

**MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE REPUBLIC OF KAZAKHSTAN
KAZAKH NATIONAL PEDAGOGICAL UNIVERSITY NAMED AFTER ABAI**



We train teachers who are able to anticipate the needs of modern education, based on advanced methods, national heritage and global approaches. We are increasing the prestige of the teaching profession and becoming a driver of human capital development.

EDUCATIONAL PROGRAM

7M01510-Chemistry

Department of Chemistry

Data on disciplines

№	Name of discipline	Short description of discipline	Cycle	Component	Credits
1	Foreign language (professional)	Objective: to increase the initial level of foreign language proficiency achieved at the previous stage of education, and to master the necessary and sufficient level of communicative competence by undergraduates to solve social and communicative tasks in various fields. Content: This course helps undergraduates to master a foreign language at the level of C1, C2 (language specialties), LSP to communicate in a monological and dialogical form (report, presentation, conversation, discussion). To study the grammar of scientific style in oral, written forms. Writing, registration of scientific articles, reports, projects, etc. Competencies: possess the skills and ability to apply existing knowledge in the field of pedagogy, psychology and methods of teaching chemistry in English.	BD	UC	4
2	Higher School Pedagogy	Objective: formation of general cultural, general professional and professional competencies, abilities to solve urgent pedagogical problems and tasks of higher education. Content: Pedagogy as a science. History of pedagogy. The main categories of pedagogy. The subject and tasks of pedagogy. The system of pedagogical sciences. The connection of pedagogy with other sciences. The modern paradigm of higher education. Methodology of pedagogy. Professional competence, the theory of teaching a university teacher. Credit technology of training. Organization of fuel and lubricants, research. Compilation of educational and methodological materials. Educational work at the university. Management in education. Competencies: demonstrate knowledge and professional positions on modern problems of pedagogy, creatively approach the solution of pedagogical tasks, be tolerant and able to cooperate.	BD	UC	4
3	History and philosophy of science	Objective: To develop the skills necessary for the successful implementation of research activities based on the philosophical and methodological culture of scientific knowledge of students, ideas about the ways of organization and functioning of science, general laws of its development, rational methods and norms of access to knowledge, socio-cultural conditionality of scientific and technical creativity. Content: Philosophy of Science. Science in culture, civilization. The emergence and development of science. The structure of scientific knowledge. Scientific revolutions. Scientific rationality. Features of modern science. Science as a social institution Natural Sciences. History of social sciences and humanities. Organization of scientific activity. The evolution of knowledge. Ethical aspects of modern science. Communication technologies, information processes in modern science. Actual problems of natural and social sciences and humanities. Competencies: know the basics of the laws of philosophy and be able to apply them in research activities, make creative decisions in the pedagogical process, are tolerant and capable of cooperation.	BD	UC	4
4	Psychology of management	Purpose: to use psychological knowledge and skills professionally in management activities. Content: Analysis of psychological conditions, features of managerial activity. Diagnostics and forecasting of the state and changes of the management subsystem; formation of the program of subordinates' activities; organization of decision execution. Managerial needs and abilities of the manager. Practical implementation in the form of the creation of diagnostic tools, the development of active methods of training managers, management consulting. Competencies: the ability to use knowledge skills in management activities, to creatively approach the solution of various situations, tolerant and capable of pedagogical cooperation, to realize the importance of the principles and culture of academic integrity.	BD	UC	4
5	Academic writing	Purpose: to form the readiness and ability of scientific and pedagogical personnel to implement their	BD	EC	5

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		scientific projects and present their results in writing in accordance with the norms of the international academic community. Content: concepts, functions and genres of academic texts. Types of design of academic texts. Mastering the skills of creating academic texts. Skills of written presentation of the results of research work. Competencies: to formulate the skills of writing and formalizing scientific articles, projects, dissertations and presenting empirical research data in the state, Russian, foreign languages.			
6	Active methods of teaching chemistry	Purpose: to systematize knowledge about innovative forms of learning, the use of these methods and forms of work in the educational process Content: The course program offers an overview of active and interactive teaching methods, the use of these methods in the educational process, and game modeling. The study of psychological and pedagogical principles of game learning. Competencies: to use knowledge and skills professionally in the pedagogical process, to be creative in solving various situations, tolerant and capable of pedagogical cooperation, to be aware of the importance of the principles and culture of academic integrity.	BD	EC	5
7	Development of creative thinking in the study of chemistry	Purpose: to form and systematize knowledge about creative thinking in the study of chemistry and chemical processes, the use of creative thinking in the educational process. Content: Technology for the development of creative thinking. The use of a creative approach in teaching chemistry. Potential opportunities of chemistry sections for the development of creativity. Organizational and methodological model of teaching chemistry. The use of information and communication learning tools. Assessment of the level of development of creative thinking. Stimulating the development of creative abilities. Basic principles of psychological training. Development of educational problem situations. Competencies: possession of the knowledge system of creative thinking, the use of this method in the organization of the educational process, studying the influence of external and internal factors on chemical processes.	BD	EC	5
8	Didactics of chemistry at the present stage	Purpose: to systematize and generalize the knowledge of undergraduates acquired during the study of pedagogical and methodological disciplines and improve their practical skills in working with students of general educational institutions. Content: didactics of modern chemistry. The structure and development of didactics of chemistry. General Chemical Education content. Methods and means of Chemical Education. Quality of Chemical Education: Assessment and control. Modern technologies in teaching. Didactic practices in education in the Republic of Kazakhstan and abroad. Competencies: the ability to carry out the upbringing and development of training, taking into account social , psychophysical, personal and age characteristics, including the special educational needs of students; willingness to use systematized theoretical and practical knowledge to set and solve Research tasks in the field of chemistry and education	BD	EC	5
9	Methods of solving tasks in the course of chemistry at higher education	Purpose: to form and consolidate practical skills in solving problems in chemistry, familiarization with new methods for solving chemical computational and qualitative problems. Contents: Solving problems in the main sections of general chemistry (chemical stoichiometry, mixtures of substances in a gaseous, liquid and solid state, solutions, ionic equilibria in electrolyte solutions, redox processes, the main classes of inorganic compounds). The main types of mathematical calculations in organic chemistry, features of the content and solutions of complicated and Olympiad problems. An innovative approach to solving problems. Competencies: formation of skills and abilities to solve various chemical problems.	BD	EC	5
10	Quantum-chemical calculations of chemical processes	Objective: to systematize theoretical knowledge about modern theories of quantum chemistry, methods for calculating the spatial and electronic structure of organic molecules, as well as forecasting chemical	BD	EC	5

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		processes. Contents: quantum theory of the structure of molecules, quantum theory of chemical bonds and intermolecular interactions, quantum theory of chemical reactions and reactivity. Chemical and physical properties of substances at the atomic level (models of electron-nuclear structure and interactions presented from the point of view of quantum mechanics). Mathematical methods of quantum chemistry adapted for the creation of special computer programs used to calculate molecular properties, the amplitude of the probability of finding electrons in atoms, simulation of the interaction of molecules. Competencies: knowledge of the basic quantum-chemical concepts and approximations used in quantum chemistry, apply modern IT technologies for modeling chemical processes.			
11	Applied Organic Chemistry	Objective: To systematize knowledge about the use of organic chemistry in various fields of industry, the creation of new chemical products and the study of external and internal factors in various chemical processes Contents: Modern organic chemistry. Mechanisms of reactions, reactions. Factors determining the reactivity of molecules. Application of organic chemistry in various fields: cosmetic chemistry, household chemicals. The study of the chemical nature of various cosmetics, cleaning agents, the mechanisms of their impact on the human body the body, various methods of preparation of cosmetic products, household chemicals. Competencies: The ability to safely and efficiently use organic chemistry in everyday life.	PD	EC	5
12	Conformational analysis of organic substances	Objective: to systematize knowledge about the conformational analysis of new polyfunctional nitroalkanes, bifunctional monotio- and monoselenoacetals, as well as a wide range of polyfunctional acyclic and cyclic compounds Contents: Stereochemistry of organic molecules. The practice of applying region- and stereoselectivity. Conformational analysis of organic substances. Application of modern methods of reaction control in organic chemistry. Electrocyclic reactions and cycloaddition reactions. Stages of development of chemistry and practical application of organoelement compounds, metal complexes. Competencies: formation of ideas about conformational analysis and the influence of the conformation of molecules on chemical processes	PD	EC	5
13	Methodological aspects of teaching kinetics and thermodynamics of the electrochemical process	Purpose: professionally use knowledge of the basic principles of electrochemical thermodynamics and kinetics, form a clear understanding of the fundamental possibilities in solving specific chemical problems Content: Methodological aspects of the course study. Kinetics and thermodynamics of the electrochemical process as a branch of physical chemistry. Modern learning technologies. Thermodynamics of electrochemical processes. Transfer processes in electrochemical systems. Electrochemical kinetics and electrochemical corrosion. Modern technologies for teaching electrochemical processes. Competencies: be able to explain the basic provisions of the kinetics and thermodynamics of the electrochemical process; form an idea of the electrical conductivity of electrolyte solutions, the rate of electrochemical reactions, possess the skills of conducting scientific research in the field of chemistry, interpret the results of the study	PD	EC	5
14	Methodology and methodology of directed chemical synthesis	Purpose: to obtain primary professional skills and skills for the organization, conduct and presentation of the results of research work by undergraduates. Content: Structure and reactivity of organic compounds. Methods of organic synthesis and application of polyfunctional compounds of the limiting, unsaturated, as well as aromatic, heterocyclic and organoelement series. Nanotechnology of synthesis of organic molecules. Combinatorial chemistry of organic compounds. Competencies: willingness to master methods of safe handling of chemicals, taking into account their physical and chemical properties	PD	EC	5

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15	Methodology and modern technologies of teaching general and inorganic chemistry	Objective: to systematize knowledge of the basic laws of inorganic chemistry, methodological foundations of teaching and innovative forms of teaching. Content: The content of general and inorganic chemistry courses at universities. Modern methodological techniques for the formation of goals and objectives of teaching inorganic chemistry. Structural and logical connection and sequence of presentation of educational material in the school-university-postgraduate education system. Competencies: demonstrate knowledge of general and inorganic chemistry, innovative forms of education	PD	EC	5
16	Modern analytical chemistry	Purpose: to systematize knowledge about modern analytical chemistry, methods of theoretical analysis of scientific research results. Contents: Fundamentals of modern analytical chemistry. The role and significance of various chemical reactions in analytical chemistry. Types of qualitative and quantitative analysis. The main modern physico-chemical methods for the study of substances. Competencies: to systematize knowledge about modern methods of analysis, the ability to use physico-chemical research methods and work with modern laboratory equipment, taking into account compliance with safety requirements	PD	EC	5
17	Modern methodological foundations of teaching physical and colloidal chemistry	Purpose: to systematize knowledge about the Basic Laws of physical and colloidal chemistry, modern methodological foundations of teaching. Contents: innovative forms of teaching physical and colloidal chemistry. Statistical thermodynamics. Catalytic processes. Kinetics of chemical reactions. Scientific and methodological approaches to the study of the physical chemistry of surface phenomena. Prospects for the production and use of biocatalysts. Competencies: demonstration of knowledge and skills on the methodological foundations of teaching physical and colloidal chemistry.	PD	EC	5
18	Modern methods of environmental analysis	Objective: to apply an integrated approach to solving environmental problems, showing the ability to critical thinking and analysis, using knowledge of fundamental and applied chemistry. Contents: to systematize and generalize theoretical and practical knowledge about physico-chemical methods of analysis, to acquire skills in working with devices for monitoring and measuring parameters that pollute the environment, to study external and internal chemical factors on the environment; Competencies: the ability to apply an integrated approach to solving environmental problems, to work with modern laboratory equipment and technologies, including data processing of eco-analytical monitoring of environmental objects.	PD	EC	5
19	Modern problems of creating electronic textbooks in chemistry	Purpose: generalization of knowledge on the creation of electronic manuals to improve the quality of the educational process. Content: Principles of development of online textbooks and their content. Uniform requirements for visual and informational characteristics of modern learning tools. Development of scientific and methodological foundations for the development of electronic online textbooks. Electronic educational resources-EBR. Open educational modular multimedia Systems (AFM). Competencies: proficiency in creating electronic textbooks on chemistry	PD	EC	5
20	Organization, planning and execution of research	Purpose: forecasting, organization and planning of scientific, pedagogical and chemical research, interpret the results of research, design the results in accordance with the requirements. Content: Introduction to the basics of the methodology of scientific research. Methodological foundations of working with special chemical literature. Preparation of a scientific work plan, organization of scientific research. The methodology of the master's thesis design. Methodology of research works. Competencies: the ability to organize and plan scientific research using innovative technologies of fundamental and applied chemistry.	PD	EC	5

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21	Scientific methodic bases of chemistry organic and high molecular compounds	Purpose: formation of logic and methodology of scientific knowledge in organic chemistry and chemistry of high-molecular compounds. Content: The study of theoretical and methodological analysis, innovative forms of learning, the use of these methods and forms of work in the educational process. Organic chemistry in higher education and postgraduate education. Modern technologies for teaching organic chemistry and IUD. The relationship of organic, bioorganic and polymer chemistry. Competencies: to systematize knowledge of the methodological foundations of organic chemistry and chemistry of high-molecular compounds, as well as the influence of external and internal factors on various chemical processes	PD	EC	5
22	Theoretical and applied foundations of modern ecology	Purpose: To systematize knowledge on general ecology in further education and practical activities; solving environmental problems. Content: Interaction of the organism and the environment. Ecological systems. Cycles of elements. Environmental factors of the environment and their effect. The biosphere. The doctrine of the biosphere as a natural stage in the development of Earth sciences. Anthropogenic impact on the biosphere. Environmental pollution. Economic and legal aspects of rational nature management. Development of chemical science taking into account scientific and technological progress in international practice. Competencies: the ability to apply an integrated approach to solving environmental problems, showing the ability to critical thinking and analysis, using knowledge of fundamental and applied chemistry	PD	EC	5