CATALOG OF ELECTIVE DISCIPLINES

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

6B015 - Training of teachers in Natural science subjects
(Code and classification of the direction of training)

0114
(Code in the International Standard Classification of Education)

B013 - Biology teacher training
(Code and classification of the educational program group)

6B01517 - Biology (IP)
(Code and name of the educational program)

Bachelor
(Level of preparation)

set of 2024

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Developed
By the Academic Committee of the EP 6B01510 - Biology
The head of the AC Mukaev Zhandos Toleubekovich
EP Manager Zharmukhametova Raushan

Reviewed
At the meeting of the Quality Assurance Commission Natural and Mathematical of the faculty
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At the meeting of the Commission on Academic Quality
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Approved
at a meeting of the University Academic Council by protocol No. 3 of January 16, 2024.

at a meeting of the University Academic Council by protocol No. 6 of June 18, 2024.

Idea Mangilik El and spiritual modernization

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

Short description of discipline
The study of the content of the idea of "Mangilik el", its value character, significance in the face of external challenges and threats, the role of spiritual and social guidelines in the modernization of the country. 7 key values aimed at the formation of Kazakhstan`s patriotism and value orientations are considered, the main economic, political and social features of the development of Kazakhstan`s society are studied.

Purpose of studying of the discipline
The purpose of the discipline "Mangilik El" is to educate a new generation of specialists, socially active members of society with a high level of development of national identity, national spirit, spirit of patriotism, historical consciousness and social memory; spirit of professionalism and competitiveness, ready for active and decisive actions to preserve stability, independence, security of our state, able to build a constructive dialogue with representatives of other cultures.

Learning Outcomes
ON1 To develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio- political, economic and legal knowledge, demonstrating personal and professional competitiveness

Learning outcomes by discipline
to develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio- political, economic and legal knowledge, demonstrating personal and professional competitiveness

to develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio- political, economic and legal knowledge, demonstrating personal and professional competitiveness

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Fundamentals of anti-corruption culture

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

Short description of discipline
In the process of studying, the causes, prerequisites, main methods and forms of combating corruption are considered. The course examines the problems of forming an anti- corruption culture in modern society, analyzes social, economic, legal, moral and ethical methods and forms of countering corruption.

Purpose of studying of the discipline
-to form a system of knowledge on combating corruption and develop on this basis a civil position in relation to this phenomenon;
- to implement an anti-corruption policy in all areas of the university`s activities, to successfully implement the Anti-Corruption Strategy of Shakarim University

Learning Outcomes
ON1 To develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio- political, economic and legal knowledge, demonstrating personal and professional competitiveness

Learning outcomes by discipline
to develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio- political, economic and legal knowledge, demonstrating personal and professional competitiveness

to develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio- political, economic and legal knowledge, demonstrating personal and professional competitiveness

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Life Safety Basics

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

Short description of discipline
Students master the main components of a healthy lifestyle in accordance with the requirements of hygiene, labor protection and rules of protection from possible negative external influences, use the knowledge in life situations. Working in groups, students will master the techniques of first aid, understand the importance of preventive measures for the safety of life.

Purpose of studying of the discipline
The basics of life safety are the formation of healthy, safe behavior at home, as well as the right actions in the event of various emergencies, obtaining the necessary knowledge and skills to provide primary medical care both to oneself and to nearby injured people.
Learning Outcomes
ON4 To focus on a healthy lifestyle to ensure the sustainable development of society and nature, full-fledged social and professional activities
Learning outcomes by discipline
to focus on a healthy lifestyle to ensure the sustainable development of society and nature, full-fledged social and professional activities
to develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio-political, economic and legal knowledge, demonstrating personal and professional competitiveness
Prerequisites
School course
Postrequisites
Basic and profile disciplines of the EP

Fundamentals of Law

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

Short description of discipline
The objectives of studying the training course "Fundamentals of Law" is to acquire students` knowledge in the field of fundamental theoretical provisions of legislation, acquire skills in working with legislation, understand the rule of law in the state, develop the ability to navigate the complex system of current legislation, as well as improve the level of legal culture.
Purpose of studying of the discipline
acquisition of initial knowledge of law, develop a positive attitude towards it, realize the need to comply with legal norms, thereby ensuring full professional training of a bachelor functioning in a state governed by the rule of law.
Learning Outcomes
ON1 To develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio-political, economic and legal knowledge, demonstrating personal and professional competitiveness
Learning outcomes by discipline
to develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio-political, economic and legal knowledge, demonstrating personal and professional competitiveness
to develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio-political, economic and legal knowledge, demonstrating personal and professional competitiveness
Prerequisites
School course
Postrequisites
Basic and profile disciplines of the EP

Business basics

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

Short description of discipline
When mastering this discipline, students study the theoretical foundations and practical skills of organizing entrepreneurial activity in a competitive environment. Performing practical tasks explore the nature of new business concepts, describe the main ingredients that are driven by success in entrepreneurial activity. Working in groups, students draw up business projects and develop the ability to critically analyze and develop or develop new business plans.
Purpose of studying of the discipline
Acquiring practical skills in carrying out entrepreneurial activities based on the study of the theory and practice of entrepreneurship as a system of economic, organizational and legal relations of entrepreneurial structures.
Learning Outcomes
ON1 To develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio-political, economic and legal knowledge, demonstrating personal and professional competitiveness
Learning outcomes by discipline
to develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio-political, economic and legal knowledge, demonstrating personal and professional competitiveness
to develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio-political, economic and legal knowledge, demonstrating personal and professional competitiveness
Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Religious studies

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

Short description of discipline
The study of the essence of religion, its structure, functions and role in the life of society and man, the features of its historical development, the formation and dynamics of the religions of Kazakhstan, the essence of state policy in the field of religion. Aimed at developing the skills of interfaith dialogue, analysis and assessment of the religious situation, critical thinking. Methods: problem-based learning, comparative, analytical, hermeneutical methods, essay.

Purpose of studying of the discipline
The purpose of studying the discipline "Religious Studies" is to form students` religious knowledge, a general idea of the place and role of religion in spiritual culture, which will allow future social workers to navigate modern religious systems and use their knowledge to successfully fulfill their professional duty, to form a tolerant attitude towards representatives of various faiths, respect for the spiritual values of our society, to develop the skills of obtaining, analyzing and generalizing religious information.

Learning Outcomes
ON1 To develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio- political, economic and legal knowledge, demonstrating personal and professional competitiveness

Learning outcomes by discipline
to develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio- political, economic and legal knowledge, demonstrating personal and professional competitiveness

to develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio- political, economic and legal knowledge, demonstrating personal and professional competitiveness

Prerequisites
School course

Postrequisites
Life Safety Basics

Financial literacy

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

Short description of discipline
The purpose of studying the discipline is to improve the financial literacy of individuals, the formation of competencies in the field of personal finance management. The objective of the course is the practical application of experience in finance and financial institutions to effectively improve the financial literacy of individuals. The acquired knowledge is necessary for self- development in the field of financial management, making responsible and informed decisions in the field of financial resources management and increasing the ability to implement these decisions.

Purpose of studying of the discipline
formation of knowledge and skills of financial literacy among students of a higher educational institution through the development of basic financial and economic concepts that reflect the most important areas of financial relations, as well as skills and competencies that allow them to effectively interact with a wide range of financial institutions, such as banks, the currency system, the tax authority, business, pension system.

Learning Outcomes
ON1 To develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio- political, economic and legal knowledge, demonstrating personal and professional competitiveness

Learning outcomes by discipline
to develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio- political, economic and legal knowledge, demonstrating personal and professional competitiveness

to develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio- political, economic and legal knowledge, demonstrating personal and professional competitiveness

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Digital Technology in Education

Discipline cycle	General educational disciplines
Course	1
Credits count	5

Knowledge control form	Examination

Short description of discipline
Students get an idea about the processes of digitalization of education, General methods of digitalization of the educational process, monitoring and measuring learning results, extracurricular, research and organizational and managerial activities of educational institutions, the concept and principles of "MachineLearning". Students acquire the skills to use digital technologies in education.

Purpose of studying of the discipline
The formation of students` theoretical knowledge and practical skills in the use of digital technologies in the educational process, including methods of digitalizing educational activities, monitoring and assessing learning outcomes, as well as the development of competencies in machine learning and the application of information and communication technologies in scientific research and educational management.

Learning Outcomes
ON3 To use various types of information and communication technologies, modern methods of processing and synthesizing information in the field of scientific and pedagogical research

Learning outcomes by discipline
to use various types of information and communication technologies, modern methods of processing and synthesizing information in the field of scientific and pedagogical research
- o use various types of information and communication technologies, modern methods of processing and synthesizing information in the field of scientific and pedagogical research
- to develop and apply methods of teaching, education, assessment in various types of educational environment, taking into account the principles of student-centered, competence-based, inclusive approaches
- to build professional relationships for constructive pedagogical and social activities, own pedagogical development and well-being

Prerequisites
School course

Postrequisites
STEM education in biology

Cytology, histology and embryology

Discipline cycle	Basic disciplines
Course	1
Credits count	6
Knowledge control form	Examination

Short description of discipline
Pre-service teachers have fundamental knowledge about the structure and principles of cell life, subcellular components, their structure, and functions, as well as the features of embryonic development. They develop their skills in working with optical devices, histopreparations, and fixed material. They also practice the technique of preparing micropreparations. Pre- service teachers who demonstrate competence can: compare the structure of cells of living organisms, the functions of organoids; describe morphological features of organoids, subcellular structures, types and morphology of tissues; compare methods of reproduction of living organisms and embryology; put into practice the methods of cytological and histological studies; explain the types and mechanisms of cell division.

Purpose of studying of the discipline
The purpose of this course is to enhance the following areas of subject competencies:
· Competencies of conceptual and theoretical knowledge (1)
· Competencies in conducting scientific research (6)
· Competencies of application in science (9)

Learning Outcomes
ON6 To carry out the choice of methodology and analysis for planning, conducting, collecting and processing data from laboratory and field studies
ON9 To use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world
ON11 To analyze the level organization of wildlife, the biological nature and social essence of a person, to demonstrate a scientific worldview, environmental and genetic literacy

Learning outcomes by discipline
to carry out the choice of methodology and analysis for planning, conducting, collecting and processing data from laboratory and field studies
- to use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world
- to analyze the level organization of wildlife, the biological nature and social essence of a person, to demonstrate a scientific worldview, environmental and genetic literacy

Prerequisites
School course

Postrequisites
Patterns of inheritance and variability

Theoretical foundations of inorganic chemistry

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

Short description of discipline
The course forms pre-service teachers` knowledge of the basic concepts and laws of chemistry, the basics of atomic and molecular theory, the structure of matter, the Periodic law, chemical bonding, laws of the chemical process, the doctrine of solutions, exchange

reactions in electrolyte solutions, and redox reactions. Pre-service teachers investigate the basics of chemical thermodynamics, kinetic principles of describing chemical reactions, methods and mechanisms of their acceleration, the doctrine of chemical equilibrium and methods of its displacement, the basics of the theory of solutions, and elements of electrochemistry. The course is practice-oriented: all concepts, laws, and theories, as well as the most important processes, substances and materials are introduced in terms of their practical significance and use in everyday life as well as their role in living and inanimate nature. Pre-service teachers who demonstrate competence can: predict the possibilities of chemical processes and the factors affecting the equilibrium of chemical reactions and determine the direction of the process under these conditions; classify reactions occurring in aqueous solutions and offer optimal conditions for conducting reversible reactions; compare the thermodynamic, and redox activity of substances; apply the academic language of chemical concepts and terms; formulate the basic laws of chemistry with reasoned judgments; understand the properties of substances and the mechanism of chemical processes and discuss chemical phenomena with a thermal effect occurring in nature, in a living organism; apply the acquired theoretical knowledge and skills with general scientific and special disciplines in their teaching activities; teach conducting experiments using elementary methods of chemical research of substances and compounds for the formation of research skills; collect, process and interpret research data.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of subject competencies:
· Competencies of conceptual and theoretical knowledge (2)
· Competencies in conducting scientific research (6)
· Competencies of application in science (11)

Learning Outcomes

ON8 To integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students
ON9 To use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world

Learning outcomes by discipline

Future teachers demonstrating competence can:
· predict the possibilities of chemical processes and factors affecting the equilibrium of chemical reactions, and determine the direction of the process under these conditions;
· Classify reactions occurring in aqueous solutions and propose optimal conditions for conducting reversible reactions;
· compare the thermodynamic and redox activity of substances;
· apply the academic language of chemical concepts and terms;
· formulate the basic laws of chemistry with the help of reasoned judgments;
· understand the properties of substances and the mechanism of chemical processes, discuss chemical phenomena with a thermal effect occurring in nature, in a living organism;
- to integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students
- to use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world

Prerequisites

School course

Postrequisites

Biochemistry

Environmental Chemistry

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

Short description of discipline

During the course, pre-service teachers build their knowledge about the basic principles of environmental chemistry on a local and global scale. Pre-service teachers give scientific substantiations of the processes occurring in the environment using knowledge in the field of physics, chemistry, Earth sciences and biology. They also apply methods of analysis of physico-chemical processes involving pollutants in the atmosphere, hydrosphere, and soil. During the course, pre-service teachers develop their civic position to realize the responsibility of their decisions and actions. Pre-service teachers demonstrating competence can: form an understanding of the basic principles of environmental chemistry; form their own moral and civic position for their decisions and actions; apply knowledge in the field of physics, chemistry, Earth sciences and biology for scientific substantiation of processes occurring in the environment; assess anthropogenic changes in environmental objects.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of subject competencies:
· Competencies of conceptual and theoretical knowledge (2).
· Competencies in conducting scientific research (6)
· Competencies of application in science (11)

Learning Outcomes

ON7 To build professional relationships for constructive pedagogical and social activities, own pedagogical development and well-being
ON8 To integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students
ON9 To use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world

Learning outcomes by discipline

Learning outcomes Future teachers demonstrating competence can:
· describe the properties of simple and complex substances and patterns of chemical processes;
· apply basic physico-chemical and chemical
· methods of analysis in professional activity;

· conduct chemical and biological experiments and use the results obtained in teaching schoolchildren
· discuss the role of the development of natural science knowledge in solving the problems of modern society;
· to form environmental literacy through the integration of basic knowledge in physics, chemistry, Earth sciences and biology in search of solutions to global and local environmental problems;
· document information sources using the accepted citation style;
- to build professional relationships for constructive pedagogical and social activities, own pedagogical development and well-being
- to integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students

Prerequisites
School course

Postrequisites
Biochemistry

Academic letter

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

Short description of discipline
During the course, pre-service teachers develop their academic writing skills, registration of all types of written works, in accordance with existing requirements. They become proficient in communication and teamwork technologies, as well as communication strategies. They also investigate the features of academic writing, ways of correct writing and execution various types of written work in accordance with the principles of academic integrity. Pre-service teachers demonstrating competence can: prepare and execute the submitted works in accordance with the existing requirements: a scientific essay, an experimental research report, a description and results of project activities, etc, document the sources of information on one of the citation systems to comply with intellectual property rights; work with databases of scientific publications, bibliographic sources, make references to the sources used.

Purpose of studying of the discipline
The purpose of this course is to enhance the following areas of subject competencies:
• Competence in conducting scientific research (4,7)
• Area of competence for interaction (5)

Learning Outcomes
ON2 To assess situations in various areas of interpersonal, social and professional communication in oral and written forms in the state, russian and foreign languages using analytical and critical thinking to develop language competencies
ON12 To create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty

Learning outcomes by discipline
Future teachers demonstrating competence are able to:
• use the knowledge gained within the discipline to write, design all types of written works, in accordance with the requirements;
• work with databases of scientific publications, bibliographic sources, make references to used sources;
• use links correctly according to the citation system used;
• present information to the audience, interact with the audience, competently build communication based on the goals and situation of communication
to create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty

Prerequisites
Kazakh(Russian) language (1)

Postrequisites
Modern approaches to the organization of a biological experiment

Bioorganic chemistry

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

Short description of discipline
During the course, pre-service teachers examine the issues and problems of bioorganic chemistry and develop their skills in obtaining and identifying organic substances in a living organism. During lectures and laboratory classes, pre- service teachers analyze the relationship between the structure of organic substances and their biological functions, and conduct laboratory studies of the structure, properties and functions of biologically important natural (biopolymers, vitamins, hormones, antibiotics) and synthetic compounds (drugs, pesticides, etc.). Pre-service teachers practice skills in working with devices and materials and choose ways and methods of conducting individual and group research. They solve creative tasks and offer new non- standard solutions to problems. They also demonstrate practical application of the results of a biological experiment for their professional development, and evaluate experimental and calculated data, as well as prepare research reports and pass an exam. Pre-service teachers who demonstrate competence can: classify organic compounds by nomenclature when composing names and writing formulas of biologically active substances; conduct experiments to study the chemical structure and properties of biologically important substances; demonstrate the skills of conducting a biological experiment using chemical, physical, physico- chemical, mathematical and biological methods; evaluate the importance of biopolymers, enzymes, hormones, vitamins, signaling substances, antibiotics, and others in the vital activity of living organisms; conduct small projects: formulation of hypotheses and conclusions, planning, assessment of strengths and weaknesses, preparation of a report; collect, process and interpret research data on design and laboratory work; use scientific language, subject terminology and conventions appropriately; offer creative non- standard solutions to problems in the field of bioorganic chemistry; apply the results of biological research for their professional development.

Purpose of studying of the discipline
The purpose of this course is to enhance the following areas of subject competencies:
· Competencies of conceptual and theoretical knowledge (2)
· Competencies in conducting scientific research (5, 6. 7)
· Competencies of application in science (8, 9, 13)
Learning Outcomes
ON2 To assess situations in various areas of interpersonal, social and professional communication in oral and written forms in the state, russian and foreign languages using analytical and critical thinking to develop language competencies
ON6 To carry out the choice of methodology and analysis for planning, conducting, collecting and processing data from laboratory and field studies
ON7 To build professional relationships for constructive pedagogical and social activities, own pedagogical development and well-being
ON8 To integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students
ON12 To create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty
Learning outcomes by discipline
Learning outcomes Future teachers demonstrating competence can:
• classify organic compounds by nomenclature when composing names and writing formulas of biologically active substances
• conduct experiments to study the chemical structure and properties of biologically important substances
• demonstrate the skills of conducting a biological experiment using chemical, physical, physico-chemical, mathematical and biological methods
• evaluate the importance of biopolymers, enzymes, hormones, vitamins, signaling substances, antibiotics, BAS and others in the vital activity of living organisms
• carry out small projects: formulation of hypotheses and conclusions, planning, assessment of strengths and weaknesses, preparation of a report
• to collect, process and interpret research data on design and laboratory work
• it is appropriate and correct to use scientific language, subject terminology and symbols
- to integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students
- to create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty
Prerequisites
Environmental Chemistry
Postrequisites
Experimental Biology

Biochemistry

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

Short description of discipline
Pre-service teachers investigate chemical processes in living organisms occurring at the molecular level. They determine the causal relationships between the structure of the molecule and its function allowing them to predict the mechanisms of interaction of molecules by analyzing the structure and properties of proteins, nucleic acids, fats, carbohydrates, as well as cellular organelles. Pre-service teachers also consider the processes of cell interaction during growth or disease control and explore the achievements of science in the field of biochemistry. Pre-service teachers plan and conduct research to determine the influence of various factors (temperature, pH, substrate concentration on enzyme activity). Pre-service teachers who demonstrate competence can: understand the structure and functions of bioorganic substances in living organisms; establish causal relationships between the metabolism in a living organism and the biochemical functions of cellular organelles; draw conclusions on the relationship between the structures of bioorganic molecules and their function in living organisms; determine the ways of transformation of nutrients; compare the features of the course of biochemical reactions in the human body, animals and plants, such as the biosynthesis of vital compounds; apply chemical knowledge and methods in their teaching activities; give a scientific justification of the proposed assumption (formulation of the hypothesis) and design an experiment to determine the influence of various factors (temperature, pH, substrate concentration on enzyme activity); conduct a safe experiment to investigate the chemical structure, properties and function of carbohydrates, fats, proteins and nucleic acids; collect, process and interpret research data; document reliable sources of information used following the established (selected) citation system (ARA style or others.); evaluate the strengths and weaknesses of the study, such as the limitations of data and the sources of errors and inaccuracies of the experiment; formulate a reasoned and detailed conclusion on the research topic and make a structured and clear report on all stages of the study; use scientific language, subject terminology and conventions appropriately and correctly.
Purpose of studying of the discipline
The purpose of this course is to enhance the following areas of subject competencies:
· Competencies of conceptual and theoretical knowledge (2)
· Competencies in conducting scientific research (5, 6)
· Competencies of application in science (9)
Learning Outcomes
ON2 To assess situations in various areas of interpersonal, social and professional communication in oral and written forms in the state, russian and foreign languages using analytical and critical thinking to develop language competencies
ON6 To carry out the choice of methodology and analysis for planning, conducting, collecting and processing data from laboratory and field studies
ON8 To integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students

Learning outcomes by discipline
Learning outcomes Future teachers demonstrating competence can:
• Describe the structure and functions of bioorganic substances in living organisms;
• to establish causal relationships between metabolism in a living organism and the biochemical functions of cellular organelles;
• to draw conclusions about the relationship between the structures of bioorganic molecules and their function in living organisms;
• identify the pathways of transformation of nutrients
• compare the features of the course of biochemical reactions in humans, animals and plants, such as the biosynthesis of vital compounds;
• apply chemical knowledge and methods in their teaching activities;
• provide a scientific justification for the proposed assumption (formulation of the hypothesis) and develop an experiment to determine the influence of various factors (temperature, pH, substrate concentration on enzyme activity);
• provide a scientific justification for the proposed assumption (formulation of a hypothesis);
• conduct a safe experiment to study the chemical structure, properties and function of carbohydrates, fats, proteins and nucleic acids;
• to collect, process and interpret research data,
• to formulate a reasoned and detailed conclusion on the research issue.
• evaluate the strengths and weaknesses of the study, such as limited data and sources of errors and inaccuracies of the experiment;
• document reliable sources of information used in accordance with the established (selected) citation system (ARA style, etc.);
• create a structured and clear report on all stages of the study;
• it is appropriate and correct to use scientific language, subject terminology and symbols
to integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students

Prerequisites
Environmental Chemistry

Postrequisites
Experimental Biology

Research and project activities in biological education

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

Short description of discipline
Pre-service teachers analyze the methodology of project activity in education, the method of projects in a modern school, the practice of educational design, the organization and stages of project activity of students, as well as the collaboration between a teacher and students. The discipline is aimed at developing pre-service teachers' skills within the framework of research and project activities. Pre-service teachers who demonstrate competence can: set goals and define tasks in the organization of scientific and project research; carry out information-analytical and information-bibliographic work with the involvement of modern information technologies; creatively find solutions for new problems and situations; mentor students during research project; competently present the results of research and project activities.

Purpose of studying of the discipline
The purpose of this course is to enhance the following areas of subject competencies:
• Competence in conducting scientific research (4, 7)
• Competence of application in science (8,11, 12)
• Competence in the field of pedagogy and didactics (2)
• Competence for interaction (3,4)
• Competence for professional development (8,9)

Learning Outcomes
ON3 To use various types of information and communication technologies, modern methods of processing and synthesizing information in the field of scientific and pedagogical research
ON12 To create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty

Learning outcomes by discipline
Future teachers demonstrating competence are able to:
• set goals and define tasks in the organization of scientific and project research;
• to carry out information-analytical and information-bibliographic work with the involvement of modern information technologies;
• think creatively and be creative in solving new problems and situations;
• to work and mentor students in conducting project research;
• competently present the results of research and project activities.
to create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty

Prerequisites
Digital Technology in Education

Postrequisites
Design of STEM education

Methodology of biological research

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

Short description of discipline

Pre-service teachers analyze the methodology of organizing scientific research in the field of biology, the stages of research, the variety of research methods in biology, the methods of processing data, and the ways of presenting the results. The course is aimed at developing pre-service teachers' skills in working with scientific equipment and conducting theoretical and applied research. Pre-service teachers who demonstrate competence can: use methods of conducting biological research in their professional and research activities; work with scientific and laboratory equipment, use them during research; determine and formulate a research hypothesis, draw up an experiment plan, select methods, and on the basis of this conduct theoretical and applied research in the field of biology; organize and conduct experimental work with biological objects, processing and presenting the results of this work; teach research methods in various types of learning environments.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of subject competencies:
• Competence in conducting scientific research (4, 5, 7)
• Competence of application in science (8,11, 12)
• Competence in the field of pedagogy and didactics (2)

Learning Outcomes

ON3 To use various types of information and communication technologies, modern methods of processing and synthesizing information in the field of scientific and pedagogical research
ON6 To carry out the choice of methodology and analysis for planning, conducting, collecting and processing data from laboratory and field studies
ON12 To create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty

Learning outcomes by discipline

Future teachers demonstrating competence are able to:
• use methods of conducting biological research in their professional and research activities;
• work with scientific and laboratory equipment, use it in research;
• define and formulate a research hypothesis, draw up an experimental plan, select methods, and on the basis of this conduct theoretical and applied research in the field of biology;
• demonstrate the ability to organize and conduct experimental work with biological objects, process and present the results of this work.
• Teach research methods in different types of learning environments.
- to use various types of information and communication technologies, modern methods of processing and synthesizing information in the field of scientific and pedagogical research
- to create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty

Prerequisites

Pedagogical Research

Postrequisites

Teaching Methods and Technologies

Content-language integrated learning in biology

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

Short description of discipline

Pre-service teachers explore the basic approaches, techniques and forms used in content-language integrated learning (CLIL) in biology. During the course, pre-service teachers acquire knowledge of biology, while improving their foreign language knowledge and skills. Pre-service teachers who demonstrate competence can: identify language problems of students; use communicative and interactive tasks that contribute to a better understanding of biology studied in a foreign language; apply error correction strategies that encourage the correct use of a spoken foreign language; use activities in the classroom that contribute to both studying biology and developing foreign language skills; · use authentic educational material.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of subject competencies:
· Competencies of conceptual and theoretical knowledge (2).
· Competencies in conducting scientific research (7)
· Competencies of application in science (8,12,13)
· Competence in the field of pedagogy and didactics (1)
· Area of competence for interaction (5)
· Area of competence for professional development (8,9)

Learning Outcomes

ON2 To assess situations in various areas of interpersonal, social and professional communication in oral and written forms in the state, russian and foreign languages using analytical and critical thinking to develop language competencies
ON5 To develop and apply methods of teaching, education, assessment in various types of educational environment, taking into account the principles of student-centered, competence-based, inclusive approaches

Learning outcomes by discipline

Future teachers demonstrating competence can:
· identify students` language problems;
· use communicative and interactive tasks that contribute to a better understanding of biology studied in a foreign language;
· apply error correction strategies that encourage the correct use of a foreign language in speech;
· use activities in the classroom that contribute to both the study of biology and the development of language skills;
· use authentic educational material
to develop and apply methods of teaching, education, assessment in various types of educational environment, taking into account the principles of student-centered, competence-based, inclusive approaches

Prerequisites

Academic letter

Postrequisites

Final examination

Modern approaches to the organization of a biological experiment

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

Short description of discipline

Pre-service teachers analyze modern approaches to the organization of experiments in the field of biological sciences, the stages of conducting and the aspects of organizing and planning of experiments, the methods of data processing, and the ways of presenting the results. Special emphasis is placed on molecular genetic approaches to the organization of experiments. The course is aimed at developing pre- service teachers' skills in conducting biological experiments by using modern approaches and experiments in their professional and research activities. Pre- service teachers who demonstrate competence can: apply modern approaches to the organization of biological experiments and apply them in their professional and research activities; work with scientific and laboratory equipment, use them during biological experiments; determine and formulate a research hypothesis, draw up an experiment plan, select methods, and on the basis of this conduct theoretical and applied research in the field of biology; organize and conduct experimental work with biological objects, processing and presenting the results of this work.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of subject competencies:
• Competence in conducting scientific research (4, 6)
• Competence of application in science (10,12)

Learning Outcomes

ON6 To carry out the choice of methodology and analysis for planning, conducting, collecting and processing data from laboratory and field studies
ON7 To build professional relationships for constructive pedagogical and social activities, own pedagogical development and well-being
ON12 To create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty

Learning outcomes by discipline

Future teachers demonstrating competence will:
• possess modern approaches to the organization of biological experiments and apply them in their professional and research activities;
• work with scientific and laboratory equipment, use it in conducting biological experiments;
• define and formulate a research hypothesis, draw up an experimental plan, select methods, and on the basis of this conduct theoretical and applied research in the field of biology;
• demonstrate the ability to organize and conduct experimental work with biological objects, process and present the results of this work. to build professional relationships for constructive pedagogical and social activities, own pedagogical development and well-being

Prerequisites

Pedagogical Research

Postrequisites

Digital technologies in biology

Human anatomy

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

Short description of discipline

Pre-service teachers build their understanding of the basic laws of the structure and function of the body, as well as individual organs and systems of a person. They are able to use correct terminology and develop their skills in working with laboratory devices. Pre-service teachers who demonstrate competence can: understand the general laws of the structure of the human body, the structural and functional relationships of parts of the body; use conceptual apparatus and specialized terminology; determine the location and relative position of organs in the body; analyze information about the topography, structure of the human body, its systems, organs and tissues and their main functions; describe morphological changes in the studied macroscopic preparations; design and conduct simple experiments to study the work of individual organs and organ systems at school; observe ethical standards when performing experiments.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of subject competencies:
· Competencies of conceptual and theoretical knowledge (1,3).
· Competencies in conducting scientific research (6)
· Competencies of application in science (9,10)

Learning Outcomes

ON9 To use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world
ON10 To use the fundamental basics of biology and modern trends in its development, knowledge about the diversity and functioning of biological systems, their vast variety and evolution
ON11 To analyze the level organization of wildlife, the biological nature and social essence of a person, to demonstrate a scientific worldview, environmental and genetic literacy

Learning outcomes by discipline

Future teachers demonstrating competence can:
· explain the general patterns of the human body structure, structural and functional relationships of parts of the body;

· use a conceptual framework and specialized terminology;
· determine the location and relative position of organs in the body
· analyze information about the topography, structure of the human body, its systems, organs and tissues and their main functions;
· describe morphological changes in the studied macroscopic preparations
· design and conduct simple experiments to study the work of individual organs and organ systems at school;
· observe ethical standards when performing experiments
- to use the fundamental basics of biology and modern trends in its development, knowledge about the diversity and functioning of biological systems, their vast variety and evolution
- to analyze the level organization of wildlife, the biological nature and social essence of a person, to demonstrate a scientific worldview, environmental and genetic literacy

Prerequisites
Structure and functions of animals 2

Postrequisites
Human and Animal Physiology

Biogeocenology

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

Short description of discipline
Pre-service teachers build their understanding of the basic laws of the organization and functioning of biogeocenoses. They are able to prove the essence of the complex of living, inanimate components of nature that are in causal interactions, and justify the totality of complex ecological systems in the biogeosphere. They also conduct studies of the structural components of biogeocenosis considering the forms of species coadaptation in different natural and geographical conditions using the skills of collaboration. Pre-service teachers who demonstrate competence can: understand the structure and methodology of biogeocenosis processes; characterize the basic principles of the organization and functioning of biogeocenoses; analyze the structural and functional organizations of biogeocenotic systems of various types; evaluate production processes and efficiency of energy flow in food chains of biogeocenoses; analyze the role of components of biogeocenoses as elementary environment- forming structural and functional blocks of the biosphere; teach conducting safety-based research with phyto- and zoocenosis objects to determine the types and forms of coadaptations in different natural conditions, geographical location, and the impact of environmental factors.

Purpose of studying of the discipline
Целью данного курса является повышение следующих областей профессиональных компетенций:
- *Компетенции концептуально-теоретических знаний (1,3)*
- *Компетенции в проведении научных исследований (6)*
- *Компетенции применения в науке (10)*

Learning Outcomes
ON8 To integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students
ON9 To use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world

Learning outcomes by discipline
Future teachers demonstrating competence can:
· explain the structure and methodology of biogeocenosis processes;
· to characterize the basic principles of the organization and functioning of biogeocenoses;
· analyze the structural and functional organizations of biogeocenotic systems of various types;
· evaluate production processes and energy flow efficiency in food chains of biogeocenoses;
· analyze the role of biogeocenosis components as elementary environment-forming structural and functional blocks of the biosphere
· to train in conducting safety studies with phyto- and zoocenosis facilities to determine the types and forms of coadaptation in different natural conditions, geographical location and environmental factors.
to use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world

Prerequisites
Structure and functions of animals 1

Postrequisites
Flora and fauna of the world

Human biology

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

Short description of discipline
During the course, pre-service teachers form a comprehensive understanding of the functioning of the human being as a biological object. They examine the features of the structure and functioning of organ systems, considering ontogenetic and phylogenetic features. Pre-service teachers who demonstrate competence can: describe the features of topography and patterns of the structure of the human body at the micro- and macroscopic levels; understand the relationship of the structure of organs with the functions performed; systematize knowledge about the structure and function of organs and systems of the human body, their interrelation and mechanisms of regulation; navigate the structure of the human body, find and determine the location and projection of organs and their parts on the surface of the body; evaluate the structural and functional parameters of human body development; design and conduct experiments to study the work of organs and organ systems; apply anatomical and physiological knowledge in life, including as a prevention of various

diseases.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of subject competencies:
* Competencies of conceptual and theoretical knowledge (1).*
* Competencies in conducting scientific research (6)*
* Competencies of application in science (9)*

Learning Outcomes

ON6 To carry out the choice of methodology and analysis for planning, conducting, collecting and processing data from laboratory and field studies
ON9 To use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world
ON10 To use the fundamental basics of biology and modern trends in its development, knowledge about the diversity and functioning of biological systems, their vast variety and evolution

Learning outcomes by discipline

Future teachers demonstrating competence can:
· determine the features of the topography and patterns of the structure of the human body at the micro- and macroscopic levels
· explain the relationship between the structure of organs and the functions performed
· systematize knowledge about the structure and function of organs and systems of the human body, their interrelation and regulation mechanisms;
· navigate the structure of the human body, find and determine the location and projection of organs and their parts on the surface of the body;
· evaluate the structural and functional parameters of human body development;
· design and conduct experiments to study the work of organs and organ systems;
* apply anatomical and physiological knowledge in life, including as a preventive measure for various diseases*
- to use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world
- to use the fundamental basics of biology and modern trends in its development, knowledge about the diversity and functioning of biological systems, their vast variety and evolution

Prerequisites

Age and Physiological Features of the Development of Children

Postrequisites

Human and Animal Physiology

Ecology of plants, animals and humans

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

Short description of discipline

Pre-service teachers analyze the fundamental concepts of the organism and biological diversity in nature, as well as biogeocenosis as special levels of organization of life. Pre-service teachers evaluate the relationship of organisms and the environment considering the characteristics of the structure and vital activity of organisms in various environmental conditions of the Earth. They teach planning and monitoring of biological objects and the state of their own body under the influence of environmental factors. They also assess the consequences of anthropogenic activities in relation to the natural environment and the health of other people. Pre-service teachers who demonstrate competence can: determine the type of interaction of different species in the ecosystem and the features of the structure of cells, tissues, organs, organ systems in accordance with the effects of environmental factors and anthropogenic impact; understand the importance of the activity of living organisms in the circulation of ecosystem substances in human life and economy; identify essential features of biological objects and processes and compare them; identify the variability of living organisms under anthropogenic influences and environmental factors; teach safe research to study the adaptations of organisms to the environment and explain their meanings.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of professional competence:
· Competencies of conceptual and theoretical knowledge (1,3)
· Competencies in conducting scientific research (6)
· Competencies of application in science (10)

Learning Outcomes

ON4 To focus on a healthy lifestyle to ensure the sustainable development of society and nature, full-fledged social and professional activities
ON9 To use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world
ON11 To analyze the level organization of wildlife, the biological nature and social essence of a person, to demonstrate a scientific worldview, environmental and genetic literacy

Learning outcomes by discipline

Future teachers demonstrating competence can:
· determine the type of interaction of different species in the ecosystem and the structural features of cells, tissues, organs, organ systems in accordance with the effects of environmental factors and anthropogenic impact;
· explain the importance of the activity of living organisms in the circulation of ecosystem substances in human life and economy;
· identify the essential features of biological objects and processes and compare them;
· to identify the variability of living organisms under anthropogenic influences and environmental factors;
· to teach research on the adaptations of organisms to their environment and explain their significance.
- to use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world

- to analyze the level organization of wildlife, the biological nature and social essence of a person, to demonstrate a scientific worldview, environmental and genetic literacy

Prerequisites

Diversity of plant organisms

Postrequisites

Bioresources of Kazakhstan

Bioresources of Kazakhstan

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

Short description of discipline

Pre-service teachers understand the geographical distribution and placement of living organisms and their communities on the territory of Kazakhstan. They determine the most important patterns of the structure and dynamics of the flora and fauna in certain regions. They also compare the main stages of the history and economic development of certain groups and species of useful plants and animals in the Republic of Kazakhstan. Pre-service teachers distinguish the locations of specially protected natural areas of Kazakhstan and assess the role of the state and society in the conservation of landscape and biological diversity. Pre- service teachers who demonstrate competence can: systematize the position of the main types of biological resources; list biological resources on the territory of the Republic of Kazakhstan; specify categories and criteria of endangered species of biological resources; determine the importance of the environment in increasing the productivity of Kazakhstan`s bioresources; present modern conceptual approaches to the problem of conservation of biological diversity of Kazakhstan; name the main ways to increase the productivity of biological resources; teach the assessment of the role of specially protected natural territories of the Republic of Kazakhstan in preserving and increasing the productivity of biodiversity.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of professional competence:
· Competencies of conceptual and theoretical knowledge (1,3)
· Competencies in conducting scientific research (6)
· Competencies of application in science (8)

Learning Outcomes

ON8 To integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students
ON9 To use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world
ON11 To analyze the level organization of wildlife, the biological nature and social essence of a person, to demonstrate a scientific worldview, environmental and genetic literacy

Learning outcomes by discipline

Future teachers demonstrating competence can:
· systematize the position of the main types of biological resources;
· to characterize biological resources on the territory of the Republic of Kazakhstan;
· Explain the categories and criteria of endangered species of biological resources;
· assess the importance of the environment in increasing the productivity of Kazakhstan`s bioresources;
· to present modern conceptual approaches to the problem of conservation of biological diversity in Kazakhstan;
· to name the main ways to increase the productivity of biological resources;
· to teach the assessment of the role of specially protected natural territories of the Republic of Kazakhstan in preserving and increasing the productivity of biodiversity.
- to use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world
- to analyze the level organization of wildlife, the biological nature and social essence of a person, to demonstrate a scientific worldview, environmental and genetic literacy

Prerequisites

Ecology of plants, animals and humans

Postrequisites

Comparative anatomy and evolution of living organisms

Genetics and the basis of breeding

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

Short description of discipline

Genetics includes ideas and methods that play an important role in medicine, agriculture, microbiological industry, as well as in genetic engineering. Pre-service teachers investigate the cytological foundations of heredity, the laws of heredity, and variability of traits at all levels of the organization of living matter. They also analyze the types of inheritance of breeding traits, the role of heredity, and the environment in the formation of the phenotype. Pre-service teachers consider the issues of modification and mutational variability, polyploidy, and distant hybridization. Pre- service teachers also analyze the patterns of transmission and realization of genetic information. Pre-service teachers examine the basics of breeding, genetic engineering, and methods of molecular genetic analysis. Pre-service teachers who demonstrate competence can: analyze the types of inheritance of traits; use genetic terms and conventions appropriately, contributing to an understanding of the nature, process, and results of the study; apply in practice methods of hybridological, cytological and population analysis to solve genetic problems for all types of inheritance; design and conduct genetic experiments; · process and analyze the measurement results of quantitative features; distinguish the role of heredity and variability in the

evolution of life on the planet, the main provisions of the chromosomal theory of heredity and the mechanism of inheritance of human diseases; distinguish the causes and consequences of mutations for the vital activity of living organisms and the evolution of life on the planet; combine the concepts of genetic processes in plants and animals; perform calculations to determine the percentage of crossing between genes and design genetic maps for genes; determine the genotypic structure of populations and the frequency of alleles and genotypes by phenotypic frequencies in populations; distinguish the types of heredity (nuclear – chromosomal and extra– nuclear - cytoplasmic) and their causes; determine the influence of factors on the type of variability; make schemes of crosses according to the form accepted in genetics; draw conclusions about the importance of induced mutations in the selection of microorganisms, plants and animals; apply the knowledge and methods of genetics to solve the problems of breeding organisms; model and design an intraspecific crossing experiment.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of subject competencies:
· Competencies of conceptual and theoretical knowledge (3)
· Competencies in conducting scientific research (5, 6)
· Competencies of application in science (10, 11)

Learning Outcomes

ON9 To use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world
ON10 To use the fundamental basics of biology and modern trends in its development, knowledge about the diversity and functioning of biological systems, their vast variety and evolution
ON11 To analyze the level organization of wildlife, the biological nature and social essence of a person, to demonstrate a scientific worldview, environmental and genetic literacy

Learning outcomes by discipline

Future teachers demonstrating competence can:
· distinguish and analyze the types of inheritance of traits;
· it is appropriate and correct to use genetic terms and conventions, which contributes to understanding the essence, process and results of the study
· to apply in practice methods of hybridological, cytological and population analysis to solve genetic problems for all types of inheritance;
· design and conduct genetic experiments;
· process and analyze the measurement results of quantitative features;
· explain the role of heredity and variability in the evolution of life on the planet, the main provisions of the chromosomal theory of heredity and the mechanism of inheritance of human diseases.
· Determine the influence of factors on the type of variability, discuss the causes and consequences of mutations for the vital activity of living organisms and the evolution of life on the planet;
· to combine the concepts of genetic processes in plants and animals;
· perform calculations to determine the percentage of crossover between genes and design genetic maps for genes;
· determine the genotypic structure of populations and the frequency of alleles and genotypes by phenotypic frequencies in populations;
· Describe the types of heredity (nuclear – chromosomal and non–nuclear - cytoplasmic) and their causes;
· apply the knowledge and methods of genetics to understand and solve the problems of breeding organisms;
- to use the fundamental basics of biology and modern trends in its development, knowledge about the diversity and functioning of biological systems, their vast variety and evolution
- to analyze the level organization of wildlife, the biological nature and social essence of a person, to demonstrate a scientific worldview, environmental and genetic literacy

Prerequisites

Cytology, histology and embryology

Postrequisites

Molecular Biology

Patterns of inheritance and variability

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

Short description of discipline

Pre-service teachers investigate the patterns of inheritance of traits, chromosomal theory of heredity, non-nuclear inheritance, natural and induced mutation process, fundamentals of genetic engineering, developmental genetics, population and evolutionary genetics, genetic foundations of breeding, and features of human genetics. Pre-service teachers determine the relationship between the influence of genotype and environmental factors on the development of organisms. Pre- service teachers also consider heritability in the population, and the influence of various factors on the genetic structure of the population. Pre- service teachers who demonstrate competence can: · distinguish inheritance patterns in intraspecific and distant hybridization; solve genetic problems of inheritance of traits and interpret the results obtained; explain the role of environmental and hereditary factors in variability; use modern research methods and information and communication technologies to model crosses; analyze the types of inheritance of breeding traits, types of genetic variability arising under the influence of mutagenic factors; explain the role of heredity and variability in the evolution of life on the planet, the main provisions of the chromosomal theory of heredity and the mechanism of inheritance of human diseases; solve genetic problems of inheritance of traits and interpret the results obtained.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of subject competencies:
· Competencies of conceptual and theoretical knowledge (3)
· Competencies in conducting scientific research (5,6)
· Competencies of application in science (10, 11)

Learning Outcomes

ON3 To use various types of information and communication technologies, modern methods of processing and synthesizing information in the field of scientific and pedagogical research

ON9 To use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world
ON10 To use the fundamental basics of biology and modern trends in its development, knowledge about the diversity and functioning of biological systems, their vast variety and evolution
ON11 To analyze the level organization of wildlife, the biological nature and social essence of a person, to demonstrate a scientific worldview, environmental and genetic literacy

Learning outcomes by discipline

Future teachers demonstrating competence can:
· distinguish inheritance patterns in intraspecific and distant hybridization;
· solve genetic problems of inheritance of traits and interpret the results obtained;
· explain the role of environmental and hereditary factors in variability;
· use modern research methods and information and communication technologies to model crossings.
· analyze the types of inheritance of breeding traits, types of genetic variability arising under the influence of mutagenic factors;
· explain the role of heredity and variability in the evolution of life on the planet, the main provisions of the chromosomal theory of heredity and the mechanism of inheritance of human diseases;
· solve genetic problems of inheritance of traits and interpret the results obtained
- to use the fundamental basics of biology and modern trends in its development, knowledge about the diversity and functioning of biological systems, their vast variety and evolution
- to analyze the level organization of wildlife, the biological nature and social essence of a person, to demonstrate a scientific worldview, environmental and genetic literacy

Prerequisites

Cytology, histology and embryology

Postrequisites

Evolutionary teaching

Flora and fauna of the world

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

Short description of discipline

Pre-service teachers have knowledge of the biological diversity of flora and fauna in different habitats of the Earth, according to faunal and floral zoning. Pre-service teachers distinguish and evaluate faunal and floral kingdoms. Identify the processes of speciation and the state of species and subspecies of flora and fauna at the global level. Substantiate measures to preserve the natural habitat of plants and animals and propose measures to protect them from overexploitation by humans. Pre- service teachers who demonstrate competence can: describe the main faunal complexes: tundra, taiga, forest, steppe, semi-desert, desert, pantropical, paleotropical, and faunal zoning; separate types of fauna: mainland, island, marine; identify zoogeographic regions and kingdoms and floristic complexes; characterize the endangered species of flora and fauna and to focus on the scale and importance of endangered flora and fauna, train in planning and organizing activities aimed at protecting existing species, including endangered and endemic plant and animal species.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of professional competence:
· Competencies of conceptual and theoretical knowledge (1,3)
· Competencies in conducting scientific research (6)
· Competencies of application in science (8)

Learning Outcomes

ON1 To develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio- political, economic and legal knowledge, demonstrating personal and professional competitiveness
ON9 To use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world

Learning outcomes by discipline

Future teachers demonstrating competence can:
· describe the main faunal complexes: tundra, taiga, forest, steppe, semi-desert, desert, pantropical, paleotropic and faunal zoning;
· separate types of fauna: mainland, island, marine;
· identify zoogeographic regions and kingdoms and floristic complexes;
· To characterize endangered species of flora and fauna and to focus on the scale and importance of endangered flora and fauna.
· Train in the planning and organization of activities aimed at protecting existing species, including endangered and endemic plant and animal species.
to use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world

Prerequisites

Diversity of plant organisms

Postrequisites

Plant Physiology

Biometrics

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

Short description of discipline

Pre- service teachers have basic knowledge in the field of mathematics and natural sciences and apply methods of mathematical analysis and modeling, as well as theoretical and experimental research in the field of biology. During the course, pre-service teachers acquire the basics of practical knowledge and skills in the field of biometrics understanding its relationship with other sciences. Pre-service teachers who demonstrate competence can: use the knowledge of mathematical statistics, the principle and various methods of analysis in professional activity; apply statistical processing methods in practice; identify trends in the patterns of the studied objects; perform correct statistical processing of experimental data; organize experimental work and analyze the observations and the results of the experiments; work with biological objects in natural and laboratory conditions; make reports, reviews, analytical maps and explanatory notes; present and critically analyze the information received to present the results of field and laboratory biological studies.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of subject competencies:
· Competencies of conceptual and theoretical knowledge (2).
· Competencies in conducting scientific research (7)
· Competencies of application in science (11)

Learning Outcomes

ON3 To use various types of information and communication technologies, modern methods of processing and synthesizing information in the field of scientific and pedagogical research
ON6 To carry out the choice of methodology and analysis for planning, conducting, collecting and processing data from laboratory and field studies
ON8 To integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students

Learning outcomes by discipline

Future teachers demonstrating competence can:
• use knowledge of mathematical statistics, the principle and various methods of analysis in their professional activities;
• apply statistical processing methods in practice
• identify trends in the patterns of the studied objects;
• perform correct statistical processing of experimental data
• to organize experimental and experimental work
• work with biological objects in natural and laboratory conditions
• analyze the results of experiments, observations, experiments;
• prepare reports, reviews, analytical maps and explanatory notes,
• present and critically analyze the information received and present the results of field and laboratory biological studies
- to carry out the choice of methodology and analysis for planning, conducting, collecting and processing data from laboratory and field studies
- to integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students

Prerequisites

Individual development of living organisms

Postrequisites

Experimental Biology

Experimental Biology

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

Short description of discipline

Pre-service teachers learn the principles and structure of the organization of scientific activity, the Fundamentals of Experimental Biology, the methodology of scientific cognition, techniques of setting goals and research tasks. The course develops pre-service teachers' skills in experimental research, processing and analysis of the results. Pre-service teachers demonstrating competence can: apply research results in pedagogical and professional activities; understand and solve problems in new or unfamiliar situations in contexts and within broader (or interdisciplinary) areas related to the field of study; adapt modern science achievements to educational process; collect, process, and interpret research data; formalize results of research work into various forms of scientific production; use quantity and quality methods for scientific research; arrange discussion with evidence from theoretical and experimental research.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of subject competencies:
· Research competencies (7)
· Application competencies in science (11)

Learning Outcomes

ON2 To assess situations in various areas of interpersonal, social and professional communication in oral and written forms in the state, russian and foreign languages using analytical and critical thinking to develop language competencies
ON6 To carry out the choice of methodology and analysis for planning, conducting, collecting and processing data from laboratory and field studies
ON12 To create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty

Learning outcomes by discipline

Future teachers who demonstrate competence are able to:
• apply scientific methods of cognition in their professional activities;
• Understand and solve problems in new or unfamiliar situations in contexts and within broader (or interdisciplinary) fields related to the field being studied;
• adapt modern scientific achievements to the educational process;
*• * collect, process and interpret research data;*
• to formalize the results of research work into various forms of scientific products;

• conduct a scientific discussion using the evidence base obtained as a result of theoretical and experimental research.
- to carry out the choice of methodology and analysis for planning, conducting, collecting and processing data from laboratory and field studies
- to create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty

Prerequisites

Environmental Chemistry

Postrequisites

Microbiology with the basics of biotechnology

Comparative anatomy and evolution of living organisms

Discipline cycle	Basic disciplines
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline

Pre-service teachers explore the historical process of adaptive transformations of wildlife at different levels of organization – from the macromolecular to the biosphere as a whole. During the course, pre-service teachers analyze comparative anatomical evidence of the evolution of the main types of living organisms. They also pay special attention to the evolution of vertebrates as the most highly organized, studied and economically important group. Learning outcomes Pre- service teachers who demonstrate competence can: classify organs by their origin in embryogenesis; compare the features of the structure of organs in connection with their functions performed; characterize the main stages of the evolution of organ systems; distinguish aromorphoses, idioadaptation and degeneration in the stages of evolution; understand the adaptive nature of the evolution of organ systems; identify the main directions of the evolution of living organisms; apply knowledge on the current state of evolutionary theory in the educational process; understand the content of the main provisions of the evolutionary theory; analyze scientific data to prove the provisions of the evolutionary doctrine; integrate the acquired knowledge on comparative anatomy and evolution of living organisms; use methods of comparative analysis of various groups of living organisms, considering their systematic position, phylogenetic relationships, ecology and biology; analyze the anatomical and morphological structure of organs, considering their functions; systematize research results, evaluate their reliability and significance; plan and conduct experiments, and process and analyze research results.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of subject competencies:
· Competencies of conceptual and theoretical knowledge (1, 2)
· Competencies in conducting scientific research (6)
· Competencies of application in science (10)

Learning Outcomes

ON3 To use various types of information and communication technologies, modern methods of processing and synthesizing information in the field of scientific and pedagogical research
ON9 To use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world
ON10 To use the fundamental basics of biology and modern trends in its development, knowledge about the diversity and functioning of biological systems, their vast variety and evolution

Learning outcomes by discipline

Learning outcomes Future teachers who demonstrate competence are able to:
· Classify organs by their origin in embryogenesis
· compare the features of the structure of organs in connection with their functions
· to characterize the main stages of the evolution of organ systems
· identify aromorphoses, idioadaptation and degeneration in the stages of evolution
· explain the adaptive nature of the evolution of organ systems
· identify the main directions of evolution of living organisms
· apply knowledge on the current state of evolutionary theory in the educational process;
· explain the content of the main provisions of the evolutionary theory;
· to analyze scientific data to prove the provisions of the evolutionary doctrine,
· integrate the acquired knowledge on comparative anatomy and evolution of living organisms.
· use methods of comparative analysis of various groups of living organisms, taking into account their systematic position, phylogenetic relationships, ecology and biology
· analyze the anatomical and morphological structure of organs, taking into account their functions;
· systematize research results, evaluate their reliability and significance
· plan and conduct experiments; process and analyze research results
- to use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world
- to use the fundamental basics of biology and modern trends in its development, knowledge about the diversity and functioning of biological systems, their vast variety and evolution

Prerequisites

Ecology of plants, animals and humans

Postrequisites

Microbiology with the basics of biotechnology

Evolutionary teaching

Discipline cycle	Basic disciplines
Course	4
Credits count	5

Knowledge control form	Examination

Short description of discipline

Pre-service teachers investigate the basic laws of the development of the organic world at the macro- and microevolutionary levels, the features of speciation, and the mechanisms of natural selection. During the course, pre-service teachers gain knowledge in explaining the processes occurring in nature, as well as develop their skills in analyzing various data at an interdisciplinary level. Pre-service teachers who demonstrate competence can: describe the process and significance of the evolutionary process in wildlife; apply knowledge about the basic laws and mechanisms of evolutionary changes in the life of plants and animals in pedagogical activity and in solving practical problems; substantiate the role of the evolutionary idea in the biological worldview; use the skills of interpreting changes occurring in ecosystems; document, correctly formalize links to the used sources of information using the selected citation style; argue the modern evolutionary approach to the study of biological objects; apply the skills of scientific explanation of natural processes in professional activity.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of subject competencies:
· Competencies of conceptual and theoretical knowledge (1, 2)
· Competencies of application in science (9,10,11)

Learning Outcomes

ON1 To develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the Kazakh society, using the foundations of socio- political, economic and legal knowledge, demonstrating personal and professional competitiveness
ON9 To use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world

Learning outcomes by discipline

Future teachers demonstrating competence can:
· describe the process and significance of the evolutionary process in wildlife;
· apply knowledge about the basic patterns and mechanisms of evolutionary changes in the life of plants and animals in teaching and solving practical problems;
to substantiate the role of the evolutionary idea in the biological worldview;
· use skills to interpret changes occurring in ecosystems;
· document and correctly formalize links to the sources of information used using the selected citation style;
· to argue for a modern evolutionary approach to the study of biological objects;
· apply the skills of scientific explanation of natural processes in professional activity.
to use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world

Prerequisites

Flora and fauna of the world

Postrequisites

Final examination

STEM education in biology

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

Short description of discipline

During the course, pre-service teachers practice pedagogical methods and technologies based on the activation and intensification of students` educational activities, diagnostics, and assessment in biology teaching using STEM approach. Pre-service teachers master the subject content through projects in which scientific knowledge and design, information technology and mathematical calculations are naturally integrated. Pre- service teachers explore the methodology of the organization of STEM learning, discuss the stages, apply various research methods in the practice of teaching STEM learning, and design STEM research. Pre-service teachers form their skills in integrating research into teaching practice in various types of learning environments. Pre-service teachers who demonstrate competence can: carry out the selection of pedagogical STEM– learning technologies and effectively implement them in the practice of teaching school academic disciplines in the classroom and in extracurricular activities; design STEM learning, considering the diversity of students; apply various methods and technologies of pedagogical diagnostics used in evaluation of the quality of results and content of the educational process; perform consistent, planned actions to improve the practice of teaching and STEM learning; develop their research skills, direct them to improve the quality of education and their functional literacy; develop a plan for the implementation of research on the practice of teaching STEM learning; conduct systematic evaluation of the results during STEM training; evaluate the strengths and weaknesses of STEM education.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of subject competencies:
· Competence of conceptual and theoretical knowledge (3)
· Competence in conducting scientific research (7,8)
· Competence of application in science (10, 13)
· Competence in the field of pedagogy and didactics (1,2)
· Competence for professional development (8,9)

Learning Outcomes

ON5 To develop and apply methods of teaching, education, assessment in various types of educational environment, taking into account the principles of student-centered, competence-based, inclusive approaches
ON8 To integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students
ON12 To create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty

Learning outcomes by discipline
Future teachers demonstrating competence can:
• select pedagogical STEM learning technologies and effectively implement them in the practice of teaching school academic disciplines in the classroom and in extracurricular activities
• design STEM learning, taking into account the diversity of students;
• apply various methods and technologies of pedagogical diagnostics used in monitoring the assessment of the quality of the results and content of the educational process;
• Perform consistent, planned actions to improve teaching and STEM learning practices;
• develop their research skills, direct them to improve the quality of education and functional literacy of students;
• develop a plan for the implementation of research on the practice of teaching STEM learning
• carry out systematic monitoring of the results obtained during STEM training;
• evaluate the strengths and weaknesses of the study
- to integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students
- to create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty

Prerequisites
Modern approaches to the organization of a biological experiment

Postrequisites
Final examination

Biophysics and bioinformatics

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

Short description of discipline
The course focuses on the use of theoretical knowledge and practical skills in biology in integration with physics and computer science, applying basic knowledge in the field of molecular biology and genomics, as well as the basics of statistics and mathematics. During lectures, practical and laboratory classes, pre- service teachers analyze the impact of natural phenomena (photobiological, electrical, sound, etc.) on living organisms, the principles of structured bioinformatics to reveal the essence of biological phenomena, a database search algorithm (BLAST), and the basics of gene mapping. During the course, pre- service teachers develop their interdisciplinary competencies (BTEAM) to solve creative tasks as well as their practical skills in biological physics in solving problems of biomedicine, and biomechanics. The course promotes the development of pre-service teachers' practical skills in working with databases of biological data (DNA, RNA, proteins), and modeling biological processes. Pre- service teachers can write a good scientific report and use biophysical and bioinformatic methods to solve research issues, working independently and in groups. Pre- service teachers who demonstrate competence can: describe the application of biomechanical processes in robotics and medicine; analyze the physical foundations of the study of heart automatics using an electrocardiogram, the functioning of muscle tissue (electrophysiology); evaluate the thermodynamic feature of biological systems and electrical processes in living organisms, problems of stability and evolution of biological systems; investigate the effects of electromagnetic and sound waves on the organism of living beings; simulate photobiological processes, ultrastructure of the cell and cell membrane, etc.; explain how information is transferred from genes to proteins in living organisms; · describe the technology of the neurocomputer interface, the system of information exchange between the brain and the computer; apply modern methods of obtaining, analyzing, storing, organizing and visualizing biological data; evaluate the advantages and disadvantages of using computer systems and tools for solving biological problems; use of the most important databases and software (for example, OMIM, PubMed, UniProt, Cosmic, BioMart) for the extraction, analysis and interpretation of data at the level of DNA, RNA and protein; perform BLAST- search, alignment of DNA and protein sequences; critically interpret the results, visualize the protein and evaluate the differences created by sequence variations; create computer modeling of the genome (gene mapping), and phylogenetic trees on databases of biodata.

Purpose of studying of the discipline
The purpose of this course is to enhance the following areas of subject competencies:
· Competencies of conceptual and theoretical knowledge (2)
· Competencies in conducting scientific research (5,7)
· Application competencies in science (9, 10, 11)

Learning Outcomes
ON3 To use various types of information and communication technologies, modern methods of processing and synthesizing information in the field of scientific and pedagogical research
ON6 To carry out the choice of methodology and analysis for planning, conducting, collecting and processing data from laboratory and field studies
ON8 To integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students
ON12 To create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty

Learning outcomes by discipline
Learning outcomes Future teachers demonstrating competence can:
• describe the application of biomechanical processes in robotics and medicine
• analyze the physical foundations of the study of cardiac automatics using an electrocardiogram, the functioning of muscle tissue (electrophysiology)
• to evaluate the thermodynamic features of biological systems and electrical processes in living organisms, problems of stability and evolution of biological systems
• to investigate the effects of electromagnetic and sound waves on the body of living beings
• simulate photobiological processes, ultrastructure of the cell and cell membrane, etc.
• explain how information is transmitted from genes to proteins in living organisms

• describe the technology of the neurocomputer interface, the information exchange system between the brain and the computer
• apply modern methods of obtaining, analyzing, storing, organizing and visualizing biological data
• evaluate the advantages and disadvantages of using computing systems and tools to solve biological problems
• practices the use of the most important databases and software (e.g. OMIM, PubMed, UniProt, Cosmic, BioMart) to extract, analyze and interpret data at the DNA, RNA and protein levels
• perform BLAST search, alignment of DNA and protein sequences
• critically interpret the results, visualize the protein and evaluate the differences created by sequence variations
• create computer modeling of the genome (gene mapping), phylogenetic trees on databases of biodata
to carry out the choice of methodology and analysis for planning, conducting, collecting and processing data from laboratory and field studies

Prerequisites
Biometrics

Postrequisites
Final examination

Microbiology with the basics of biotechnology

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

Short description of discipline
During the course, pre-service teachers examine morphology, physiology, biochemistry, genetics and systematics of microorganisms. They also investigate the principles of using bacterial, yeast, animal and plant cell cultures, metabolism and biosynthetic capabilities in genetic engineering and biotechnological production by using knowledge of chemistry and physics. After the course, pre- service teachers have a good basic knowledge of the prospects for the development of biotechnology: the methods of obtaining recombinant DNA and DNA cloning, the use of plasmids, the stages of microclonal reproduction, and the use of enzymes in various fields. Pre-service teachers who demonstrate competence can: compare morpho-physiology, biochemistry, genetics of microorganisms with the use of modern molecular genetic methods; use disinfection and sterilization methods when working with biotechnological objects, and preparing nutrient media and coloring by using the Gram method to identify microorganisms; check the parameters of growth and development of microbial cultures, and correctly identify microorganisms by cultural and morphological characteristics; evaluate the use of living organisms in biotechnological production: production of microbial protein, enzyme preparation, biogas, bioethanol; practice the skills of cultivation and cloning of living organisms, experimentation of microclonal reproduction, microscopy of preparations of cells of living organisms; analyze the ethical issues of the use of GMOs, the principles of genetic engineering manipulations, and the importance of molecular genetic approaches in taxonomy, medicine and criminology; investigate the influence of various factors (temperature, pH, nutrient content) on the growth and development of microorganisms, the use of enzymes (pectinase, protease, etc.), the influence of antiseptic and disinfectants; design experiments for obtaining a cumulative and pure culture of microorganisms, obtaining callus tissues by microclonal reproduction; conduct a safe experiment to study the microflora of water, air, and dairy products; organize small projects: formulation of hypotheses and conclusions, planning, assessment of strengths and weaknesses, preparation of a report; collect, process and interpret research data on design and laboratory work; use scientific language, subject terminology and conventions appropriately.

Purpose of studying of the discipline
The purpose of this course is to enhance the following areas of professional competence:
· Competencies of conceptual and theoretical knowledge (2)
· Competencies in conducting scientific research (5, 6, 7)
· Competencies of application in science (9,11,13)

Learning Outcomes
ON2 To assess situations in various areas of interpersonal, social and professional communication in oral and written forms in the state, russian and foreign languages using analytical and critical thinking to develop language competencies
ON3 To use various types of information and communication technologies, modern methods of processing and synthesizing information in the field of scientific and pedagogical research
ON8 To integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students
ON10 To use the fundamental basics of biology and modern trends in its development, knowledge about the diversity and functioning of biological systems, their vast variety and evolution
ON12 To create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty

Learning outcomes by discipline
Learning outcomes Future teachers demonstrating competence can:
• compare morphophysiology, biochemistry, and genetics of microorganisms using modern molecular genetic methods
• demonstrate skills in applying disinfection and sterilization methods when working with biotechnological facilities, preparing nutrient media and coloring using the Gram method to identify microorganisms
• check the growth and development parameters of microbial cultures, correctly identify microorganisms by cultural and morphological characteristics
• evaluate the use of living organisms in biotechnological production: production of microbial protein, enzyme preparation, biogas, bioethanol, etc.
• practice the skills of cultivation and cloning of living organisms, experimentation of microclonal reproduction, microscopy of preparations of cells of living organisms
• analyze the ethical issues of the use of GMOs, the principles of genetic engineering manipulations, the importance of molecular genetic approaches in taxonomy, medicine and criminology
• to investigate the influence of various factors (temperature, pH, nutrient content) on the growth and development of microorganisms, the use of enzymes (pectinase, protease, etc.), the effect of antiseptic and disinfectants, etc.
• design experiments to obtain a cumulative and pure culture of microorganisms, to obtain callus tissues by microclonal reproduction
• conduct a safe experiment to study the microflora of water, air, and dairy products

• organize small projects: formulation of hypotheses and conclusions, planning, assessment of strengths and weaknesses, preparation of a report
• to collect, process and interpret research data on design and laboratory work
• it is appropriate and correct to use scientific language, subject terminology and symbols
- to integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students
- to use the fundamental basics of biology and modern trends in its development, knowledge about the diversity and functioning of biological systems, their vast variety and evolution

Prerequisites

Bioorganic chemistry

Postrequisites

Final examination

Scientific foundations of natural science

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

Short description of discipline

The course forms pre-service teachers` knowledge about the modern natural-scientific world view and the methods of natural sciences. They also develop their skills in applying the acquired knowledge to explain the phenomena of the surrounding world, and the perception of natural-scientific information. Pre-service teachers who demonstrate competence can: understand the natural science method of cognition, the main ideas and achievements of natural science, determining influence on the development of technology; navigate modern scientific concepts and information of natural science; understand the applied significance of the most important achievements in the field of natural sciences; critically analyze the phenomena, perception and interpretation of natural science; apply natural science knowledge in their professional activities.

Purpose of studying of the discipline

The purpose of this course is to improve the following areas of subject competencies:
* Competencies of conceptual and theoretical knowledge (2)*
* Competencies in conducting scientific research (5)*
* Competencies of application in science (9)*

Learning Outcomes

ON8 To integrate knowledge of related sciences necessary for everyday professional activities and the formation of functional literacy of students
ON9 To use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world

Learning outcomes by discipline

Future teachers demonstrating competence can:
* master the natural science method of cognition, the main ideas and achievements of natural science, the decisive influence on the development of technology and technology;*
* explain the applied significance of the most important achievements in the field of natural sciences;*
* navigate modern scientific concepts and information of natural science content;*
* demonstrate intellectual, creative abilities and critical thinking in the course of conducting research, analyzing phenomena, perceiving and interpreting natural science information;*
* apply natural science knowledge in professional activities.*
to use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world

Prerequisites

Educational Science and Key Theories of Learning

Postrequisites

Final examination

Applied biology with the basics of soil science

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

Short description of discipline

During the course, pre-service teachers examine the topics of soil science, agrochemistry, and crop production: the process of soil formation, soil morphology, structure and properties of soil, tillage, chemistry of agriculture, and cultivated plants. The course consists of lectures and laboratory classes, during which pre-service teachers develo their skills in working with laboratory equipment, materials, tools in the organization of educational and research activities. They also develop their interdisciplinary competencies during laboratory work and small scientific projects. Pre-service teachers who demonstrate competence can: · classify soil by mechanical composition; analyze the relationship of soil science with biological, chemical and other sciences; conduct safe experiments to study the influence of various factors on soil formation, the influence of living organisms on soil formation; identify morphological, biological and economic features of cultivated plants; assess the soil-ecological and bioecological condition of the territory of Kazakhstan; practice the skills of cultivating soil microorganisms, microscoping preparations of cells of living organisms; design experiments to determine the composition and properties of the soil (physical, physico-mechanical, rheological); investigate the use of organic and mineral fertilizers in crop production; plan and carry out projects: formulation of hypotheses and conclusions, assessment of strengths and weaknesses, preparation of a report; collect, process and interpret research data on design and laboratory work; use scientific language, subject terminology and conventions appropriately.

Purpose of studying of the discipline
The purpose of this course is to enhance the following areas of subject competencies:
· Competencies of conceptual and theoretical knowledge (2)
· Competencies in conducting scientific research (5, 6, 7)
· Competencies of application in science (9, 11, 13)
Learning Outcomes
ON6 To carry out the choice of methodology and analysis for planning, conducting, collecting and processing data from laboratory and field studies
ON9 To use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world
ON12 To create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty
Learning outcomes by discipline
Future teachers demonstrating competence can:
• classify soil by mechanical composition
• analyze the relationship of soil science with biological, chemical and other sciences
• conduct safe experiments in order to study the influence of various factors on soil formation, the influence of living organisms on soil formation
• identify morphological, biological and economic features of cultivated plants
• to assess the soil-ecological and bioecological condition of the territory of Kazakhstan
• practice the skills of cultivating soil microorganisms, microscoping preparations of cells of living organisms
• design experiments to determine the composition and properties of the soil (physical, physico-mechanical, rheological)
• to investigate the use of organic and mineral fertilizers in crop production
• plan and carry out projects: formulation of hypotheses and conclusions, assessment of strengths and weaknesses, preparation of a report
• to collect, process and interpret research data on design and laboratory work
• it is appropriate and correct to use scientific language, subject terminology and symbols
- to use conceptual theories and laws of natural sciences to explain patterns, phenomena and processes in nature, to form a holistic view of the natural science picture of the world
- to create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty
Prerequisites
Environmental Chemistry
Postrequisites
Final examination

Design of STEM education

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

Short description of discipline
Pre-service teachers analyze the design features of STEM learning based on the applied nature of the real world challenges, learning through problem solving and critical thinking, and the integration of different content into the educational process. The course builds pre-service teachers' abilities to use new technological opportunities in biology, as well as to design and adapt STEM education considering the diversity of students. Pre- service teachers who demonstrate competence can: link science and STEM subjects with real life challenges or situations; identify practice- oriented problem situations; build project/ phenomena- based learning processes in which students make observations, identify problems and find solutions independently and with their peers; conduct experimental research with mathematical and IT modeling; design STEM lessons for students` academic and extracurricular activities in an inclusive environment.
Purpose of studying of the discipline
The purpose of this course is to enhance the following areas of subject competencies:
· Competence in conducting scientific research (4,5,8)
· Competence of application in science (10,13, 14)
· Area of competence in the field of pedagogy and didactics (2)
· Area of competence for professional development (8,9)
Learning Outcomes
ON3 To use various types of information and communication technologies, modern methods of processing and synthesizing information in the field of scientific and pedagogical research
ON5 To develop and apply methods of teaching, education, assessment in various types of educational environment, taking into account the principles of student-centered, competence-based, inclusive approaches
ON12 To create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty
Learning outcomes by discipline
Future teachers demonstrating competence are able to:
*• * connect science and STEAM subjects with real life problems or situations;*
• identify practice-oriented problem situations;
• build learning based on projects and phenomena in which students make observations, identify problems and find solutions independently and with their peers;
• conduct experimental research with mathematical and IT modeling;
• Design STEM lessons for students` academic and extracurricular activities in an inclusive environment.
- to develop and apply methods of teaching, education, assessment in various types of educational environment, taking into account the principles of student-centered, competence-based, inclusive approaches

- to create and offer solutions to non-standard problems, to model and carry out biological and pedagogical research using the skills of academic writing, the principles of academic honesty

Prerequisites

Modern approaches to the organization of a biological experiment

Postrequisites

Final examination

Digital technologies in biology

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

Short description of discipline

Pre-service teachers investigate the possibilities of using digital equipment and software in the educational process in biology, and plan effective ways of teaching using IT technologies, including in distance learning. They also create digital educational resources in biology. Pre- service teachers who demonstrate competence can: use various forms of interactive electronic educational content; use IT technologies in the organization of project activities; structure, integrate and present information in teaching activities, considering life and educational context of students; plan effective teaching using IT technologies; develop digital educational resources on biology.

Purpose of studying of the discipline

The purpose of this course is to enhance the following areas of subject competencies:
· Competence in conducting scientific research (7)
· Competence of application in science (8, 10, 12)
· Area of competence in the field of pedagogy and didactics (2)
· Area of competence for professional development (8,9)

Learning Outcomes

ON3 To use various types of information and communication technologies, modern methods of processing and synthesizing information in the field of scientific and pedagogical research
ON5 To develop and apply methods of teaching, education, assessment in various types of educational environment, taking into account the principles of student-centered, competence-based, inclusive approaches
ON7 To build professional relationships for constructive pedagogical and social activities, own pedagogical development and well-being

Learning outcomes by discipline

Future teachers demonstrating competence can:
• use various forms of interactive interaction with electronic educational content;
• use IT technologies in the organization of project activities;
• use the skills of structuring, integrating and presenting information in teaching activities, taking into account the life and educational context of students;
• plan effective teaching using IT technologies;
• Develop digital educational resources on biology.

Prerequisites

Information and communication technology

Postrequisites

Final examination