

Kazakh Humanitarian Juridical Innovative University

MODULAR EDUCATIONAL PROGRAM
6B01509 "Chemistry-Biology"

Semey, 2020

1. EXPLANATORY NOTE

The modular educational program (MEP) is compiled on the basis of the following documents:

- The Law of the Republic of Kazakhstan "On Education" dated 27.07.2007 with additions and amendments dated 21.02.2019;
- The State mandatory standard of education at all levels of education, approved by the Order of the Minister of Education and Science of the Republic of Kazakhstan No. 604 dated 31.10.2018.
- Professional standard "Teacher" approved by Order No. 133 of the Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" dated June 8, 2017;
- Rules of the organization of the educational process on credit technology of training. approved by the Order of the Minister of Education and Science of the Republic of Kazakhstan dated 12.10.2018 (No. 563).
- Standard rules of activity of educational organizations implementing educational programs of higher and (or) postgraduate education, approved by the order of the Minister of Education and Science of the Republic of Kazakhstan dated 30.10.2018.
- Form 26 "Structure of the modular educational program" No. 1 dated 17.01.2014
- Item 01.04/2012 of the Regulation on the formation of the trajectory of students' education No. 1 dated 25.10.2012;
- Regulations on the MEP

The MEP is designed as a set of sequential training modules for the entire period of study and is aimed at mastering the competencies necessary for awarding the Bachelor of Education degree in the educational program 6B01509 "Chemistry-Biology".

The modules of the block of general education disciplines (GED) include disciplines of the mandatory component: (MC) – 51 credits and elective components (EC) - 5 credits.

The block of basic disciplines (BD) includes disciplines of the university component (UC) – 36 credits and elective components (EC) - 76 credits.

The block of profile disciplines (PD) includes disciplines of the university component (UC) – 19 credits and elective components (EC) - 41 credits.

Additional types of training (ATT) – 12 credits, which include the military department and the Final state certification.

Practices are included in the block of the university component of basic and profile disciplines.

The criterion for the completion of the educational process is the development of 240 credits by a student.

The MEP consists of 21 modules.

When developing a modular educational program, the recommendations and wishes of external stakeholders - potential employers were taken into account (round table "Social Partnership: prospects and problems" from 08.01.2020), who proposed to expand the material on the topic of modern

garden and park design in the discipline "Decorative gardening with the basics of landscape design" (educational program 6B01509 "Chemistry-Biology")

Also, the social partners noted that the EP was compiled in accordance with the professional standard "Teacher", the formulated learning outcomes of this educational program are relevant and achievable.

The field (application of knowledge and skills) of the graduate of the educational program "6B01509 - Chemistry-Biology":

- educational institutions of secondary education: secondary schools, boarding schools, gymnasiums and lyceums;
- vocational and technical educational institutions, colleges;
- research institutions and laboratories of specialized disciplines;
- state and public environmental organizations: nature reserves, nature reserves and natural parks, etc.;
- zoological and botanical gardens, plant protection stations;
- extracurricular organizations and organizations of additional education and upbringing;
- administrative bodies of education.

Subjects of professional activity:

The subject of professional activity of the Bachelor of Education in the educational program "6B01509 - Chemistry-Biology".

It is the content of the interaction of the teacher (teacher) and students in the conditions of the pedagogical process, as well as methodological and research activities in science and in production in the disciplines of the profile.

Types of professional activity:

Bachelor of Education in the educational program "6B01509 - Chemistry-Biology" can perform the following types of professional activities:

- educational (possession of a full-fledged high-quality professional pedagogical education, professional competence in the field of chemistry and biology; organization of the educational process at a methodically competent and professional level, including according to the updated training system; use of the latest pedagogical technologies in the educational process);
- experimental research (study of scientific and methodological literature; study and generalization of advanced pedagogical experience in the field of teaching chemistry and biology; conducting pedagogical experiments with the introduction of their results into the educational process; conducting chemical and biological experiments and the ability to synthesize and analyze the results; setting and organizing conditions for chemical processes);

- organizational and managerial (planning the content and determining the ways of organizing and conducting the educational process, including in the direction of inclusive education; management of the conditions for chemical processes and biological experiments; management of research projects of students);
- socio-pedagogical (formation of a multicultural personality);
- educational (implementation of educational work in accordance with the laws, laws, principles, mechanisms of the pedagogical process, including in the direction of inclusive education; planning of extracurricular educational work; solving specific educational tasks; selection and use of various forms and methods of education and training of schoolchildren in extracurricular work in chemistry and biology; establishing relationships with colleagues, with a team of students, with parents).

Functions of professional activity:

- teaching of chemical and biological disciplines in educational institutions in accordance with the objects of professional activity;
- conducting extracurricular activities (in the disciplines of the profile);
- implementation of scientific and methodological, organizational and educational work;
- conducting group work in general educational institutions and extracurricular organizations;
- ensuring the unity of education and upbringing;
- improvement of methods and technologies of teaching chemical and biological sciences;
- identification of current research directions in the field of pedagogy, chemistry and biology;
- cultural and educational work among students;
- sanitary and hygienic work among students;
- possession of self-analysis and self-education skills for professional and personal growth.

The purpose of the educational program. Implementation of education aimed at training competitive highly qualified bachelors of education in the educational program "Chemistry - Biology", with fundamental knowledge and skills, practical skills and leadership qualities, ready to make decisions that combine the interests of the individual, society and the state.

The objectives of the modular educational program are to:

- obtaining a full-fledged, high-quality education, professional competence in the field of chemistry and biology;
- acquiring a high general intellectual level of development, mastering competent and developed speech, humanitarian culture, high moral, ethical and legal norms, culture of thinking and skills of scientific organization of work;
- development of creativity, initiative and innovation;
- selection of individual educational programs by students;
- providing targeted training on the orders of organizations;

- mastering fundamental courses at the intersection of biological and chemical sciences, guaranteeing them professional mobility at the international level;
- deepening the creative, practical and individual training of students in their chosen field of activity;
- development of students' ability to self-improvement and self-development, needs and skills of independent creative mastery of new knowledge throughout their active life;
- training of specialists with a high level of professional culture, including the culture of professional communication, having a civic position, able to formulate and practically solve modern scientific and practical problems, successfully carry out experimental research, production activities.

2. The graduate's competence model

The learning outcomes are determined on the basis of the Dublin descriptors of the first level (Bachelor's degree) and are expressed through competencies.

Competence is the possession of a certain competence, the availability of knowledge, skills and abilities necessary for effective activity in a certain professional field.

Competence is the ability to apply knowledge, skills, and successfully act on the basis of practical experience in solving professional tasks. Competencies are formed both at the level of the entire program, and at the level of a module and a separate discipline.

The competencies that a graduate should have after mastering the MEP are listed below.

1. General education competencies (GC):

- 1) evaluate the surrounding reality on the basis of worldview positions formed by knowledge of the fundamentals of philosophy, which provide scientific understanding and study of the natural and social world by methods of scientific and philosophical cognition;
- 2) to show a civic position based on a deep understanding and scientific analysis of the main stages, patterns and peculiarities of the historical development of Kazakhstan and to use methods and techniques of historical description to analyze the causes and consequences of events in the modern history of Kazakhstan;
- 3) to assess situations in various spheres of socio-political disciplines, applying knowledge in the field of social and humanitarian sciences in practice,
- 4) to engage in communication in oral and written forms in Kazakh, Russian and foreign languages to solve the problems of interpersonal, intercultural and industrial (professional) communication, using various types of information and communication technologies;
- 5) build a personal educational trajectory throughout life for self-development and career growth, focus on a healthy lifestyle to ensure full-fledged social and professional activities through methods and means of physical culture.
- 6) systematize, summarize legal and economic information for use in professional, including entrepreneurial activities. Analyze, summarize economic information and systematize safety standards for use in professional activities.

2. Basic Competencies (BC):

- 1) demonstrate knowledge and ability to compare structures, structure, components, functions, development, properties, inheritance and change of traits and the use of various prokaryotic and eukaryotic cells, tissues and extracellular structures;
- 2) apply theoretical knowledge and skills of using measuring instruments, laboratory equipment, cytochemical, biochemical methods of studying various environmental objects to solve practical problems and in experimental research; (methodological function)
- 3) possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process; use computational methods to solve various chemical tasks of an educational and scientific laboratory nature; possess methods of safe use of chemical materials taking into account their physical and chemical properties;. (methodical function)
- 4) possess applied aspects of biology;
- 5) to analyze the proposed plant objects based on knowledge of the anatomical, morphological and physiological characteristics of the plant organism, the principles of their systematic classification, as well as the dependence of their structure and functions on the conditions of existence;
- 6) apply biological knowledge to explain the processes and phenomena of the vital activity of one's own organism and other representatives of the animal kingdom, indicating their taxonomic group, anatomical, morphological and ecological features in different periods of evolution; (training function)
- 7) to solve real management tasks, identifying the reasons for the low effectiveness of educational, educational, cognitive and self-educational activities of the subjects of the holistic pedagogical process (teaching staff and students); (social and communicative)
- 8) classify methods, forms and principles of teaching and upbringing of the modern educational process; (educating function)
- 9) apply the peculiarities of the development of schoolchildren of different age groups in practical activities;
- 10) offer options for correctional and pedagogical impact in inclusive education, depending on the type of impaired development, the needs of the child, learning conditions, resources of the locality, knowing the main international and domestic documents on the rights of the child and the rights of persons with disabilities to receive quality education; (research function)
- 11) use the state (Russian) and foreign languages in professional activities, scientific and practical work, in communication with foreign colleagues, for self-educational and other purposes; (training function)

3. Professional Competencies (PC):

- 1) possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process; use computational methods to solve various chemical tasks of an educational and scientific laboratory nature; possess methods of safe use of chemical materials taking into account their physical and chemical properties;. (methodical function)
- 2) apply the principles of ecological and green chemistry when performing chemical experiments;
- 3) demonstrate knowledge about the laws of chemical transformations in industrial production conditions, as well as about the structure, organization and technological design of the main chemical industries;
- 4) possess applied aspects of biology;

5) use standard, applied, modern pedagogical methods and technologies in accordance with the set goals and objectives when planning and conducting classes in high school and college; possess knowledge of regulatory and legal documents in the field of education, instructional documentation, skills and abilities to develop current educational and organizational documentation for the implementation of educational concepts of curricula; (methodical function)

6) classify methods, forms and principles of teaching and upbringing of the modern educational process; (educating function)

Table 1. The sequence of mastering disciplines in the process of forming special competencies BD/ EC, PD/ EC

№	Competencies	The list of compulsory, elective disciplines and the sequence of their study		Expected results
		List of disciplines	The sequence of their study	
Basic disciplines				
1	Basic	Cytology and Histology	3rd semester	Be able to: in practical classes, using microscopes to examine cytological and histological preparations, as well as students should independently work with microscopes, drawings depicting the morphology, physiology of cells and tissue systems; demonstrate knowledge and ability to compare structures, structure, components, functions, development, properties, inheritance and change of signs and the use of various prokaryotic and eukaryotic cells, tissues and extracellular structures; apply theoretical knowledge and skills of using laboratory equipment to solve practical problems and in experimental research; as a result of studying the discipline, the student must master: the methodology for preparing cytological, histological preparations; material about cell types and basic types of tissues with viewing preparations on a microscope and performing drawings and diagrams in albums; apply in practice the theoretical knowledge gained; as a result of studying the course, the student should know the following types of laboratory research: basic principles of cell theory; methods of research of cells and tissues; structure and functions of cells and organoids of cells; differentiation and mechanisms of cellular distribution; methods of studying the structure, classification of tissues in the body.
	Basic	Cell and tissue biology		Know: theoretical foundations of cell and tissue biology, objects of cell and tissue biology, structural features of plant, animal, fungal and prokaryotic cells, plant and animal cells, their cultures, the use of plant and animal cell cultures, biology of cultivated plant cells, cellular, tissue and genetic engineering; must be able to: critically analyze experiments, conduct a bibliographic search of literary sources, formalize

				literary data; demonstrate knowledge and ability to compare structures, structure, components, functions, development, properties, inheritance and change of traits and the use of various prokaryotic and eukaryotic cells, tissues and extracellular structures; apply theoretical knowledge and skills in the use of measuring instruments, laboratory equipment, methods of studying various environmental objects to solve practical problems and in experimental must possess: skills of using microscopes, preparation of cellular and histological preparations.
2	Basic	General and Molecular Genetics	3rd semester	To know: the subject and tasks of general and molecular genetics, the history of its development; the material foundations of heredity and variability, the structure and types of nucleic acids, the implementation of hereditary information, types of reproduction of organisms, patterns of inheritance of traits, the basics of genetic analysis, chromosomal theory of heredity, types and causes of variability of organisms, the fine structure of the gene, the basic molecular cellular mechanisms, the current state of the problems of genetics, the possibilities of managing heredity and variability of organisms; be able to: conduct a bibliographic search for literary sources; solve genetic problems for mono-, di- and polyhybrid crossing; competently conduct experiments to study heredity and variability; be able to apply the knowledge of genetics in practice; learn to use the studied techniques and methods of genetics for the needs of biotechnology; demonstrate knowledge and ability to compare structures, structure, components, functions, development, properties, inheritance and change of signs of various prokaryotic and eukaryotic cells, tissues and extracellular structures; have the skills of: constructing the second DNA chain in accordance with the nucleotide composition of the first DNA chain; constructing mRNA in accordance with the nucleotide composition of one of the DNA chains; determining the amino acid composition of proteins in accordance with the nucleotide composition of DNA or mRNA; constructing a Pannet lattice for solving genetic problems of inheritance of traits; using a hybridological method for studying the patterns of inheritance of traits; assessment of the contribution of genetic and external factors to the development of pathology with hereditary predisposition; determining the frequency of pathological genes and genotypes in the human population; compiling pedigrees, presenting them graphically and analyzing the type of inheritance of a pathological trait; making a forecast of the development of a hereditary disease in a carrier of a pathological gene

				or a forecast of the birth of a child with a hereditary pathology.
	Basic	Genetics with the basics of breeding		Know: the material foundations of heredity, variability and mechanisms of their implementation; patterns of inheritance of traits; the influence of genotype and environmental factors on the development of the organism; be able to: apply the basic laws of heredity and patterns of inheritance of traits to the analysis of inheritance of normal and pathological traits; analyze material from different sources of information; calculate the frequency of occurrence of alleles in populations of different plant species and animals; demonstrate knowledge and ability to compare structures, structure, components, functions, development, properties, inheritance and change of signs of various prokaryotic and eukaryotic cells, tissues and extracellular structures; possess: skills of working with literature, including periodical scientific literature; methods of genetic, cytogenetic and population analysis of heredity and variability phenomena; skills of karyotype description plants and animals.
3	Basic	Microbiology and Virology	3rd semester	To know: the basic properties of microorganisms; their classification, role in nature and human life; the kingdom of viruses, their use in the production of antiviral vaccines; biological features of microorganisms causing food spoilage; to be able to: use literature in the field of microbiology and biology; to demonstrate knowledge and ability to compare structures, structure, components, functions, development, properties, inheritance and change of traits and use of various prokaryotic and eukaryotic cells; apply theoretical knowledge and skills of using measuring instruments, laboratory equipment, cytochemical, biochemical methods of studying various environmental objects to solve practical problems and in experimental studies; possess: methods that allow identifying non-permanent elements of microorganisms; isolation of pure cultures of microorganisms and studying their biochemical properties by methods of microbiological studies used to assess environmental objects.
	Basic	Soil Microbiology		Know: morphology, systematics, physiology and ecology of microorganisms, the role of microorganisms in the transformations of various compounds and chemical elements in the soil; be able to: determine the biological activity of the soil and propose ways to regulate it, use bioindication, biotests; demonstrate knowledge and ability to compare structures, structure, components, functions, development, properties, inheritance and change of signs and use of various prokaryotic and eukaryotic cells; apply theoretical knowledge and skills of using measuring instruments, laboratory equipment,

				cytochemical, biochemical methods of studying various environmental objects to solve practical problems and in experimental research; possess a culture of thinking, capable of generalization, analysis, perception of information, setting goals and choosing ways to achieve it; ready to cooperate with colleagues, work in a team.
4	Basic	General and Inorganic Chemistry	3rd semester	To know: fundamentals of chemical thermodynamics, kinetic fundamentals of the description of chemical reactions, methods and mechanisms of their acceleration, the doctrine of chemical equilibrium and methods of its displacement, fundamentals of the theory of solutions, elements of electrochemistry; theoretical foundations of inorganic chemistry; patterns of change in the properties of simple substances and compounds within groups and series of the periodic system; methods and methods of synthesis of inorganic substances; the essence of modern physical and physico-chemical research methods used in inorganic chemistry; be able to: use knowledge, skills and abilities in the field of theory and practice of general and inorganic chemistry to master the theoretical foundations and methods of research in the field of inorganic materials, on the basis of thermodynamic and kinetic concepts to predict the possibilities of chemical processes, to propose optimal conditions for reversible reactions; to predict the possibilities of exchange reactions in electrolyte solutions; to justify the processes at electrolysis; compare the thermodynamic, redox activity of substances; conduct experiments on the synthesis and research of inorganic compounds; possess: basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process; use computational methods to solve various chemical tasks of an educational and scientific laboratory nature; possess methods of safe use of chemical materials taking into account their physical properties and chemical properties.
	Basic	Chemistry of the elements of the periodic system		To know: the theoretical foundations of inorganic chemistry; to know the methods of obtaining and chemical properties of basic simple substances and compounds of elements; to know the physical meaning of the periodic law and the periodic system of traditional and international; to be able to explain modern theories of periodicity; to be able to creatively analyze theoretical concepts and factual material of inorganic chemistry; to characterize in the historical development of the formulation of the periodic law and the form of the periodic system chemical elements; be able to use reference and scientific and technical literature; possess basic chemical laws, theories,

				patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process; use computational methods to solve various chemical tasks of an educational and scientific laboratory nature; possess methods of safe use of chemical materials taking into account their physical and chemical properties.
5	Basic	Analytical chemistry	4th semester	Be able to: describe the mechanism of chemical reactions of quantitative and qualitative analysis; justify the choice of analysis methods, reagents and chemical equipment for a specific task; prepare solutions of a given concentration; conduct quantitative and qualitative analysis in compliance with safety regulations; analyze mixtures of cations and anions; monitor and evaluate the flow of chemical processes; calculate the results of analysis and evaluate the reliability results; must know: aggregate states of matter; analytical classification of ions; equipment and techniques for performing analyses; the significance of chemical analysis, methods of qualitative and quantitative analysis of chemical compounds; frequency of properties of elements; methods of expressing the concentration of substances; theoretical foundations of analysis methods; theoretical foundations of chemical and physico-chemical processes; technique of analysis; types of errors in analysis; the device of the main laboratory equipment and the rules of its operation; possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process; use computational methods to solve various chemical tasks of an educational and scientific laboratory nature; possess methods of safe use of chemical materials taking into account their physical and chemical properties.
	Basic	Physico-chemical methods of analysis		To know: mastering the theoretical foundations and acquiring the skills of physico-chemical analysis of research; the essence of the laws and chemical processes underlying the method of analysis, methods of definitions; to be able to: understand the processes of physico-chemical analysis; to use methods of physico-chemical analysis for analysis and examination of various objects; to comprehensively use methods of physico-chemical for various types of analysis; make analysis schemes; use computational methods to solve various chemical tasks of an educational and scientific-laboratory nature; possess methods of safe use of chemical materials, taking into account their physical and chemical properties; possess: basic techniques of

				chemical definitions and analysis of objects; theoretical foundations of physico-chemical chemistry; have an idea of the possibilities and limitations of using a particular method of analysis, solving certain practical problems; possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process.
6	Basic	Cell Biotechnology	4th semester	Know about: the subject, tasks of the history of development, objects, methods of cellular biotechnology, trends in the development of cellular biotechnology in the modern world and its most promising areas, cellular biotechnology of microbiological systems, genetic engineering of plants and animals, achievements of cellular biotechnology in medicine, environmental aspects of biotechnology; be able to: critically analyze scientific experiments; demonstrate knowledge and ability to compare structures, structure, components, functions, development, properties, inheritance and change of traits and the use of various prokaryotic and eukaryotic cells, tissues and extracellular structures; apply theoretical knowledge and skills in the use of measuring instruments, laboratory equipment, cytochemical, biochemical methods of studying various environmental objects to solve practical problems and in experimental studies; have the skills to work with specialized laboratory equipment and devices for solving practical problems.
	Basic	Introduction to biotechnology		To know: the scientific foundations of biotechnology; the main directions of the production of useful substances; the basics of engineering enzymology; methods and possibilities of genetic and cellular engineering; the basics of technological bioenergy and biological processing of raw materials; the use of biotechnology as an alternative in agriculture; the basics of environmental biotechnology; be able to: navigate in modern directions and methods of biotechnology; use knowledge about biotechnology in the study of special disciplines; apply the acquired knowledge in the rational use of natural resources and environmental protection; use the obtained data when writing abstracts; possess applied aspects of biology.
7	Basic	Anatomy and morphology of plants	4th semester	Possess the basic botanical terms underlying the anatomy and morphology of plants; know the structure of cells, tissues and organs of plants; have an idea of the formation of the structure of plant organisms in ontogeny and phylogeny; be able to use a microscope, prepare preparations for microscopy, recognize elements of the structure of plant organisms and correctly formalize the results of observations; to analyze the

				<p>proposed plant objects based on knowledge of the anatomical, morphological and physiological characteristics of the plant organism, the principles of their systematic classification, as well as the dependence of their structure and functions on the conditions of existence.</p>
	Basic	Botany		<p>To know: basic concepts (terms), features of the structure of plant organisms at the macro- and microscopic levels; features of plant reproduction; features of plant development during ontogenesis and in the process of evolution; characteristic features, classification of various taxa of modern and fossil higher plants; to be able to: navigate the diversity of the plant world, diagnose various taxonomic groups of plants; to use knowledge and practical skills in pedagogical, scientific, industrial and environmental activities, in the study of other biological disciplines; to analyze the proposed plant objects based on knowledge of the anatomical, morphological and physiological characteristics of the plant organism, the principles of their systematic classification, as well as the dependence of their structure and functions on the conditions of existence; possess: basic methods of anatomy, morphology, systematics, geobotany for the study of plants at the level of tissues, organs, organisms, plant communities; identification skills of various taxonomic groups of higher plants; basic methods and techniques for describing plant communities.</p>
8	Basic	Zoology of invertebrates and vertebrates	4th semester	<p>To know: the basics of systematics, morphology, physiology of invertebrates and vertebrates; to know about the origin and evolution of the type, subtypes and classes of chordates; about the role of animals in ecosystems and the biosphere as a whole; to know the structure and features of the local fauna and ecology of mass and rare animal species; Latin names of animal taxa; to be able to: demonstrate basic ideas on zoology of invertebrates and vertebrates, apply them in practice, critically analyze the information received and present the results of research; apply biological knowledge to explain the processes and phenomena of the life activity of representatives of the animal kingdom, indicating their taxonomic group, anatomical, morphological and ecological features in different periods of evolution; possess: skills of research work, discussion; methods of laboratory zoological research on morphology.</p>
	Basic	Fauna of the world		<p>To know: the basics of animal taxonomy in the scope of classes and main orders; the diversity of invertebrates of the Republic of Kazakhstan and East Kazakhstan Region (rare and endangered species of animals); information about the role of animals in</p>

				nature and human economic activity; to be able to: use methods of observation, description, identification and classification of biological objects; apply modern methods of working with biological objects in in field and laboratory conditions; to distinguish representatives of different classes and families; to characterize the structure and ecological features of the main groups of animals; identify and recognize the main groups and species of animals in nature by traces of vital activity, appearance, voices; create educational collections; design and store collectible material; work with animals in nature and laboratories; conduct excursions and speak publicly; apply biological knowledge to explain the processes and phenomena of vital activity of representatives of the animal kingdom, indicating their taxonomic groups, anatomical, morphological and ecological features in different periods of evolution; possess: modern methods of processing, analysis and synthesis of field and laboratory biological information; skills of determining animals to family, genus and species; skills of independent work, self-organization and organization of tasks.
9	Basic	Plant Physiology	5th semester	To know: the subject and tasks of plant physiology, the history of its development; totipotency of plant cells; carbon nutrition of plants: leaf pigments, energy and chemistry of photosynthesis, composition, localization and functions of photosystem I and II; water exchange of plants: the main mechanisms of water entry into the cell and the movement of water through the plant; evaporation of water by the plant, the basics of stability plants to drought; mineral nutrition: the intake and movement of nutrients in the plant, the main macro- and microelements, the physiological basis of the use of fertilizers; plant respiration: its importance in plant life, the influence of various factors on the intensity of respiration; components of the respiratory chain; the mechanism of oxidative phosphorylation; plant growth and development: phytohormones, principles of regulation of growth and development processes; physiological foundations of plant protection and resistance; be able to: conduct a bibliographic search for literary sources; clearly carry out the plan of experiments with plant objects; work with live plants, compare and find differences between control and experimental plants; conduct phenological observations; to conduct experiments on the removal of physiological indicators of plants; to formalize the results obtained using graphic images; to make a comparative analysis of the results obtained; to generalize and draw conclusions based on the results obtained; to analyze the proposed plant objects based on knowledge of

				<p>the anatomical, morphological and physiological characteristics of the plant organism, the principles of their systematic classification, as well as the dependence of their structure and functions of the conditions of existence; have the skills to: conduct experiments to study basic physiological processes; determine osmotic pressure, transpiration intensity, photosynthesis, respiration; release chlorophyll and determine its quantity and physico-chemical properties; determine the effect of various mineral elements on plant growth and development, individual growth indicators, plant resistance.</p>
		Phytochemistry		<p>To know: the basic concepts of phytochemistry, methods of phytochemical analysis; the main directions of scientific research in the field of phytochemistry of medicinal plants; the main groups of biologically active substances of natural origin and their most important physico-chemical properties; ways of biosynthesis of the main groups of biologically active substances; methods of isolation and purification of the main biologically active substances from medicinal plant raw materials; the main methods of qualitative and quantitative determination of biologically active substances in medicinal plant raw materials; biological standardization of medicinal plant raw materials; raw material quality indicators and methods of their determination; safety rules when working with medicinal plants and medicinal raw materials; acquire such skills and abilities as: isolate and purify active biologically active substances from medicinal plant raw materials; conduct qualitative and microchemical reactions to biologically active substances to confirm their presence in medicinal plants and raw materials; to analyze medicinal plant raw materials for the content of essential oils, cardiac glycosides, saponins, alkaloids, anthracene derivatives, tannins, flavonoids, coumarins, vitamins, etc. by quantitative determination methods; to determine humidity, ash, extractive substances; to carry out statistical processing and registration of the results of pharmacognostic and phytochemical analyses; apply theoretical knowledge and skills of using measuring instruments, laboratory equipment, cytochemical, biochemical methods of studying various environmental objects to solve practical problems and in experimental studies.</p>
10	Basic	Human Anatomy	5th semester	<p>To know: the place of anatomy in biology and medicine, the main stages of its development as a science; the main directions in modern anatomy and the nature of anatomical research methods; general principles of the structure of the human body and</p>

				<p>their manifestations in the organization of body systems; patterns of the structure of organs of various types and their principal organ-specific features; anatomy, topography and functions of organs, systems and devices of the body, taking into account the main constitutional features; the most significant in practical terms features of age-related anatomy; be able to: determine by visual signs the constitutional type of a person (meso-, brachy- or dolichomorphic); demonstrate and correctly name the movements carried out in the main joints of the human body; apply biological knowledge to explain the processes and phenomena of the vital activity of one's own body; possess: skills of morphological assessment of the human body in anthropological research.</p>
		Morphology of human internal organs		<p>To know: morphological features of the structure of human internal organs, their topography; patterns of formation of internal organs and systems in the process of ontogenesis as a reflection of phylogenetic development; features of the morphological structure of a person; to be able to: establish the relationship of anatomical structure, morphology and functions of organs; to make judgments about the main directions of development of internal organs and systems of the human body; to apply biological knowledge to explanations of the processes and phenomena of the vital activity of one's own body; possess the skills of morphological assessment of the human body in anthropological research.</p>
11	Basic	Organic Chemistry	5th semester	<p>To know: the subject of organic chemistry, the theory of the chemical structure of A.M. Butlerov, the characteristics of covalent bonds; isomerism; addition reactions, cleavage, substitution, rearrangement, homolytic and heterolytic reactions; homologous series of methane, ethylene, acetylene, oxygen-containing compounds, nitrogen-containing compounds, their nomenclature, laboratory and industrial methods of preparation, physical and chemical properties; be able to: depict structurally isomers of the main classes of organic compounds; give names for different types of nomenclature and determine the structure of a substance by name; be able to describe the reaction taking into account the mechanism and determine the reaction products by analyzing the conditions of its conduct; possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process; use computational methods to solve various chemical tasks of an educational and scientific-laboratory nature; possess methods without hazardous</p>

				use of chemical materials, taking into account their physical and chemical properties.
		Chemistry of high-molecular compounds		Know: types of chemical reactions and their main signs; recent achievements and prospects for development in the field of chemistry, their relationship with other fields of knowledge; be able to: perform calculations using chemical formulas and equations; conduct chemical experiments in accordance with the rules of safe handling of equipment and chemicals; develop an individual trajectory of self-education; possess: work skills with laboratory equipment; skills in determining the physico-chemical constants of the resulting compound; methods of processing the experimental results obtained; rules and techniques of self-education; possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process; use computational methods to solve various chemical tasks of an educational and scientific-laboratory nature.
12	Basic	Systematics of plants	6th semester	To know: the diversity of the plant world and the basic laws of its formation, structure, spatial distribution, structure, evolution, systematic groups of plants; the relationship of concepts: taxonomy, evolution, phylogeny, systematics and floristics; taxonomic categories used in modern taxonomy; lower and higher plants as the main formations of modern vegetation cover; characteristics of specific plants, which embody the features of the structure of the group as an association of species and higher systematic categories; the volume of systematic groups, geographical distribution of plants, the place and role of plants in ecological systems; the practical significance of the properties of plants of various groups; be able to: distribute plants into groups, have a clear idea of the place in the system of certain plants; use in practice economically important properties of representatives of various groups of plants; to analyze the proposed plant objects based on knowledge of the anatomical, morphological and physiological characteristics of the plant organism, the principles of their systematic classification, as well as the dependence of their structure and functions on the conditions of existence; to be able to make dichotomous keys; to possess the skills of: determining plants belonging to systematically complex groups; microscopy, dissection, sketching, work with herbarium; distribution of plants by groups.
		Flora of the world		To know: the terminology of the discipline, the features of the flora of the world, RK and East Kazakhstan region, modern approaches to the analysis of flora, the principles of geobotanical and floristic zoning, the main systematic and ecological groups of

				plants, the features of the protection of the flora of the world, RK and the region in the reserve, national park, nature reserves; to be able to: apply knowledge in floristic research, make notes of flora and their analysis, to recognize rare and protected plant species of the Republic of Kazakhstan, in collections, in drawings, in nature; to analyze the proposed plant objects based on knowledge of the anatomical, morphological and physiological characteristics of the plant organism, the principles of their systematic classification, as well as the dependence of their structure and functions on the conditions of existence; to possess: methods of floristic research, techniques for describing plant communities, methods for determining the range of the species, knowledge and skills for professional handling of botanical objects.
13	Basic	Human and animal physiology	6th semester	To know about: the subject and tasks of human and animal physiology, the history of its development; the features of the structure of an animal cell and its differences from a plant cell; theoretical and methodological foundations of physiology; physiology of excitable tissues; physiology of human analyzers; private physiology of the central nervous system; mechanisms and patterns of activity of vegetative functions of the body; be able to: conduct a bibliographic search for literary sources; conduct somatometry (anthropometry); determine short-term verbal and logical memory; determine mental performance; to determine the main physiometric indicators; to evaluate the physical development of a person; to apply the theoretical knowledge and practical skills in practical and research activities; to apply biological knowledge to explain the processes and phenomena of the vital activity of one's own organism and other representatives of the animal kingdom, indicating their taxonomic group, anatomical, morphological and ecological features in different periods of evolution.
		Physiology of higher nervous activity		Possess a sufficient arsenal of the subject; know the mechanisms of the brain, the mechanisms of psychological processes; be able to apply biological knowledge to explain the processes and phenomena of the vital activity of one's own body and other representatives of the animal kingdom, indicating their taxonomic group, anatomical, morphological and environmental features.
14	Basic	Physical and Colloidal Chemistry	6th semester	To know: the basic laws of chemical processes and the characteristics of the equilibrium state; the principles of thermodynamics and the basic equations of chemical thermodynamics; methods of thermo-dynamic description of chemical and phase equilibria in multicomponent systems; thermodynamics of electrolyte solutions

			<p>and electrochemical systems; equations of formal kinetics and kinetics of complex reactions; on the fundamental concepts and laws of colloidal chemistry as a science of surface phenomena and dispersed systems; basic concepts and relations of thermodynamics of surface phenomena, surface tension and surface energy, adsorption, adhesion, cohesion, wetting, spreading, capillary condensation; mechanisms of processes of formation of the surface layer; structural and mechanical properties and rheological methods of research of dispersed systems; features of optical properties of dispersed systems, scattering, absorption of light, coloring of sols; be able to: determine the thermodynamic characteristics of chemical reactions and equilibrium concentrations of substances; to determine the direction of the process under the given initial conditions; to establish the boundaries of the stability regions of phases in single-component and binary systems; to determine the compositions of coexisting phases in binary heterogeneous systems; to make kinetic equations in differential and integral form for simple reactions; to carry out calculations using the basic relations of thermodynamics of surface phenomena and calculations of the main characteristics of dispersed systems; to calculate the energy parameters of adsorption; to predict the influence of various factors on surface tension and surface energy; to obtain and purify colloidal solutions; to determine the charge sign of colloidal particles; to predict the effect of dispersion on reactivity, equilibrium constant and phase transition temperature; to generalize and process experimental information in the form of laboratory reports; to possess: the skills of calculating the thermal effects of chemical reactions at a given temperature under conditions of constancy of pressure or volume; skills in calculating the equilibrium constants of chemical reactions at a given temperature; methods for calculating chemical equilibrium; methods for measuring surface tension, edge angle, adsorption and specific surface area, viscosity; possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process; use computational methods to solve various chemical tasks of an educational and scientific laboratory nature; possess methods of safe use of chemical materials, taking into account their physical and chemical properties.</p>
		Polymer Chemistry	To know: modern ideas about the structure and properties of high-molecular compounds used in the production of gunpowder, solid rocket fuel and polymer

				<p>composite materials; theoretical foundations of the synthesis of polymers and their chemical transformations; basic physico-chemical processes occurring in the manufacture of polymer composite materials; standard methods for determining the properties of gunpowder, solid rocket fuels, polymer materials; be able to: to conduct research on the properties of polymer materials, gunpowders, solid rocket fuels according to standard methods; possess: experience in choosing a methodology for conducting complex tests of polymers, polymer composite materials and products based on them; possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process; use computational methods to solve various chemical tasks of an educational and scientific-laboratory nature; possess methods of safe use of chemical materials, taking into account their physical and chemical properties.</p>
15	Basic	Biochemistry	7th semester	<p>To know: the basic principles of the structural organization of the most important biological macromolecules – proteins, nucleic acids, carbohydrates, lipids; the functional role of proteins, nucleic acids, carbohydrates, lipids, hormones in the processes of vital activity; the specific properties and kinetic characteristics of enzymes, as well as the role of enzymes for biotechnology; the properties and role of DNA and RNA in the reproduction and transmission of genetic information; the main ways and mechanisms of regulation of metabolism; theoretical and practical significance of biochemistry, the latest achievements in the field of biochemistry and prospects for their use in various fields of biotechnology, national economy, medicine, pharmacy; on the relationship of biological function and molecular structure of compounds; be able to: use the knowledge gained for the development of other biological disciplines, as well as to solve practical issues of biotechnology; conduct qualitative and quantitative analysis biological material; work with biochemical equipment equipment; apply theoretical knowledge in solving technological problems; possess: modern laboratory biochemical methods of studying biological molecules to solve practical issues of biotechnology; possess basic chemical laws, theories, patterns and chemical transformations to explain and use in real chemical processes occurring in the educational process; use computational methods to solve various chemical tasks of an educational and scientific laboratory nature; possess methods of safe use of chemical materials, taking into account their physical and</p>

				chemical properties.
	Basic	Agrochemistry with the basics of soil science		To know: chemical composition of plants and peculiarities of their nutrition; agrochemical properties of various types of soils; chemical composition and properties of fertilizers; conditions for the effective use of fertilizers to obtain planned crop yields; modern methods for determining the need of crops for fertilizers; methods of chemical analyses of soils and plants; methods of mathematical and static processing of experimental data; be able to: conduct selection of soil and plant samples for analysis; conduct chemical analysis of soils, plants and fertilizers; to determine the need for fertilizers, the most effective terms and methods, technology of application and incorporation of fertilizers; to carry out soil and plant diagnostics; to possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process; to use computational methods to solve various chemical tasks of educational and scientific-laboratory nature.
16	Basic	Evolutionary teaching	7th semester	To know: the subject, goals and objectives of the course; the emergence, development and modern problems of evolutionary theory; evolutionary concepts of J.B.Lamarck, Charles Darwin; speciation processes; ways of macroevolution (divergence, convergence, parallelism); methods of phylogenetic transformation of organs; to be able to: determine qualitative functional changes of organs; determine quantitative functional changes of organs; determine and describe the issues of human origin; determine the driving forces of anthropogenesis; apply biological knowledge to explain the processes and phenomena of the vital activity of one's own organism and other representatives of the animal kingdom, indicating their taxonomic group, anatomical, morphological and ecological features in different periods of evolution; possess the skills: application of the acquired knowledge in theoretical and practical activities.
	Basic	Anthropogenesis		To know: theoretical and methodological principles of the modern stage of development of the complex of biological sciences about man in their inseparable unity by social sciences; to be able to: apply the knowledge gained in the field of scientific research and professional activity; to apply biological knowledge to explain the processes and phenomena of the vital activity of one's own organism, indicating anatomical, morphological and ecological features in different periods of evolution; to possess: terminological apparatus of this discipline; methods of collecting and analyzing ethnological materials.

17	Professional	Room and Garden Floriculture	5th semester	To know: the main groups of indoor and garden plants, the peculiarities of their organization, diversity, ecological, aesthetic and practical role; principles of plant placement; rules of plant care; the main diseases of indoor plants; to be able to: make a plant passport, design projects for flower beds and flower beds, flower beds; prepare soil mixtures; transplant and transfer plants; make fertilize and feed plants; propagate plants by seeds and vegetatively; describe your own observations or experiments, distinguish in them the purpose, conditions and results obtained; possess the skills of drawing up the simplest recommendations for the maintenance and care of indoor and other cultivated plants; plant propagation; certification of indoor and garden plants, as well as the organization of an educational and experimental site; thus, possess the applied aspects of biology.
	Professional	Ornamental gardening with the basics of landscape design		Know: a zoned assortment of decorative woody plants for landscaping territories of various functional purposes and interiors; agrotechnical techniques used at different stages of green construction; be able to: recognize the main types of woody, shrubby, floral and herbaceous crops used in decorative gardening by morphological characteristics of plants, fruits, seeds; use drawing and artistic tools and materials; create a landscape project, develop design and estimate documentation, select plants for landscaping objects; own: methods of production of planting material and maintenance of ornamental plantings; ability to build, design and read drawings, to constructively draw natural forms and landscape elements, to compose landscape compositions; possess applied aspects of biology.
18	Professional	Modern methods of teaching biology	6th semester	To know: modern methods and technologies of multicultural, differentiated and developmental education in the biology course; to be able to: use a variety of forms, techniques, methods and means of teaching biology within the framework of the updated education system of basic general education and secondary general education; to use standard, applied, modern pedagogical methods and technologies in accordance with the set goals and objectives when planning and conducting classes in high school and college; possess: forms and methods of teaching biology, including those beyond the scope of training sessions: project activities, laboratory experiments, field practice, desk processing, etc.; possess knowledge of regulatory and legal documents in the field of education, instructional documentation, skills and abilities to develop current educational and organizational documentation for the implementation of educational

				<p>concepts of educational programs.</p> <p>To know: the content of the State standard of general secondary education, school biology programs, taking into account updates, the content of biology textbooks; to be able to: use standard, applied, modern pedagogical methods and technologies in accordance with the set goals and objectives when planning and conducting classes in high school and college; to produce didactic material for biology lessons; to work independently with a book (textbook, determinant); schematically depict the object under study and provide it with appropriate signatures; conduct phenological observations in nature; possess the technology of teaching; apply their knowledge in practice; skills of setting up a laboratory experiment, methods of conducting practical work in nature, etc.; possess knowledge of regulatory and legal documents in the field of education, instructional documentation, skills and abilities to develop current educational and organizational documentation for the implementation of educational concepts of curricula.</p>
19	Professional	Theory and technology of teaching biology	7th semester	<p>To know: methods and technologies of multicultural, differentiated and developing teaching in the chemistry course; to be able to: use a variety of forms, techniques, methods and means of teaching chemistry within the updated system of basic general education and secondary general education; to use standard, applied, modern pedagogical methods and technologies in accordance with the goals and objectives in planning and conducting classes in high school and college; possess: forms and methods of teaching chemistry, including those beyond the scope of training sessions: project activities, laboratory experiments, industrial chemical research, etc.; possess knowledge of regulatory and legal documents in the field of education, instructional documentation, skills and abilities to develop current educational and organizational documentation for the implementation of educational concepts of curricula.</p>
	Professional	Theory and technology of teaching chemistry		<p>To know: the requirements of the state standard of general education in terms of the subject area of chemistry for all levels of education at school; goals, objectives and content of chemistry of general education; content, structure and methodological apparatus of curricula and school textbooks in chemistry; methods and techniques of teaching chemistry; basic organizational forms of education in chemistry; be able to: plan pedagogical activity; analyze from a theoretical standpoint the methods of teaching chemistry school curricula and textbooks on chemistry, other teaching tools;</p>

				<p>optimally choose the method of teaching chemistry; prepare a lesson plan, organize and conduct various forms of chemistry education; conduct a demonstration experiment; use standard, applied, modern pedagogical methods and technologies in accordance with the set goals and objectives when planning and conducting classes in high school and college; possess knowledge of regulatory and legal documents in the field of education, educational and instructional documentation, skills and abilities to develop current educational and organizational documentation for the implementation of educational concepts of training programs.</p>
20	Professional	Methods of solving problems in chemistry	7th semester	<p>Possess methodological techniques for solving problems of varying degrees of complexity in the main sections of chemistry; possess methodological techniques for solving Olympiad problems; be able to solve complex creative problems of a theoretical and applied nature; be able to solve problems using a computer and a personal computer; own computer programs for solving problems; own the methodology of using multimedia tools for teaching students to solve chemical problems; be able to create conditions and formalize solutions to problems and exercises of increased complexity; use standard, applied, modern pedagogical methods and technologies in accordance with the set goals and objectives when planning and conducting classes at secondary school and college; possess knowledge of regulatory and legal documents in the field of education, instructional documentation, skills and abilities to develop current educational and organizational documentation for the implementation of educational concepts of curricula.</p>
	Professional	Methods of conducting a school chemical experiment		<p>Know: the scheme of construction and methodology of conducting a chemical experiment at school; the technique and methodology of chemical experiment in the study of the main sections of chemistry; be able to: organize and conduct basic demonstration experiments and laboratory work; use standard, applied, modern pedagogical methods and technologies in accordance with the goals and objectives when planning and conducting classes in high school and college; possess: methodological techniques for conducting a school chemical experiment; possess knowledge of regulatory and legal documents in the field of education, educational and instructional documentation, skills and abilities to develop current educational and organizational documentation for the implementation of educational concepts of training programs for conducting chemical experiments.</p>

21	Professional	Applied Chemistry	7th semester	To know: the main technological processes of production of the most important chemical products in industrial and laboratory conditions, the main devices and devices of chemical technology, safety requirements, industrial sanitation and environmental standards of chemical products production; to be able to: solve typical tasks in applied chemistry, determine technologically and economically optimal conditions for technological processes; to make structural formulas of polymers; to design the main ways of polymer synthesis; demonstrate knowledge about the laws of chemical transformations in industrial production conditions, as well as about the structure, organization and technological design of the main chemical industries; possess: skills of synthesis, isolation and purification of chemicals in laboratory conditions, work with modern equipment for modeling technological processes by the main methods of obtaining polymers, skills of determining physical and mechanical properties and identification of polymers and composite materials; possess knowledge of applied chemistry.
	Professional	Introduction to chemical technology		To know: prospects of technical development of the enterprise; technical requirements for raw materials, materials, finished products; basic technical and design features of chemical production; methods of rational use of raw materials, energy and other types of resources; methods of intensification of chemical and technological special terminology; to be able to: evaluate the composition and properties of intermediate products in order to develop new technological processes that ensure the most complete use of them; analyze and justify the optimal parameters of technological processes; demonstrate knowledge about the laws of chemical transformations in industrial production conditions, as well as about the structure, organization and technological design of the main chemical industries; possess: skills in drawing up thermal and material balances of chemical apparatuses and installations; methods of kinetic analysis and modeling of chemical reactors.
22	Professional	Applied biology	7th semester	To know: about the essence of applied biology; about the connection of biological knowledge and biological objects with human practical activity; biological features of agricultural crops and domestic animals, agricultural technology of cultivation of agricultural crops and promising varieties of cultivated plants, about the importance of seed banks, about breeding, feeding, growing agricultural animals, the role of the latest biological research in modern scientific knowledge about nature; about the use of

				<p>biological objects in food production technology; about the relationship between biology and biotechnology; be able to: work with biological objects in laboratory and natural conditions; organize the process of using biological objects in food production; possess: basic methods of biological sciences (including field research); possess applied aspects of biology.</p>
	Professional	Methods of organizing extracurricular work in chemistry and biology		<p>To know: methods of designing educational routes; forms, methods and means of self-education - the main directions of innovative educational policy; be able to: design educational routes when organizing extracurricular work in chemistry and biology; select components of the educational environment for the implementation of innovative educational tasks through the implementation of extracurricular work in chemistry and biology; to use standard, applied, modern pedagogical methods and technologies in accordance with the set goals and objectives when planning and conducting classes in high school and college; to classify methods, forms and principles of teaching and upbringing of the modern educational process; to possess: skills of using forms, methods of organizing extracurricular work as an integral component of professional improvement of a teacher; skills of application of innovative forms, methods of organization of extracurricular work in chemistry and biology; possess knowledge of regulatory and legal documents in the field of education, educational and instructional documentation, skills and abilities to develop current educational and organizational documentation for the implementation of educational concepts of training programs.</p>
23	Professional	Ecological and green chemistry	8th semester	<p>To know: the current state and trends in the development of ecological chemistry; patterns of interaction of living organisms and their aggregates with the environment, as well as factors affecting these processes; the ecological significance of soil chemical properties; the effect on living organisms of the movement and chemical composition of air masses; types of bioindicator plants used in environmental diagnostics; principles of "green chemistry" and its latest developments; be able to: conduct a screening analysis of the quality of the habitat; it is reasonable to choose a method and methodology for analyzing environmental objects and biological objects in accordance with the objectives of the study; to carry out a screening bioindication survey of the ecological state of biogeocenoses; to process the results of analytical measurements; to apply the principles of ecological and "green chemistry" when performing chemical experiments; to possess: the laws of the action of environmental factors to predict</p>

				<p>optimal ecological niches of plants; methods of sampling and conservation of biological material and environmental objects to determine the quality of the habitat; methods of recording analytical parameters during bioindication and chemical studies.</p>
	Professional	Coordination chemistry		<p>Know: general ideas about coordination chemistry, including coordination chemistry of rare earth elements and actinides, as well as general patterns in changing the chemical properties of the corresponding CS; be able to: isolate the main thing; make suggestions when setting up or rationalizing the corresponding experiment; use computational methods to solve various chemical tasks of an educational and scientific laboratory nature; possess: terminology and the technique of conducting the simplest estimates and calculations, for example, using circular thermochemical cycles or ligand field theory; possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes encountered in the educational process; possess methods of safe use of chemical materials taking into account their physical and chemical properties.</p>
24	Professional	Chemical Technology	8th semester	<p>To know: the basic principles of the organization of chemical production, its hierarchical structure; methods for evaluating the effectiveness of the chemical-technological process and the entire production as a whole; general patterns of chemical transformations in industrial production conditions; structure, organization and technological design of the main chemical industries modern enterprises of the chemical profile of East Kazakhstan Region and the Republic of Kazakhstan; be able to: demonstrate knowledge about the laws of chemical transformations in industrial production conditions, as well as about the structure, organization and technological design of the main chemical industries; calculate the main characteristics of the chemical process, choose a rational scheme for the production of a given product; evaluate the technological efficiency of production; generalize and process experimental information; possess: methods of analyzing the efficiency of chemical production; skills of calculation and determination of technological indicators of the process.</p>
	Professional	Nanotechnology in Chemistry		<p>To know: definition and classification of nanoparticles, concepts of nanomaterials, their special physical and chemical properties; basic methods of synthesis and analysis of nanomaterials; existing and promising applications of nanotechnology and nanomaterials; harmful effects of nanomaterials on the environment, human health and</p>

				safety, as well as ways to prevent them; to be able to: analyze and evaluate various methods of synthesis to propose methods for the analysis of nanomaterials depending on their nature; to propose possible applications of various nanomaterials; demonstrate knowledge about the laws of chemical transformations in industrial production conditions, as well as about the structure, organization and technological design of the main chemical industries; possess: skills of searching for sources of information about new achievements in nanochemistry and nanotechnology.
--	--	--	--	---

Table 2. Sequence of mastering disciplines of social and professional interaction

Course	Providing disciplines	Competencies	Expected result
1	The modern history of Kazakhstan	General education	<p>-Demonstrate knowledge of the main periods of the formation of the historical past of independent Kazakhstan statehood; -correlate the phenomena and events of the historical past with the general paradigm of the world-historical development of human society through critical analysis; - master the techniques of historical description and analysis of the causes and consequences of events in the modern history of Kazakhstan; -offer possible solutions to modern problems based on the analysis of the historical past and reasoned information; - to analyze the features and significance of the modern Kazakh model of development; - to determine the practical potential of international dialogue and respect for spiritual heritage; - to substantiate the fundamental role of historical knowledge in the formation of Kazakhstan's identity and patriotism; - to form their own civil position on the priorities of mutual understanding, tolerance and democratic values of modern society.</p>
1	Kazakh (Russian) language	General education	<p><u>Russian language</u> The student has the following learning outcomes: 1) to make the right choice and use of language and speech means to solve certain communication and cognition tasks based on knowledge of a sufficient volume of vocabulary, grammatical knowledge system, pragmatic means of expressing intentions; 2) to convey the factual content of texts, formulate their conceptual information, describe deductive knowledge (pragmatic focus) both the entire text and its individual structural elements; 3) interpret the information of the text, explain the stylistic and genre specifics of the texts of socio-cultural, socio-political, official-business and professional spheres of communication in the scope of certification requirements; 4) request and report information in accordance with the communication situation, evaluate the actions and actions of participants, use information as a tool to influence the interlocutor in situations of cognition and communication in accordance with the certification requirements; 5) build programs of speech behavior in situations of personal, social and professional communication in accordance with the norms of language, culture, specifics of the sphere of communication, certification requirements; 6) discuss ethical, cultural, socially significant problems in discussions, express your point of view, defend it in a reasoned manner, critically evaluate the opinion of interlocutors; 7) participate in communication in various situations of different spheres of communication in order to realize their own intentions and needs (domestic, educational, social, cultural), stating them ethically correctly,</p>

			<p>meaningfully fully, lexically-grammatically and pragmatically adequate to the situation; 8) compose everyday, socio-cultural, official business texts in accordance with with generally accepted norms, functional orientation, using lexico-grammatical and pragmatic material of a certain certification level that is adequate for the set goal.</p> <p><u>Kazakh language</u></p> <p>The student has the following learning outcomes: students should know: the main functions of the language, functional and semantic types of speech and their features, functional speech styles, communicative tasks of the text, text compression techniques, annotation techniques, taking notes and reviewing the text; students should be able to: understand information on topics of personal, public, educational and professional spheres of life, to note the highlighted provisions in the argumentation in general terms to understand the implied and openly stated provisions in texts and direct messages; use the language correctly and effectively in a conversation on personal and professional topics, noting the connection of the theses being expressed, clearly express their position through appropriate explanations; argue, evaluate the information received, speak on professional topics, solve typical and professional tasks in order to master professional and communicative skills, formulate a topic, determine the linguistic features of the text; the student must possess: the language system and the ways of its use in intercultural and communicative activities, possess the system of speech and communication, the skills of using information from the media, official sources and fiction, possess the skills of creating texts of different functional types, have an idea of the peculiarities of the functioning of language in scientific discourse, possess the skills of description, generalization and analysis of information, compressions of a scientific text.</p>
1	Foreign language	General education	<p>The student has the following learning outcomes:</p> <p>1) systematizes the conceptual foundations of understanding the communicative intentions of the partner, the authors of texts at this level; 2) compares and selects the forms and types of speech/communication corresponding to the communicative intention with a logical construction adequate to the type of speech; 3) adequately expresses its own communicative intentions with the correct selection and appropriate use of appropriate linguistic means, taking into account their compliance with socio-cultural norms of the language being studied; 4) classifies the levels of use of real facts, references to authoritative opinion; speech behavior is communicatively and cognitively justified; 5) identifies patterns of development of a foreign language, paying attention to the study of stylistic originality; 6) knows the techniques of linguistic description and analysis of the causes and consequences of events in texts of a scientific and social nature; 7) expresses in a foreign language possible solutions to modern problems based on the use</p>

			of reasoned information; 8) evidently uses language material with reasoned language means sufficient for this level, corrects mistakes in a timely manner and independently with 75% of error-free utterances, 9) knows the strategy and tactics of constructing a communicative act, correctly forms speech intonation, relying on lexical sufficiency within the framework of speech topics and grammatical correctness.
1	Information and communication technologies (in English language)	General education	<p>To know: - what economic and political factors contributed to the development of information and communication technologies; - features of various operating systems, architecture.</p> <p>Be able to: - identify the main trends in the field of information and communication technologies; - use information resources to search and store information; - work with spreadsheets, consolidate data, build graphs; - apply methods and means of information protection; design and create simple websites; - process vector and raster images; create multimedia presentations; use various platforms for communication; - calculate and evaluate performance indicators of supercomputers; - use various forms of e-learning to expand professional knowledge; - use various cloud services.</p> <p>Have the skills to: - develop a database structure; - design and create presentations; - receive data from the server; - create video files; - work with Smart applications; - work with services on the e-government website.</p>
1	Модуль социально-политических знаний	Sociology	<p>General education</p> <p>Have an idea: about the subject and the basic laws of sociology, about the social structure of society and the ways of socialization of personality in society; about the sociological approach to personality, the basic laws and forms of regulation of its social behavior; about the mechanism of the emergence of social communities and social groups, the dynamics of social processes.</p> <p>To know: the main categories of sociology and their place in the analysis of social phenomena; typology, the main sources of the emergence and development of mass social movements, forms of social interactions, factors of social development of society; types and structures of social organizations; the main features of social institutions; the content of the theory of social management in organizations.</p> <p>Be able to: analyze the social structure of society, the nature of the changes taking place in it; apply the basic provisions of sociological science to analyze social phenomena and processes occurring in society and production collectives; conduct sociological research and have the skill of processing empirical social information; use the results of sociological research to solve practical problems of training and education of subordinates, increase the efficiency of economic work.</p>
1		Political science	<p>General education</p> <p>To know: - the main stages of the development of political knowledge in the history of civilization; - schools and directions of modern political science; - political life of society; - the political system and its institutions; the essence of political processes in the country and the world.</p> <p>To master the skills and abilities: - to use scientific methods of cognition, which contributes to the</p>

				formation of a scientific worldview; - to show the place of political science in the system of social sciences and humanities; - to independently analyze, think critically and politically; - to develop your intelligence and broaden your horizons; – to develop your civic position and bear social responsibility to society.
1		Cultural studies	General education	The student has the following learning outcomes: - must study and understand the essence and role of culture in the life of society, its structure and functions, its typologization, differentiation into branches, types and forms, the human purpose of culture; - be able to analyze theoretical systems, concepts and categories that make it possible to form a holistic picture of the formation and development of culture, and formulate rules of description that reflect the specifics of the deployment of socio-cultural processes; - must analyze and carry out an adequate assessment of the impact of the integral phenomenon of culture, its various types, branches, types and forms on the formation of social and spiritual qualities of the individual, social community, society as a whole; - must be able to explain the features of cultural complexes, phenomena and events, the mechanisms of functioning of cultural agents and institutions, their socializing effect on the formation of personality based on scientific understanding of the revealed facts, trends and patterns of development of socio-cultural processes
1		Psychology	General education	To know: - the meaning and place of psychology in the system of sciences; - the main directions of personality development in modern psychology; - personal values and meanings in professional self-determination; - interrelation and mutual influence of the psyche and body; - techniques and techniques of effective communication. Be able to: - study the psychological characteristics of students and classroom groups to solve professional problems; - take into account the individual psychological characteristics of the individual when designing the educational process; - identify patterns of behavior in a conflict situation and conduct self-diagnosis of the prevailing type of behavior in a conflict situation; - develop psychological recommendations for the development of tolerant behavior. To master: - skills of self-regulation of personality (stress management); - skills of prevention of emotional burnout in professional activity; - skills of recognition of psychological impact; - skills of effective communication.
1	economic and	Basics of a Market Economy	General education	Have an idea: about the theoretical and methodological foundations of entrepreneurship, about trends in the organization and evaluation of the effectiveness of entrepreneurial activity, about state mechanisms for supporting and regulating the development of entrepreneurship, about the mechanisms of functioning

		and Entrepreneurship		<p>of enterprises and firms of various organizational and legal forms that are an integral part of professional education and allow making effective decisions in the implementation of practical activities.</p> <p>Be able to: use the acquired knowledge to develop an effective business building system and possess the necessary competencies to solve problems in the field of research; demonstrate their knowledge in the field of entrepreneurship, including the organization, development and management of Kazakhstani enterprises, provide information to interested persons and specialists in the field of entrepreneurship about directions, ideas, problems and ways to solve them, summarize and interpret information about the theoretical foundations and experience of entrepreneurship to draw conclusions taking into account social, economic, scientific or ethical approaches.</p> <p>Have skills: independent continuation of education, organization of entrepreneurship.</p>
		Fundamentals of law and anti-corruption		<p>The student should know: the basics and essence of corruption offenses; the system and legislative foundations of the fight against corruption; the importance of the state and values and their legislative protection; the development and features of branches of law in public relations; the issue of responsibility and penalties for corruption; the application of legislation and their application; the general foundations of the Constitution of the Republic of Kazakhstan; the main provisions of the current legislation of Kazakhstan; the system of state bodies and their powers; the mechanism between substantive and procedural law.</p> <p>The student should be able to correctly assess the behavior of his or another person in a specific life situation, choose the right way to protect them in case of violation of their rights, correctly analyze them when working with regulatory legal acts in the field of public administration;</p> <p>The student must have basic legal concepts and legal institutions, general theoretical knowledge;</p> <p>be able to: analyze events and actions from the point of view of the sphere of legal regulation and refer to the necessary regulations; apply the current legislation; use the right to their own rights and interests.</p> <p>Skills: conducting discussions on legal issues, on the application of norms at the present stage, legal analysis of various documents. The student must be able to correctly analyze the acquired knowledge and regulatory legal acts, determine its basic concepts;</p> <p>The student should be able to apply the acquired knowledge in practice and form experience working with the main normative legal acts in this area, skills of respect, observance of rights and freedoms inherent in the legal culture.</p>
	mic and natura	Basics of a Market Economy	General education	<p>Have an idea: about the theoretical and methodological foundations of entrepreneurship, about trends in the organization and evaluation of the effectiveness of entrepreneurial activity, about state mechanisms for supporting and regulating the development of entrepreneurship, about the mechanisms of functioning</p>

		and Entrepreneurship	<p>of enterprises and firms of various organizational and legal forms that are an integral part of professional education and allow making effective decisions in the implementation of practical activities.</p> <p>Be able to: use the acquired knowledge to develop an effective business building system and possess the necessary competencies to solve problems in the field of research; demonstrate their knowledge in the field of entrepreneurship, including the organization, development and management of Kazakhstani enterprises, provide information to interested persons and specialists in the field of entrepreneurship about directions, ideas, problems and ways to solve them, summarize and interpret information about the theoretical foundations and experience of entrepreneurship to draw conclusions taking into account social, economic, scientific or ethical approaches.</p> <p>Have skills: independent continuation of education, organization of entrepreneurship.</p>
		Basics of life safely and ecology	<p>To know: the legislative framework for life safety and environmental control, as well as methods for identifying, eliminating the influence of harmful factors on humans and the environment, and ensuring comfortable conditions for human life and activity; to be able to: systematize safety standards for use in professional activities; to choose methods of protection from hazards in relation to the field of their professional activities and to choose ways ensuring comfortable living conditions; possess the skills of ensuring the safety of life in industrial, domestic conditions and in emergency situations, the skills of first aid.</p>
1	Developmental physiology and school hygiene	Basic	<p>Students should:- know: • general patterns of growth and development of the body; • age-related features of physiology and hygiene of all systems of the child's body; • hygienic requirements for buildings, classrooms, the air environment, lighting of classrooms and equipment of schools; • hygienic foundations of the organization of the educational process and the daily routine for children of six years of age; • fundamentals of the health of children and adolescents, familiarization with the rules of a healthy lifestyle; - be able to: • apply methods and means of cognition, training and self-control for their intellectual development, cultural level improvement, professional competence, preservation of their health, moral and physical self-improvement; - possess the skills of: • using knowledge about the modern natural science picture of the world in educational and professional activities; • organization of educational work with children and adolescents, taking into account the anatomical and physiological characteristics of the body in different age periods, as well as taking into account hygienic requirements for buildings and classrooms, furniture and equipment of schools; • ensuring the protection of life and health of students in the educational process and extracurricular activities; • countering adverse environmental factors by introducing children and adolescents to the formation of a healthy lifestyle and health promotion.</p>

1	Pedagogy	Basic	<p>To know: - about the role of science and education in public life; - about current trends in the global educational space; - about the professional competence of a teacher of 12-year secondary education; - about the social purpose and role of a teacher in modern society;- about the social meaning and content of their future specialty;- about the object of the future teacher's activity; - about the factors of continuous professional and personal formation of the teacher;- about the education system of the Republic of Kazakhstan;- theoretical and methodological foundations of pedagogy and the history of its development, the world pedagogical heritage; - theory and practice of the holistic pedagogical process; - technology for the implementation of the pedagogical process; be able to: - carry out pedagogical communication and interaction in the pedagogical process; - to design and carry out educational work in accordance with the laws, educational mechanisms of the pedagogical process; - to diagnose the educational process in the classroom according to the main characteristics (variables) and predict its further development; - formulate educational tasks, choose activities, forms and methods adequate to these tasks; - develop their own approaches to the process of education and upbringing, comprehend trends in the development of educational systems at different stages of history; possess the skills of: - research activities; - pedagogical communication and pedagogical techniques; - organization of subject-subject interaction all participants of the pedagogical process; - the use of pedagogical technologies in the educational process; - application of the acquired knowledge during the period of professional practice.</p>
1	Psychology and human development	Basic	<p>To know: - the history of the development of the subject of psychology and human development and Soviet and foreign psychology; - characteristics of psychology and human development as a science, its methods and tasks; dynamics of development and structure of personality and human activity; - To have an idea of the psychological characteristics of a person's personality in ontogenesis and phylogeny. Have: - an idea of the psychological features of a person's personality in ontogenesis and phylogeny: Be able to: - use the acquired knowledge in practice; - to create a methodological basis for monitoring the progress, completeness of the content and conditions of the child's mental development.</p>
1,2	Physical culture	General education	<p>To know: - the role of physical culture in the development and training of a specialist; - fundamentals of the state policy of the Republic of Kazakhstan in the field of physical culture and sports; - theoretical and methodological foundations of physical culture; - the main achievements of the Republic of Kazakhstan in the field of physical culture; - hygienic and organizational bases of physical culture and sports. Be able to: - use practical skills and abilities in life that ensure the preservation and strengthening of health, development and improvement of psychophysical abilities and qualities; - use physical culture, sports and wellness activities to achieve life and professional goals; - apply the rules for the safe conduct</p>

			<p>of physical exercises and sports.</p> <p>Possess: - the skills of organizing mass sports competitions; - exercises for professional and pedagogical physical training, general physical training, special physical training, as well as apply special games in practice; - a system of practical skills that ensure the preservation and strengthening of health, development and improvement of psychomotor abilities and qualities.</p>
2	Philosophy	General education	<p>The student has the following learning outcomes: 1) describe the main content of ontology and metaphysics in the context of the historical development of philosophy; 2) explain the specifics of philosophical understanding of reality; 3) substantiate the worldview as a product of philosophical understanding and study of the natural and social world; 4) classify the methods of scientific and philosophical knowledge of the world; 5) interpret the content and specific features mythological, religious and scientific worldview; 6) to substantiate the role and significance of key ideological concepts as values of social and personal existence of a person in the modern world; 7) to analyze the philosophical aspect of media texts, socio-cultural and personal situations to substantiate and make ethical decisions; 8) to formulate and competently argue their own moral position in relation to the current problems of modern global society; 9) to conduct research, relevant to identify the philosophical content of problems in the professional field and present the results for discussion.</p>
2	Management in education	Basic	<p>To know: - theoretical and methodological foundations of management in education: functions, patterns, principles, methods of pedagogical management, system-forming factors of pedagogical management, the history of the development of management concepts in education: features of school management based on systematic, humane, competence and technological approaches: - fundamentals of the management of the holistic pedagogical process of the school; -conditions for effective management of pedagogical by the school staff</p> <p>Be able to: - apply the acquired theoretical knowledge in the practice of managing an educational institution; - to carry out diagnostic, analytical and design activities within the framework of a unified management system of an educational institution; - to design and carry out various types of management activities; - to use the skills of a systematic, humane, human-centered, competence-based and technological approaches to the management of an educational institution; - to evaluate the quality of management activities from the standpoint of the holistic pedagogical process of the school as an open pedagogical system; - to be involved in the methodological work of an educational institution, analyze and evaluate the effectiveness of the educational process using modern methods of assessing the quality of teaching, education and development of students, to apply methods of work to overcome the limitations of pedagogical management.</p>

			<p>Possess: - theoretical knowledge on the basics of pedagogical management in accordance with modern requirements; skills in designing and analyzing the management of the holistic pedagogical process of the school. - the skills of research activity; - the skills of pedagogical communication; - the skills of organizing subject-subject interaction of all participants in the pedagogical process; - the skills of applying the knowledge gained during the period of professional practice, as well as in solving professional tasks; be flexible and mobile in various conditions and situations related to the activities of the management of the CPP.</p>
2	Theory and methods of educational work	Basic	<p>Must master the knowledge: - about the essence, goals and objectives of educational work in school and classroom; - about the modern concept of education in the Republic of Kazakhstan and educational systems of school and class; - about the system and activities of the class teacher; - on the forms and methods of pedagogical interaction and cooperation of the subjects of the educational process-teachers, students, parents; - about the patterns of development and methods of forming a children's team; - about the forms, methods, means and techniques of educational work in various directions, - about modern technologies of education; - on the diagnosis of the results of educational work.</p> <p>Must be able to: - model, plan and conduct educational work in the classroom, school with a focus on the formation of a citizen of Kazakhstan on the basis of universal and national values; - choose types of education taking into account its goals and objectives, as well as age and individual characteristics of pupils; - variatively apply methods and techniques of education, select and use means, organizational forms of education; - to carry out pedagogical guidance and management of the process of forming a class team and organizing its activities; - to organize class hours, CTD and educational events of various directions; - to choose and use innovative technologies of education, including technologies of re-education of difficult children; - choose forms of effective cooperation with parents; - organize work with gifted children; - plan, organize and conduct career guidance work in the classroom and school; - study the effectiveness of the educational process and methodically ensure it.</p> <p>Must master the following skills: - theoretical knowledge on the basics of pedagogical management in accordance with modern requirements; -the skills of designing and analyzing the management of the holistic pedagogical process of the school; - the skills of research activities; - the skills of pedagogical communication; - the skills of organizing subject-subject interaction of all participants in the pedagogical process; - the skills of applying the acquired knowledge during the period of professional practice, as well as when solving professional tasks; be flexible and mobile in various conditions and situations related to the activities of the management of the CPP.</p>
2	Inclusive Education	Basic	To know:

			<ul style="list-style-type: none"> - The Law of the Republic of Kazakhstan "On social and medical-pedagogical correctional support for children with disabilities"; other international and republican legal and by-laws regulating the activities of general education organizations operating in inclusive education; - the essence, content, structure of educational processes and systems, pedagogical technologies and innovative processes in the field of inclusive education; - the main directions and prospects for the development of inclusive education and pedagogical science; - the essence and specifics of the professional activity of teachers of general education organizations and teachers-defectologists in the process of inclusive education; - concepts of psychological and pedagogical assistance and systems of correctional and pedagogical influence. <p>Be able to:</p> <ul style="list-style-type: none"> - to find, analyze and systematize information on the organization of inclusive education; - to use in professional activity the main international and domestic documents on the rights of the child and the rights of persons with disabilities to receive a quality education; - design work to inform the public about the problems of education of persons with disabilities; - to design the directions of correctional and pedagogical influence in the conditions of inclusive education, depending on the type of impaired development, the needs of the child, learning conditions, resources of the locality; - to organize and provide optimal socio-environmental and educational (professional) conditions for children with disabilities in general education organizations.
2	Cytology and Histology	Basic	<p>Be able to: in practical classes, using microscopes to examine cytological and histological preparations, as well as students should independently work with microscopes, drawings depicting the morphology, physiology of cells and tissue systems; demonstrate knowledge and ability to compare structures, structure, components, functions, development, properties, inheritance and change of signs and the use of various prokaryotic and eukaryotic cells, tissues and extracellular structures; apply theoretical knowledge and skills of using laboratory equipment to solve practical problems and in experimental research; as a result of studying the discipline, the student must master: the methodology for preparing cytological, histological preparations; material about cell types and basic types of tissues with viewing preparations on a microscope and performing drawings and diagrams in albums; apply in practice the theoretical knowledge gained; as a result of studying the course, the student should know the following types of laboratory research: basic principles of cell theory; methods of research of cells and tissues; structure and functions of cells and organoids of cells; differentiation and mechanisms of cellular distribution; methods</p>

			of studying the structure, classification of tissues in the body.
	Cell and tissue biology	Basic	Know: theoretical foundations of cell and tissue biology, objects of cell and tissue biology, structural features of plant, animal, fungal and prokaryotic cells, plant and animal cells, their cultures, the use of plant and animal cell cultures, biology of cultivated plant cells, cellular, tissue and genetic engineering; must be able to: critically analyze experiments, conduct a bibliographic search of literary sources, formalize literary data; demonstrate knowledge and ability to compare structures, structure, components, functions, development, properties, inheritance and change of traits and the use of various prokaryotic and eukaryotic cells, tissues and extracellular structures; apply theoretical knowledge and skills in the use of measuring instruments, laboratory equipment, methods of studying various environmental objects to solve practical problems and in experimental must possess: skills of using microscopes, preparation of cellular and histological preparations.
2	General and Molecular Genetics	Basic	To know: the subject and tasks of general and molecular genetics, the history of its development; the material foundations of heredity and variability, the structure and types of nucleic acids, the implementation of hereditary information, types of reproduction of organisms, patterns of inheritance of traits, the basics of genetic analysis, chromosomal theory of heredity, types and causes of variability of organisms, the fine structure of the gene, the basic molecular cellular mechanisms, the current state of the problems of genetics, the possibilities of managing heredity and variability of organisms; be able to: conduct a bibliographic search for literary sources; solve genetic problems for mono-, di- and polyhybrid crossing; competently conduct experiments to study heredity and variability; be able to apply the knowledge of genetics in practice; learn to use the studied techniques and methods of genetics for the needs of biotechnology; demonstrate knowledge and ability to compare structures, structure, components, functions, development, properties, inheritance and change of signs of various prokaryotic and eukaryotic cells, tissues and extracellular structures; have the skills of: constructing the second DNA chain in accordance with the nucleotide composition of the first DNA chain; constructing mRNA in accordance with the nucleotide composition of one of the DNA chains; determining the amino acid composition of proteins in accordance with the nucleotide composition of DNA or mRNA; constructing a Penet lattice for solving genetic problems of inheritance of traits; using a hybridological method for studying the patterns of inheritance of traits; assessment of the contribution of genetic and external factors to the development of pathology with hereditary predisposition; determining the frequency of pathological genes and genotypes in the human population; compiling pedigrees, presenting them graphically and analyzing the type of inheritance of a pathological trait; forecasting the development of hereditary disease in a carrier of a pathological gene or predicting the birth of a child with hereditary pathology.

	Genetics with the basics of breeding	Basic	Know: the material foundations of heredity, variability and mechanisms of their implementation; patterns of inheritance of traits; the influence of genotype and environmental factors on the development of the organism; be able to: apply the basic laws of heredity and patterns of inheritance of traits to the analysis of inheritance of normal and pathological traits; analyze material from different sources of information; calculate the frequency of occurrence of alleles in populations of different plant species and animals; demonstrate knowledge and ability to compare structures, structure, components, functions, development, properties, inheritance and change of signs of various prokaryotic and eukaryotic cells, tissues and extracellular structures; possess: skills of working with literature, including periodical scientific literature; methods of genetic, cytogenetic and population analysis of heredity and variability phenomena; skills of karyotype description plants and animals.
2	Microbiology and Virology	Basic	To know: the basic properties of microorganisms; their classification, role in nature and human life; the kingdom of viruses, their use in the production of antiviral vaccines; biological features of microorganisms causing food spoilage; be able to: use literature in the field of microbiology and virology; demonstrate knowledge and ability to compare structures, structure, components, functions, development, properties, inheritance and alteration of traits and use of various prokaryotic and eukaryotic cells; apply theoretical knowledge and skills of using measuring instruments, laboratory equipment, cytochemical, biochemical methods of studying various environmental objects to solve practical problems and in experimental studies; possess: methods that allow identifying non-permanent elements of microorganisms; isolation of pure cultures of micro-organisms and studying their biochemical properties by methods of microbiological studies used to assess environmental objects Wednesday.
	Soil Microbiology	Basic	Know: morphology, systematics, physiology and ecology of microorganisms, the role of microorganisms in the transformations of various compounds and chemical elements in the soil; be able to: determine the biological activity of the soil and propose ways to regulate it, use bioindication, biotests; demonstrate knowledge and ability to compare structures, structure, components, functions, development, properties, inheritance and change of signs and use of various prokaryotic and eukaryotic cells; apply theoretical knowledge and skills of using measuring instruments, laboratory equipment, cytochemical, biochemical methods of studying various environmental objects to solve practical problems and in experimental research; possess a culture of thinking, capable of generalization, analysis, perception of information, setting goals and choosing ways to achieve it; ready to cooperate with colleagues, work in a team.
2	General and Inorganic Chemistry	Basic	To know: fundamentals of chemical thermodynamics, kinetic fundamentals of the description of chemical reactions, methods and mechanisms of their acceleration, the doctrine of chemical equilibrium

			and methods of its displacement, fundamentals of the theory of solutions, elements of electrochemistry; theoretical foundations of inorganic chemistry; patterns of change in the properties of simple substances and compounds within groups and series of the periodic system; methods and methods of synthesis of inorganic substances; the essence of modern physical and physico-chemical research methods used in inorganic chemistry; be able to: use knowledge, skills and abilities in the field of theory and practice of general and inorganic chemistry to master the theoretical foundations and methods of research in the field of inorganic materials, on the basis of thermodynamic and kinetic concepts to predict the possibilities of chemical processes, to propose optimal conditions for reversible reactions; to predict the possibilities of exchange reactions in electrolyte solutions; to justify the processes at electrolysis; compare the thermodynamic, redox activity of substances; conduct experiments on the synthesis and research of inorganic compounds; possess: basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process; use computational methods to solve various chemical tasks of an educational and scientific laboratory nature; possess methods of safe use of chemical materials taking into account their physical properties and chemical properties.
	Chemistry of the elements of the periodic system	Basic	To know: the theoretical foundations of inorganic chemistry; to know the methods of obtaining and chemical properties of basic simple substances and compounds of elements; to know the physical meaning of the periodic law and the periodic system of traditional and international; to be able to explain modern theories of periodicity; to be able to creatively analyze theoretical concepts and factual material of inorganic chemistry; to characterize in the historical development of the formulation of the periodic law and the form of the periodic system chemical elements; be able to use reference and scientific and technical literature; possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process; use computational methods to solve various chemical tasks of an educational and scientific laboratory nature; possess methods of safe use of chemical materials taking into account their physical and chemical properties.
2	Analytical chemistry	Basic	Be able to: describe the mechanism of chemical reactions of quantitative and qualitative analysis; justify the choice of analysis methods, reagents and chemical equipment for a specific task; prepare solutions of a given concentration; conduct quantitative and qualitative analysis in compliance with safety regulations; analyze mixtures of cations and anions; monitor and evaluate the flow of chemical processes; calculate the results of analysis and evaluate the reliability results; must know: aggregate states of matter; analytical classification of ions; equipment and techniques for performing analyses; the significance of chemical analysis, methods of qualitative and quantitative analysis of chemical

			compounds; frequency of properties of elements; methods of expressing the concentration of substances; theoretical foundations of analysis methods; theoretical foundations of chemical and physico-chemical processes; technique of analysis; types of errors in analysis; the device of the main laboratory equipment and the rules of its operation; possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process; use computational methods to solve various chemical tasks of an educational and scientific laboratory nature; possess methods of safe use of chemical materials taking into account their physical and chemical properties.
	Physico-chemical methods of analysis	Basic	To know: mastering the theoretical foundations and acquiring the skills of physico-chemical analysis of research; the essence of the laws and chemical processes underlying the method of analysis, methods of definitions; to be able to: understand the processes of physico-chemical analysis; to use methods of physico-chemical analysis for analysis and examination of various objects; to comprehensively use methods of physico-chemical for various types of analysis; make analysis schemes; use computational methods to solve various chemical tasks of an educational and scientific-laboratory nature; possess methods of safe use of chemical materials, taking into account their physical and chemical properties; possess: basic techniques of chemical definitions and analysis of objects; theoretical foundations of physico-chemical chemistry; have an idea of the possibilities and limitations of using a particular method of analysis, solving certain practical problems; possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process.
2	Cell Biotechnology	Basic	Know about: the subject, tasks of the history of development, objects, methods of cellular biotechnology, trends in the development of cellular biotechnology in the modern world and its most promising areas, cellular biotechnology of microbiological systems, genetic engineering of plants and animals, achievements of cellular biotechnology in medicine, environmental aspects of biotechnology; be able to: critically analyze scientific experiments; demonstrate knowledge and ability to compare structures, structure, components, functions, development, properties, inheritance and change of traits and the use of various prokaryotic and eukaryotic cells, tissues and extracellular structures; apply theoretical knowledge and skills in the use of measuring instruments, laboratory equipment, cytochemical, biochemical methods of studying various environmental objects to solve practical problems and in experimental studies; have the skills to work with specialized laboratory equipment and devices for solving practical problems.

	Introduction to biotechnology	Basic	To know: the scientific foundations of biotechnology; the main directions of the production of useful substances; the basics of engineering enzymology; methods and possibilities of genetic and cellular engineering; the basics of technological bioenergy and biological processing of raw materials; the use of biotechnology as an alternative in agriculture; the basics of environmental biotechnology; be able to: navigate in modern directions and methods of biotechnology; use knowledge about biotechnology in the study of special disciplines; apply the acquired knowledge in the rational use of natural resources and environmental protection; use the obtained data when writing abstracts; possess applied aspects of biology.
2	Anatomy and morphology of plants	Basic	Possess the basic botanical terms underlying the anatomy and morphology of plants; know the structure of cells, tissues and organs of plants; have an idea of the formation of the structure of plant organisms in ontogeny and phylogeny; be able to use a microscope, prepare preparations for microscopy, recognize elements of the structure of plant organisms and correctly formalize the results of observations; to analyze the proposed plant objects based on knowledge of the anatomical, morphological and physiological characteristics of the plant organism, the principles of their systematic classification, as well as the dependence of their structure and functions on the conditions of existence.
	Botany	Basic	To know: basic concepts (terms), features of the structure of plant organisms at the macro- and microscopic levels; features of plant reproduction; features of plant development during ontogenesis and in the process of evolution; characteristic features, classification of various taxa of modern and fossil higher plants; to be able to: navigate the diversity of the plant world, diagnose various taxonomic groups of plants; to use knowledge and practical skills in pedagogical, scientific, industrial and environmental activities, in the study of other biological disciplines; to analyze the proposed plant objects based on knowledge of the anatomical, morphological and physiological characteristics of the plant organism, the principles of their systematic classification, as well as the dependence of their structure and functions on the conditions of existence; possess: basic methods of anatomy, morphology, systematics, geobotany for the study of plants at the level of tissues, organs, organisms, plant communities; identification skills of various taxonomic groups of higher plants; basic methods and techniques for describing plant communities.
2	Zoology of invertebrates and vertebrates	Basic	To know: the basics of systematics, morphology, physiology of invertebrates and vertebrates; to know about the origin and evolution of the type, subtypes and classes of chordates; about the role of animals in ecosystems and the biosphere as a whole; to know the structure and features of the local fauna and ecology of mass and rare animal species; Latin names of animal taxa; to be able to: demonstrate basic ideas on zoology of invertebrates and vertebrates, apply them in practice, critically analyze the

			information received and present the results of research; apply biological knowledge to explain the processes and phenomena of the life activity of representatives of the animal kingdom, indicating their taxonomic group, anatomical, morphological and ecological features in different periods of evolution; possess: skills of research work, discussion; methods of laboratory zoological research on morphology.
	Fauna of the world	Basic	To know: the basics of animal taxonomy in the scope of classes and main orders; the diversity of invertebrates of the Republic of Kazakhstan and East Kazakhstan Region (rare and endangered species of animals); information about the role of animals in nature and human economic activity; to be able to: use methods of observation, description, identification and classification of biological objects; apply modern methods of working with biological objects in in field and laboratory conditions; to distinguish representatives of different classes and families; to characterize the structure and ecological features of the main groups of animals; identify and recognize the main groups and species of animals in nature by traces of vital activity, appearance, voices; create educational collections; design and store collectible material; work with animals in nature and laboratories; conduct excursions and speak publicly; apply biological knowledge to explain the processes and phenomena of vital activity of representatives of the animal kingdom, indicating their taxonomic groups, anatomical, morphological and ecological features in different periods of evolution; possess: modern methods of processing, analysis and synthesis of field and laboratory biological information; skills of determining animals to family, genus and species; skills of independent work, self-organization and organization of tasks.
3	Professional Kazakh (Russian) language	Basic	Know: professional terminology, subject area in Kazakh (Russian) language, in the practice of communication and professional activity. Be able to: consistently and competently formulate and express their thoughts in their native language, possess oral and written language skills in Kazakh (Russian) to work with scientific texts and public speeches; possess a lexical and terminological minimum in the specialty; be able to use oral communication skills in general scientific and professional communication. Skills: have skills of developing communication tools, skills of expressing their thoughts in Kazakh (Russian) using chemical, biological and biotechnological terms; possess the basic principles of translation.; has language skills to a degree sufficient for successful communication with educated native speakers, both in written and oral form, in including on professional topics; proficiency in professional terminology in biotechnology; the use of the state language in professional activities, scientific and practical work, in communication with foreign colleagues, for self-educational and other purposes.

3	Professionally-oriented foreign language	Basic	<p>To know: features of oral and written professionally-oriented texts, including scientific and technical ones; general scientific terminology of the specialty in English; the main stylistic characteristics of the scientific presentation of the material in the studied foreign language.</p> <p>Be able to: read fluently, translate original literature on the chosen specialty; independently prepare and make oral reports on professional topics, including using multimedia tools; recognize and use the basic terminology of the specialty in oral and written statements.</p> <p>Have the following skills: independent reading and translation of original literature in the specialty in order to extract the necessary information; writing articles, abstracts and reports related to the scientific interests of students;</p> <p>Is able to use a foreign language in professional activities, scientific and practical work, in communication with foreign colleagues, for self-educational and other purposes.</p>
3	Plant Physiology	Basic	<p>To know: the subject and tasks of plant physiology, the history of its development; totipotency of plant cells; carbon nutrition of plants: leaf pigments, energy and chemistry of photosynthesis, composition, localization and functions of photosystem I and II; water exchange of plants: the main mechanisms of water entry into the cell and the movement of water through the plant; evaporation of water by the plant, the basics of stability plants to drought; mineral nutrition: the intake and movement of nutrients in the plant, the main macro- and microelements, the physiological basis of the use of fertilizers; plant respiration: its importance in plant life, the influence of various factors on the intensity of respiration; components of the respiratory chain; the mechanism of oxidative phosphorylation; plant growth and development: phytohormones, principles of regulation of growth and development processes; physiological foundations of plant protection and resistance; be able to: conduct a bibliographic search for literary sources; clearly carry out the plan of experiments with plant objects; work with live plants, compare and find differences between control and experimental plants; conduct phenological observations; to conduct experiments on the removal of physiological indicators of plants; to formalize the results obtained using graphic images; to make a comparative analysis of the results obtained; to generalize and draw conclusions based on the results obtained; to analyze the proposed plant objects based on knowledge of the anatomical, morphological and physiological characteristics of the plant organism, the principles of their systematic classification, as well as the dependence of their structure and functions of the conditions of existence; have the skills to: conduct experiments to study basic physiological processes; determine osmotic pressure, transpiration intensity, photosynthesis, respiration; release chlorophyll and determine its quantity and physico-chemical properties; determine the effect of various mineral elements on plant growth and development, individual growth indicators, plant</p>

			resistance.
	Phytochemistry	Basic	To know: the basic concepts of phytochemistry, methods of phytochemical analysis; the main directions of scientific research in the field of phytochemistry of medicinal plants; the main groups of biologically active substances of natural origin and their most important physico-chemical properties; ways of biosynthesis of the main groups of biologically active substances; methods of isolation and purification of the main biologically active substances from medicinal plant raw materials; the main methods of qualitative and quantitative determination of biologically active substances in medicinal plant raw materials; biological standardization of medicinal plant raw materials; raw material quality indicators and methods of their determination; safety rules when working with medicinal plants and medicinal raw materials; acquire such skills and abilities as: isolate and purify active biologically active substances from medicinal plant raw materials; conduct qualitative and microchemical reactions to biologically active substances to confirm their presence in medicinal plants and raw materials; to analyze medicinal plant raw materials for the content of essential oils, cardiac glycosides, saponins, alkaloids, anthracene derivatives, tannins, flavonoids, coumarins, vitamins, etc. by quantitative determination methods; to determine humidity, ash, extractive substances; to carry out statistical processing and registration of the results of pharmacognostic and phytochemical analyses; apply theoretical knowledge and skills of using measuring instruments, laboratory equipment, cytochemical, biochemical methods of studying various environmental objects to solve practical problems and in experimental studies.
3	Human Anatomy	Basic	To know: the place of anatomy in biology and medicine, the main stages of its development as a science; the main directions in modern anatomy and the nature of anatomical research methods; general principles of the structure of the human body and their manifestations in the organization of body systems; patterns of the structure of organs of various types and their principal organ-specific features; anatomy, topography and functions of organs, systems and devices of the body, taking into account the main constitutional features; the most significant in practical terms features of age-related anatomy; be able to: determine by visual signs the constitutional type of a person (meso-, brachy- or dolichomorphic); demonstrate and correctly name the movements carried out in the main joints of the human body; apply biological knowledge to explain the processes and phenomena of the vital activity of one's own body; possess: skills of morphological assessment of the human body in anthropological research.
	Morphology of human internal organs	Basic	To know: morphological features of the structure of human internal organs, their topography; patterns of formation of internal organs and systems in the process of ontogenesis as a reflection of phylogenetic development; features of the morphological structure of a person; to be able to: establish the relationship of anatomical structure, morphology and functions of organs; to make judgments about the main

			directions of development of internal organs and systems of the human body; to apply biological knowledge to explanations of the processes and phenomena of the vital activity of one's own body; possess the skills of morphological assessment of the human body in anthropological research.
3	Organic Chemistry	Basic	To know: the subject of organic chemistry, the theory of the chemical structure of A.M. Butlerov, the characteristics of covalent bonds; isomerism; addition reactions, cleavage, substitution, rearrangement, homolytic and heterolytic reactions; homologous series of methane, ethylene, acetylene, oxygen-containing compounds, nitrogen-containing compounds, their nomenclature, laboratory and industrial methods of preparation, physical and chemical properties; be able to: depict structurally isomers of the main classes of organic compounds; give names for different types of nomenclature and determine the structure of a substance by name; be able to describe the reaction taking into account the mechanism and determine the reaction products by analyzing the conditions of its conduct; possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process; use computational methods to solve various chemical tasks of an educational and scientific-laboratory nature; possess methods of safe use chemical materials, taking into account their physical and chemical properties.
	Chemistry of high-molecular compounds	Basic	Know: types of chemical reactions and their main signs; recent achievements and prospects for development in the field of chemistry, their relationship with other fields of knowledge; be able to: perform calculations using chemical formulas and equations; conduct chemical experiments in accordance with the rules of safe handling of equipment and chemicals; develop an individual trajectory of self-education; possess: work skills with laboratory equipment; skills in determining the physico-chemical constants of the resulting compound; methods of processing the experimental results obtained; rules and techniques of self-education; possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process; use computational methods to solve various chemical tasks of an educational and scientific-laboratory nature.
3	Room and Garden Floriculture	Professional	To know: the main groups of indoor and garden plants, the peculiarities of their organization, diversity, ecological, aesthetic and practical role; principles of plant placement; rules of plant care; the main diseases of indoor plants; to be able to: make a plant passport, design projects for flower beds and flower beds, flower beds; prepare soil mixtures; transplant and transfer plants; make fertilize and feed plants; propagate plants by seeds and vegetatively; describe your own observations or experiments, distinguish in them the purpose, conditions and results obtained; possess the skills of drawing up the simplest recommendations for the maintenance and care of indoor and other cultivated plants; plant propagation;

			certification of indoor and garden plants, as well as the organization of an educational and experimental site; thus, possess the applied aspects of biology.
	Ornamental gardening with the basics of landscape design	Professional	Know: a zoned assortment of decorative woody plants for landscaping territories of various functional purposes and interiors; agrotechnical techniques used at different stages of green construction; be able to: recognize the main types of woody, shrubby, floral and herbaceous crops used in decorative gardening by morphological characteristics of plants, fruits, seeds; use drawing and artistic tools and materials; create a landscape project, develop design and estimate documentation, select plants for landscaping objects; own: methods of production of planting material and maintenance of ornamental plantings; ability to build, design and read drawings, to constructively draw natural forms and landscape elements, to compose landscape compositions; possess applied aspects of biology.
3	Methodology of teaching biology	Professional	To know: the content and construction of the secondary school chemistry course, methods of teaching chemistry, forms of control and assessment of students' knowledge; conceptual and theoretical foundations of the methodology of teaching chemistry, its place in the system of pedagogical sciences and values, the history of the development of chemistry methods and the current state; the specifics of secondary education, owns the means of implementing continuity in the education of children of different ages; be able to: in accordance with the studied to determine the optimal methods of teaching chemistry, to conduct oral and written forms of control of students' knowledge; possess: methods, approaches and technologies of teaching chemistry to secondary school students; methods of pedagogical analysis of the results of observations and experiments, computer modeling techniques; algorithm of pedagogical activity focused on the results of educational work.
3	Methods of teaching chemistry	Professional	To know: the content of biological education and upbringing in a general education school; the development of a system of knowledge, skills and abilities for the application of modern methods, methodological techniques and technologies that have undergone changes in the process of cooperation between teachers and students; modern technologies and forms of education used in biology lessons; methods and techniques for the formation of independence and creative approach in pedagogical activity; be able to: diagnose and plan the educational process; organize the educational process in biology in secondary school; competently use visual teaching aids, educational and laboratory equipment in lessons, excursions; possess: the theoretical foundations of the methodology and technology of teaching biology to secondary school students; the algorithm of pedagogical activity focused on the results of educational work.
3	Systematics of plants	Basic	To know: the diversity of the plant world and the basic laws of its formation, structure, spatial distribution, structure, evolution, systematic groups of plants; the relationship of concepts: taxonomy,

			<p>evolution, phylogeny, systematics and floristics; taxonomic categories used in modern taxonomy; lower and higher plants as the main formations of modern vegetation cover; characteristics of specific plants, which embody the features of the structure of the group as an association of species and higher systematic categories; the volume of systematic groups, geographical distribution of plants, the place and role of plants in ecological systems; the practical significance of the properties of plants of various groups; be able to: distribute plants into groups, have a clear idea of the place in the system of certain plants; use in practice economically important properties of representatives of various groups of plants; to analyze the proposed plant objects based on knowledge of the anatomical, morphological and physiological characteristics of the plant organism, the principles of their systematic classification, as well as the dependence of their structure and functions on the conditions of existence; to be able to make dichotomous keys; to possess the skills of: determining plants belonging to systematically complex groups; microscopy, dissection, sketching, work with herbarium; distribution of plants by groups.</p>
	Flora of the world	Basic	<p>To know: the terminology of the discipline, the features of the flora of the world, RK and East Kazakhstan region, modern approaches to the analysis of flora, the principles of geobotanical and floristic zoning, the main systematic and ecological groups of plants, the features of the protection of the flora of the world, RK and the region in the reserve, national park, nature reserves; to be able to: apply knowledge in floristic research, make notes of flora and their analysis, to recognize rare and protected plant species of the Republic of Kazakhstan, in collections, in drawings, in nature; to analyze the proposed plant objects based on knowledge of the anatomical, morphological and physiological characteristics of the plant organism, the principles of their systematic classification, as well as the dependence of their structure and functions on the conditions of existence; to possess: methods of floristic research, techniques for describing plant communities, methods for determining the range of the species, knowledge and skills for professional handling of botanical objects.</p>
3	Human and animal physiology	Basic	<p>To know about: the subject and tasks of human and animal physiology, the history of its development; the features of the structure of an animal cell and its differences from a plant cell; theoretical and methodological foundations of physiology; physiology of excitable tissues; physiology of human analyzers; private physiology of the central nervous system; mechanisms and patterns of activity of vegetative functions of the body; be able to: conduct a bibliographic search for literary sources; conduct somatometry (anthropometry); determine short-term verbal and logical memory; determine mental performance; to determine the main physiometric indicators; to evaluate the physical development of a person; to apply the theoretical knowledge and practical skills in practical and research activities; to apply biological knowledge to explain the processes and phenomena of the vital activity of one's own</p>

			organism and other representatives of the animal kingdom, indicating their taxonomic group, anatomical, morphological and ecological features in different periods of evolution.
	Physiology of higher nervous activity	Basic	Possess a sufficient arsenal of the subject; know the mechanisms of the brain, the mechanisms of psychological processes; be able to apply biological knowledge to explain the processes and phenomena of the vital activity of one's own body and other representatives of the animal kingdom, indicating their taxonomic group, anatomical, morphological and environmental features.
3	Physical and Colloidal Chemistry	Basic	To know: the basic laws of chemical processes and the characteristics of the equilibrium state; the principles of thermodynamics and the basic equations of chemical thermodynamics; methods of thermodynamic description of chemical and phase equilibria in multicomponent systems; thermodynamics of electrolyte solutions and electrochemical systems; equations of formal kinetics and kinetics of complex reactions; on the fundamental concepts and laws of colloidal chemistry as a science of surface phenomena and dispersed systems; basic concepts and relations of thermodynamics of surface phenomena, surface tension and surface energy, adsorption, adhesion, cohesion, wetting, spreading, capillary condensation; mechanisms of processes of formation of the surface layer; structural and mechanical properties and rheological methods of research of dispersed systems; features of optical properties of dispersed systems, scattering, absorption of light, coloring of sols; be able to: determine the thermodynamic characteristics of chemical reactions and equilibrium concentrations of substances; to determine the direction of the process under the given initial conditions; to establish the boundaries of the stability regions of phases in single-component and binary systems; to determine the compositions of coexisting phases in binary heterogeneous systems; to make kinetic equations in differential and integral form for simple reactions; to carry out calculations using the basic relations of thermodynamics of surface phenomena and calculations of the main characteristics of dispersed systems; to calculate the energy parameters of adsorption; to predict the influence of various factors on surface tension and surface energy; to obtain and purify colloidal solutions; to determine the charge sign of colloidal particles; to predict the effect of dispersion on reactivity, equilibrium constant and phase transition temperature; to generalize and process experimental information in the form of laboratory reports; to possess: the skills of calculating the thermal effects of chemical reactions at a given temperature under conditions of constancy of pressure or volume; skills in calculating the equilibrium constants of chemical reactions at a given temperature; methods for calculating chemical equilibrium; methods for measuring surface tension, edge angle, adsorption and specific surface area, viscosity; possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes encountered in the educational process; use computational methods to solve various chemical tasks of an

			educational and scientific-laboratory nature; possess methods of safe use of chemical materials, taking into account their physical and chemical properties.
	Polymer Chemistry	Basic	To know: modern ideas about the structure and properties of high-molecular compounds used in the production of gunpowder, solid rocket fuel and polymer composite materials; theoretical foundations of the synthesis of polymers and their chemical transformations; basic physico-chemical processes occurring in the manufacture of polymer composite materials; standard methods for determining the properties of gunpowder, solid rocket fuels, polymer materials; be able to: to conduct research on the properties of polymer materials, gunpowders, solid rocket fuels according to standard methods; possess: experience in choosing a methodology for conducting complex tests of polymers, polymer composite materials and products based on them; possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process; use computational methods to solve various chemical tasks of an educational and scientific-laboratory nature; possess methods of safe use of chemical materials, taking into account their physical and chemical properties.
3	Modern methods of teaching biology	Professional	To know: modern methods and technologies of multicultural, differentiated and developmental education in the biology course; to be able to: use a variety of forms, techniques, methods and means of teaching biology within the framework of the updated education system of basic general education and secondary general education; to use standard, applied, modern pedagogical methods and technologies in accordance with the set goals and objectives when planning and conducting classes in high school and college; possess: forms and methods of teaching biology, including those beyond the scope of training sessions: project activities, laboratory experiments, field practice, desk processing, etc.; possess knowledge of regulatory and legal documents in the field of education, instructional documentation, skills and abilities to develop current educational and organizational documentation for the implementation of educational concepts of educational programs.
	Theory and technology of teaching biology	Professional	To know: the content of the State standard of general secondary education, school biology programs, taking into account updates, the content of biology textbooks; to be able to: use standard, applied, modern pedagogical methods and technologies in accordance with the set goals and objectives when planning and conducting classes in high school and college; to produce didactic material for biology lessons; to work independently with a book (textbook, determinant); schematically depict the object under study and provide it with appropriate signatures; conduct phenological observations in nature; possess the technology of teaching; apply their knowledge in practice; skills of setting up a laboratory experiment, methods of conducting practical work in nature, etc.; possess knowledge of regulatory and

			legal documents in the field of education, instructional documentation, skills and abilities to develop current educational and organizational documentation for the implementation of educational concepts of curricula.
4	Biochemistry	Basic	To know: the basic principles of the structural organization of the most important biological macromolecules – proteins, nucleic acids, carbohydrates, lipids; the functional role of proteins, nucleic acids, carbohydrates, lipids, hormones in the processes of vital activity; the specific properties and kinetic characteristics of enzymes, as well as the role of enzymes for biotechnology; the properties and role of DNA and RNA in the reproduction and transmission of genetic information information; the main ways and mechanisms of regulation of metabolism; theoretical and practical significance of biochemistry, the latest achievements in the field of biochemistry and prospects for their use in various fields of biotechnology, national economy, medicine, pharmacy; on the relationship of biological function and molecular structure of compounds; be able to: use the knowledge gained for the development of other biological disciplines, as well as to solve practical issues of biotechnology; conduct qualitative and quantitative analysis biological material; work with biochemical equipment equipment; apply theoretical knowledge in solving technological problems; possess: modern laboratory biochemical methods of studying biological molecules to solve practical issues of biotechnology; possess basic chemical laws, theories, patterns and chemical transformations to explain and use in real chemical processes occurring in the educational process; use computational methods to solve various chemical tasks of an educational and scientific laboratory nature; possess methods of safe use of chemical materials, taking into account their physical and chemical properties.
	Agrochemistry with the basics of soil science	Basic	To know: chemical composition of plants and peculiarities of their nutrition; agrochemical properties of various types of soils; chemical composition and properties of fertilizers; conditions for the effective use of fertilizers to obtain planned crop yields; modern methods for determining the need of crops for fertilizers; methods of chemical analyses of soils and plants; methods of mathematical and static processing of experimental data; be able to: conduct selection of soil and plant samples for analysis; conduct chemical analysis of soils, plants and fertilizers; to determine the need for fertilizers, the most effective terms and methods, technology of application and incorporation of fertilizers; to carry out soil and plant diagnostics; to possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes occurring in the educational process; to use computational methods to solve various chemical tasks of educational and scientific-laboratory nature.
4	Evolutionary teaching	Basic	To know: the subject, goals and objectives of the course; the emergence, development and modern problems of evolutionary theory; evolutionary concepts of J.B.Lamarck, Charles Darwin; speciation

			processes; ways of macroevolution (divergence, convergence, parallelism); methods of phylogenetic transformation of organs; to be able to: determine qualitative functional changes of organs; determine quantitative functional changes of organs; determine and describe the issues of human origin; determine the driving forces of anthropogenesis; apply biological knowledge to explain the processes and phenomena of the vital activity of one's own organism and other representatives of the animal kingdom, indicating their taxonomic group, anatomical, morphological and ecological features in different periods of evolution; possess the skills: application of the acquired knowledge in theoretical and practical activities.
	Anthropogenesis	Basic	To know: theoretical and methodological principles of the modern stage of development of the complex of biological sciences about man in their inseparable unity by social sciences; to be able to: apply the knowledge gained in the field of scientific research and professional activity; to apply biological knowledge to explain the processes and phenomena of the vital activity of one's own organism, indicating anatomical, morphological and ecological features in different periods of evolution; to possess: terminological apparatus of this discipline; methods of collecting and analyzing ethnological materials.
4	Modern methods of teaching chemistry	Professional	To know: methods and technologies of multicultural, differentiated and developing teaching in the chemistry course; to be able to: use a variety of forms, techniques, methods and means of teaching chemistry within the updated system of basic general education and secondary general education; to use standard, applied, modern pedagogical methods and technologies in accordance with the goals and objectives in planning and conducting classes in high school and college; possess: forms and methods of teaching chemistry, including those beyond the scope of training sessions: project activities, laboratory experiments, industrial chemical research, etc.; possess knowledge of regulatory and legal documents in the field of education, instructional documentation, skills and abilities to develop current educational and organizational documentation for the implementation of educational concepts of curricula.
	Theory and technology of teaching chemistry	Professional	To know: the requirements of the state standard of general education in terms of the subject area of chemistry for all levels of education at school; goals, objectives and content of chemistry of general education; content, structure and methodological apparatus of curricula and school textbooks in chemistry; methods and techniques of teaching chemistry; basic organizational forms of education in chemistry; be able to: plan pedagogical activity; analyze from a theoretical standpoint the methods of teaching chemistry school curricula and textbooks on chemistry, other teaching tools; optimally choose the method of teaching chemistry; prepare a lesson plan, organize and conduct various forms of chemistry education; conduct a demonstration experiment; use standard, applied, modern pedagogical

			methods and techniques in accordance with the set goals and objectives when planning and conducting classes in high school and college; possess knowledge of regulatory and legal documents in the field of education, educational and instructional documentation, skills and abilities to develop current educational and organizational documentation for the implementation of educational concepts of training programs.
4	Methods of solving problems in chemistry	Professional	Possess methodological techniques for solving problems of varying degrees of complexity in the main sections of chemistry; possess methodological techniques for solving Olympiad problems; be able to solve complex creative problems of a theoretical and applied nature; be able to solve problems using a computer and a personal computer; own computer programs for solving problems; own the methodology of using multimedia tools to teach students how to solve chemical problems; be able to create conditions and formalize solutions to problems and exercises of increased complexity; use standard, applied, modern pedagogical methods and technologies in accordance with the set goals and objectives when planning and conducting classes at secondary school and college; possess knowledge of regulatory and legal documents in the field of education, instructional documentation, skills and abilities to develop current educational and organizational documentation for the implementation of educational concepts of curricula.
	Methods of conducting a school chemical experiment	Professional	Know: the scheme of construction and methodology of conducting a chemical experiment at school; the technique and methodology of chemical experiment in the study of the main sections of chemistry; be able to: organize and conduct basic demonstration experiments and laboratory work; use standard, applied, modern pedagogical methods and technologies in accordance with the goals and objectives when planning and conducting classes in high school and college; possess: methodological techniques for conducting a school chemical experiment; possess knowledge of regulatory and legal documents in the field of education, educational and instructional documentation, skills and abilities to develop current educational and organizational documentation for the implementation of educational concepts of training programs for conducting chemical experiments.
4	Applied Chemistry	Professional	To know: the main technological processes of production of the most important chemical products in industrial and laboratory conditions, the main devices and devices of chemical technology, safety requirements, industrial sanitation and environmental standards of chemical products production; to be able to: solve typical tasks in applied chemistry, determine technologically and economically optimal conditions for technological processes; to make structural formulas of polymers; to design the main ways of polymer synthesis; demonstrate knowledge about the laws of chemical transformations in industrial production conditions, as well as about the structure, organization and technological design of the main chemical industries; possess: skills of synthesis, isolation and purification of chemicals in laboratory

			conditions, work with modern equipment for modeling technological processes by the main methods of obtaining polymers, skills of determining physical and mechanical properties and identification of polymers and composite materials; possess knowledge of applied chemistry.
	Introduction to chemical technology	Professional	To know: prospects of technical development of the enterprise; technical requirements for raw materials, materials, finished products; basic technical and design features of chemical production; methods of rational use of raw materials, energy and other types of resources; methods of intensification of chemical and technological special terminology; to be able to: evaluate the composition and properties of intermediate products in order to develop new technological processes that ensure the most complete use of them; analyze and justify the optimal parameters of technological processes; demonstrate knowledge about the laws of chemical transformations in industrial production conditions, as well as about the structure, organization and technological design of the main chemical industries; possess: skills in drawing up thermal and material balances of chemical apparatuses and installations; methods of kinetic analysis and modeling of chemical reactors.
4	Applied biology	Professional	To know: about the essence of applied biology; about the connection of biological knowledge and biological objects with human practical activity; biological features of agricultural crops and domestic animals, agricultural technology of cultivation of agricultural crops and promising varieties of cultivated plants, about the importance of seed banks, about breeding, feeding, growing agricultural animals, the role of the latest biological research in modern scientific knowledge about nature; about the use of biological objects in food production technology; about the relationship between biology and biotechnology; be able to: work with biological objects in laboratory and natural conditions; organize the process of using biological objects in food production; possess: basic methods of biological sciences (including field research); possess applied aspects of biology.
	Methods of organizing extracurricular work in chemistry and biology	Professional	To know: methods of designing educational routes; forms, methods and means of self-education - the main directions of innovative educational policy; be able to: design educational routes when organizing extracurricular work in chemistry and biology; select components of the educational environment for the implementation of innovative educational tasks through the implementation of extracurricular work in chemistry and biology; to use standard, applied, modern pedagogical methods and technologies in accordance with the set goals and objectives when planning and conducting classes in high school and college; to classify methods, forms and principles of teaching and upbringing of the modern educational process; to possess: skills of using forms, methods of organizing extracurricular work as an integral component of professional improvement of a teacher; skills of application of innovative forms, methods of organization of extracurricular work in chemistry and biology; possess knowledge of regulatory and

			legal documents in the field of education, educational and instructional documentation, skills and abilities to develop current educational and organizational documentation for the implementation of educational concepts of training programs.
4	Ecological and green chemistry	Professional	To know: the current state and trends in the development of ecological chemistry; patterns of interaction of living organisms and their aggregates with the environment, as well as factors affecting these processes; the ecological significance of soil chemical properties; the effect on living organisms of the movement and chemical composition of air masses; types of bioindicator plants used in environmental diagnostics; principles of "green chemistry" and its latest developments; be able to: conduct a screening analysis of the quality of the habitat; it is reasonable to choose a method and methodology for analyzing environmental objects and biological objects in accordance with the objectives of the study; to carry out a screening bioindication survey of the ecological state of biogeocenoses; to process the results of analytical measurements; to apply the principles of ecological and "green chemistry" when performing chemical experiments; to possess: the laws of the action of environmental factors to predict optimal ecological niches of plants; methods of sampling and conservation of biological material and environmental objects to determine the quality of the habitat; methods of recording analytical parameters during bioindication and chemical studies.
	Coordination chemistry	Professional	Know: general ideas about coordination chemistry, including coordination chemistry of rare earth elements and actinides, as well as general patterns in changing the chemical properties of the corresponding coordination compounds; be able to: isolate the main thing; make suggestions when setting up or rationalizing the corresponding experiment; use computational methods to solve various chemical tasks of an educational and scientific-laboratory nature; possess: terminology and techniques for conducting the simplest assessments and calculations, for example, using circular thermochemical cycles or ligand field theory; possess basic chemical laws, theories, patterns and chemical transformations for explanation and use in real chemical processes encountered in the educational process; possess methods of safe use of chemical materials taking into account their physical and chemical properties.
4	Chemical Technology	Professional	To know: the basic principles of the organization of chemical production, its hierarchical structure; methods for evaluating the effectiveness of the chemical-technological process and the entire production as a whole; general patterns of chemical transformations in industrial production conditions; structure, organization and technological design of the main chemical industries modern enterprises of the chemical profile of East Kazakhstan Region and the Republic of Kazakhstan; be able to: demonstrate knowledge about the laws of chemical transformations in industrial production conditions, as well as

			about the structure, organization and technological design of the main chemical industries; calculate the main characteristics of the chemical process, choose a rational scheme for the production of a given product; evaluate the technological efficiency of production; generalize and process experimental information; possess: methods of analyzing the efficiency of chemical production; calculation skills and determination of technological indicators of the process.
	Nanotechnology in Chemistry	Professional	To know: definition and classification of nanoparticles, concepts of nanomaterials, their special physical and chemical properties; basic methods of synthesis and analysis of nanomaterials; existing and promising applications of nanotechnology and nanomaterials; harmful effects of nanomaterials on the environment, human health and safety, as well as ways to prevent them; to be able to: analyze and evaluate various methods of synthesis to propose methods for the analysis of nanomaterials depending on their nature; to propose possible applications of various nanomaterials; demonstrate knowledge about the laws of chemical transformations in industrial production conditions, as well as about the structure, organization and technological design of the main chemical industries; possess: skills of searching for sources of information about new achievements in nanochemistry and nanotechnology.

3. List of modules included in the educational program

This modular educational program consists of 240 credits. Below is a list of modules.

Table 3. List of modules included in the educational program

Module No.	Name of the module	List of disciplines included in the module	Block	Semester	number of credits	Form of control	Total credits by module	
M.1	The modern history of Kazakhstan	The modern history of Kazakhstan	MC GE	1	5	FSA	5	
M.2	Language and communication	Kazakh (Russian) language	MC GE	1,2	10	exam	20	
		Foreign language	MC GE	1,2	10	exam		
M.3	Pedagogy and psychology in human development	Pedagogy	UC BD	1	5	exam	10	
		Educational practice (Introduction to pedagogical activity)	UC BD	2	1	Diff. credit		
		Psychology and human development	UC BD	1	4	exam		
M.4	Socio-political, economic-legal, economic-natural knowledge and philosophy	Philosophy	MC GE	3	5	exam	18	
		<u>Social and political knowledge module</u>		MC GE	1	8		exam
		Sociology	2					exam
		Political science	1					exam
		Cultural studies	2					exam
		Psychology						
<u>Module of economic and legal knowledge</u>	<u>Module of economic and natural knowledge</u>	UC OOD	2	3	exam			
Basics of a Market Economy and Entrepreneurship	Basics of a Market Economy and Entrepreneurship							

		Fundamentals of law and anti-corruption	Basics of life safely and ecology		2	2	exam	
M.5	Information and communication technologies	Information and communication technologies (in English language)		MC GE	2	5	exam	5
M.6	Физическая культура	Physical culture		MC GE	1,2,3,4	8	Diff. credit	8
M.7	Developmental physiology and school hygiene	Developmental physiology and school hygiene		UC BD	2	3	exam	3
M.8	Cells, tissues and non-cellular structures, their use	Cytology and Histology / Cell and tissue biology		EC BD	3	3	exam	17
		General and Molecular Genetics / Genetics with the basics of breeding		EC BD	3	4	exam	
		Microbiology and Virology / Soil Microbiology		EC BD	3	5	exam	
		Cell Biotechnology / Introduction to biotechnology		EC BD	4	5	exam	
M.9	Chemistry and chemical analysis	General and Inorganic Chemistry / Chemistry of the elements of the periodic system		EC BD	3	5	exam	10
		Analytical chemistry / Physico-chemical methods of analysis		EC BD	4	5	exam	
M.10	Education	Management in education		UC BD	3	3	exam	13
		Theory and methods of educational work		UC BD	3	3	exam	
		Inclusive Education		UC BD	4	3	exam	
		Psychological and pedagogical practice		UC BD	4	2	Diff. credit	
		Teaching and educational pedagogical practice		UC BD	5	2	Diff. credit	
M.11	Structure, physiology and chemistry of plants	Educational and field practice (botany)		UC BD	4	1	Diff. credit	11
		Anatomy and morphology of plants / Botany		EC BD	4	5	exam	
		Plant Physiology / Phytochemistry		EC BD	5	5	exam	
M.12	Animal World	Educational and field practice (zoology)		UC BD	4	1	Diff. credit	15
		Zoology of invertebrates and vertebrates / Fauna of the world		EC BD	4	6	exam	
		Human Anatomy / Morphology of human internal organs		EC BD	5	4	exam	

		Human and animal physiology / Physiology of higher nervous activity	EC BD	6	4	exam	
M.13	Professional languages	Professional Kazakh (Russian) language	UC BD	5	3	exam	6
		Professionally-oriented foreign language	UC BD	6	3	exam	
M.14	Methods of teaching biology and applied biology	Methodology of teaching biology	UC PD	5	6	exam	16
		Modern methods of teaching biology / Theory and technology of teaching biology	EC PD	6	5	exam	
		Applied biology / Methods of organizing extracurricular work in chemistry and biology	EC PD	7	5	exam	
M.15	Indoor and garden plant growing	Educational practice (the organization of the school decorative and teaching and experimental site)	UC BD	6	1	Diff. credit	6
		Room and Garden Floriculture / Ornamental gardening with the basics of landscape design	EC PD	5	5	exam	
M.16	Organic Chemistry	Organic Chemistry / Chemistry of high-molecular compounds	EC BD	5	5	exam	15
		Physical and Colloidal Chemistry / Polymer Chemistry	EC BD	6	5	exam	
		Biochemistry / Agrochemistry with the basics of soil science	EC BD	7	5	exam	
M.17	Flora and evolution of living organisms	Educational and field practice (plant systematics)	UC BD	6	1	Diff. credit	11
		Systematics of plants / Flora of the world	EC BD	6	5	exam	
		Evolutionary teaching / Anthropologenesis	EC BD	7	5	exam	
M.18	Methods of teaching chemistry	Methods of teaching chemistry	UC PD	6	6	exam	21
		Modern methods of teaching chemistry / Theory and technology of teaching chemistry	EC PD	7	5	exam	
		Methods of solving problems in chemistry / Methods of conducting a school chemical experiment	EC PD	7	5	exam	
		Production-based practice	UC PD	8	5	Diff. credit	
M.19	Applied Chemistry	Applied Chemistry / Introduction to chemical technology	EC PD	7	5	exam	16
		Ecological and green chemistry / Coordination chemistry	EC PD	8	6	exam	
		Chemical Technology / Nanotechnology in Chemistry	EC PD	8	5	exam	

M.20	Predegree practice	Predegree practice	UC PD	8	2	Diff. credit	2
M.21	Final state certification	Writing and defending a diploma thesis (project) or preparing and passing a comprehensive exam	ATT	8	12		12