NJSC SHAKARIM UNIVERSITY OF SEMEY

EDUCATIONAL PROGRAM

7M05 - Natural Sciences, Mathematics and Statistics
(Code and classification of the field of education)

7M051 - Biological and related sciences
(Code and classification of the direction of training)

0510
(Code in the International Standard Classification of Education)

M080 - Biology
(Code and classification of the educational program group)

7M05101 - Biology
(Code and name of the educational program)

Master
(Level of preparation)

Semey

Educational program

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Master
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Semey 2023

PREFACE

Developed

The educational program 7M05101 - Biology in the direction of preparation 7M051 - Biological and related sciences on the basis of the State Compulsory Standards of Higher and Postgraduate Education approved by the Order of the Ministry of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 No 2 (as amended by the order) was developed by the Academic Committee dated 20.02.2023 No 66).

Members of the Academic Committee	Full name	Academic degree, academic title, position	Signature
Head of the Academic Committee	Nurymkhan Gulnur	Dean of the Faculty of Engineering and Technology, Candidate of Technical Sciences, associate professor	
Educational program manager	Mirasheva Gulmira	Candidate of Technical Sciences, Associate Professor of the Department of Food Production Technology and Biotechnology	
Member of the AC	Kalibekkyzy Zhanar	Member of the Board -Vice-Rector for Science and Innovation, Candidate of Biological Sciences	
Member of the AC	Kakimova Zhainagul	Candidate of Technical Sciences, Head of the Department of Food Production Technology and Biotechnology	
Member of the AC	Voshchakina Daria	head of the Biological Department of the regional Childrens Biological Center	
Member of the AC	Zharykbasova Klara	Doctor of Technical Sciences, Vice-Rector for Academic Affairs of Alikhan Bokeikhan University	
Member of the AC	Tylgatbekova Asem	Master s student of group MBL -201.1	
Member of the AC	Otynbaeva Madina	Master s student of group MBL -101	

Reviewing

Full name of the reviewer	Position, place of work	Signature
Silybayeva Batiyash	Associate Professor of the Department of Applied Biology, Alikhan Bokeikhan University, Candidate of Biological Sciences	

Reviewed

at the meeting of the Quality Assurance Commission of the Faculty of Engineering and Technology
Recommended for approval by the Academic Council of the University
Protocol № 4.6 "10" April2023
Chairman of the Commission on Quality Assurance Abdilova G.

Approved at the meeting of the Academic Council of the University Protocol No. 8 "25" April 2023.

Approved

at the meeting of the Academic Council of the University
Protocol № 1 "01" of September 2023
Chairman of the Academic Council of the University Orynbekov D.R.

Content

1.Introduction

1.1.General data

The educational program 7M05101- biology is designed to master in- depth, theoretical and practical knowledge in the field of biology, prepare masters students who have ideas about new directions of modern biology and are able to apply their competencies in scientific, practical and pedagogical fields.

1.2.Completion criteria

The main criterion for the completion of the educational process for the preparation of masters of the scientific and pedagogical direction is the development of at least 88 credits of theoretical training, including 6 credits of pedagogical practice, 13 credits of research practice, as well as at least 24 credits of research work of a master s student, including internships and the completion of a master s thesis, at least 8 credits of the final attestations .A totalof 120 credits.

1.3.Typical study duration: 2 years

2.PASSPORT OF THE EDUCATIONAL PROGRAM

2.1.EP purpose	Preparation of masters with fundamental and applied knowledge in the field of biological sciences, research skills for carrying out scientific research, professional and practical, organizational, managerial and pedagogical activities.
2.2.Map of the training profile within the educational program	
Code and classification of the field of education	7M05 - Natural Sciences, Mathematics and Statistics
Code and classification of the direction of training	7M051 - Biological and related sciences
Code in the International Standard Classification of Education	0510
Code and classification of the educational program group	M080 - Biology
Code and name of the educational program	7M05101 - Biology
2.3.Qualification characteristics of the graduate	
Degree awarded / qualification	Master of Science in the educational program 7M05101-Biology
Name of the profession / list of positions of a specialist	researcher; specialist of the nature reserve, national park, zoo, biological garden, biological center, Semipalatinsk Forest reserve, etc.; teacher, specialist of the Department of Education.
OQF qualification level (industry qualification framework)	7
Area of professional activity	science; specialist in the nature reserve, national park, zoo, biological garden, biological center, "Semey Ormany", etc.; education, management.
Object of professional activity	research institutes, as well as nature reserves, national parks, zoos, biological gardens, biological centers, etc.; secondary specialized, higher educational institutions of state and non-state profile.
Types of professional activity	research work (researcher, laboratory assistant, researcher, etc.); research work in the field of education and science; educational (teacher of biology in secondary specialized and higher educational institutions of state and non-state profile); management (in education departments, biological centers, nature reserves, national parks, zoos, biological gardens, landscaping organizations, etc.).
Graduate Model	As a result of mastering the educational program, a graduate of EP 7M05101-Biology should have the following competencies: 1. General cultural: - ability to abstract thinking, analysis, synthesis; - the ability to professional growth, to self-study new research methods; - the ability to use skills in practice in the organization of research and in the management of the team. 2. General professional: - the ability to use modern information technologies for the collection, processing and dissemination of scientific information in the field of biology, the ability to use databases, software products and information

	network resources. 3. Professional: - plan, organize and conduct research in the field of biology, be able to carry out correct processing of experimental results and make informed conclusions and conclusions; - be able to present the results of the work performed in the form of scientific and technical reports, reviews, scientific reports and publications; - conduct fundamental and applied scientific research in the field of biology, analyze and solve theoretical and applied problems of biology; - to use immunobiological, biochemical, molecular genetic, breeding, statistical and other methods of biological and related sciences in conducting scientific research; - to carry out the formulation of a scientific experiment in laboratory and field conditions, to use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational tasks.

3.Modules and content of the educational program

Module 1. Sociolinguistic and scientific-pedagogical activity

Foreign language (professional)

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	32903 (3024520)
Course	1
Term	1
Credits count	3
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

Mastery of general cultural, professional and special competencies for the implementation of professional activities, involving teaching free reading of original literature of the relevant branch of knowledge in a foreign language; development of oral communication skills in monological and dialogical form in the specialty; development of written scientific communication skills on topics related to the scientific work of a graduate student, as well as familiarization with the forms and types of international cooperation in the scientific field.

Purpose of studying of the discipline

The purpose of studying the discipline "Foreign language (professional)" in the master`s degree program is the systematic deepening of communicative competence within the framework of international standards of foreign language education on the basis of further development of skills and abilities of active language proficiency in the professional activity of the future master.

Learning Outcomes

ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activity.

Prerequisites

Bachelor

Postrequisites

Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis I The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

History and philosophy of science

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	32902 (3024519)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at studying the culture of scientific thinking, forms analytical capabilities and research skills, provides theoretical and practical knowledge necessary for a future scientist. Explores the historical evolution of the sciences and the philosophical perspectives they form. The origins of modern science, its social and institutional connections are described. General philosophical issues related to thought experiments, confirmation and refutation of theories, the origin and application of quantitative and high-quality research methods are considered.

Purpose of studying of the discipline

the formation of an interdisciplinary worldview among undergraduates, based on a deep understanding of the history and philosophy (theory) of scientific thinking, as part of a universal culture.

Learning Outcomes

ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activity.

Prerequisites

Bachelor

Postrequisites

Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis I The research work of a student, including an internship and the implementation of a master s thesis II The research

work of a student, including an internship and the implementation of a master s thesis III

Tertiary education

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	32905 (3024522)
Course	1
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

The course is aimed at studying the main directions, principles and patterns of higher education. During the course of the course, the basic concepts of modern pedagogy, concepts and theories of teaching and upbringing, didactics of higher education will be considered. The master`s student will master the skills of designing the organization of the educational process, techniques of individual and group reflection, will be able to correctly formulate pedagogical goals, apply educational technologies in the educational process. in the process, to design work programs of disciplines.

Purpose of studying of the discipline

The purpose of mastering the discipline is to master the system of knowledge about higher education, its content, structure, principles of educational process management and mastering modern technologies in the field of management and organization of the educational process

Learning Outcomes

ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activity.
ON2 Possess the methodology and algorithm of planning, organization of research and scientific-pedagogical activities.

Prerequisites

Bachelor

Postrequisites

Final examination Pedagogical practice Methods of teaching biology at the present level

Psychology of management

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	32904 (3024521)
Course	1
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

The content of the course is aimed at mastering the approaches and directions of management psychology, psychological laws of management, features of planning and solving management problems. Students will get acquainted with the psychological methods of resolving conflict situations, master the ways of motivating work, the methods of using effective management styles. Skills will be formed to analyze the psychological causes underlying the decline in the effectiveness of the management process.

Purpose of studying of the discipline

The purpose of the discipline "Psychology of Management" is the formation of scientifically based ideas about the system of mental phenomena, psychological variables of behavior and conscious human activity in modern conditions and allows undergraduates to form skills of applying the acquired psychological knowledge in educational activities

Learning Outcomes

ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activity.
ON2 Possess the methodology and algorithm of planning, organization of research and scientific-pedagogical activities.

Prerequisites

Bachelor

Postrequisites

Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis I The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Pedagogical practice

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	32919 (3024484)
Course	2
Term	1
Credits count	6
Pedagogical practics	180hours
Total	180hours
Knowledge control form	Total mark on practice

Short description of discipline
General acquaintance with the structure of the university, educational, educational scientific process. Study of curricula, individual work plans of the teaching staff, educational work plans, research work plans. Drawing up a schedule of classes during practice.

Purpose of studying of the discipline
The purpose of pedagogical practice is the practical consolidation of theoretical knowledge, skills and abilities of students, the acquisition of practical experience in the field of future professional activity

Learning Outcomes
ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activity.
ON5 Possess the theoretical and methodological foundations of scientific research in biology, methods of introducing research results into practical and pedagogical activities.

Prerequisites
Psychology of management Tertiary education

Postrequisites
Final examination

Module 2. Organization of scientific research.

Statistical methods in biology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	32898 (3024488)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the basic concepts, the need for multidimensional processing of biological data, data collection and preprocessing, selection of research data for statistical analysis. Considers external factors as possible causes of variability, linear regression, projection, methods for analyzing biological data, cluster analysis, multidimensional scaling.

Purpose of studying of the discipline
Formation of undergraduates` skills and abilities of statistical processing of information obtained as a result of performing field and laboratory biological, environmental studies using modern equipment and computer systems.

Learning Outcomes
ON3 Conduct fundamental and applied scientific research in the field of biology.
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON7 Improve the level of scientific biological research through the widespread use of modern methods of processing, biometrics and interpretation of scientific data in the field of botany, zoology, cell biology, embryology, molecular biology, bioengineering.

Prerequisites
Bachelor

Postrequisites
Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis I The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Bionics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	32900 (3024514)
Course	1

Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline examines the theoretical foundations of practical bionics, bionic modeling, bionic research, constructive natural systems, prospects for the development of practical
bionics. Considers the application in technical devices and systems of the principles of organization, properties, functions and structures of wildlife, that is, forms of life in nature and their industrial analogues. Studies biological bionics, which studies the processes occurring in biological systems, theoretical bionics, which builds mathematical models of processes

Purpose of studying of the discipline

the study of the basic laws and patterns, processes in natural objects and systems in order to use bionic knowledge in the design and creation of constructive three-dimensional systems from various materials.

Learning Outcomes

ON3 Conduct fundamental and applied scientific research in the field of biology.
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON7 Improve the level of scientific biological research through the widespread use of modern methods of processing, biometrics and interpretation of scientific data in the field of botany, zoology, cell biology, embryology, molecular biology, bioengineering.

Prerequisites

Bachelor

Postrequisites

Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis I The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

The research work of a student, including an internship and the implementation of a master s thesis I

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	32913 (3024507)
Course	1
Term	2
Credits count	11
Working practice	330hours
Total	330hours
Knowledge control form	Total mark on practice

Short description of discipline

The research work of the undergraduate is focused on solving the tasks set on the topic of the dissertation of the undergraduate. Setting up a research experiment, using organoleptic, physico- chemical, microbiological research methods in assessing the quality of raw materials and finished products. The research work of a master`s student is carried out by conducting scientific work at the department.

Purpose of studying of the discipline

development of the ability to independently carry out activities in the field of education and science related to solving complex professional tasks in innovative conditions, ensuring the development of professional research thinking of undergraduates, forming a clear idea of their main professional tasks, ways to solve them, carrying out bibliographic work with the involvement of modern information technologies.

Learning Outcomes

ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activity.
ON2 Possess the methodology and algorithm of planning, organization of research and scientific-pedagogical activities.
ON3 Conduct fundamental and applied scientific research in the field of biology.
ON5 Possess the theoretical and methodological foundations of scientific research in biology, methods of introducing research results into practical and pedagogical activities.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.

Prerequisites

Basic and profile disciplines of the EP Modern methods and organization, planning of scientific research

Postrequisites

Final examination Research practice The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Organization and planning of scientific research abroad

Discipline cycle	Profiling discipline

Discipline component	Electives
SubjectID	32918 (3024515)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline considers modern methods of conducting research work abroad, the main stages of conducting research and components of research work abroad, methods of analysis, processing, systematization of information, methods of statistical processing of experimental data, the basics of experiment planning in the study of technological processes, statistical processing of experimental data, formulation of conclusions for each stage research work.

Purpose of studying of the discipline
to provide knowledge on the main directions of scientific research abroad and to instill skills in the use of biological methods, as well as to know and be able to apply them in practice.

Learning Outcomes
ON2 Possess the methodology and algorithm of planning, organization of research and scientific-pedagogical activities.
ON3 Conduct fundamental and applied scientific research in the field of biology.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.

Prerequisites
History and philosophy of science Foreign language (professional)

Postrequisites
Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Organization of research work in schools and colleges

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32917 (3024513)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline considers modern methods of conducting research work, the main stages of conducting research and the components of research work, methods of analysis, processing, systematization of information, methods of statistical processing of experimental data, the basics of experiment planning in the study of technological processes, conducting statistical processing of experimental data, formulating conclusions for each stage of research work.

Purpose of studying of the discipline
to provide undergraduates with knowledge on the organization and planning of research and innovation activities.

Learning Outcomes
ON2 Possess the methodology and algorithm of planning, organization of research and scientific-pedagogical activities.
ON3 Conduct fundamental and applied scientific research in the field of biology.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.

Prerequisites
History and philosophy of science Foreign language (professional)

Postrequisites
Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Modern methods and organization, planning of scientific research

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32907 (3024491)
Course	1

Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Basic concepts, principles and methods of organizing and planning research. Choosing the best plan. Plans for multifactorial experiments. Methods for optimizing multi-factor objects. Selection of significant factors. Planning with selective control.

Purpose of studying of the discipline
Principles and methods of organizing and planning scientific research.

Learning Outcomes
ON2 Possess the methodology and algorithm of planning, organization of research and scientific-pedagogical activities.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.

Prerequisites
History and philosophy of science

Postrequisites
Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Methods of teaching biology at the present level

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32920 (3024494)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course of training of biology technology in secondary vocational and university must equip undergraduate's knowledge of theoretical and methodological bases of methodical science and the initial methodological skills that contribute to the implementation of the various functions of the teacher of biology.

Purpose of studying of the discipline
The main purpose of the course is to develop a system of methodological knowledge and skills among undergraduates that ensure readiness to effectively carry out the educational process in biology at school, independence and creativity in their teaching activities.

Learning Outcomes
ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activity.
ON5 Possess the theoretical and methodological foundations of scientific research in biology, methods of introducing research results into practical and pedagogical activities.

Prerequisites
Psychology of management Tertiary education

Postrequisites
Final examination

The research work of a student, including an internship and the implementation of a master s thesis II

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	32933 (3024508)
Course	2
Term	1
Credits count	4
Working practice	120hours

Total	120hours
Knowledge control form	Total mark on practice

Short description of discipline
The master s research work is focused on solving the tasks set on the topic of the master s thesis. Setting up a research experiment, using organoleptic, physico-chemical, microbiological research methods in assessing the quality of raw materials and finished products. The research work of a master s student is carried out by conducting scientific work at the department.

Purpose of studying of the discipline
development of the ability to independently carry out activities in the field of education and science related to solving complex professional tasks in innovative conditions, ensuring the development of professional research thinking of undergraduates, forming a clear idea of their main professional tasks, ways to solve them, carrying out bibliographic work with the involvement of modern information technologies.

Learning Outcomes
ON2 Possess the methodology and algorithm of planning, organization of research and scientific-pedagogical activities.
ON5 Possess the theoretical and methodological foundations of scientific research in biology, methods of introducing research results into practical and pedagogical activities.

Prerequisites
Modern methods and organization, planning of scientific research The research work of a student, including an internship and the implementation of a master s thesis I

Postrequisites
Final examination The research work of a student, including an internship and the implementation of a master s thesis III

New approaches to learning

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32936 (3024523)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Teaching methods at the modern level should equip undergraduates with knowledge of the theoretical and methodological foundations of methodological science and initial methodological skills that contribute to the performance of various functions of a teacher. In connection with modern requirements, the focus of this course is on the development of independent cognitive activity of students, their upbringing in the process of learning the discipline

Purpose of studying of the discipline
to develop a system of methodological knowledge and skills among undergraduates that ensure readiness to effectively carry out the educational process in biology at school, independence and creativity in their teaching activities.

Learning Outcomes
ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activity.
ON5 Possess the theoretical and methodological foundations of scientific research in biology, methods of introducing research results into practical and pedagogical activities.

Prerequisites
Psychology of management Tertiary education

Postrequisites
Final examination Pedagogical practice

Professional guide of the teacher

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32939 (3024524)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline considers the targets of higher education in modern educational paradigms, the axiological component of the professional image of a teacher,the values and meanings of pedagogical activity,
the methodological component of the professional image of a teacher. Professional and personal development of a teacher in the context of his professional image

Purpose of studying of the discipline

Preparation of a master `s student for teaching at a university and the creation of conditions for the formation of his professional image .

Learning Outcomes

ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activity.
ON5 Possess the theoretical and methodological foundations of scientific research in biology, methods of introducing research results into practical and pedagogical activities.

Prerequisites

Psychology of management Tertiary education

Postrequisites

Final examination Pedagogical practice

Research practice

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	32955 (3024506)
Course	2
Term	2
Credits count	13
Working practice	390hours
Total	390hours
Knowledge control form	Total mark on practice

Short description of discipline

Research practice is part of the research work of a graduate student. Research practice is focused on the solution of tasks on the topic of the thesis of a graduate student. The formulation of a research experiment, the use of organoleptic, physico-chemical, microbiological research methods in assessing the quality of raw materials and finished products. The practice is carried out by conducting scientific work at the Department.

Purpose of studying of the discipline

Familiarization with the latest theoretical, methodological and technological achievements of domestic and foreign literature, modern methods of scientific research, processing and interpretation of experimental data

Learning Outcomes

ON2 Possess the methodology and algorithm of planning, organization of research and scientific-pedagogical activities.
ON3 Conduct fundamental and applied scientific research in the field of biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.

Prerequisites

Basic and profile disciplines of the EP The research work of a student, including an internship and the implementation of a master s thesis I The research work of a student, including an internship and the implementation of a master s thesis II

Postrequisites

Final examination

The research work of a student, including an internship and the implementation of a master s thesis III

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	32956 (3024509)
Course	2
Term	2
Credits count	9
Working practice	270hours
Total	270hours
Knowledge control form	Total mark on practice

Short description of discipline

The master s research work is focused on solving the tasks set on the topic of the master s thesis. Setting up a research experiment, using organoleptic, physico-chemical, microbiological research methods in assessing the quality of raw materials and finished products. The research work of a master s student is carried out by conducting scientific work at the department.

Purpose of studying of the discipline

development of the ability to independently carry out activities in the field of education and science related to solving complex professional tasks in innovative conditions, ensuring the development of professional research thinking of undergraduates, forming a clear idea of their main professional tasks, ways to solve them, carrying out bibliographic work with the involvement of modern information technologies.

Learning Outcomes

ON2 Possess the methodology and algorithm of planning, organization of research and scientific-pedagogical activities.
ON3 Conduct fundamental and applied scientific research in the field of biology.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.

Prerequisites

Basic and profile disciplines of the EP The research work of a student, including an internship and the implementation of a master s thesis I The research work of a student, including an internship and the implementation of a master s thesis II

Postrequisites

Final examination

Module 3. Modern problems in biology.

Stem cell

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	32944 (3024485)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is a synthesis of the achievements of cytology, histology and radiobiology in the context of stem cell problems. Studies the basic properties, isolation and reproduction of stem cells, models and mechanisms of radiation carcinogenesis and the role of stem cells in it. Examines the stem cells of the breast, thyroid gland, stem cells of the gastrointestinal tract, the risks of antenatal and postnatal radiation.

Purpose of studying of the discipline

undergraduates gain knowledge about stem cells, about the features of their structure, development and metabolism, about the role of stem cells in the mechanisms of radiation carcinogenesis and about the methods of isolation and reproduction of tissue stem cells

Learning Outcomes

ON3 Conduct fundamental and applied scientific research in the field of biology.
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.

Prerequisites

Bachelor

Postrequisites

Basic and profile disciplines of the EP Final examination

The Evolutionary Theory

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	32899 (3024490)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline considers the basic theories of evolution, forms of variability, modifications, types of modifications, types of mutations. Studies modern ideas about the structure of the gene, mutations in natural populations, combinative variability, mutation process and genetic combinatorics. Studies speciation, allopatric and sympatric speciation, quantum speciation. The concept of ontogenesis, ontogenesis in protozoa, stages of ontogenesis and types of evolutionary trends: complication, simplification, embryonization.

Purpose of studying of the discipline

Formation of ideas about the evolutionary doctrine as a science about the general laws and driving forces of the development of wildlife.

Learning Outcomes
ON3 Conduct fundamental and applied scientific research in the field of biology.
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.
Prerequisites
Bachelor
Postrequisites
Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis I The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Biometrics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	32423 (3024487)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline considers the planning of observations and methods of statistical processing of their results. Biometrics is an applied science that studies specific biological objects using mathematical methods. Studies statistical patterns and basic concepts of probability theory, compilation of a variation series, basic statistical indicators, statistical aggregates, types and types of samples, correlation analysis, regression analysis, variance analysis.
Purpose of studying of the discipline
mathematical processing of certain indicators based on physical and behavioral characteristics.
Learning Outcomes
ON3 Conduct fundamental and applied scientific research in the field of biology.
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON7 Improve the level of scientific biological research through the widespread use of modern methods of processing, biometrics and interpretation of scientific data in the field of botany, zoology, cell biology, embryology, molecular biology, bioengineering.
Prerequisites
Bachelor
Postrequisites
Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis I The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Cell Biology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	32424 (3024517)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The purpose of the course is to deepen the knowledge of masters in the field of cell biology, acquaintance with modern ideas about the structural and molecular organization of pro and eukaryotic cells, the executive and regulatory mechanisms of their functions, as well as about the main directions

Purpose of studying of the discipline
to acquaint undergraduates with various fields of cell biology in order to solve practical problems that are most in demand in biology, biomedical science and practice, to master them to deepen their knowledge.
Learning Outcomes
ON3 Conduct fundamental and applied scientific research in the field of biology.
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.
Prerequisites
Bachelor
Postrequisites
Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis I The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Cell therapy

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	32360 (3024486)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline examines the basic principles of cell therapy, sources of stem and progenitor cells, the main methods of their isolation, cell cultures, tissues. Studies the possibilities of modeling therapeutic effects in an in vitro experiment, features of cell settlement on materials (vitalization), static and dynamic cultivation, the possibility of changing
the tensor of mechanical stresses to stimulate cellular stress, modification of the structure of materials to change cell migration.
Purpose of studying of the discipline
mastering knowledge in the field of fundamental regenerative cell therapy as a basis for the use of high-tech methods of treatment.
Learning Outcomes
ON3 Conduct fundamental and applied scientific research in the field of biology.
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.
Prerequisites
Bachelor
Postrequisites
Final examination The research work of a student, including an internship and the implementation of a master s thesis I The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Modern problems of evolution

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	32353 (3024489)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the methods of studying evolution, the main sections of the evolutionary doctrine, the basic theories of evolution, the genetic foundations of the evolutionary process. Considers the organization of life and its main characteristics, the main properties of living systems, the concept of speciation, mutation as an elementary evolutionary material. Studies the population gene pool, the problems of macroevolution, the evolution of ontogenesis. The importance of evolution for environmental protection and biodiversity conservation.

Purpose of studying of the discipline
to orient the undergraduate student in the course of the problems facing modern evolutionary teaching, to help him in forming his own position on the causes and course of evolution.

Learning Outcomes
ON3 Conduct fundamental and applied scientific research in the field of biology.
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.

Prerequisites
Bachelor

Postrequisites
Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis I The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Theory of evolution

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	32901 (3024518)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies modern ideas about the origin of life on Earth. Studies the mechanisms of evolutionary transformations, experimental study of all links of the evolutionary process, starting with the variability of populations and ending with speciation, methods of analysis and modeling of evolutionary processes. Examines theoretical studies of the main problems of evolutionary science, the topic of microevolution, the problems of anthropogenesis.

Purpose of studying of the discipline
Study of the mechanisms of evolutionary transformations, experimental study of all links of the evolutionary process, starting with the variability of populations and ending with speciation, theoretical studies of the main problems of evolutionary science

Learning Outcomes
ON3 Conduct fundamental and applied scientific research in the field of biology.
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.

Prerequisites
Bachelor

Postrequisites
Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis I The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Actual problems of genetics

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32914 (3024510)
Course	1
Term	2
Credits count	5
Lections	15hours

Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Actual problems of genetics is a discipline that is included in all areas of modern biology. The achievements of genetics today are a key factor in the study of complex biological processes and systems at the molecular, cellular, organismic, and population levels. Currently, the problems of genetic science are relevant, since it is important to apply in science general provisions and approaches in plant and animal genetics, achievements and prospects, the basic principles of obtaining recombinant DNA, the stages of genetic experimental work

Purpose of studying of the discipline

formation of deep theoretical knowledge in the field of actual problems of genetics, possession of modern methods for crossing plant and animal material.

Learning Outcomes

ON3 Conduct fundamental and applied scientific research in the field of biology.
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON7 Improve the level of scientific biological research through the widespread use of modern methods of processing, biometrics and interpretation of scientific data in the field of botany, zoology, cell biology, embryology, molecular biology, bioengineering.

Prerequisites

Biometrics Modern problems of evolution Cell Biology

Postrequisites

Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Population genetics

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32916 (3024512)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the concept of population, the Hardy-Weinberg-Castle Law and the consequences of the law, polymorphism and heterozygosity in populations.
Considers models of selection against recessive homozygotes, against dominant homozygotes, selection in the absence of domonation, selection against heterozygotes, selection in favor of heterozygotes, the concept of inbreeding, regular and irregular inbreeding in populations. Path coefficient analysis and inbreeding coefficient.

Purpose of studying of the discipline

formation of basic knowledge among undergraduates about the mechanisms of heredity and variability in populations

Learning Outcomes

ON3 Conduct fundamental and applied scientific research in the field of biology.
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON7 Improve the level of scientific biological research through the widespread use of modern methods of processing, biometrics and interpretation of scientific data in the field of botany, zoology, cell biology, embryology, molecular biology, bioengineering.

Prerequisites

Biometrics Modern problems of evolution Cell Biology

Postrequisites

Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Genetic engineering

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32915 (3024511)

Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the main stages of recombinant DNA technology, enzymes used in genetic engineering, vector systems for gene transfer, methods for constructing recombinant DNA, characteristics of cloned DNA sequences. Examines the genetic transformation of bacteria and mammals, the genetic transformation of plants: methods and applications

Purpose of studying of the discipline

in-depth study of the theoretical foundations of the design, cloning and expression of genetic material in bacterial and eukaryotic cells, as well as the creation of organisms with a new genetic program

Learning Outcomes

ON3 Conduct fundamental and applied scientific research in the field of biology.
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON7 Improve the level of scientific biological research through the widespread use of modern methods of processing, biometrics and interpretation of scientific data in the field of botany, zoology, cell biology, embryology, molecular biology, bioengineering.

Prerequisites

Biometrics Modern problems of evolution Cell Biology

Postrequisites

Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Environment and biological diversity

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32910 (3024503)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Protection of the environment and biodiversity. Classification of biological diversity of animals and birds. Adaptation of animals to various biological factors, formation taksonomicheskogo diversity, morphological variety of plants and animals in ierarkhicheskaya of heredity, taxonomy and kinship, geographical distribution

Purpose of studying of the discipline

the study of the biological diversity of plants, animals and microorganisms, the features of their structure, adaptations to the environment, patterns of distribution, conservation of biodiversity.

Learning Outcomes

ON3 Conduct fundamental and applied scientific research in the field of biology.
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.

Prerequisites

Biometrics Modern problems of evolution Cell Biology

Postrequisites

Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Variety of associations and ekosistem

Discipline cycle	Profiling discipline
Discipline component	Electives

SubjectID	32912 (3024505)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline examines the history of the study of biological forms and natural communities, levels of biodiversity, principles of classification of biological taxa, forms of life. Studies natural communities, major terrestrial biomes, intrazonal natural communities,.agricultural biocenoses, problems of biodiversity protection.

Purpose of studying of the discipline
formation of in- depth systematic knowledge of basic concepts in the study of biodiversity and practical skills in the field of its conservation, skills and competencies for assessing biodiversity at various levels of the biosphere organization, taking into account the main strategies for its restoration, ensuring security and sustainable human interaction with the natural environment and society.

Learning Outcomes
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON7 Improve the level of scientific biological research through the widespread use of modern methods of processing, biometrics and interpretation of scientific data in the field of botany, zoology, cell biology, embryology, molecular biology, bioengineering.

Prerequisites
Biometrics Modern problems of evolution Cell Biology

Postrequisites
Final examination Biotechnology of plants and animals Ethology The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Modern problems of human and animal biology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32908 (3024492)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the molecular mechanisms of development regulation, modern methods of genome research, free radical reactions in cells and problems of their regulation, problems of plant immunity, the human genome. The problems of new and emerging viral infections, the problem of consciousness in modern biology, modern problems of neurobiology, modern approaches to the study of the evolution of living organisms, the current state of the study of biodiversity and its prospects are considered

Purpose of studying of the discipline
familiarization of undergraduates with current problems and promising areas of modern scientific research in the field of human and animal biology.

Learning Outcomes
ON3 Conduct fundamental and applied scientific research in the field of biology.
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON7 Improve the level of scientific biological research through the widespread use of modern methods of processing, biometrics and interpretation of scientific data in the field of botany, zoology, cell biology, embryology, molecular biology, bioengineering.

Prerequisites
Modern problems of evolution Cell Biology

Postrequisites
Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Ecological physiology of animals

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32909 (3024493)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies methods of studying physiological processes in animals, physiological mechanisms of adaptation of the body, regulation of vital functions of the body, physiological mechanisms of adaptations at the population level. Examines the mechanisms of adaptive regulation of the number of animals, physiological mechanisms of adaptation to changing environmental conditions (temperature, light), biological rhythms, ecological and physiological characteristics of temperature adaptations.

Purpose of studying of the discipline

study of the influence of extreme environmental factors on the animal body, such as acceleration, weightlessness, noise, vibration, motion sickness, hypoxia and hyperoxia, hyper- and hypocapnia, magnetic fields, ionizing radiation.

Learning Outcomes

ON3 Conduct fundamental and applied scientific research in the field of biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.

Prerequisites

Cell Biology

Postrequisites

Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Ecological human physiology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32906 (3024525)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the influence of extreme environmental factors on the human body, such as acceleration, weightlessness, noise, vibration, motion sickness, hypoxia and hyperoxia, hyper- and hypocapnia, magnetic fields, ionizing radiation. Physiological and psychological reactions of the body to extreme environmental conditions, adaptation of the body to the action of these factors. Physiological and psychological reactions of the body to extreme environmental conditions, adaptation of the body to the action of these factors.

Purpose of studying of the discipline

the study of the dependence of the functions and vital activity of the organism on the living conditions in different physical and geographical zones, in different seasons, time periods, as well as the physiological basis of adaptation of organisms to various environmental factors

Learning Outcomes

ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.

Prerequisites

Bachelor

Postrequisites
Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Ecology biodiversity

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32911 (3024504)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the diversity of life in all its manifestations, as well as indicators of the complexity of biological systems, the heterogeneity of its components. Considers general approaches to modeling biological diversity at different levels of the biological hierarchy, as well as ways to preserve biological diversity.

Purpose of studying of the discipline
study of the biological diversity of the environment, protection and its rational use.

Learning Outcomes
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON7 Improve the level of scientific biological research through the widespread use of modern methods of processing, biometrics and interpretation of scientific data in the field of botany, zoology, cell biology, embryology, molecular biology, bioengineering.

Prerequisites
Modern problems of evolution Cell Biology

Postrequisites
Basic and profile disciplines of the EP Final examination The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Biotechnology of plants and animals

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32924 (3024498)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline considers the cultivation of eukaryotic cells in vitro, the technology of obtaining and cultivating animal cell lines, methods of creating chimeras, hybridization of animal cells. Studies the cultivation of individual plant cells, the main directions of plant cell engineering, suspension cultures, morphogenesis in callus tissues, clonal micro-propagation of plants.

Purpose of studying of the discipline
formation of a complex of basic knowledge on plant and animal biotechnology

Learning Outcomes
ON5 Possess the theoretical and methodological foundations of scientific research in biology, methods of introducing research results into practical and pedagogical activities.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON7 Improve the level of scientific biological research through the widespread use of modern methods of processing, biometrics and interpretation of scientific data in the field of botany, zoology, cell biology, embryology, molecular biology, bioengineering.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.

Prerequisites
Biometrics Modern problems of evolution Environment and biological diversity Actual problems of genetics Cell Biology
Postrequisites
Final examination The research work of a student, including an internship and the implementation of a master s thesis III

Ethology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32927 (3024500)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Apply the acquired knowledge to solve scientific, practical and industrial problems related to animal ecology. Formation of undergraduates ` ideas about modern scientific developments in the field of animal ethology. Formation of undergraduates ` ideas about modern scientific developments in the field of animal ethology
Purpose of studying of the discipline
Studying the basics of animal behavior.
Learning Outcomes
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.
Prerequisites
Modern problems of evolution Modern problems of human and animal biology Actual problems of genetics Cell Biology
Postrequisites
Final examination The research work of a student, including an internship and the implementation of a master s thesis III

Ethology with fundamentals of zoopsychology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32930 (3024502)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the main directions of the science of animal behavior and representatives of these directions and the social behavior of animals. Examines the conditions for observing animal behavior, methods of describing behavior, methods and approaches in the study of animal behavior: physiological, biochemical, immunological, molecular genetic.
Purpose of studying of the discipline
To form an idea of ethology and zoopsychology as scientific fields, their formation, goals, tasks, and also to show the determining role of behavior in the life of individual animals and communities as a whole.
Learning Outcomes
ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.
Prerequisites
Modern problems of evolution Modern problems of human and animal biology Actual problems of genetics Cell Biology
Postrequisites

Final examination The research work of a student, including an internship and the implementation of a master s thesis III

Nature protection in Kazakhstan

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32922 (3024496)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the system of specially protected natural territories: principles and approaches to creation, main categories, history of formation. It also considers the protected territories of Kazakhstan, the specifics of their fauna and flora, national parks and reserves, their inhabitants, protection measures and recreational use.

Purpose of studying of the discipline

undergraduates receive stable knowledge about the system of specially protected natural territories of Kazakhstan, the organization of national parks and reserves in Kazakhstan, about the development and current state of conservation in Kazakhstan, about the role of protected areas in the process of maintaining the stability of biological diversity.

Learning Outcomes

ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON7 Improve the level of scientific biological research through the widespread use of modern methods of processing, biometrics and interpretation of scientific data in the field of botany, zoology, cell biology, embryology, molecular biology, bioengineering.

Prerequisites

Modern problems of evolution Cell Biology

Postrequisites

Final examination The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Nature protection of Kazakhstan

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32921 (3024495)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the legislative and regulatory framework of environmental protection activities. Considers the Law of the Republic of Kazakhstan "On Specially Protected Natural territories", specially protected natural territories are the basis for the long-term existence of a biocenosis. The geographical location of the zones and their natural and climatic features. Flora and fauna. Environmental fundamentals of ecosystem protection. Protection of endangered plant communities.

Purpose of studying of the discipline

To study the legislative and regulatory framework of environmental protection activities and specially protected natural areas

Learning Outcomes

ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON7 Improve the level of scientific biological research through the widespread use of modern methods of processing, biometrics and interpretation of scientific data in the field of botany, zoology, cell biology, embryology, molecular biology, bioengineering.

Prerequisites

Modern problems of evolution Cell Biology

Postrequisites

Final examination The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Population of wild animals

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32929 (3024501)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline examines fundamental laws in the field of ecology of populations and communities, ideas about the peculiarities of the development and functioning of populations and communities, the influence of environmental factors on the dynamics and structure of plant and animal populations, mechanisms for maintaining a stable state of biotic communities and biological diversity on the planet

Purpose of studying of the discipline

to form a master`s student`s idea of the population and its place in modern environmental management technologies;

Learning Outcomes

ON4 Analyze and solve theoretical and applied problems in biology.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.

Prerequisites

Modern problems of evolution Modern problems of human and animal biology Actual problems of genetics Cell Biology

Postrequisites

Final examination The research work of a student, including an internship and the implementation of a master s thesis III

Agricultural biotechnology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32926 (3024499)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the molecular foundations of heredity and the realization of hereditary information, methods of regulating the reproduction of farm animals, biotechnological
aspects of animal cloning, the main directions of biotechnology of feed preparations. Considers the technology of obtaining and using fertilizers, biotechnological methods of creating
highly tolerant plants to a wide range of adverse factors.

Purpose of studying of the discipline

formation of knowledge about modern post- genomic and biotechnological methods of molecular breeding of new varieties of agricultural plants and animals

Learning Outcomes

ON5 Possess the theoretical and methodological foundations of scientific research in biology, methods of introducing research results into practical and pedagogical activities.
ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.
ON7 Improve the level of scientific biological research through the widespread use of modern methods of processing, biometrics and interpretation of scientific data in the field of botany, zoology, cell biology, embryology, molecular biology, bioengineering.
ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.

Prerequisites

Modern problems of evolution Modern problems of human and animal biology Actual problems of genetics Cell Biology

Postrequisites

Final examination The research work of a student, including an internship and the implementation of a master s thesis III

Technology of reproduction of animals

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32934 (3024516)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the origin of farm animals, the individual development of farm animals (ontogenesis), directed rearing of young animals. Considers the assessment and selection of animals by origin, breeding selection, breeding of animals by lines and families, biological features: increased heterozygosity, the occurrence of heterosis, the formation of new hereditary forms and properties of animals

Purpose of studying of the discipline

undergraduates receive theoretical knowledge on general issues of animal reproduction techniques and practical skills in embryo transplantation and embryoengineering research in animal husbandry.

Learning Outcomes

ON4 Analyze and solve theoretical and applied problems in biology.

ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.

ON8 Carry out scientific experiments in laboratory and field conditions, use systematized theoretical and practical knowledge of natural sciences in solving scientific, applied and educational problems.

Prerequisites

Modern problems of evolution Modern problems of human and animal biology Actual problems of genetics Cell Biology

Postrequisites

Final examination The research work of a student, including an internship and the implementation of a master s thesis III

Ecology Of Kazakhstan

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32923 (3024497)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Issues related to the environmental conditions of the Republic of Kazakhstan. In modern conditions, the volumes of science and scientific and technical data are intensively growing in the development of scientific technology. When training highly qualified specialists in higher educational institutions, attention is paid to their education, purposefulness. Undergraduates should use their knowledge in solving global, regional and local environmental problems

Purpose of studying of the discipline

To study the manifestations of natural processes, to master the processing techniques used in industry that reduce the harmful effects on the environment, the development of biological thinking and basic engineering and biological knowledge, for their application in industrial enterprises and in other areas.

Learning Outcomes

ON4 Analyze and solve theoretical and applied problems in biology.

ON6 Demonstrate fundamental knowledge in the field of general biology, cellular and molecular biology, genetics, microbiology, biotechnology when conducting scientific research, developing innovative technologies, including in the educational practice of higher education.

ON7 Improve the level of scientific biological research through the widespread use of modern methods of processing, biometrics and interpretation of scientific data in the field of botany, zoology, cell biology, embryology, molecular biology, bioengineering.

Prerequisites
Modern problems of evolution Cell Biology
Postrequisites
Final examination The research work of a student, including an internship and the implementation of a master s thesis II The research work of a student, including an internship and the implementation of a master s thesis III

Final assessment

Master`s dissertation

Credits count	8

4.Summary table on the scope of the educational program

«7M05101 - Biology»

Name of discipline	Cycle/ Component	Term	Number of credits	Total hours	Lec	SPL	LC	IWST	IWS	Knowledge control form
Module 1. Sociolinguistic and scientific-pedagogical activity										
Foreign language (professional)	BS/US	1	3	90		30		20	40	Examination
History and philosophy of science	BS/US	1	5	150	15	30		35	70	Examination
Tertiary education	BS/US	1	3	90	15	15		20	40	Examination
Psychology of management	BS/US	1	3	90	15	15		20	40	Examination
Pedagogical practice	BS/US	3	6	180						Total mark on practice
Module 2. Organization of scientific research.										
Statistical methods in biology	BS/CCh	1	5	150	15	30		35	70	Examination
Bionics	BS/CCh	1	5	150	15	30		35	70	Examination
The research work of a student, including an internship and the implementation of a master s thesis I	AS/US	2	11	330						Total mark on practice
Organization and planning of scientific research abroad	AS/CCh	2	5	150	15	30		35	70	Examination
Organization of research work in schools and colleges	AS/CCh	2	5	150	15	30		35	70	Examination
Modern methods and organization, planning of scientific research	AS/CCh	2	5	150	15	30		35	70	Examination
Methods of teaching biology at the present level	AS/CCh	3	5	150	15	30		35	70	Examination
The research work of a student, including an internship and the implementation of a master s thesis II	AS/US	3	4	120						Total mark on practice
New approaches to learning	AS/CCh	3	5	150	15	30		35	70	Examination
Professional guide of the teacher	AS/CCh	3	5	150	15	30		35	70	Examination
Research practice	AS/US	4	13	390						Total mark on practice
The research work of a student, including an internship and the implementation of a master s thesis III	AS/US	4	9	270						Total mark on practice
Module 3. Modern problems in biology.										
Stem cell	BS/CCh	1	5	150	15	30		35	70	Examination
The Evolutionary Theory	BS/CCh	1	5	150	15	30		35	70	Examination
Biometrics	BS/CCh	1	5	150	15	30		35	70	Examination
Cell Biology	BS/CCh	1	5	150	15	30		35	70	Examination
Cell therapy	BS/CCh	1	5	150	15	30		35	70	Examination
Modern problems of evolution	BS/CCh	1	5	150	15	30		35	70	Examination

Theory of evolution	BS/CCh	1	5	150	15	30		35	70	Examination
Actual problems of genetics	AS/CCh	2	5	150	15	30		35	70	Examination
Population genetics	AS/CCh	2	5	150	15	30		35	70	Examination
Genetic engineering	AS/CCh	2	5	150	15	30		35	70	Examination
Environment and biological diversity	AS/CCh	2	5	150	15	30		35	70	Examination
Variety of associations and ekosistem	AS/CCh	2	5	150	15	30		35	70	Examination
Modern problems of human and animal biology	AS/CCh	2	5	150	15	30		35	70	Examination
Ecological physiology of animals	AS/CCh	2	5	150	15	30		35	70	Examination
Ecological human physiology	AS/CCh	2	5	150	15	30		35	70	Examination
Ecology biodiversity	AS/CCh	2	5	150	15	30		35	70	Examination
Biotechnology of plants and animals	AS/CCh	3	5	150	15	30		35	70	Examination
Ethology	AS/CCh	3	5	150	15	30		35	70	Examination
Ethology with fundamentals of zoopsychology	AS/CCh	3	5	150	15	30		35	70	Examination
Nature protection in Kazakhstan	AS/CCh	3	5	150	15	30		35	70	Examination
Nature protection of Kazakhstan	AS/CCh	3	5	150	15	30		35	70	Examination
Population of wild animals	AS/CCh	3	5	150	15	30		35	70	Examination
Agricultural biotechnology	AS/CCh	3	5	150	15	30		35	70	Examination
Technology of reproduction of animals	AS/CCh	3	5	150	15	30		35	70	Examination
Ecology Of Kazakhstan	AS/CCh	3	5	150	15	30		35	70	Examination
Final assessment										
Master`s dissertation		4	8	240						