CATALOG OF ELECTIVE DISCIPLINES

6B01 - Pedagogical sciences
(Code and classification of the field of education)

6B015 - Teacher training in natural science subjects
(Code and classification of the direction of training)

0114
(Code in the International Standard Classification of Education)

B012 - Chemistry teacher training
(Code and classification of the educational program group)

6B01509 - Chemistry-Biology
(Code and name of the educational program)

Bachelor
(Level of preparation)

set of 2023

Semey 2023

Developed
By the Academic Committee of the EP
The head of the AC Mukayev Zh
EP Manager Ontagarova D

Reviewed
At the meeting of the Quality Assurance Commission of the
Natural-mathematical faculty
Recommended for approval by the Academic Council of the University
Record № 4/1, april 4, 2023 y.
Chairman of the Commission on Quality Assurance Zheldybayeva B.S.

Approved
at a meeting of the Academic Council of the University
Minutes No.5 april 21, 2023
Chairman of the Academic Council Oralkanova I.A.

General and Inorganic Chemistry

Discipline cycle	Basic disciplines
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline

This course examines the theoretical foundations of chemistry, atomic and molecular science, the electronic structure of the atom; periodic law; chemical bond, main classes of inorganic compounds, fundamentals of chemical kinetics, properties of chemical elements. When studying the course, students develop systemic knowledge about the structure and properties of inorganic substances, the mechanisms of chemical reactions and the development of inorganic chemistry.

Purpose of studying of the discipline

To master the theoretical foundations of general and inorganic chemistry.

Learning Outcomes

ON 5 To link educational material on all issues of the school and university program of chemical and biological disciplines for everyday professional activities and continuing education in the masters program.

ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.

Learning outcomes by discipline

- *Discuss the theoretical foundations of general and inorganic chemistry and their applied aspects.*
- *Formulate the basic regularities and laws of chemistry, features of the chemical composition of inorganic compounds.*
- *Solve computational and experimental problems in general and inorganic chemistry.*
- *Conduct laboratory work and simple experiments.*
- *Explain the stability of substances and the direction of processes, the mechanisms of chemical reactions.*
- *Describe the characteristics of elements and their compounds.*
- *Compare methods of obtaining, physical and chemical properties of substances.*

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Chemistry of the metals and nonmetals

Discipline cycle	Basic disciplines
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline

This discipline provides an in-depth presentation of individual sections of chemistry, highlighting the properties of metals and non-metals, and their compounds, new classes of chemical compounds that have a complex of very valuable physical and chemical properties. When studying the course, students develop in-depth knowledge of the theoretical provisions of general, inorganic chemistry relating to the chemistry of metals and non-metals.

Purpose of studying of the discipline

To get acquainted with the chemical classification of elements, the properties of chemical elements and their compounds.

Learning Outcomes

ON 5 To link educational material on all issues of the school and university program of chemical and biological disciplines for everyday professional activities and continuing education in the masters program.

ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.

Learning outcomes by discipline

- *Link the presentation of individual sections of chemistry, highlighting the properties of metals and non-metals, and their compounds.*
- *Describe a complex of very valuable physical and chemical properties of new classes of chemical compounds of metals and nonmetals.*
- *Solve computational and experimental problems in the chemistry of elements.*
- *Conduct laboratory work and simple experiments.*
- *Explain the stability of substances and the direction of processes, the mechanisms of chemical reactions.*
- *Describe the characteristics of elements and their compounds.*
- *Compare methods of obtaining, physical and chemical properties of substances.*

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Chemistry of heavy metals

Discipline cycle	Basic disciplines
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline

This discipline provides for the study of the concept of heavy metals, their properties and classification, migration and their content in the main objects of the environment. When studying the course, students form systematic knowledge about heavy metals, about natural and

man-made sources of their receipt, about the factors and mechanisms of accumulation of heavy metals in environmental objects.

Purpose of studying of the discipline

To get acquainted with the chemical classification of elements, the properties of chemical elements and their compounds.

Learning Outcomes

ON 5 To link educational material on all issues of the school and university program of chemical and biological disciplines for everyday professional activities and continuing education in the masters program.
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.

Learning outcomes by discipline

- *Link the presentation of individual sections of chemistry, highlighting the properties of metals and non-metals, and their compounds.*
- *Describe a complex of very valuable physical and chemical properties of new classes of chemical compounds of metals and nonmetals.*
- *Solve computational and experimental problems in the chemistry of elements.*
- *Conduct laboratory work and simple experiments.*
- *Explain the stability of substances and the direction of processes, the mechanisms of chemical reactions.*
- *Describe the characteristics of elements and their compounds.*
- *Compare methods of obtaining, physical and chemical properties of substances.*

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Mathematics in natural history

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

Students have the necessary knowledge in selected areas of mathematics. In the process of studying the discipline, students consider the main issues of probability theory and mathematical statistics, mathematical analysis and graph theory. Students apply mathematical knowledge in drawing up an equation with one and two unknowns, rounding numbers, differential calculus of functions of one and two variables in the calculations of the quantitative determination of a substance.

Purpose of studying of the discipline

To acquaint with the basics of elements of higher and linear algebra, differential and integral calculus, probability theory and mathematical statistics

Learning Outcomes

ON8 Present the results of experimental research work in the form of a report, scientific report, message, conclusions.
ON9 To integrate the main provisions, concepts and laws in the field of chemistry and related natural science disciplines in the explanation of theoretical and practical tasks.
ON10 Use natural science terms for professional purposes.

Learning outcomes by discipline

- apply knowledge of sections of mathematics in the calculations of the quantitative determination of a substance;
- design mathematical models of chemical processes;
- to carry out physical and chemical calculations of the results of the study and their quantitative assessment;

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Mathematical statistics in chemistry

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

The course discusses the methods of factorial planning of the experiment to find the optimal conditions for the analysis. Students acquire skills in drawing up plans for various types of experiments, mastering ways to process the results of analysis and make decisions. The course provides for the right to choose the ways of conducting the experiment and data processing, compiling mathematical models of the study.

Purpose of studying of the discipline

Familiarize yourself with the basic methods of mathematical statistics in chemistry.

Learning Outcomes

ON8 Present the results of experimental research work in the form of a report, scientific report, message, conclusions.
ON9 To integrate the main provisions, concepts and laws in the field of chemistry and related natural science disciplines in the explanation of theoretical and practical tasks.
ON10 Use natural science terms for professional purposes.

Learning outcomes by discipline

- *apply mathematical methods in solving typical professional problems;*
- *plan the process of mathematical processing of experimental data;*
- *to carry out practical calculations according to the available experimental data using statistical tables;*

Prerequisites
School course
Postrequisites
Basic and profile disciplines of the EP

Mathematical modeling of the experiment

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course deals with the use of chemometric procedures in the analysis of experimental data in various fields of chemistry.
When studying chemometrics, students use the methods and tools of chemometrics to solve problems of chemical analysis, to delve deeper into the terminology used in the processing of chemical information. Also, students use modern software tools for processing experimental information (Microsoft Office Excel, OpenOffice. org Calc).
Purpose of studying of the discipline
To study the issues of using a multidimensional approach based on formal logic when planning an experiment and analyzing its results.
Learning Outcomes
ON8 Present the results of experimental research work in the form of a report, scientific report, message, conclusions.
ON9 To integrate the main provisions, concepts and laws in the field of chemistry and related natural science disciplines in the explanation of theoretical and practical tasks.
ON10 Use natural science terms for professional purposes.
Learning outcomes by discipline
- Demonstrate a theoretical and practical understanding of the chemometric concept for the interpretation of complex (chemical) data and processes.
- design and evaluate (chemical) experiments in which many variables influence the outcome.
- master typical multidimensional applications in science and industry, such as quantitative relations of structure and properties, multidimensional calibration, multidimensional classification, as well as monitoring and control of production and other processes.
Prerequisites
School course
Postrequisites
Basic and profile disciplines of the EP

Qualitative and quantitative analysis

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course examines the system of qualitative analysis of cations and anions and the quantitative composition of substances. Qualitative and quantitative analysis contributes to the development of a scientific approach to the study of chemical phenomena, helps to develop the ability to consider chemical phenomena in their interaction and connection.
Purpose of studying of the discipline
The study of the main sections of analytical chemistry.
Learning Outcomes
ON 5 To link educational material on all issues of the school and university program of chemical and biological disciplines for everyday professional activities and continuing education in the masters program.
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
Learning outcomes by discipline
- *determine the qualitative and quantitative composition of chemical substances;*
- *classify anions and cations by groups;*
- *put into practice knowledge about the determination of the quality and columnical composition of the substance;*

Prerequisites
General and Inorganic Chemistry
Postrequisites
Basic and profile disciplines of the EP

Methods for extraction and purification of the substances

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
This discipline considers methods for isolating and purifying substances. Such methods of separation of a mixture of substances as filtration, centrifugation, precipitation, decantation, distillation, recrystallization, sublimation and sublimation, extraction, chromatography are considered. The method of electrophoresis is based on the difference in the speed of movement of particles in an electric field. When studying this course, students learn to use theoretical and practical knowledge on the methods of isolation and purification of substances for everyday professional activities and continuing education in the magistracy.

Purpose of studying of the discipline
The assimilation of knowledge in the field of physical methods in chemical research.
Learning Outcomes
ON 5 To link educational material on all issues of the school and university program of chemical and biological disciplines for everyday professional activities and continuing education in the masters program.
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
Learning outcomes by discipline
- *Describe the methods for the selection and purification of substances*
- *Choose the necessary method when cleaning pollutants in the environment*
- *Compare the effectiveness of the selected method of purification of substances*

Prerequisites
General and Inorganic Chemistry
Postrequisites
Basic and profile disciplines of the EP

Methods of chromatographic analysis

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
This discipline examines the basics of chromatographic analysis, principles, their types, such as gas-liquid, liquid-liquid, thin-layer and paper chromatography, as well as physical methods in chemical research. When studying the course, students systematize knowledge about the use of the basic laws and concepts of chemical disciplines in solving experimental, computational and other tasks of increased complexity for professional purposes. Master the methodology of conducting types of chromatographic analysis
Purpose of studying of the discipline
The study of the main methods of chromatographic analysis
Learning Outcomes
ON 5 To link educational material on all issues of the school and university program of chemical and biological disciplines for everyday professional activities and continuing education in the masters program.
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
Learning outcomes by discipline
- *describe the main methods of chromatographic analysis;*
- *put in practice methods of chromatographic analysis;*
- *compare the effectiveness of chromatographic analysis methods in practice*

Prerequisites
General and Inorganic Chemistry
Postrequisites
Basic and profile disciplines of the EP

Anatomy and Morphology of Plants

Discipline cycle	Basic disciplines
Course	1
Credits count	3
Knowledge control form	Examination

Short description of discipline
This subject introduces students to the diversity of the plant world, studies the anatomical and morphological features of the structure of plants, explains the differences and similarities in the structure of lower and higher plants and their deep interdependence on the environment. Based on modern scientific research on the macro- and microscopic structure of plants, the course, taking into account structural features, reveals the features of the structure of each organ from the point of view of ontophylogenesis.
Purpose of studying of the discipline
show the subject and objectives of the discipline, its position in the system of biological knowledge, familiarization with the diversity of the plant world, study of the structural features and reproduction of plants.
Learning Outcomes
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.
Learning outcomes by discipline
Broadcasts educational information, teaches you how to get knowledge yourself
ON10 - Use theoretical and practical knowledge of biological disciplines for everyday professional activities and continuing education in the magistracy.
Prerequisites
School course
Postrequisites
Basic and profile disciplines of the EP

Taxonomy of higher plants

Discipline cycle	Basic disciplines
Course	1
Credits count	3
Knowledge control form	Examination

Short description of discipline
This discipline studies the classification of species of higher plants belonging to the section rhinophytes, lycopods, psilotoids, horsetails, gymnosperms and angiosperms, depending on the anatomical and morphological features of the structure, reproduction features. It also introduces the taxonomy and detailed characteristics of plants belonging to the class of liverworts of mosses, the class of monocots and the class of dicots.

Purpose of studying of the discipline
To form students` ideas about the variety of plants, their classification, phylogenia, possible ways of evolution, diversity and systematics.

Learning Outcomes
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.

Learning outcomes by discipline
- conduct a full morphological description of the highest plants, taking into account the specifics of the structural organization of representatives of different departments;
- determine the taxonomic position of the highest plants based on the analysis of their anatomical and morphological features;
- make a full description of the main departments of the highest plants, state modern views on the evolution and phylony of the main systematic groups;

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Evolutionary adaptation of plants

Discipline cycle	Basic disciplines
Course	1
Credits count	3
Knowledge control form	Examination

Short description of discipline
This discipline studies the origin, adaptation, evolutionary development of primary aquatic plants, and plants in general, plants of the first land origin, roots, stems, leaves, flowers, seeds. In the course of studying the discipline, students will get acquainted with the structure of algae of aquatic plants, the features of the process of their reproduction, and also establish the dependence of various methods of reproduction of plant seeds on gradual adaptation and understand the cause-and-effect relationships of natural phenomena.

Purpose of studying of the discipline
Formation of dialectical-materialistic views of students, increasing the ability to biological thinking, explaining the cause-and-effect relationships of natural phenomena.

Learning Outcomes
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.

Learning outcomes by discipline
- Understands the origin of species as a result of evolution, the history of their evolutionary development, the basic principles of population and evolutionary genetics.
- Uses various methods of evolutionary biology to explain a certain evolutionary factor; determines the systematic position of species.
- Explains the main theories and methods of evolutionary biology, Apply these principles to solve evolutionary problems that the student will encounter in their field of study: cell and molecular biology, genetics, physiology, ecology.

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Organic chemistry

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course examines the main classes of organic substances, mutual transformations between them, the main types of mechanisms of organic reactions and methods for their establishment. The course is aimed at developing students` systemic knowledge about the properties, structure and chemical behavior and modern ideas about the nature of the chemical bond of organic compounds.

Purpose of studying of the discipline
The study of the structure and chemical properties of the main types of organic compounds, the most important areas practical use of organic compounds.

Learning Outcomes

ON 5 To link educational material on all issues of the school and university program of chemical and biological disciplines for everyday professional activities and continuing education in the masters program.
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.

Learning outcomes by discipline

- *demonstrate fundamental knowledge of the laws and theory of classical and modern organic chemistry;*
- *describe the mechanisms of a chemical reaction;*
- *conduct chemical experiments to study the physical and chemical properties, identify the most important classes of organic compounds in compliance with the safety of the experiment.*

Prerequisites

General and Inorganic Chemistry

Postrequisites

Basic and profile disciplines of the EP

Chemistry of Organoelement compounds

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

In this discipline, students get acquainted with the physical and chemical properties and applied aspects of organoelement compounds. In the process of studying the discipline, students discuss the structural features of organoelement compounds, consider the mechanisms and conditions for reactions and methods of synthesis, which are of practical value to organoelement compounds.

Purpose of studying of the discipline

Study of the electronic structure, properties, mechanism of reactions of organoelement compounds

Learning Outcomes

ON 5 To link educational material on all issues of the school and university program of chemical and biological disciplines for everyday professional activities and continuing education in the masters program.
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.

Learning outcomes by discipline

- *demonstrate theoretical material on the chemistry of organoelement compounds;*
- *to establish a connection with related sciences in explaining the nature of the chemical bond of organoelement compounds and the mutual influence of atoms in a molecule;*
- *describe the mechanisms of a chemical reaction involving organoelement compounds.*

Prerequisites

General and Inorganic Chemistry

Postrequisites

Basic and profile disciplines of the EP

Chemistry of natural compounds

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

This course covers the basic chemistry of carbohydrates, lipids, porphyrins, vitamins and antibiotics, which are the main components of living cells, methods for their synthesis and analysis
In the course of studying the discipline, students develop knowledge and skills that allow planning the synthesis of different classes of natural compounds and predicting their possible biological activity.

Purpose of studying of the discipline

Study of the chemical structure, chemical transformations and biological functions of natural organic compounds

Learning Outcomes

ON 5 To link educational material on all issues of the school and university program of chemical and biological disciplines for everyday professional activities and continuing education in the masters program.
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.

Learning outcomes by discipline

formulate the basic concepts of natural organic compounds, their classification and special physical and chemical properties;
- characterize the main biological functions and methods for the synthesis of natural organic compounds;
- discuss existing and prospective areas of application of natural organic compounds.

Prerequisites

General and Inorganic Chemistry

Postrequisites

Basic and profile disciplines of the EP

Chemical ecology

Discipline cycle	Profiling discipline

Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course is aimed at acquiring knowledge about the basic principles of environmental chemistry and their operation on a local and global scale. During the study of the discipline, students discuss and predict the consequences of the impact of pollution on the environment, use knowledge in the field of physics, chemistry, earth sciences and biology to scientifically substantiate the processes occurring in the environment.

Purpose of studying of the discipline
To study the basics of chemical ecology in terms of chemical pollution of the atmosphere, hydrosphere, lithosphere and biosphere

Learning Outcomes
ON8 Present the results of experimental research work in the form of a report, scientific report, message, conclusions.
ON9 To integrate the main provisions, concepts and laws in the field of chemistry and related natural science disciplines in the explanation of theoretical and practical tasks.
ON10 Use natural science terms for professional purposes.

Learning outcomes by discipline
- *discuss the role of the development of natural science knowledge in solving the problems of modern society;*
- *predict and explain possible ways of migration and transformation of chemical compounds in environmental objects and their impact on ecosystems;*
- *evaluate anthropogenic changes in environmental objects.*

Prerequisites
General and Inorganic Chemistry

Postrequisites
Basic and profile disciplines of the EP

Agrochemistry

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course examines the subject and methods of agrochemistry, agrochemical properties of soils, processes of formation, transformation of soil organic matter, types of mineral and organic fertilizers, chemical plant protection products. When studying the course, students develop systemic knowledge about the basics of agrochemical analysis of soils, fertilizers, plants, pesticides; on the compilation and use of a cartogram for the reasonable use of fertilizers.

Purpose of studying of the discipline
To master the theoretical foundations of agricultural chemistry.

Learning Outcomes
ON8 Present the results of experimental research work in the form of a report, scientific report, message, conclusions.
ON9 To integrate the main provisions, concepts and laws in the field of chemistry and related natural science disciplines in the explanation of theoretical and practical tasks.
ON10 Use natural science terms for professional purposes.

Learning outcomes by discipline
- *Discuss the theoretical foundations of agricultural chemistry and its applied aspects.*
- *Formulate the main regularities of the processes of formation, transformation of soil organic matter, its chemical composition.*
- *Solve computational and experimental problems on the rationing of fertilizers.*
- *Conduct laboratory work and simple experiments.*
- *Explain the rational use of fertile soils, the reclamation of disturbed soil cover.*
- *Describe the agrochemical properties of soils.*
- *Classify chemical plant protection products against pests, diseases, weeds of agricultural plants.*

Prerequisites
General and Inorganic Chemistry

Postrequisites
Basic and profile disciplines of the EP

Soil chemistry

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
This discipline studies the chemical composition and structure of soils, the course of chemical reactions in the soil, which in turn depend on the mineral composition, organic substances, and environmental factors. Students` knowledge of how to study the chemical composition of soil in the environment is of paramount importance in predicting the fate of pollutants.

Purpose of studying of the discipline
Acquaintance of students with the peculiarities of the chemical properties of soils in solving the problems of soil science, agricultural chemistry, land reclamation.

Learning Outcomes
ON8 Present the results of experimental research work in the form of a report, scientific report, message, conclusions.

ON9 To integrate the main provisions, concepts and laws in the field of chemistry and related natural science disciplines in the explanation of theoretical and practical tasks.
ON10 Use natural science terms for professional purposes.

Learning outcomes by discipline

- *describe the chemical composition and structure of soils, the course of chemical reactions in the soil*
- *analyze data on chemical soil sotava*
- *compare the chemical composition of different types of soils*

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Theory solution

Discipline cycle	Profiling discipline
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

This discipline considers the physical, chemical and thermodynamic theory of solutions. According to the physical theory of solutions, in the process of dissolution of substances there is no interaction between them, when considering the chemical theory, the process of dissolution of chemicals is observed, with the formation of compounds, accompanied by a thermal effect and a change in the volume of the system.

Purpose of studying of the discipline

Improving knowledge about the theory of solutions.

Learning Outcomes

ON 5 To link educational material on all issues of the school and university program of chemical and biological disciplines for everyday professional activities and continuing education in the masters program.
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.

Learning outcomes by discipline

- *Describe the theory of solutions;*
- *Compare chemical and thermodynamic theory of solutions;*
- *Analyze the processes and phenomena occurring during the processes of dissolution;*

Prerequisites

General and Inorganic Chemistry

Postrequisites

Basic and profile disciplines of the EP

Physical and colloidal chemistry

Discipline cycle	Profiling discipline
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

This discipline considers such sections as chemical thermodynamics, chemical kinetics, electrochemistry, catalysis, solutions of electrolytes and non-electrolytes, colloidal solutions, as well as general patterns of chemical phenomena based on physical laws and principles. This course is aimed at developing knowledge among specialist teachers of performing chemical laboratory operations, determining concentrations in solutions, the ability to determine the direction of processes, their speed.

Purpose of studying of the discipline

To study the main sections of physical and colloid chemistry.

Learning Outcomes

ON 5 To link educational material on all issues of the school and university program of chemical and biological disciplines for everyday professional activities and continuing education in the masters program.
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.

Learning outcomes by discipline

- *describe the basic laws of physical and colloidal chemistry*
- *compare the parameters and functions of the state of exos and endothermic processes*
- *analyze thermodynamic processes.*

Prerequisites

General and Inorganic Chemistry

Postrequisites

Basic and profile disciplines of the EP

Cinetical of chemistry

Discipline cycle	Profiling discipline
Course	3
Credits count	5

Knowledge control form	Examination

Short description of discipline
This discipline studies such sections as "Kinetics of heterogeneous processes", "Theoretical foundations of chemical kinetics", "Kinetics of special types of reactions: topochemical and catalytic reactions, non-isothermal, as well as chain and radiation-chemical reactions". The main goal of studying the discipline is to form students` modern ideas about the basics of chemical kinetics, as the science of the rate of chemical reactions.

Purpose of studying of the discipline
Study the basics of chemical kinetics.

Learning Outcomes
ON 5 To link educational material on all issues of the school and university program of chemical and biological disciplines for everyday professional activities and continuing education in the masters program.
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.

Learning outcomes by discipline
- *Find the speed of chemical reactions*
- *evaluate factors affecting the speed of chemical reactions*
- *put into practice knowledge about the kinetics of chemical reactions.*

Prerequisites
General and Inorganic Chemistry

Postrequisites
Basic and profile disciplines of the EP

Human anatomy

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
This discipline considers the formation of a scientific understanding of the features of the internal structure of the human body. During the course, students develop systematic knowledge about human morphology, the anatomy of individual organs and systems, as well as the relationship in the human body with the motor, digestive, respiratory, circulatory, endocrine, genitourinary, nervous systems and sensory organs. The course contributes to the development of anatomical and morphological knowledge of students.

Purpose of studying of the discipline
Students gain knowledge about the structure and functioning of the human body, the basic laws of growth and development of children and adolescents, morphology features.

Learning Outcomes
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.

Learning outcomes by discipline
- *Describe the patterns of the structure and topographical features of the human body*
- *explain the relationship of the structure of organs with the functions performed;*
- *explain the role of movement, digestion, respiration, blood composition, vascular system, endocrine glands, genitourinary, nervous system, sensory organs; use macro- and micro-preparations.*

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Anatomy, the basics of sports morphology

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
The course is aimed at forming students` systematic knowledge about the structure and functions of the human body, changes in the body as a whole under the influence of various physical activities or sports activities. This course focuses on the anatomy of muscles and the physiology of human activity based on sports activity. The acquired knowledge of the course teaches students practical use for maintaining a healthy lifestyle.

Purpose of studying of the discipline
Students gain knowledge about the structure and functioning of the human body, the basic laws of growth and development of children and adolescents, the features of sports morphology of athletes.

Learning Outcomes
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.

Learning outcomes by discipline
- *Describe the anatomical structure of the human body at different levels of organization.*

- *analyze and synthesize the studied material, highlight and reveal the cause-and-effect relationships of the formation of the human body.*
- *to determine on a living person the main anatomical formations – bone protrusions, gaps, the direction of the ligaments, the contours of the muscles, their place of origin and attachment, - projection of internal organs, vessels and peripheral nerves.*

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Comparative anatomy of humans and animals

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
This discipline considers the formation of a natural and scientific understanding of the structure of each organ of man and animals. While studying the course, students gain knowledge on the embryonic development of humans and animals, comparative morphology and anatomy of the skeleton, blood transport, respiration, digestion, genitourinary, nervous systems and sensory organs. Includes the study of general patterns of the structure and development of the organ system

Purpose of studying of the discipline
Students gain knowledge about the structure of organs, organ systems and organisms of animals and humans in general and in a comparative aspect.

Learning Outcomes
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.

Learning outcomes by discipline
- *Demonstrate knowledge about the human and animal body as an integral system.*
- *Explain the features of the respiratory, digestive, genitourinary, nervous and sensory systems of humans and animals.*
- *Conduct a comparative analysis of human and animal systems.*

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Vertebrate and Invertebrate Zoology

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
This discipline provides for the study of issues related to the main issues of the biological diversity of the animal world. When studying the course, students develop deep knowledge about the general patterns of development and origin of various groups of invertebrates and vertebrates, about the role of animals in the environment and human life, the principles of the structure of organs, systems.

Purpose of studying of the discipline
To acquaint with the morphofunctional, taxonomic and ecological diversity of invertebrates and vertebrates, their evolution and significance in human life.

Learning Outcomes
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.

Learning outcomes by discipline
- Describe the morphological and anatomical structure and functions of the organs of various groups of invertebrates and vertebrates; understand the levels of organization of life.
- Classify invertebrates and vertebrates from unicellular to chordates and explain the belonging of different species to different taxonomic ranks. Make temporary micropreparations, wet preparations, animal collections.
- Compare different types, classes of animals by habitat, by way of life, by type of food, by type of reproduction and by ecology

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Vertebrates of Kazakhstan

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
This discipline provides for the theoretical physiological conditions in the body and the interpretation of the life of the body. When studying the course, systematic knowledge is formed about the life of a living organism, individual systems, organs, tissues and cells, the influence on each other, the relationship and relationships with the external environment.
Purpose of studying of the discipline
Analysis of the problems and prospects for the protection of wildlife to solve the tasks of protection and rational use of resources of various ecosystems of Kazakhstan that are vital for the development of society.
Learning Outcomes
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.
Learning outcomes by discipline
- *Describe the main groups of vertebrates on the territory of Kazakhstan; list the species listed in the Red Book of Kazakhstan.*
- *Separate aquatic, amphibious and terrestrial vertebrates of Kazakhstan. To make wet preparations, carcasses and stuffed animals of Kazakhstan vertebrates.*
- *Assess the state of the ichthyofauna, herpetofauna, avifauna and theriofauna of Kazakhstan. Solve the problems of conservation of the biodiversity of vertebrates in Kazakhstan.*
Prerequisites
School course
Postrequisites
Basic and profile disciplines of the EP

Comparative anatomy of vertebrates

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
This discipline provides for the study of the general patterns of the structure and development of organs and organ systems by comparing them in different systematic groups of vertebrates. When studying the course, students have professional competencies about the history of the development of comparative anatomy of animals, about the systematics and classification of animals.
Purpose of studying of the discipline
contribute to the preparation of young specialists - zoologists for research work: memorization and reproduction of the studied material; development of zoological methods in practical and research work; the ability to analyze the studied material; correct assessment of the studied material.
Learning Outcomes
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.
Learning outcomes by discipline
- Broadcasts educational information, teaches you how to get knowledge yourself
- Use theoretical and practical knowledge of biological disciplines for everyday professional activities and continuing education in the magistracy.
Prerequisites
School course
Postrequisites
Basic and profile disciplines of the EP

Methodology of biology training

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course provides for the formation of students` knowledge about science in the process of teaching the subject of biology, studied in the school curriculum. The course is compiled in accordance with the updated requirements of education, new innovative technologies, group work of students. In the course of studying the course, students gain knowledge and experience to form professional competencies for the activities of a teacher.
Purpose of studying of the discipline
The purpose of teaching methods of biology as an academic discipline is the development of the major problems of education and training subjects of the biological cycle to school, to familiarize students with the organizational forms of educational process, methods and methodological techniques of biology lessons.
Learning Outcomes
ON2 Apply modern teaching technologies and criteria- based assessment, taking into account the individual, physiological and psychological characteristics of students.
ON3 Analyze and apply pedagogical and methodological norms and documents in the field of social, professional and scientific communications.
ON4 Apply educational resources and modern media and information technology in the educational process.

Learning outcomes by discipline
- selects the main methodological principles, forms and techniques of effective teaching of biology
- to develop lessons of the main types according to the sections of the course "Biology"
- actively uses methods, means of teaching and educating students in the pedagogical process
Prerequisites
Pedagogy
Postrequisites
Pedagogical practice

Scientific-methodical bases of teaching chemistry in small schools

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
Students get acquainted with the peculiarities of teaching chemistry in an ungraded school. This discipline is aimed at studying the principles, tasks and forms of teaching chemistry in rural schools, the scientific foundations of the content of the chemistry course, considers the modern structure and content of the chemistry textbook.
Purpose of studying of the discipline
Acquisition of knowledge of methods, forms and means of teaching chemistry, principles of teaching and principles of building school programs in an ungraded school, methods of controlling students` knowledge.
Learning Outcomes
ON2 Apply modern teaching technologies and criteria- based assessment, taking into account the individual, physiological and psychological characteristics of students.
ON3 Analyze and apply pedagogical and methodological norms and documents in the field of social, professional and scientific communications.
ON4 Apply educational resources and modern media and information technology in the educational process.
Learning outcomes by discipline
- *define and understand the goals and principles of training;*
- *be able to choose and use different styles, methods and techniques that ensure the achievement of the goal of the activity;*
- *organize vertical and horizontal relationships in interactions during training;*

Prerequisites
Pedagogy
Postrequisites
Pedagogical practice

Modern approaches to education

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course provides a methodological substantiation of teaching methods, their system, interconnection, which are the basis in modern educational approaches. Teaching methods are an integral part of the education system and a general didactic form of studying the subject.
The subject serves to provide information about the chosen educational strategy, for the possibility of choosing and analyzing teaching methods.
Purpose of studying of the discipline
Formation in the future specialist of the necessary level of knowledge about modern teaching methods, as well as skills and abilities to use knowledge in practical activities.
Learning Outcomes
ON2 Apply modern teaching technologies and criteria- based assessment, taking into account the individual, physiological and psychological characteristics of students.
ON3 Analyze and apply pedagogical and methodological norms and documents in the field of social, professional and scientific communications.
ON4 Apply educational resources and modern media and information technology in the educational process.
Learning outcomes by discipline
- *stages of constructing the pedagogical process: forecasting and design;*
- *to freely navigate the variety of modern technologies intended for teaching school-age children;*
- *Able to take into account the general patterns of mental development and the trajectory of the individual development of students, the features of the regulation of behavior and activities of schoolchildren*

Prerequisites
Pedagogy
Postrequisites
Pedagogical practice

Physiology of the central nervous system and higher nervous activity

Discipline cycle	Basic disciplines
Course	3
Credits count	5

Knowledge control form	Examination

Short description of discipline
This discipline provides for the theoretical physiological conditions in the body and the interpretation of the life of the body. When studying the course, systematic knowledge is formed about various forms of physiological activity of the higher nervous system, including higher psychological forms, about the integrating function of the central nervous system, conditioned reflexes, signaling system.

Purpose of studying of the discipline
The purpose of studying the discipline: To study the role of the central nervous system and higher nervous activity in ensuring the mental and mental activity of a person and his interaction with the environment.

Learning Outcomes
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.

Learning outcomes by discipline
- *Describe the physiology of the central nervous system, especially the cerebral cortex, which provides the conditioned reflex activity of the body; show the role of the nervous system in providing adaptive reactions of the organism;*
- *Make diagrams of reflex arcs of conditioned reflexes, systematize the types of higher nervous activity.;*
- *Analyze the neurophysiological mechanisms of human mental activity.*

Prerequisites
Human anatomy

Postrequisites
Basic and profile disciplines of the EP

Human and animal physiology

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
This discipline provides for the theoretical physiological conditions in the body and the interpretation of the life of the body. When studying the course, systematic knowledge is formed about the life of a living organism, individual systems, organs, tissues and cells, the influence on each other, the relationship and relationships with the external environment.

Purpose of studying of the discipline
To study the features of the vital activity of the human and animal organism in a changing environment and the mechanisms of neuro-humoral regulation

Learning Outcomes
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.

Learning outcomes by discipline
- *To consider the organism of man and animals as a single integral system;*
- *Explain the role of the mechanisms of neurohumoral regulation in the adaptation of the body to changing environmental conditions; features of the reflex activity of humans and animals;*
- *Analyze the integrative processes of the human cerebral cortex.*

- knows the morphological, physiological and functional features of the body, the principles of the organization of systems, differentiation, integration, regulatory mechanisms that ensure homeostasis in a living system, the structure and functions of organ systems of human and animal organisms, physiological properties and functions of cells and tissues, working with living objects in natural and laboratory conditions, methods of conducting research work on physiology with students;
- Is able to solve professional problems using theoretical and practical knowledge;
- mastering the system of subject knowledge, skills and abilities, taking into account the characteristics of the human body in the formation of a healthy lifestyle, age-related features of the development of the body of students, educational and work load during classes at school, to carry them out in further professional development.

Prerequisites
Human anatomy

Postrequisites
Basic and profile disciplines of the EP

The flora and fauna of the world

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course discusses the features of flora and fauna of various types of natural and artificial ecosystems, methods and techniques for zoning flora and fauna, habitats and biomes of the Earth. The subject reveals the mechanisms of biosphere stability, the main taxonomic groups of living organisms. During the course, students expand their knowledge about the flora and fauna of the planet, the environment and the factors that bind all its components into a single whole.

Purpose of studying of the discipline

Formation of dialectical-materialistic views of students, increasing the ability to biological thinking, explaining the cause-and-effect relationships of natural phenomena.

Learning Outcomes

ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.

ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.

Learning outcomes by discipline

- *Explain the diversity of biological objects, the importance of diversity in the stability of the biosphere;*
- *Apply methods of cultivation, classification, description, control of biological objects;*
- *Determine the taxonomy of representatives of regional flora and fauna, the causes of changes in the species composition of flora and fauna;*

Prerequisites

Human anatomy

Postrequisites

Basic and profile disciplines of the EP

Interdisciplinary communication school chemistry course

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

This course studies the theoretical aspects of interdisciplinary integration in modern science education, the essence and content of interdisciplinary integration. When studying the course, students develop systemic knowledge about the methodological methods for implementing interdisciplinary connections. The development of this discipline is a necessary basis for the formation of skills for researching the effectiveness of teaching chemistry on the basis of intersubject communications

Purpose of studying of the discipline

To study the theoretical aspects of interdisciplinary integration in modern science education.

Learning Outcomes

ON2 Apply modern teaching technologies and criteria-based assessment, taking into account the individual, physiological and psychological characteristics of students.

ON3 Analyze and apply pedagogical and methodological norms and documents in the field of social, professional and scientific communications.

ON4 Apply educational resources and modern media and information technology in the educational process.

Learning outcomes by discipline

- *To form the skills of researching the effectiveness of teaching chemistry on the basis of intersubject communications;*
- *Explain the essence and content of interdisciplinary integration;*
- *To master the diagnostics of the level of students` learning in teaching chemistry on the basis of interdisciplinary integration.*

Prerequisites

Methodology of chemistry training

Postrequisites

Pedagogical practice

Methods of conducting a school chemical experiment

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

This discipline provides for obtaining knowledge about the purpose of a chemical experiment, its varieties, the requirements for it; introduces recommendations for preparing for a chemical experiment, teaches how to make notes of chemical experiments; allows you to work out the technique of performing a chemical experiment on the main topics of the school chemistry course.

Purpose of studying of the discipline

Get knowledge about the purpose of a chemical experiment, its varieties, the requirements for it.

Learning Outcomes

ON2 Apply modern teaching technologies and criteria-based assessment, taking into account the individual, physiological and psychological characteristics of students.

ON3 Analyze and apply pedagogical and methodological norms and documents in the field of social, professional and scientific communications.

ON4 Apply educational resources and modern media and information technology in the educational process.

Learning outcomes by discipline

- *To form concepts about the types of chemical experiment according to their didactic purpose;*
- *Explain recommendations for preparing for a chemical experiment and compiling synopses of chemical experiments;*
- *Master the technique of performing a chemical experiment on the main topics of the school chemistry course.*

Prerequisites

Methodology of chemistry training

Postrequisites

Pedagogical practice

Elective courses of Chemistry in core grades

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course provides for obtaining knowledge about the organization of a fundamentally new form of education - elective courses, which should provide both preparation for choosing a profile in a basic school, and the process of profile education in high school.Concepts are formed about the types, tasks of elective courses, the requirements for them.When studying a course, students develop systemic knowledge about the principles of creating an educational and methodological complex of such courses.

Purpose of studying of the discipline
Get knowledge about the organization of a fundamentally new form of education - elective courses.

Learning Outcomes
ON2 Apply modern teaching technologies and criteria- based assessment, taking into account the individual, physiological and psychological characteristics of students.
ON3 Analyze and apply pedagogical and methodological norms and documents in the field of social, professional and scientific communications.
ON4 Apply educational resources and modern media and information technology in the educational process.

Learning outcomes by discipline
- *form concepts about the types, tasks of elective courses, the requirements for them;*
- *Explain the concepts of the types, tasks of elective courses, the requirements for them;*
- *Master the principles of creating an educational and methodological complex of such courses.*

Prerequisites
Methodology of chemistry training

Postrequisites
Pedagogical practice

The tasks of high complexity in chemistry

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
In the course of mastering the discipline, students get acquainted with the main types of problems, master the methodology for solving chemical problems of an increased level of complexity, the methodology for teaching students to solve problems of various types and levels of complexity. The study of this discipline allows you to equip students with knowledge, practical skills and abilities.

Purpose of studying of the discipline
To master modern teaching methods for solving quantitative and qualitative chemical problems of an increased level of complexity.

Learning Outcomes
ON2 Apply modern teaching technologies and criteria- based assessment, taking into account the individual, physiological and psychological characteristics of students.
ON3 Analyze and apply pedagogical and methodological norms and documents in the field of social, professional and scientific communications.
ON4 Apply educational resources and modern media and information technology in the educational process.

Learning outcomes by discipline
- *offer a methodology for teaching students to solve chemical problems of an increased level of complexity;*
- *control and evaluate the results of solving tasks in chemistry of an increased level of complexity;*
- *compose texts of tasks of various types and levels of complexity for use in the educational process.*

Prerequisites
Methodology of chemistry training

Postrequisites
Pedagogical practice

Methods of solving tasks of physical chemistry

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
In the course of studying the course, students perform tasks in the main sections of physical chemistry, electrochemistry, the kinetics of one-way, simple reactions and the kinetics of complex reactions. In the process of solving computational problems, students develop logical thinking, form the ability to find the relationship between various objects, phenomena, the ability to compare, analyze, generalize.

Purpose of studying of the discipline
Master the techniques and methods for solving specific problems from various areas of physical chemistry.

Learning Outcomes
ON2 Apply modern teaching technologies and criteria- based assessment, taking into account the individual, physiological and psychological characteristics of students.
ON3 Analyze and apply pedagogical and methodological norms and documents in the field of social, professional and scientific communications.

ON4 Apply educational resources and modern media and information technology in the educational process.

Learning outcomes by discipline

- *explain the solution of problems in thermochemistry and thermodynamic potentials of chemical processes, thermodynamics of solutions, phase and chemical equilibria;*
- *formulate the fundamental provisions and equations necessary for understanding and solving problems in chemical thermodynamics;*
- *draw up algorithms for solving problems in physical chemistry;*

Prerequisites

Methodology of chemistry training

Postrequisites

Pedagogical practice

Technique of the solution of tasks in chemistry

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

This course is aimed at applying the acquired knowledge of students to solve problems in grades 7-11 of the basic level and increased complexity of the school chemistry course. Methods for solving quantitative and experimental problems of varying complexity, methods and techniques for solving problems of the subject, problems of industrial and environmental content are considered.

Purpose of studying of the discipline

To teach students the methodology for solving computational problems in chemistry according to the secondary school program

Learning Outcomes

ON2 Apply modern teaching technologies and criteria- based assessment, taking into account the individual, physiological and psychological characteristics of students.

ON3 Analyze and apply pedagogical and methodological norms and documents in the field of social, professional and scientific communications.

ON4 Apply educational resources and modern media and information technology in the educational process.

Learning outcomes by discipline

- *analyze the content of chemistry textbooks accepted for use in the secondary education system of the Republic of Kazakhstan*
- *use interdisciplinary knowledge in solving problems*
- *explain the solution of problems of different types and levels by different methods*

Prerequisites

Methodology of chemistry training

Postrequisites

Pedagogical practice

Fuel Resources of Kazakhstan

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline

In this discipline, the types of fuels, their characteristics, solid fuel processing, complex use of solid fuel components in its high-temperature destructive processing, processing of oil and petroleum products, gaseous fuels are considered. When studying the course, students form systematic knowledge about the origin of various types of fuels, their composition, properties and applications, classification of gaseous fuels.

Purpose of studying of the discipline

To study the features of the fuel resources of the Republic of Kazakhstan.

Learning Outcomes

ON 5 To link educational material on all issues of the school and university program of chemical and biological disciplines for everyday professional activities and continuing education in the masters program.

ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.

Learning outcomes by discipline

- *Discuss fuel reserves and their role in the energy balance of the Republic of Kazakhstan.*
- *Describe the main characteristics of fuels: composition, energy characteristics, combustion temperature.*
- *Classify fuels.*

Prerequisites

Chemical ecology

Postrequisites

Undergraduate practice Productive (pedagogical) Practice

Chemical industry of Kazakhstan

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline

This discipline provides for the study of the current state of the chemical industry of the Republic of Kazakhstan, the prospects and trends of its development, the use of chemical industry products in the national economy. The development of this discipline is a necessary basis for the formation of processing substances and typical equipment; about the main branches of the chemical industry.

Purpose of studying of the discipline

To study the current state of the chemical industry of the Republic of Kazakhstan.

Learning Outcomes

ON 5 To link educational material on all issues of the school and university program of chemical and biological disciplines for everyday professional activities and continuing education in the masters program.
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.

Learning outcomes by discipline

- *Discuss the current state of the chemical industry of the Republic of Kazakhstan.*
- *Identify the features of the chemical industry as a branch of material production.*
- *Explain the development of the chemical industry in Kazakhstan.*

Prerequisites

General and Inorganic Chemistry

Postrequisites

Undergraduate practice Productive (pedagogical) Practice

Chemical technology

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline

This discipline deals with natural reserves, methods of extraction, preparation, transportation and complex processing of the most important types of chemical raw materials, theoretical foundations, technological processes of the main chemical industries. When studying the course, students develop systemic knowledge about general issues of chemical technology, the most important chemical industries, about the chemical processing of fuel, industrial organic synthesis.

Purpose of studying of the discipline

To study the general provisions and theoretical foundations of chemical technology.

Learning Outcomes

ON 5 To link educational material on all issues of the school and university program of chemical and biological disciplines for everyday professional activities and continuing education in the masters program.
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.

Learning outcomes by discipline

- *Determine the patterns of chemical transformations in industrial production.*
- *Describe the structure and composition of chemical industries.*
- *Operate methods of optimal organization of chemical- technological processes, taking into account environmental protection measures.*

Prerequisites

General and Inorganic Chemistry

Postrequisites

Undergraduate practice Productive (pedagogical) Practice

Analysis of natural objects

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline

This discipline provides for the study of environmental objects, research methods and elemental composition of natural objects; patterns of accumulation, distribution of chemical elements. The development of this discipline is a necessary basis for the formation about predicting the behavior of chemical pollutants under the influence of various natural factors and anthropogenic impacts.

Purpose of studying of the discipline

To study the basics of the analysis of natural objects in the conditions of chemical pollution of the biosphere, lithosphere, hydrosphere and atmosphere.

Learning Outcomes

ON8 Present the results of experimental research work in the form of a report, scientific report, message, conclusions.
ON9 To integrate the main provisions, concepts and laws in the field of chemistry and related natural science disciplines in the explanation of theoretical and practical tasks.
ON10 Use natural science terms for professional purposes.

Learning outcomes by discipline

- *Describe the main objects of the environment.*
- *Explain the main patterns of the processes of formation of pollutants in the objects of the surrounding area.*
- *Choose methods for analyzing soils, plants, water, air.*
- *Perform sampling of water, air, soil, plants.*
- *Conduct laboratory work and simple experiments.*
- *Analyze the qualitative and quantitative composition of environmental objects.*

- *Calculate analysis results using mathematical statistics methods.*

Prerequisites
General and Inorganic Chemistry Chemical ecology

Postrequisites
Undergraduate practice Productive (pedagogical) Practice

Methods of sampling and sample preparation, basics of biometrics

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
This discipline examines the basic methods of sampling and sample preparation, as well as the basics of biometrics. Biometrics makes it possible to calculate the average values and determine the degree of their reliability, reveal the degree of phenotypic and genotypic variability of individual traits, expressed mathematically, and establish the degree of experience reliability.

Purpose of studying of the discipline
To study the main modern methods of physical and chemical determination of air pollution, various methods of bioindication at the organismal, population, ecosystem levels.

Learning Outcomes
ON8 Present the results of experimental research work in the form of a report, scientific report, message, conclusions.
ON9 To integrate the main provisions, concepts and laws in the field of chemistry and related natural science disciplines in the explanation of theoretical and practical tasks.
ON10 Use natural science terms for professional purposes.

Learning outcomes by discipline
- *Describe the main methods of sampling and sample preparation*
- *Apply in practice the methods of mathematical statistics in the processing of research results*
- *Analyze the possibility of applying selection methods in the study of environmental objects*

Prerequisites
General and Inorganic Chemistry Chemical ecology

Postrequisites
Undergraduate practice Productive (pedagogical) Practice

Chemistry of the hydrosphere

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
This discipline considers the chemical composition of the water bodies of the globe. The chemical composition of rivers, such as the processes of organic matter in soils, various involvement in biological processes, etc. When studying the course, students develop knowledge about cleaning methods, as well as predicting the behavior of the main types of pollutants in water.

Purpose of studying of the discipline
To study the basic patterns and concepts of chemistry of the hydrosphere, methods of water research, methods of purification of water bodies;Modern data on the chemical and physicochemical properties of water, its composition.

Learning Outcomes
ON8 Present the results of experimental research work in the form of a report, scientific report, message, conclusions.
ON9 To integrate the main provisions, concepts and laws in the field of chemistry and related natural science disciplines in the explanation of theoretical and practical tasks.
ON10 Use natural science terms for professional purposes.

Learning outcomes by discipline
- *Describe the chemical composition of water bodies*
- *Assess the factors influencing water pollution*
- *Analyze the change in the chemical composition of water bodies using modern methods*

Prerequisites
General and Inorganic Chemistry Chemical ecology

Postrequisites
Undergraduate practice Productive (pedagogical) Practice

Genetics

Discipline cycle	Profiling discipline
Course	4
Credits count	6
Knowledge control form	Examination

Short description of discipline
Genetics is a basic discipline in the preparation of future biology teachers. During the development of this course, students study the basic laws of inheritance of traits and their variability, the cytological foundations of mono- and dihybrid crossing, the features of non-allelic interaction of genes. Students will get acquainted with the basic provisions of the chromosomal theory of heredity, studies the causes and consequences of mutational processes for the evolution of living organisms on the planet and the features of the concentration of traits in populations.

Purpose of studying of the discipline
Formation of students` knowledge system on the fundamental genetic foundations of the emergence and functioning of living organisms and biocenoses on Earth, their stability, variability and development in ontogeny and phylogeny.
Learning Outcomes
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.
Learning outcomes by discipline
- *explain the basic concepts of the material substrate of heredity and the mechanisms of variability, the main genetic phenomena, the laws of heredity and variability of living organisms, the role of heredity and the environment in the formation of the phenotype.*
- *analyze the types of inheritance of breeding traits, types of genetic variability arising under the influence of mutagenic factors and formulate conclusions based on calculated statistical indicators.*
- *solve problems in the main sections of genetics, making scientific conclusions and explaining the results obtained*
Prerequisites
Human anatomy
Postrequisites
Undergraduate practice

Population genetics

Discipline cycle	Profiling discipline
Course	4
Credits count	6
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at studying the genetic diversity of populations, the laws of heredity and variability in natural populations, the distribution of allele frequencies in populations under the influence of evolutionary factors. The purpose of population genetics is to determine genetic variations among different populations of the same species. Comparison of the genetic composition of different populations can give an idea of the importance of gene flow for maintaining the stability of populations of living organisms.
Purpose of studying of the discipline
Formation of basic knowledge of students about the mechanisms of heredity and variability in populations.
Learning Outcomes
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.
Learning outcomes by discipline
- Explain the basic concepts and theoretical positions of modern population and evolutionary genetics, the main methods used to study the genetic structure of a population and compare populations with each other, study the effects of factors of evolution at the genetic level, phylogenetic analysis.
- analyze population-genetic data, determine the locus of genes.
- apply the acquired knowledge to solve problems concerning the features of inheritance of traits in natural populations;
- analyze population-genetic data, determine the locus of genes.
- apply the acquired knowledge to solve problems concerning the features of inheritance of traits in natural populations
Prerequisites
Human anatomy
Postrequisites
Undergraduate practice

Methods of solving problems in genetic

Discipline cycle	Profiling discipline
Course	4
Credits count	6
Knowledge control form	Examination

Short description of discipline
The course discusses methods for solving problems in the main sections of genetics, features of analyzing crossing, interactions of non-allelic genes, patterns of cleavage in autosomal and sex-linked inheritance, the influence of the crossing mechanism in linked inheritance, methods for calculating and constructing genetic maps. In the course of mastering the course, students develop the skills of applying theoretical knowledge in practice.
Purpose of studying of the discipline
To acquaint students with the ways of solving problems according to the basic laws of heredity and variability, to master the methodology of solving complex Olympiad problems.
Learning Outcomes
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.
Learning outcomes by discipline
- *solve quantitative and qualitative problems in all sections of genetics;*
- *explain the main mechanisms of heredity and variability;*

- *apply knowledge of the basic provisions of the chromosomal theory of heredity in explaining the features of the splitting of traits in linked inheritance*

Prerequisites
Human anatomy

Postrequisites
Undergraduate practice Productive (pedagogical) Practice

Methods of organization of extracurricular work on the subject

Discipline cycle	Basic disciplines
Course	4
Credits count	3
Knowledge control form	Examination

Short description of discipline
This course covers the theoretical and methodological basis, content, methods, forms and types of extracurricular activities. During the study of the subject, future teachers learn the methods of organizing and conducting educational activities outside the classroom. Students are provided with practical knowledge and skills necessary for the organization of the educational process, independent and creative preparation for teaching, taking into account the national priorities of Kazakhstan and the educational potential of disciplines.

Purpose of studying of the discipline
Independent and creative preparation of students for extracurricular work in chemistry at school.

Learning Outcomes
ON2 Apply modern teaching technologies and criteria- based assessment, taking into account the individual, physiological and psychological characteristics of students.
ON3 Analyze and apply pedagogical and methodological norms and documents in the field of social, professional and scientific communications.
ON4 Apply educational resources and modern media and information technology in the educational process.

Learning outcomes by discipline
- *development of a plan for extracurricular work in chemistry;*
- *preparation of didactic tasks on topics;*
- *discussion of types of group, group, pair work*

Prerequisites
Pedagogy

Postrequisites
Undergraduate practice Productive (pedagogical) Practice

Organization and forms of independent work of pupils in chemistry

Discipline cycle	Basic disciplines
Course	4
Credits count	3
Knowledge control form	Examination

Short description of discipline
This course discusses the types, forms and methods of independent work of students in the study of chemistry. Students will master the practice of organizing and conducting independent work of students at different stages of the lesson, outside of school hours. Issues related to the criteria for evaluating independent work in a group and pair work are discussed.

Purpose of studying of the discipline
To master the types of independent work during practical and laboratory, extracurricular activities.

Learning Outcomes
ON2 Apply modern teaching technologies and criteria- based assessment, taking into account the individual, physiological and psychological characteristics of students.
ON3 Analyze and apply pedagogical and methodological norms and documents in the field of social, professional and scientific communications.
ON4 Apply educational resources and modern media and information technology in the educational process.

Learning outcomes by discipline
- *develop a thematic plan for independent work of students in chemistry;*
- *apply modern information systems and technologies, as well as technical training aids in the preparation of assignments;*
- *to carry out group and individual types of work on the implementation of independent work during classroom classes and out of class time*

Prerequisites
Pedagogy

Postrequisites
Undergraduate practice

Modern technologies in chemistry teaching

Discipline cycle	Basic disciplines
Course	4
Credits count	3
Knowledge control form	Examination

Short description of discipline
This discipline is aimed at mastering the necessary knowledge in the field of didactics, teaching technology and the features of their

application in the process of teaching chemistry, methods of monitoring and accounting for knowledge and skills of students. The study of the discipline also helps to support the professional development of trainee teachers, forming their research orientation towards practice and profession.

Purpose of studying of the discipline

To study modern educational technologies and features of their application in the process of teaching chemistry.

Learning Outcomes

ON2 Apply modern teaching technologies and criteria- based assessment, taking into account the individual, physiological and psychological characteristics of students.

ON3 Analyze and apply pedagogical and methodological norms and documents in the field of social, professional and scientific communications.

ON4 Apply educational resources and modern media and information technology in the educational process.

Learning outcomes by discipline

- *design elements of lessons using various technologies for teaching chemistry;*
- *use in the educational process a variety of resources, including the potential of other subjects (mathematics, biology, physics);*
- *demonstrate the ability to navigate the variety of technologies and learning models*

Prerequisites

Pedagogy

Postrequisites

Undergraduate practice

Plant Sistematic

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

This course is aimed at studying classical and modern methods of studying the vegetation cover, getting acquainted with the taxonomy of species characteristics of plants, distribution areas, the relationship of species, instilling in students theoretical knowledge of plant systematics, developing skills for independent work with plant objects. Considers the relationship of plants between themselves and the environment, determines the importance of plants and ways to protect them. In the process of studying the course, students will master the methods of studying plants in a natural phytocenosis.

Purpose of studying of the discipline

to contribute to the preparation of young specialists - botanists for research work: memorization and reproduction of the studied material; mastering botanical methods in practical and research work; the ability to analyze the studied material; correct assessment of the studied material

Learning Outcomes

ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.

ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.

Learning outcomes by discipline

- *explain the systematization of lower and higher plants, the diversity of flora, the patterns of its development and formation, the structure of phytocenoses and the spatial distribution of plant communities;*
- *to determine the main features of lower and higher plants and their types; compare all levels and main stages of the structure of life in the evolution of plants;*
- *Describe the distribution of plants on earth, methods of reproduction, ecology, significance;*
- *Discuss the biological patterns of flora development, natural relationships between groups of plants;*

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Modern aspects of cultivation of cells and tissues of the body

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

This discipline studies cell culture methods in experimental biology, the history of cell culture methods, conditions and achievements of cell culture, cell culture biology, features of the metabolism of cultured cells, the influence of the external environment on cultured cells, types of nutrient media for cell and tissue cultivation, composition, sources of cultured cells, ways to protect cultured cells from infection, suspensions of cells by cryopreservation methods.

Purpose of studying of the discipline

The formation of students` ability to cultivate cells and tissues of multicellular organisms.

Learning Outcomes

ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.

ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.

Learning outcomes by discipline
- *demonstrate knowledge about the features of the biology of various cells of man and animals in conditions of culture;The main trends in the development of scientific knowledge in the field of cell cultivation.*
- *analyze and summarize the results of scientific research in the field of cell cultivation*
- *issue and present the results of scientific research in the field of biology of cultivated cells.*

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Cytochemistry of the cell

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
This subject covers the areas of cytology, histology, embryology, general and organic chemistry. Increases the readiness and ability of students to use a number of biological research methods in research work, i.e. morphological, histochemical, morphometric, histological, cytochemical methods. The subject of cytochemistry considers the chemical nature of the cell structure, the distribution of intracellular chemical compounds, their transformation into functional bonds of the cell and its components.

Purpose of studying of the discipline
Expansion and deepening of students` knowledge in the field of cytochemical research methods. The study of the structural features and composition of cells using chemical methods.

Learning Outcomes
ON 6 Systematize theoretical material on fundamental disciplines in the independent search, analysis, and selection of the necessary information, its transformation, preservation, and transmission.
ON7 Demonstrate the theoretical foundations and current trends in the development of biology, using knowledge about the diversity and functioning of biological systems, their diversity and evolution, the level organization of wildlife.

Learning outcomes by discipline
- Explain the chemical reactions that occur in eukaryotic cells and the formation, structure, development, functions of cells and tissues, their interaction in the life of the organism;
- Analyze the advantages and problems of modern methods for studying the chemical composition of the cell;
- Use the laboratory and instrumental base in the study of cell cytochemistry.

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Undergraduate practice

Discipline cycle	Profiling discipline
Course	4
Credits count	15
Knowledge control form	Total mark on practice

Short description of discipline
The purpose of the undergraduate practice is to complete the writing of the thesis (project). Deepening and consolidation of theoretical knowledge gained by students in chemical disciplines; acquisition of skills in the specialty; collection of factual material on the topic of the thesis (project).

Purpose of studying of the discipline
Formation of practical skills related to conducting pedagogical research for the purpose of comprehensive use in further professional activities on the basis of theoretical knowledge gained in the learning process, collection and processing of practical material necessary for writing a thesis (project).

Learning Outcomes
ON8 Present the results of experimental research work in the form of a report, scientific report, message, conclusions.
ON9 To integrate the main provisions, concepts and laws in the field of chemistry and related natural science disciplines in the explanation of theoretical and practical tasks.
ON10 Use natural science terms for professional purposes.

Learning outcomes by discipline
- collection of materials for a report on teaching practice;
- preparation of a report on teaching practice in printed and electronic form;
- public defense of the report on teaching practice at the final lesson in the group.

Prerequisites
Educational practice Pedagogical practice

Postrequisites
Final examination

Productive (pedagogical) Practice

Discipline cycle	Profiling discipline
Course	4
Credits count	15

Knowledge control form | Total mark on practice

Short description of discipline

The industrial (pedagogical) practice of 4th year students involves a deeper development of professional and pedagogical competencies, subject, methodological knowledge, skills in organizing, implementing and managing the integral pedagogical process of the class. The practice is designed to provide a connection between the theoretical knowledge gained during the development of academic disciplines and practical professional activity.

Purpose of studying of the discipline

The practice is designed to provide a connection between the theoretical knowledge obtained in the development of academic disciplines and practical professional activities, aimed at conducting experimental work on a graduation project.

Learning Outcomes

ON8 Present the results of experimental research work in the form of a report, scientific report, message, conclusions.
ON9 To integrate the main provisions, concepts and laws in the field of chemistry and related natural science disciplines in the explanation of theoretical and practical tasks.
ON10 Use natural science terms for professional purposes.

Learning outcomes by discipline

- develop notes for chemistry and biology lessons in primary and high schools;
- select methodological, visual, didactic material and technical support for your own teaching of chemistry and biology;
- develop electronic educational materials for conducting lessons and additional classes in chemistry and biology in various software environments.

Prerequisites

Pedagogical practice (psychological and pedagogical) Pedagogical practice

Postrequisites

Final examination