

KAZAKH NATIONAL WOMEN'S TEACHER TRAINING UNIVERSITY
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CATALOG OF ELECTIVE DISCIPLINES

Almaty 2023

EDUCATIONAL PROGRAMME: 6B05301-CHEMISTRY

1. OPTIONAL COMPONENTS OF THE CYCLE OF GENERAL COURSES

Optional component 1

Course: Fundamentals of Legal Literacy and Anti-Corruption culture

Intensity of the Course: 5 academic credits

Module Code: **GES -1**

Module Name: General educational subjects module

Prerequisites: Basics Law (school cours)

Purpose: formation of a legally competent, law-abiding person who knows his rights and duties, intolerant of any manifestations of corruption.

Short Description: The course is aimed at the formation of a legally competent, law-abiding person who knows his rights and obligations, intolerant of any manifestations of corruption. Students will be able to operate with the social, legal and ethical norms of Kazakhstani society.

Learning Outcomes in EP (LOP):

LOP 1 - Applies a variety of communication formats taking into account socio-cultural diversity, adheres to the principles of equality and accessibility in education, to create a prosperous and inclusive environment, has leadership qualities and is able to apply them to develop collective potential

LOP 2 - Possess high-level critical and creative thinking skills, are capable of self-regulation and reflection to solve professional problems.

Learning Outcomes in Course (LOC):

LOC 1 - To know the importance and role of legal culture in the life of society, its relationship with the political culture of the individual and the main definitions of corruption;

LOC 2 - Analyze the main obstacles on the way to ensuring the inalienable human rights; the role of human rights in personal life and in the life of society;

LOC 3 - Apply the acquired knowledge in political analysis, in the activities of public authorities, political and public organizations, analyze problems related to corruption and countering it;

LOC 4 - Be able to engage in dialogue as a way of relating to legal culture and society.

Post requisites: no

Optional component 1

Course: Fundamentals of Ecology and Safe life

Intensity of the Course: 5 academic credits

Module Code: **GES -1**

Module Name: General educational subjects module

Prerequisites: Biology, Geography (school program)

Purpose: maintaining the stability of life by analyzing environmental processes, forming priority areas and setting specific tasks for nature conservation.

Short Description: The discipline forms students' modern environmental education and culture, develops skills in applying methods to improve the safety of technical means and technological processes for safe life. Reveals the basic laws of the functioning of ecosystems of various levels of organization, the biosphere as a whole, the contradictions that arise in the relationship between man and nature, as well as the need for respect for nature and ecology.

Learning Outcomes in EP (LOP):

LOP 1 - Applies a variety of communication formats taking into account socio-cultural diversity, adheres to the principles of equality and accessibility in education, to create a prosperous and inclusive environment, has leadership qualities and is able to apply them to develop collective potential

LOP 2 - Possess high-level critical and creative thinking skills, are capable of self-regulation and reflection to solve professional problems.

Learning Outcomes in Course (LOC):

LOC 1 - Knows the terms and concepts that define the main features and features of ecosystems;

LOC 2 - Has an idea of the complex relationships taking place in nature, as well as between society and nature;

LOC 3 - Can give an environmental assessment of the situation in the region and promote the knowledge gained as a result of work in all areas of its activities;

LOC 4 - It can analyze the main legislative documents on environmental safety and modern environmental problems.

Post requisites: no

Optional component 1

Course: Fundamentals of Economics and Entrepreneurship

Intensity of the Course: 5 academic credits

Module Code: **GES -1**

Module Name: General educational subjects module

Prerequisites: Fundamentals of Entrepreneurship and business (school course)

Purpose: familiarization of students with the basics of economics and entrepreneurship, mastering the conceptual apparatus and basic forms of doing business.

Short Description: The discipline is focused on the formation of students' skills of entrepreneurship and business thinking. Through a comprehensive view of the laws of the functioning of the economy, the conditions for doing business, its internal and external environment, students will have the skills to develop a business plan, create and successfully run their own business.

Learning Outcomes in EP (LOP):

LOP 1 - Applies a variety of communication formats taking into account socio-cultural diversity, adheres to the principles of equality and accessibility in education, to create a prosperous and inclusive environment, has leadership qualities and is able to apply them to develop collective potential

LOP 2 - Possess high-level critical and creative thinking skills, are capable of self-regulation and reflection to solve professional problems.

Learning Outcomes in Course (LOC):

LOC 1 - Know the basic concepts in the field of economics and entrepreneurship;

LOC 2 - Be able to find and use the necessary economic information; determine the organizational and legal forms of organizations;

LOC 3 - Determine the composition of the material, labor and financial resources of the organization;

LOC 4 - Evaluation of a business idea and development of a business plan.

Post requisites: no

Optional component 1

Course: Fundamentals of Leadership and receptivity to innovation

Intensity of the Course: 5 academic credits

Module Code: **GES -1**

Module Name: General educational subjects module

Prerequisites: no

Purpose: in the process of studying the discipline, the student develops the skills of setting goals and objectives, timely planning of group work, problem solving, a sense of responsibility and effective communication.

Short Description: The course contributes to the disclosure and development of leadership qualities in the personality of each student, the development of innovative susceptibility skills in him, as a process of adaptation to innovations caused by innovative processes, as well as the use of the results of scientific and technical processes in his life and professional activities. Studies the current state and prospects for the development of leadership qualities and the human factor in management.

Learning Outcomes in EP (LOP):

LOP 1 - Applies a variety of communication formats taking into account socio-cultural diversity, adheres to the principles of equality and accessibility in education, to create a prosperous and inclusive environment, has leadership qualities and is able to apply them to develop collective potential

LOP 2 - Possess high-level critical and creative thinking skills, are capable of self-regulation and reflection to solve professional problems.

Learning Outcomes in Course (LOC):

LOC 1 - Understands theoretical and applied research in the field of modern management achievements in Kazakhstan and abroad using modern scientific methods;

LOC 2 - Knows how to work effectively individually and in a team;

LOC 3 - Independently study and continuously improve their qualifications throughout the entire period of professional activity;

LOC 4 - Applies professional knowledge in the field of organizational and managerial activities.

Post requisites: no

Optional component 1

Course: Emotional Intellect

Intensity of the Course: 5 academic credits

Module Code: **GES -1**

Module Name: General educational subjects module

Prerequisites: no

Purpose: knowledge and ability to apply modern methods of diagnostics and development of emotional intelligence of students and soft skills, including in the format of distance learning.

Short Description: The discipline is aimed at mastering the role of a tutor by the teacher in the context of strategic guidelines and priority areas of the state educational policy of Kazakhstan. Students determine the place of emotional intelligence and "flexible competencies" in the educational process of the modern school. They apply modern methods and technologies for organizing educational activities, taking into account the development of soft skills, including in the digital environment. They possess technologies for assessing and developing the emotional intelligence of students of different age groups.

Learning Outcomes in EP (LOP):

LOP 1 - Applies a variety of communication formats taking into account socio-cultural diversity, adheres to the principles of equality and accessibility in education, to create a prosperous and inclusive environment, has leadership qualities and is able to apply them to develop collective potential

LOP 2 - Possess high-level critical and creative thinking skills, are capable of self-regulation and reflection to solve professional problems.

LOP 3 - Demonstrate knowledge of and adherence to ethical and legal norms in research and use of digital technologies. Apply security measures when working with digital information and data protection, promote the active, safe and ethical use of digital resources.

Learning Outcomes in Course (LOC):

LOC 1 - Modern methods and technologies of organizing educational activities taking into account the development of soft skills, diagnostics and evaluation of flexible skills, the formation of individual educational directions and methods of organizing group activities;

LOC 2 - Application of modern methods and technologies for organizing educational activities, taking into account the development of flexible skills, including in the digital environment;

LOC 3 - Flexible skills on the skillfolio platform have the ability to carry out complex diagnostics of soft skills, interpret the results and develop them both in individual and group forms of training.

Post requisites: no

Optional component 1

Course: Fundamentals of mathematical statistics

Intensity of the Course: 5 academic credits

Module Code: **GES -1**

Module Name: General educational subjects module

Prerequisites: Mathematics (school programme)

Purpose: is to familiarize students with the forms and laws of consistent thinking, to teach students to think consistently, to contribute to the development of skills of sound argumentation.

Short Description: Students understand the process of collecting, processing data and transmitting ideas, develop skills in using quantitative and qualitative data analysis in assessing the state of the object or phenomenon in question.

Learning Outcomes in EP (LOP):

LOP 1 - Applies a variety of communication formats taking into account socio-cultural diversity, adheres to the principles of equality and accessibility in education, to create a prosperous and inclusive environment, has leadership qualities and is able to apply them to develop collective potential

LOP 2 - Possess high-level critical and creative thinking skills, are capable of self-regulation and reflection to solve professional problems.

LOP 3 - Demonstrate knowledge of and adherence to ethical and legal norms in research and use of digital technologies. Apply security measures when working with digital information and data protection, promote the active, safe and ethical use of digital resources.

Learning Outcomes in Course (LOC):

LOC 1 - The student summarizes the results of pedagogical and scientific research and learns to process them mathematically.

LOC 2 - Learns to systematize, clarify and use statistical data using statistical and mathematical methods.

LOC 3 - Effectively uses Chi-square, SSPP and Jamovi applications that statistically process the collected numbers.

Post requisites: no

2. OPTIONAL COMPONENTS OF THE CYCLE OF CORE COURSES

Optional component 1

Course: **Chemistry of elements**

Intensity of the Course: 5 academic credits

Module Code: FCh-4

Module Name: Fundamentals of Chemistry

Prerequisites: Inorganic chemistry 1

Purpose: Study of the electronic structure of elements of the periodic table of chemical elements named after D. I. Mendeleev, their chemical and physical properties, methods of production and applications.

Short Description: The course provides knowledge on the basic laws of chemical reactions from the standpoint of thermodynamics and chemical kinetics; structure, properties, relationships between the structure and properties of the chemical elements of the periodic table and the compounds formed by them; on the technique of chemical experiment; laboratory and industrial methods for obtaining important inorganic compounds. When mastering the discipline, students will use the basic concepts and laws of chemistry of elements in solving chemical problems; determines the most probable properties of substances based on its elemental composition, masters the technique of conducting chemical experiments in laboratory conditions; the most well-known methods for obtaining important inorganic compounds in laboratory conditions; safety precautions when performing the experiment; basics of chemical science for further in-depth study of the subjects of the chemical cycle.

Learning Outcomes in EP (LOP):

LOP 6 – Possess the skills of performing chemical experiments and interpreting their results.

Learning Outcomes in Course (LOC):

LOC1 – Knows more about chemical elements and their new facets.

LOC2 – Be able to describe changes in the properties of elements of the periodic table and conduct theoretical analysis in quantum physical terms.

LOC3 – Able to experiment with obtaining chemical elements and chemical-physical properties.

LOC4 – The laboratory develops skills for working with various chemical elements in terms of toxicity and Flammability.

LOC5 – As a chemically literate person, they can conduct research on elements and form an independent opinion.

Post requisites: Fundamentals of scientific research.

Course: **Chemistry of transuranic elements**

Intensity of the Course: 5 academic credits

Module Code: FCh-4

Module Name: Fundamentals of Chemistry

Prerequisites: Inorganic chemistry 1

Purpose: Give students knowledge about the properties of transuranic chemical elements and their compounds.

Short Description: The subject studies the chemistry of radioactive isotopes, transuranium elements and substances, the laws and their physical and chemical conduct, the chemistry of nuclear transformations and the physical and chemical processes accompanying them. It will also develop the ability to draw up technological schemes for the production of transuranium elements.

Learning Outcomes in EP (LOP):

LOP 6 – Possess the skills of performing chemical experiments and interpreting their results.

Learning Outcomes in Course (LOC):

LOC1 – Knows more about chemical elements and their new facets.

LOC2 – Be able to describe changes in the properties of elements of the periodic table and conduct theoretical analysis in quantum physical terms.

LOC3 – Able to experiment with obtaining chemical elements and chemical-physical properties.

LOC4 – The laboratory develops skills for working with various chemical elements in terms of toxicity and Flammability.

LOC5 – As a chemically literate person, they can conduct research on elements and form an independent opinion.

Post requisites: Fundamentals of scientific research.

Optional component 2

Course: **Qualitative analysis**

Intensity of the Course: 6 academic credits

Module Code: FCh-4

Module Name: Fundamentals of Chemistry

Prerequisites: Inorganic chemistry 1, Inorganic chemistry 2

Purpose: Teaching general theoretical foundations of modern analytical chemistry and qualitative analysis and using the theoretical knowledge obtained.

Short Description: The course gives students the theoretical foundations of modern high-quality semi-microanalysis, to give in-depth knowledge of the analytical reactions of cations and anions; to acquaint them with the general principles of the mechanisms of chemical reactions used in analytical chemistry, methods of separation, concentration and qualitative determination of elements and their compounds.

Learning Outcomes in EP (LOP):

LOP 6 – Possess the skills of performing chemical experiments and interpreting their results.

LOP 7 – On the basis of fundamental theoretical knowledge, they are able to evaluate the possibilities of physical and chemical methods, reasonably choose the appropriate method for a specific practical task, competently use modern analytical equipment when conducting experiments, mathematically process research results, synthesize organic compounds, conduct a qualitative and quantitative analysis of organic compounds.

Learning Outcomes in Course (LOC):

LOC1 – identify the main types of chemical reactions used in analytical chemistry;

LOC2 – explain the theory of solutions, properties of weak and strong electrolytes, activity, equilibrium constants;

LOC3 – use the main provisions of the hydrolysis theory, the mechanism of buffer action;

LOC4 – distinguish analytical groups of anions and cations, choose a group reagent;

LOC5 – planning a systematic and detailed analysis of cations and anions;

LOC6 – offer qualitative analysis, make appropriate conclusions, calculations, and mathematical processing of the analysis results;

LOC7 – to protect the performance of laboratory work on the discovery of cations and anions in accordance with the method of analysis.

Post requisites: Chemical technology.

Course: Chromatographic research methods

Intensity of the Course: 6 academic credits

Module Code: FCh-4

Module Name: Fundamentals of Chemistry

Prerequisites: Inorganic chemistry 1, Chemistry of elements

Purpose: Formation of students' analytical skills in determining and separating the chemical composition of substances in various mixtures.

Short Description: To study the main chemical methods of analysis (titrimetric, gravimetric), separation and concentration methods, metrological aspects and objects of chemical analysis; the theoretical foundations and areas of application of modern instrumental methods of analysis are considered: spectroscopic, electrochemical, chromatographic and physical. Practical classes are aimed at acquiring practical skills in working with modern analytical equipment using various methods of chemical analysis.

Learning Outcomes in EP (LOP):

LOP 7 – On the basis of fundamental theoretical knowledge, they are able to evaluate the possibilities of physical and chemical methods, reasonably choose the appropriate method for a specific practical task, competently use modern analytical equipment when conducting experiments, mathematically process research results, synthesize organic compounds, conduct a qualitative and quantitative analysis of organic compounds.

LOP 9 – Possess theoretical knowledge and practical skills of analysis by physicochemical and chromatographic methods; are able to competently use modern analytical equipment when conducting experiments in their professional activities.

Learning Outcomes in Course (LOC):

LOC1 – determines the quantitative and qualitative composition of the analyzed object;

LOC2 – studies the kinetics of certain reactions;

LOC3 – distinguishes analytical chemistry methods: chemical, physico-chemical, and physical.

LOC4 – uses analytical instruments: analytical scales, pH meter, potentiometer

LOC5 – separates the defined component by various separation methods.

LOC6 – evaluates and proves the composition of the substance based on laboratory results.

LOC7 – conducts scientific search for information on new methods for determining substances.

Post requisites: Chemical technology.

Optional component 3

Course: Quantitative analysis

Intensity of the Course: 5 academic credits

Module Code: FCh-4

Module Name: Fundamentals of Chemistry

Prerequisites: Inorganic chemistry 1, Chemistry of elements

Purpose: Training in quantitative analysis methods: sampling, sample preparation for analysis; training in the theoretical foundations of quantitative analysis: equilibrium in heterogeneous processes, gravimetric analysis method, acid-base titration, redoxometry, complexometry, deposition method.

Short Description: The course gives students the theoretical foundations of modern quantitative analysis, gives deep knowledge of quantitative (chemical and a number of physico-chemical) methods for determining elements and their compounds, and prepares them for independent work with these methods of analysis.

Learning Outcomes in EP (LOP):

LOP 6 – Possess the skills of performing chemical experiments and interpreting their results.

LOP 7 – On the basis of fundamental theoretical knowledge, they are able to evaluate the possibilities of physical and chemical methods, reasonably choose the appropriate method for a specific practical task, competently use modern analytical equipment when conducting experiments, mathematically process research results, synthesize organic compounds, conduct a qualitative and quantitative analysis of organic compounds.

Learning Outcomes in Course (LOC):

LOC1 – Knows the determination of the content of various components that make up the analyzed substance, as well as the quantitative ratio of the components of the analyzed mixture.

LOC2 – can determine the atomic, molar and equivalent masses of substances.

LOC3 – Determine the number of ions and molecules, elements that make up the studied substances.

LOC4 – Determine the quality of the substance, which depends on the content of the main components and the amount of impurities. This allows you to determine that the items are suitable for use at the time.

LOC5 – is Able to distinguish chemical methods of quantitative and analyze in accordance with the law of stability, the law of conservation of mass.

Post requisites: Chemical synthesis, General chemistry

Course: Basics of metrology and standardization

Intensity of the Course: 5 academic credits

Module Code: FCh-4

Module Name: Fundamentals of Chemistry

Prerequisites: Quantitative analysis

Purpose: The purpose of studying the discipline is to develop students' knowledge in the fields of theoretical Metrology, qualimetry, standardization and certification, as well as to teach them practical skills in working with regulatory and technical documentation and means of measuring physical quantities.

Short Description: The course gives an idea of the basic concepts and metrology concepts of modern chemical analysis, teaches students to solve a wide class of problems, and conveys experience in the effective application of methods of mathematical statistics in scientific activities. Forms an understanding, knowledge, and skill in the field of storage, processing, and standardization of chemical products.

Learning Outcomes in EP (LOP):

LOP 5– Students master the basics of the theory of fundamental sections of inorganic and organic chemistry; are able to substantiate the laws and causes of changes in the structure and properties of chemicals, aliphatic, cyclic and macromolecular compounds.

LOP 7 – On the basis of fundamental theoretical knowledge, they are able to evaluate the possibilities of physical and chemical methods, reasonably choose the appropriate method for a specific practical task, competently use modern analytical equipment when conducting experiments, mathematically process research results, synthesize organic compounds, conduct a qualitative and quantitative analysis of organic compounds.

Learning Outcomes in Course (LOC):

LOC1 –Organize your own activities, choose standard methods and methods for performing professional tasks, and evaluate their effectiveness and quality.

LOC2 –Make decisions in standard and non-standard situations and be responsible for them.

LOC3 –Work in a team and in a team, communicate effectively with colleagues, management, and consumers.

LOC4 –Navigate the conditions of frequent changes in technology in professional activities.

Post requisites: Chemical technology.

Optional component 4

Course: **Quantum chemistry**

Intensity of the Course: 5 academic credits

Module Code: FCh-4

Module Name: Fundamentals of Chemistry

Prerequisites: Inorganic chemistry 1

Purpose: formation of the foundations of modern theoretical quantum chemistry, familiarization with quantum mechanical methods for describing chemical systems (atoms, molecules, crystals) and reactions. Mastering by students the basics of quantum mechanics, as well as theoretical and computational methods of quantum chemistry in solving chemical problems.

Short Description: The purpose of mastering the discipline is to obtain theoretical knowledge about modern concepts of quantum chemistry, about methods for calculating the spatial and electronic structure of molecules, as well as the acquisition of skills and abilities to work with complexes of quantum chemical programs to solve problems facing theoretical and experimental chemical science.

Learning Outcomes in EP (LOP):

LOP 6 – Possesses the skills of conducting chemical experiments and interpreting their results.

LOP 7 – On the basis of fundamental theoretical knowledge, they are able to evaluate the possibilities of physical and chemical methods, reasonably choose the appropriate method for a specific practical task, competently use modern analytical

equipment when conducting experiments, mathematically process research results, synthesize organic compounds, conduct a qualitative and quantitative analysis of organic compounds.

Learning Outcomes in Course (LOC):

LOC 1 – recognition of quantum chemistry as the theoretical basis of modern chemistry;

LOC 2 - introduces quantum chemistry, a part of physical chemistry and its role in modern chemistry;

LOC 3 - can demonstrate the connection of fundamental experiments with the theory of quantum mechanics using well-known mathematical methods; can solve problems on this topic;

LOC 4 - analyzes and discusses the results of physical and chemical studies;

LOC 5 is distinguished by the fundamentals of quantum chemistry computational methods.

Post requisites: Computer chemistry.

Course: Coordination chemistry

Intensity of the Course: 5 academic credits

Module Code: FCh-4

Module Name: Fundamentals of Chemistry

Prerequisites: Inorganic chemistry 1, Inorganic chemistry 2

Purpose: The purpose of teaching the discipline: consideration of the basic concepts of chemistry of coordination compounds; study of representatives of individual classes of coordination compounds, their nomenclature, parameters of chemical binding in molecules, their geometric configuration, types of isomerism.

Short Description: The course gives the concepts of the chemistry of coordination compounds in the description of various physical and chemical systems (catalysis, analytical chemistry, ecological systems, physical chemistry of solutions, biochemistry, etc.). In the process of studying, he uses theoretical knowledge about the nature of chemical bonds in complex compounds, their kinetic and thermodynamic properties, as well as their behavior in aqueous and non-aqueous solutions; possesses theoretical knowledge about the nature of chemical bonds in complex compounds, their kinetic and thermodynamic properties, as well as their behavior in aqueous and non-aqueous solutions.

Learning Outcomes in EP (LOP):

LOP 7 – On the basis of fundamental theoretical knowledge, they are able to evaluate the possibilities of physical and chemical methods, reasonably choose the appropriate method for a specific practical task, competently use modern analytical equipment when conducting experiments, mathematically process research results, synthesize organic compounds, conduct a qualitative and quantitative analysis of organic compounds.

Learning Outcomes in Course (LOC):

LOC1 –to Show modern views on coordination compounds, the relationship between the structure and types of reactivity of coordination compounds, the mechanisms of their transformations, ways to stabilize the electronic States of the metal and a certain ligand environment, ways to activate ligands during coordination, as well as possible applications;

LOC2 –introduction to the basic physical and chemical methods for studying the structure and properties of coordination compounds, methods of their synthesis, purification, and identification;

LOC3 –development and improvement of knowledge on thermodynamic and kinetic description of complex particle reactions;

LOC4 –formation of systematic ideas about the regularities of the structure, physical properties, reactivity and production of coordination compounds; TYPE 5 - formation of ideas about the use of coordination compounds in various areas of human life.

Post requisites: Computer chemistry

Optional component 5

Course: Higher mathematics

Intensity of the Course: 5 academic credits

Module Code: FCh-4

Module Name: Fundamentals of Chemistry

Prerequisites: Mathematics (school courses)

Purpose: deepen students' knowledge in the following branches of higher mathematics: linear algebra, analytical geometry, differential and integral calculations of functions of one and many variables, probability theory and mathematical statistics.

Short Description: The purpose of the subject: to deepen students' knowledge in the following areas of higher mathematics: linear algebra, analytical geometry, differential and integral calculations of functions of one and many variables, probability theory and mathematical statistics.

Learning Outcomes in EP (LOP):

LOP 1 – Applies a variety of communication formats taking into account socio-cultural diversity, adheres to the principles of equality and accessibility in education, to create a prosperous and inclusive environment, has leadership qualities and is able to apply them to develop collective potential.

LOP 3 – Demonstrate knowledge of and compliance with ethical and legal standards in research and use of digital technologies. Apply security measures when working with digital information and data protection, promote the active, safe and ethical use of digital resources.

Learning Outcomes in Course (LOC):

LOC1 – Knows about the basic concepts, definitions, formulas, theorems, and methods for solving problems in the listed sections;

LOC2 – Can apply modern mathematical methods to solve applied problems;

LOC3 – Can solve engineering problems using mathematical methods;

LOC4 – when choosing mathematical modeling methods for solving specific technical problems;

LOC5 – Develops logical thinking and mathematical culture.chemical methods of quantitative and analyze in accordance with the law of stability, the law of conservation of mass.

Post requisites: No.

Course: Applied Mathematics

Intensity of the Course: 5 academic credits

Module Code: FCh-4

Module Name: Fundamentals of Chemistry

Prerequisites: Mathematics (school courses)

Purpose: formation of knowledge, skills and abilities of students on the theoretical foundations of the higher mathematics course.

Short Description: The purpose of the discipline: the formation of the personality of students, the development of their intellect and logical and algorithmic thinking; expansion of professional opportunities; determination of the role and place of mathematics in the field of chemistry.

Learning Outcomes in EP (LOP):

LOP 1 – Applies a variety of communication formats taking into account socio-cultural diversity, adheres to the principles of equality and accessibility in education, to create a prosperous and inclusive environment, has leadership qualities and is able to apply them to develop collective potential.

LOP 3 – Demonstrate knowledge of and compliance with ethical and legal standards in research and use of digital technologies. Apply security measures when working with digital information and data protection, promote the active, safe and ethical use of digital resources.

Learning Outcomes in Course (LOC):

LOC1 – basic concepts, definitions, formulas, theorems, and methods for solving problems in the listed sections;

LOC2 – apply modern mathematical methods to solve applied problems;

LOC3 – solving logical problems using mathematical methods;

LOC4 – when choosing mathematical modeling methods for solving specific technical problems;

LOC5 – develop logical thinking and mathematical culture..chemical methods of quantitative and analyze in accordance with the law of stability, the law of conservation of mass.

Post requisites: No.

3.OPTIONAL COMPONENTS OF THE CYCLE OF MAJOR COURSES

Optional component 1

Course: Chemistry of natural compounds

Intensity of the Course: 5 academic credits

Module Code: FOCh-6

Module Name: Fundamentals of organic chemistry

Prerequisites: Organic chemistry 1, Organic chemistry 2

Purpose: to acquaint students with methods, methods and techniques of analysis of natural biological substances; to give an idea of the theoretical foundations of chemical and physico-chemical methods of analysis of biological active substances; to develop the ability to apply the methods of chemical and physico-chemical analysis in practice to obtain biological active substances.

Short Description: The course examines the structural components, properties and structural organization of lipid molecules, carbohydrates, peptides and proteins, nucleic acids, the structure of the most important representatives of low molecular weight biologically active compounds and bioregulators.

Learning Outcomes in EP (LOP):

LOP 7 – On the basis of fundamental theoretical knowledge, they are able to evaluate the possibilities of physical and chemical methods, reasonably choose the appropriate method for a specific practical task, competently use modern analytical equipment when conducting experiments, mathematically process research results, synthesize organic compounds, conduct a qualitative and quantitative analysis of organic compounds.

LOP 11 – Existing experimental methods and technologies for obtaining chemical and nanochemical substances are analyzed from the point of view of their safety for the environment and humans.

Learning Outcomes in Course (LOC):

LOC1 – Knows the classification of natural chemical compounds, their presence in nature.

LOC2 – Has an understanding of the structural features of natural compounds and their main chemical transformations.

LOC3 – Know the methods of isolation, purification of natural compounds, as well as methods of their synthetic production.

LOC4 – Have an understanding of the effect of natural compounds on living organisms and their participation in the processes of metabolism. Have an understanding of methods for studying natural compounds.

LOC5 – working with the nomenclature of natural chemical compounds (trivial and systematic). Possess stereochemical nomenclatures and be able to use them to designate configurations of natural compounds.

Post requisites: Chemistry of high-molecular compounds

Course: Biochemistry and BAS

Intensity of the Course: 5 academic credits

Module Code: FOCh-5

Module Name: Fundamentals of organic chemistry

Prerequisites: : Organic chemistry 1, Organic chemistry 2

Purpose: knowledge of the methodology for determining the structures of the most important biomolecules, secondary metabolites and their synthesized biologically active derivatives.

Short Description: The course provides students with knowledge about the methodology for establishing the structures of the most important biomolecules, secondary metabolites and their synthesized biologically active derivatives. In the course of studying the course, students develop the ability to analyze the structure and nomenclature of different classes of biomolecules: proteins and peptides, complex carbohydrates and major groups of lipids.

Learning Outcomes in EP (LOP):

LOP 7 – On the basis of fundamental theoretical knowledge, they are able to evaluate the possibilities of physical and chemical methods, reasonably choose the appropriate method for a specific practical task, competently use modern analytical equipment when conducting experiments, mathematically process research results, synthesize organic compounds, conduct a qualitative and quantitative analysis of organic compounds.

LOP 11 – Existing experimental methods and technologies for obtaining chemical and nanochemical substances are analyzed from the point of view of their safety for the environment and humans.

Learning Outcomes in Course (LOC):

LOC1 – must know the main pathways of metabolism and energy metabolism; the values of protein, lipid, and enzyme metabolism; General concepts of biochemistry, and biochemical methods for quality assessment.

LOC2 – is able to set up and conduct an experiment;

LOC3 – can analyze and process primary experimental material in biochemical research conducting experiments, using and developing the first biochemical studies of experimental material;

LOC4 – uses application programs to obtain, process, and interpret biochemical research data;

LOC5 – can evaluate the reliability of the data obtained, formulate conclusions, and creatively apply the knowledge gained to solve specific technological problems.

Post requisites: Chemistry of high-molecular compounds

Optional component 2

Course: Geochemistry

Intensity of the Course: 5 academic credits

Module Code: FOCh-5

Module Name: Fundamentals of organic chemistry

Prerequisites: Organic chemistry 1, Organic chemistry 2

Purpose: the laws of the distribution of elements, their relation to the construction of atoms in the periodic table of elements on Earth, on another planet.

Short Description: The course provides knowledge about the laws of distribution of elements, their connection with the construction of atoms in the periodic table of elements on Earth, on another planet, the laws of the chemical composition of the Earth, the laws of the transition and distribution of elements, methods of localization and transition of atoms in natural processes.

Learning Outcomes in EP (LOP):

LOP 11 – Existing experimental methods and technologies for obtaining chemical and nanochemical substances are analyzed from the point of view of their safety for the environment and humans.

Learning Outcomes in Course (LOC):

LOC1 –Must know the General laws of Geochemistry;

LOC2 –Knows geochemical classifications of chemical elements;

LOC3 –Mastering General theoretical knowledge about Geochemistry and cosmochemistry, isotope Geochemistry, geochemical properties of elements, distribution patterns, migration conditions and concentration of chemical elements in natural and natural-anthropogenic systems;

LOC4 – the study of the geochemical classifications of the chemical elements according to various criteria;

LOC5 –analysis of geochemical maps using GIS technologies.

Post requisites: Chemistry of high-molecular compounds

Course: Petroleum Chemistry

Intensity of the Course: 5 academic credits

Module Code: FOCh-5

Module Name: Fundamentals of organic chemistry

Prerequisites: Organic chemistry 1, Organic chemistry 2

Purpose: provide knowledge about the composition and properties of oil systems of various origins, methods of their research, separation, classification, and the relationship between the composition, thermodynamic conditions, and physical and chemical properties.

Short Description: The course provides knowledge about the composition and properties of petroleum systems of various origins, methods for their study, separation, classification and the relationship between composition, thermodynamic conditions and physico-chemical properties, the formation of the ability to apply knowledge in the field of primary preparation of oil for processing, the development of methods for demulsifying petroleum emulsions.

Learning Outcomes in EP (LOP):

LOP 11 – Existing experimental methods and technologies for obtaining chemical and nanochemical substances are analyzed from the point of view of their safety for the environment and humans.

Learning Outcomes in Course (LOC):

LOC1 –Knows the component composition of oil and other hydrocarbon systems of natural and man-made origin; physical and chemical properties of the main classes of hydrocarbons and heteroatomic compounds of oil.

LOC2 –Can use the principles of classification of oil and gas systems; apply knowledge about the composition and properties of oil and gas in the relevant calculations.

LOC3 –Can conduct standard experiments, process, interpret results, and draw conclusions.

LOC4 –Can use standard software tools and use a physical and mathematical apparatus for solving computational and analytical problems.

LOC5 – can predict the behavior of oil and gas under various thermodynamic conditions, based on knowledge of their composition and physical and chemical properties.

Post requisites: Chemistry of high-molecular compounds

Optional component 3

Course: Chemistry of high-molecular compounds

Intensity of the Course: 5 academic credits

Module Code: FOCh-5

Module Name: Fundamentals of organic chemistry

Prerequisites: Biochemistry and BAS

Purpose: Study of physical and chemical properties and regularities of polymers, the main representatives of high-molecular compounds and their application.

Short Description: The discipline considers the main definitions and postulates of the chemistry of high-molecular compounds, the ways of polymer synthesis, the physics and chemistry of polymers, polymer solutions, their properties, structure, and important representatives of high-molecular compounds.

Learning Outcomes in EP (LOP):

LOP 8 – Demonstrate knowledge of the basic concepts and laws of physical chemistry, apply physical methods to study the structural characteristics of molecules, chemical and physical processes in gaseous and condensed media, reasonably select the optimal method for qualitative and quantitative analysis of a substance.

Learning Outcomes in Course (LOC):

LOC1 –Studies the features of the concept of high-molecular compounds, their role in nature and human life, and methods of their synthesis;

LOC2 –Knows the physical and chemical laws and properties of polymers;

LOC3 –to be able to calculate the kinetics of the physical process in polymers to determine the mechanism of the process;

LOC4 –Determines the dispersion by registering the phase characteristics of high-molecular compounds;

LOC5 –Mastered the most important representatives of high-molecular compounds, their application;

LOC6 –Knows the kinetic and electrochemical conditions of polymers and methods for determining the yield of products;

Post requisites: No.

Course: Chemistry of drug substances

Intensity of the Course: 5 academic credits

Module Code: FOCh-5

Module Name: Fundamentals of organic chemistry

Prerequisites: Biochemistry and BAS

Purpose: To reveal the methodology for creating, evaluating the quality and standardization of medicines based on the General laws of chemical and biological Sciences.

Short Description: Formation of students' professional competencies for work in the field of healthcare and production of medicines, medical devices, biologically active food additives, the main directions for improving the quality control of medicines for solving professional tasks of the pharmacist.

Learning Outcomes in EP (LOP):

LOP 11 – Existing experimental methods and technologies for obtaining chemical and nanochemical substances are analyzed from the point of view of their safety for the environment and humans.

Learning Outcomes in Course (LOC):

LOC1 – Knows the principles of chemical methods of qualitative analysis of medicines.

LOC2 – Has the skills of organizing the work of an analytical laboratory.

LOC3 – Has the skills to use normative, reference and scientific literature to solve professional problems.

LOC4 – is Able to determine the methods of sampling for the input control of drugs.

LOC5 – is Able to determine the physical and chemical characteristics of individual dosage forms.

LOC6 – Has skills in setting scientific problems.

LOC7 – Able to provide advice to drug users.

Post requisites: No.

Optional component 4

Course: Methods of solving complex problems in chemistry

Intensity of the Course: 5 academic credits

Module Code: SBCh-6

Module Name: Selected branches of chemistry

Prerequisites: Inorganic chemistry 1, Organic chemistry 1, Physical chemistry

Purpose: The student should be able to apply concepts and solutions to experimental problems and other complex problems.

Short Description: An important component of this course is the ability to solve problems and exercises in chemistry, tasks of increased complexity. The ability to solve problems and exercises in chemistry is the main criterion for the creative assimilation of the discipline, it contributes to the formation of students' attentiveness, the ability to think logically, formulate questions and look for extraordinary solutions.

Learning Outcomes in EP (LOP):

LOP 5 – Students master the basics of the theory of fundamental sections of inorganic and organic chemistry; are able to substantiate the laws and causes of changes in the structure and properties of chemicals, aliphatic, cyclic and macromolecular compounds.

LOP 6 – Possesses the skills of conducting chemical experiments and interpreting their results.

Learning Outcomes in Course (LOC):

LOC 1 – Mastering methods for solving problems in chemistry;

LOC 2 – Can use reference, scientific and technical literature for solving chemical problems;

LOC 3 – Mastering the skills of the simplest ways to solve chemical problems;

LOC 4 – Analyze ways to solve experimental and complex problems in chemistry;

LOC 5 – Offers effective methods for solving chemical problems.

Post requisites: Chemistry tasks.

Course: Chemistry tasks

Intensity of the Course: 5 academic credits

Module Code: SBCh-6

Module Name: Selected branches of chemistry

Prerequisites: Inorganic chemistry 1, Organic chemistry 1, Physical chemistry

Purpose: Develop students' creative abilities and teach them to use the basic laws and concepts of chemistry in solving experimental, computational, and other problems of increased complexity.

Short Description: In the course of studying the course, develop students' creative abilities and teach them to use the basic laws and concepts of inorganic chemistry in solving experimental, computational and other problems of increased complexity, teach students how to solve problems in several alternative ways, and choose the most elegant ways to solve them. The formation of students' knowledge and skills in teaching students how to solve chemical problems.

Learning Outcomes in EP (LOP):

LOP 5 – Students master the basics of the theory of fundamental sections of inorganic and organic chemistry; are able to substantiate the laws and causes of changes in the structure and properties of chemicals, aliphatic, cyclic and macromolecular compounds.

LOP 6 – Possesses the skills of conducting chemical experiments and interpreting their results.

Learning Outcomes in Course (LOC):

LOC1 – Mastering methods for solving problems in chemistry;

LOC2 – Can use reference, scientific and technical literature for solving chemical problems;

LOC3 – Mastering the skills of the simplest ways to solve chemical problems;

LOC4 – Analyze ways to solve experimental and complex problems in chemistry;

LOC5 – Offers effective methods for solving chemical problems.

Post requisites: General chemistry.

Optional component 5

Course: Fundamentals of nanochemistry

Intensity of the Course: 5 academic credits

Module Code: SBCh-6

Module Name: Selected branches of chemistry

Prerequisites: Fundamentals of scientific research

Purpose: formation of students' knowledge about the basics of nanochemistry, synthesis and analysis of nanomaterials in chemistry.

Short Description: The course forms the basis for understanding the theoretical and applied foundations of nanochemistry and chemistry of nanostructured and nanoscale disperse systems. The discipline is aimed at studying the properties and classification of nanoparticles and nanostructured systems, methods for their preparation, the influence of the size effect on the physicochemical properties of nanoparticles, the practical importance of nanotechnology for the economy and development of science in Kazakhstan.

Learning Outcomes in EP (LOP):

LOP 11 – Existing experimental methods and technologies for obtaining chemical and nanochemical substances are analyzed from the point of view of their safety for the environment and humans.

Learning Outcomes in Course (LOC):

LOC1 – Knows the basics of nanochemistry and nanotechnology, the main types of nanoobjects and nanomaterials, devices and devices developed on the basis of nanomaterials.

LOC2 – Predicts stability and physical and chemical properties of nanoobjects and nanomaterials

LOC3 – Focuses on modern literature on nanochemistry and nanotechnology;

LOC4 – Independently set tasks for creating or practical application of nanoobjects

LOC5 – Focuses on methods for obtaining and studying nanostructures.

LOC6 – Understands the mechanism of dimensional physical and chemical effects.

Post requisites: No.

Course: Fundamentals of nanotechnology

Intensity of the Course: 5 academic credits

Module Code: SBCh-6

Module Name: Selected branches of chemistry

Prerequisites: Fundamentals of scientific research

Purpose: to acquaint students with practical scientific knowledge of nanotechnology, new achievements and directions of development in the modern interdisciplinary field.

Short Description: The course considers an overview of various nanotechnological processes for creating nanomaterials; review of the main trends in the development of nanotechnology in the world; study of the effects that determine the special patterns of the flow of various physical and chemical processes in spatial regions of nanometer sizes.

Learning Outcomes in EP (LOP):

LOP 11 – Existing experimental methods and technologies for obtaining chemical and nanochemical substances are analyzed from the point of view of their safety for the environment and humans.

Learning Outcomes in Course (LOC):

LOC1 – Knows the basics of nanotechnology.

LOC2 – Predicts stability and physical and chemical properties of nanoobjects.

LOC3 – Focuses on the current literature on nanotechnology.

LOC4 – Independently set tasks for the creation or practical application of nanoobjects.

LOC5 – Focuses on methods for obtaining and studying nanostructures.

LOC6 – Understands the mechanism of dimensional physical and chemical effects.

LOC7 – Knows the specifics of the behavior of matter in the nanometer size range.

Post requisites: no.

Optional component 6

Course: General chemistry

Intensity of the Course: 4 academic credits

Module Code: SBCh-6

Module Name: Selected branches of chemistry

Prerequisites: Fundamentals of Scientific Research

Purpose: give students knowledge about the properties of chemical elements and their compounds, based on D.I. Mendeleev's periodic law and modern information about the structure of substances and other concepts of theoretical inorganic and organic chemistry.

Short Description: The main goal of the course is to develop and consolidate skills in conducting experiments in chemistry, the ability to determine the direction and optimal conditions for the occurrence of chemical processes, to select and analyze substances used in technological processes in various industries. The chemistry course should provide a theoretical basis that allows one to navigate specific issues that arise during the passage of special disciplines or directly in the work practice of students, and help the future specialist

Learning Outcomes in EP (LOP):

LOP 10 – They are able to critically analyze and systematize the results of a study or test, incl. with the subsequent presentation of materials in the form of scientific reports, publications and presentations.

LOP 12 – They know the basic methods of searching and summarizing the information necessary to complete a thesis and professional tasks.

Learning Outcomes in Course (LOC):

LOC1 – Knows the composition, structure, properties of substances and the process of their transformation into other substances;

LOC2 – can perform calculations for the preparation of solutions of different concentrations;

LOC3 – Can use theoretical knowledge to solve complex problems in predicting the products of chemical processes, balancing redox reactions;

LOC4 – Able to work with inorganic and organic substances, allows you to prepare and conduct experiments in compliance with safety rules;

LOC5 – methods and techniques of teaching chemistry, planning and setting up experiments, analyzes and discusses the results of their professional activities;

Post requisites: No.

Course: Chemical experiment

Intensity of the Course: 4 academic credits

Module Code: SBCh-6

Module Name: Selected branches of chemistry

Prerequisites: Fundamentals of Scientific Research

Purpose: methods of organizing and conducting school chemical experiments.

Short Description: The study of the main methodological approaches to setting up, conducting and processing the results of a chemical experiment, as well as familiarization with the mathematical methods used in planning an experiment. In the process of studying this discipline, the student expands and deepens the following competencies: - plan and conduct physical and chemical experiments, process their results and evaluate errors, mathematically model physical and chemical processes and phenomena, put forward hypotheses and set limits for their application.

Learning Outcomes in EP (LOP):

LOP 7 – On the basis of fundamental theoretical knowledge, they are able to evaluate the possibilities of physical and chemical methods, reasonably choose the appropriate method for a specific practical task, competently use modern analytical equipment when conducting experiments, mathematically process research results, synthesize organic compounds, conduct a qualitative and quantitative analysis of organic compounds.

LOP 9 – Possess theoretical knowledge and practical skills in analysis using physicochemical and chromatographic methods; be able to competently use modern analytical equipment when conducting experiments in professional activities.

Learning Outcomes in Course (LOC):

LOC1 – Knows the main types of school chemical experiments.

LOC2 – Able to organize educational and cognitive activities of schoolchildren when conducting various types of school chemical experiments

LOC3 – Can help students develop scientific ideas about natural processes and phenomena and develop their interest in studying chemistry

LOC4 – Demonstrates skills in working in laboratory conditions, is able to conduct research activities in the field of chemistry and teaching methods

LOC5 – Selects and uses regulatory documents that determine the organization and safety of work in school chemical laboratories and environmental institutions

Post requisites: No.