

Ministry of Education and Science of the Republic of Kazakhstan

Karaganda Buketov University

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« 25 » 2022



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« 25 » 2022



EDUCATIONAL PROGRAM

7M05301-Chemistry degree program

Level: Master's studies

Karaganda, 2022

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»;
- The Law of the Republic of Kazakhstan dated 11 July, 1997 No. 151-I. «On languages in the Republic of Kazakhstan»;
- State compulsory standard of postgraduate education from 31 August, 2018 No. 604;
- 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 2 October, 2018 No. 152;
- Classifier of training with higher and postgraduate education of 13 October, 2018 No. 569;
- 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)

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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 Science on the 7M05301 - Chemistry educational program
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, certified SA No. 0113 / 5 dated 29 May, 2017, valid until 27 May, 2022
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	Owens 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	4
		Higher School Pedagogy	4
		Management Psychology	4
		Pedagogical practice	4
LO 1, LO 2, LO 4, LO 9, LO 10	Professional Languages	Foreign Language (professional)	4
		Chemistry English for Scientific Purposes (in English)	5
		English in the field of professional communication (in English)	
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 Scientific and Technical Activities Results	5
		Implementation of research and development results	
		Innovatics in Chemistry	5
LO 1, LO 2, LO 3, LO 6, LO 7, LO 8, LO 9, LO 10	Modern Problems of Chemistry	Introduction to chemometrics	
		Theory and Problems of Physical Chemistry	4
		Contemporary Problems of Organic Chemistry (in English)	4
LO 1, LO 2, LO 3, LO 4, LO 6, LO 7, LO 9, LO 10	Structure and Properties of Chemical Compounds	Selected Chapters of Analytical Chemistry (in English)	4
		Computer Modeling of Molecular Systems	5
		Molecular modeling and docking	
		Chemistry of Conjugated Compounds (in English)	4
LO 1, LO 3, LO 6, LO 7, LO 8, LO 10	Ecology and control of chemical products quality	Chemistry of acyclic and cyclic conjugated systems (in English)	
		Quantum Basis of Statistical Thermodynamics (in English)	5
		Modern Methods of Computational Chemistry (in English)	
		Analysis and Quality Management of Chemical Products	5
LO 1, LO 3, LO 7, LO 8, LO 9, LO 10	Research work	Standardization, certification and technical regulation of chemical products	
		Ecology in Chemical Industry	4
		Environment protection	
		Research practice	14
LO 1, LO 3, LO 7, LO 8, LO 9, LO 10	Research work	Experimental research work of a student, including internship and fulfillment of the master's project (MSRW)	24
		Formulation and defense of master's project	12
	Finalexamination		

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	History and philosophy of science as a study of the General laws of scientific knowledge in its historical development and changing socio-cultural context. Philosophy of science and methodology of science. Science as a cognitive activity and tradition, as a social institution and as a special sphere of culture. Science in the culture of modern civilization. Features of scientific knowledge. Functions of science in society. Historical development of institutional forms of scientific activity.	4	+			+	+	+				
D2	Higher School Pedagogy	Pedagogy of higher education is called upon to put on a scientific basis both the solution of the problem of higher education for specific specialties, and the development by undergraduates in their future professional activities of managing the process of mastering this content. Pedagogy of higher education makes it possible to scientifically substantiate the requirements for the modern educational process and identify its patterns.	4		+		+	+					
D3	Management Psychology	The purpose of the course: is to form master students systematic ideas about the psychological laws of management, to disclose the specifics of the use of social psychological knowledge in the structure of the Manager, in the development of skills analysis of socio-psychological principles underlying effective management. Course content: basic concepts, theoretical positions and actual problems of psychology of management; theoretical features of psychology of management	4		+		+	+					
D4	Foreign Language (professional)	The content of the discipline "Foreign language" and the variable part "Professional foreign language" include three main components that are in close relationship, due to the integrative foreign language competence: the scope of communication and topics; socio-cultural knowledge; linguistic knowledge.	4	+	+		+	+					

Cycle of basic disciplines Elective component													
D5	Chemistry English for Scientific Purposes (in English)	Course Objectives and Expected Results: The purpose of the course is to develop the skills of speech activity in a foreign language in the chemistry subject area of specialty of the master students. Course Outline: History of chemistry. Chemistry applications. Chemistry separation techniques. Acids and bases: properties and applications. Water treatment methods. Polymers. Proteins and amino acids. Vitamins: nutritional chemistry. Catalysis. Enzymes. Competence: cognitive, methodological, organizational	5	+	+		+					+	+
	English in the field of professional communication (in English)	The purpose of the course: the development and improvement of foreign language communicative competence in the professional field, which will allow the use of a foreign language in professional activities. As well as the opportunity to carry out intercultural communication to solve professional problems, implement scientific and practical exchange with foreign partners as part of their activities based on the use of interdisciplinary links with other disciplines studied in the magistracy, and for further self-education.		+	+		+	+					
D6	Commercialization of Scientific and Technical Activities Results	The study of the process of commercialization of the results of scientific and intellectual activity, attracting investment, implementation of development in production and their further support.	5	+			+	+			+	+	+
	Implementation of research and development results	The purpose of the course: the introduction of completed scientific research into production, the final stage of research work. Practical use of progressive ideas, inventions, results of scientific research (innovations). Restructuring of production, retraining of workers, capital costs, the risk of not getting the desired result and incurring losses.		+			+	+			+	+	+
D7	Innovatics in Chemistry	Knowledge: sources and factors of economic growth; concepts of innovation and innovation development; theories of innovation; structures and stages of the innovation process; forms of implementation of innovations, types of innovation firms, economic and organizational processes in the creation and implementation of innovations; methods and instruments of state support for the development of innovation; investment and market life cycle of an innovation project	5	+			+	+	+		+	+	+
	Introduction to chemometrics	The purpose of the course: to study the chemometric approach to data analysis for solving various problems. The use of mathematical methods in chemistry, the anal-		+		+			+	+		+	+

		ysis of a large amount of data and the search for various kinds of patterns. Organization of efficient storage and retrieval of chemical information, development of models linking the structure of chemical objects and their properties.											
Cycle of profile disciplines University component													
D8	Theory and Problems of Physical Chemistry	Knowledge: theoretical foundations and mathematical apparatus of modern physical chemistry, as well as methods of their use for solving theoretical and applied problems of modern chemistry Skills: use the quantitative characteristics of the compounds to conduct a systematic thermodynamic analysis of the objects; competently carry out the selection of the mathematical apparatus necessary for the assessment of the physicochemical parameters of unexplored objects. Skills: performing calculations	4	+	+				+	+		+	
D9	Contemporary Problems of Organic Chemistry (in English)	This course will treat the mechanistic, theoretical and synthetic aspects of a broad range of reactions utilized in organic chemistry. Classical reactions as well as recently developed reactions will be reviewed with examples from the literature. Master students will identify classes of organic compounds and typical reactions, discriminate amongst intermediate stabilities, postulate reaction mechanisms, plan multi-step syntheses, and analyze/interpret spectroscopic data.	4	+	+		+		+	+		+	+
D10	Selected Chapters of Analytical Chemistry (in English)	The objective of this course is to review many of the principles and applications of selected analytical methods in chemistry. Focus will be placed on topics including the analytical process, types and sources of error, calibration, mass spectrometry, spectroscopic methods, chromatography, as well as selected analytical techniques and applications that have garnered much interest in recent years.	4	+	+		+		+	+	+	+	
Cycle of profile disciplines Elective component													
D11	Computer Modeling of Molecular Systems	Course objectives and expected results: the formation of in-depth understanding of the use of computer methods for the study of molecular systems. Course Outline: The main approaches to computer molecular modeling and analysis of the relationship between the structure and properties of chemical compounds are considered. Competence: in the field of computer modeling, as a means of studying the structural and dynamic properties of molecular compounds	5	+		+			+			+	

	Molecular modeling and docking	The purpose of studying the discipline is to master the methods of molecular modeling, which make it possible to predict the most favorable orientation and conformation of one molecule in the binding site of another for the formation of a stable complex. Ability to apply methods. Prediction of interaction forces by means of so-called scoring functions using position and conformation data. Knowledge of macromolecular docking.		+		+			+			+	+
D12	Chemistry of Conjugated Compounds (in English)	Course objectives and expected results: This course will take a theoretical turn with development of the concepts underlying current understanding of conjugated systems, including aromaticity and the use of orbital symmetry in interpreting cycloaddition reactions. Summary of the course: The course will cover a wide range of topics about the structure and mechanisms of the reaction of conjugated compounds, intermolecular and intramolecular interactions that determine the chemical structure of materials	4	+		+		+	+			+	
	Chemistry of acyclic and cyclic conjugated systems (in English)	The purpose of studying the discipline is to expand the understanding of the fundamentals of the structure and reaction mechanisms of acyclic and cyclic conjugated compounds, the study of catalytic reactions with their participation, knowledge and definition of new structural types of conjugated compounds, non-stoichiometric conjugated compounds. Application of the received information in research work.		+	+		+		+	+		+	
D13	Quantum Basis of Statistical Thermodynamics(in English)	Course Objectives and Expected Results: The goal of this course is to introduce the fundamentals of quantum statistical mechanics developed and used to elucidate gas phase and condensed phase behaviour, as well as to establish a microscopic derivation of the postulates of thermodynamics. Classical results are obtained according to the classical limit of the quantum mechanical expressions. Topics include ensembles, Fermi, Bose and Boltzmann statistics, density matrices	5	+		+	+		+			+	+
	Modern Methods of Computational Chemistry (in English)	Course Objectives and Expected Results: The field of computational chemistry encompasses the development and application of numerical methods for the study of chemical systems. The successful investigation of problems in chemistry using computational chemistry requires both an understanding of the nature of the chemistry being studied and an understanding of the computational methods employed. The theoretical framework of computational chemistry methods will be presented		+		+	+		+			+	+
D14	Analysis and Quality	Knowledge: methodologies and terminology of quality	5			+			+	+	+		

	Management of Chemical Products	management of chemical products; recommendations of domestic and international standards of the ISO 9000 series for ensuring product quality; features of existing management systems and quality assurance, the evolution and main stages of the development of quality management and general management; modern methods of analysis, forecasting and ensuring a given level of product quality; product certification procedures and quality management systems											
	Standardization, certification and technical regulation of chemical products	The purpose of studying the discipline is to determine the quality of products, as an indicator of the competitiveness of the enterprise, its viability and sustainable development. Knowledge of criteria for chemical and environmental safety of products. Knowledge and ability to apply regulatory documentation to ensure product quality, standardization and certification of chemical laboratories and products.		+		+			+	+	+		
D15	Ecology in Chemical Industry	Course objectives and expected results: to give undergraduates an idea of the harmful substances of the chemical industry, methods of organizing and planning research on the types of pollution monitoring. Selection and development of optimal measures to find the right literature, systematization of the collected material, as well as have an understanding of the principles of a systematic approach to planning and managing research based on program-targeted methods	4						+	+	+		+
	Environment protection	The purpose of studying the discipline is to familiarize with the main methods of cleaning the atmospheric air, water resources and soil cover from the impact of anthropogenic nature, knowledge of the possibilities of applying these methods. Ability to analyze production technology from an environmental point of view. Acquaintance with objects and methods of environmental protection. The study of waste-free and low-waste production technologies.		+					+	+	+		+

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

CodesofLO	Criteria
LO 1	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.
	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
	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.
LO 2	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.
	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.
	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.
LO 3	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.
	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.
	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.
LO 4	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.
	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.
	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.
LO 5	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.
	Can: Ability to plan and solve problems of professional and personal development.
	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.
LO 6	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.
	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.

	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 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</p>

	<p>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>
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Compiled by:

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 Educational program was discussed at the meeting of the Academic Council and recommended for approval by 28.04.2014 Protocol № 5
 Educational program was considered and approved at the meeting of the University Board from 26.05.2014 Protocol № 14

Board member– Vice-rector for Academic affairs

T.Z. Zhussipbek

Director of the Department of Academic work

G.S. Akybayeva

Dean of the Chemical Faculty

M.Zh. Burkeev