills)	<p>Demonstrates knowledge of the theoretical and methodological foundations of the chosen field of scientific research; the history of the formation and development of the main scientific schools; actual problems and trends in the development of the relevant scientific field and field of professional activity; existing interdisciplinary relationships and the possibility of using economic tools in conducting research at the intersection of sciences.</p> <p>Owens the ways, methods and forms of introducing scientific discussion, the basics of effective scientific and professional communication, the laws of rhetoric and the requirements for public speaking, the ability to develop one's point of view on professional issues and defend it during discussions with specialists and non-specialists.</p> <p>Able to plan and carry out teaching activities in the field of chemistry and chemical technology in general education, secondary vocational schools and higher education organizations.</p> <p>Demonstrates knowledge of the content of the goal-setting process of personal and professional development, its features and methods of implementation in solving professional problems, based on the stages of career growth and the requirements of the labor market. Owns the techniques and technologies of goal-setting, goal-realization and evaluation of the results of activities in solving professional problems; ways to identify and evaluate individual, personal, professionally significant qualities and ways to achieve a higher level of their development.</p>
2. Digital competencies: (Digitalskills):	<p>Demonstrates knowledge of the features of the use of software tools for general and special purposes in their subject area in the field of science and education; tools and methods for processing research results. Knows how to make a rational choice of equipment, software and technologies for solving scientific, pedagogical and managerial tasks; solve typical developments and use of information resources and software and methodological support of the educational process, the tasks of processing management information and research results. Possesses theoretical knowledge and practical skills in the use of information, communication and multimedia technologies in educational and scientific work.</p>
3. Professional competencies: (Hardskills)	<p>Demonstrates knowledge of methods and technologies of scientific communication; stylistic features of presenting the results of scientific activity in oral and written form in native and foreign languages. Able to follow the basic norms adopted in scientific communication in native and foreign languages. Possesses the skills of analyzing scientific texts; various methods, technologies and types of communications in the implementation of professional activities in native and foreign languages</p> <p>Demonstrates knowledge of legal documents regulating the organization and content of the educational process, the basic principles of building educational programs, including taking into account foreign experience. Knows how to develop educational programs based on a competency-based approach, a modular principle, a system of credits; to select and use the best methods of teaching and assessing the progress of students. Owns the technology of designing the educational process; methods and technologies of teaching and assessing the progress of students.</p> <p>Demonstrates knowledge of the current state of science, trends, problems, theories and methods of research activities in the subject area. He knows how to choose and apply experimental and computational-theoretical research methods in professional activities, use fundamental</p>

	<p>chemical concepts in the field of professional activity.</p> <p>Demonstrates knowledge of the basic methods of experimental research in chemistry and chemical technology, the principles of operation of modern research equipment for scientific research. Able to choose and apply experimental and computational-theoretical research methods in professional activities; interpret and correctly evaluate experimental data, identify substances. Has an idea about the sensitivity and resolution of the method, about the characteristic time of the method</p> <p>Demonstrates knowledge of legislative and regulatory legal acts on metrology, standardization and certification, safety regulations, industrial sanitation, fire safety and labor protection standards; control systems for standards and uniformity of measurements; theory of reproduction of units of physical quantities and transfer of their sizes; methods for processing measurement results and measuring instruments, their metrological characteristics; rules for testing and acceptance of products. Able to apply existing regulations in practice.</p> <p>Demonstrates knowledge of methods for planning scientific research, taking into account the latest innovations in science and technology, analyzing the results obtained and formulating conclusions. Able to search, including using information systems and databases, and perform a critical analysis of information on the subject of ongoing research. Possesses the skills of presenting and promoting the results of intellectual activity, their commercialization.</p> <p>Demonstrates knowledge of all types of scientific and technical documentation, including scientific reports, reviews, reports and articles. Able to professionally draw up, present and report the results of chemical research, research and production and technological chemical work in accordance with approved forms. Owns modern technologies for the design of scientific and technical documentation.</p>
--	---

Compiled by:

Assistant Professor of the Physical and Analytical Chemistry Department,
Candidate of Chemical Sciences

Head of the Physical and Analytical Chemistry Department

Master's student of M2-He-23-2r group



I.L. Stadnik

S.N. Nikolskiy

M.M. Mezhenina

Educational program was reviewed and recommended at the Faculty Council from 24.04.2024 protocol № 10

Educational program was discussed at the meeting of the Academic Council and recommended for approval by 29.04.2024 Protocol № 5

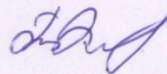
Educational program was considered and approved at the meeting of the University Board from 24.04.2024 Protocol № 8

Board member– Vice-rector for Academic affairs



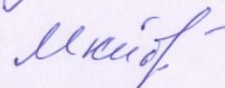
M. M. Umurkulova

Director of the Department of Academic work



T.T. Khassenova

Dean of the Chemical Faculty



M.K. Ibrayev