



MINISTRY OF EDUCATION AND SCIENCE OF THE RUSSIAN FEDERATION
Federal state autonomous educational institution
of higher education
«Far Eastern Federal University»
(FEFU)

INSTITUTE OF LIFE SCIENCES AND BIOMEDICINE (SCHOOL)

AGREED

APPROVE

Head of OP

Head of VSP

Kalenik T.K.
(signature) (full name)
«28» September 2021 r.

Kalenik T.K.
(signature) (full name)
«28» September 2021 r.

WORKING PROGRAM OF THE DISCIPLINE

«Research scientific methodology in biotechnology»
Direction of training 19.04.01 «Biotechnology»
(«Agri-Food Biotechnology»)
Form of training full-time

course 1 semester 1
lectures 18 hours
practical classes 0 h.
laboratory work 0 hours.
including using
total classroom hours 18 hours.
independent work 90 h.
including preparation for the exam 0 hours (if the exam is provided).
control works (quantity) are not provided
term paper / term project are provided
credit 1 semester
exam not included

The program of the state final certification was compiled in accordance with the requirements of the Federal State Educational Standard in the field of study 19.04.01 Biotechnology, approved by order of the Ministry of Science and Higher Education of the Russian Federation dated August 10, 2021 No. 737.

The program at the meeting of the Academic Council of the Institute of Life Sciences and Biomedicine (School) December 21, 2021
Director of the Department of Food Science and Technology Kalenik T.K.
Compiled by: Kalenik T.K., Senotrusova T.A.

Reverse side of the title page of the RPMU

I. The work program was revised at the meeting of the department:

Protocol dated « _____ » _____ 20__ № _____

Director _____
(signature) (full name)

II. The work program was revised at the meeting of the department:

Protocol dated « _____ » _____ 20__ № _____

Director _____
(signature) (full name)

III. The work program was revised at the meeting of the department:

Protocol dated « _____ » _____ 20__ № _____

Director _____
(signature) (full name)

IV. The work program was revised at the meeting of the department:

Protocol dated « _____ » _____ 20__ № _____

Director _____
(signature) (full name)

ANNOTATION
of the educational complex of discipline
«Research scientific methodology in biotechnology»
Direction of preparation: 19.04.01 Biotechnology
Educational program: «Agri-Food Biotechnology»

The educational-methodical complex of the discipline «Research scientific methodology in biotechnology» was developed for 1st year students in the direction 19.04.01 «Biotechnology» master's program «Agri-food biotechnology» in accordance with the requirements of OS HE in this area and the regulation on educational and methodical complexes of the disciplines of educational programs of higher vocational education (approved by order of the rector of the FEFU dated 04/17/2012 No. 12-13-87).

The discipline «Research scientific methodology in biotechnology» is included in the basic part of the curriculum.

The total complexity of mastering the discipline is 108 hours. The curriculum includes lecture classes (18 hours), independent work of the student (90 hours). Discipline is implemented on 1 course in the _1_ semester.

The content of the discipline covers the following range of issues:

- The structure and models of theoretical research.
- The role of biotechnology in the development of nutrition science and the food industry.
- Theoretical and experimental studies in the development of biotechnology of food products.
- Methodological foundations of biotechnology of food products of animal and vegetable origin.

The discipline «Research scientific methodology in biotechnology» is logically and meaningfully connected with such courses as «Philosophical problems of science and technology», «Biotechnology of combined foods», «Fundamentals of general and technical biochemistry» and is interconnected with such disciplines as «Research work» , «History of World and Domestic

Biotechnology», «Industrial Microbiology», «Engineering Enzymology», «Research Techniques in Biotechnology».

The discipline is aimed at the formation of cultural and professional competencies.

Educational complex includes:

- the work program of the discipline;
- educational and methodological support of students' independent work

(Appendix 1);

- appraisal fund (appendix 2).

Директор Департамента

пищевых наук и технологий



_____ Каленик Т.К.

ABSTRACT

Master's degree in 19.04.01 – «Biotechnology».

Master's Program «Title» «Agri-food Biotechnology».

Course title: Research scientific methodology in biotechnology

Basic part of Block 1, 3 credits

At the beginning of the course a student should be able to:

- the ability to perceive and creatively use the achievements of science and technology in the professional sphere, in accordance with the needs of regional and global labor market;
- the ability to use modern methods and technologies (including information) in professional activity;
- the ability and willingness to use the basic laws of natural sciences in professional activities;
- the ability to use knowledge of modern physical picture of the world, the laws of space-time, the structure of matter to understand the world and natural phenomena;
- the ability to work with scientific and technical information, to use the Russian and international experience in professional work;
- possession of the main methods and techniques of experimental research in the professional field; ability to carry out standard and certification tests of raw materials, finished products and production processes;
- knowledge of methods of experimental design, processing and presentation of the results.

Learning outcomes:

GS-5 Ability to generate ideas in scientific and professional activities.

GC-6 The ability to lead a scientific discussion, knowledge of the norms of the scientific style of the modern Russian language.

GC-7 Ability to free scientific and professional communication in a foreign language environment.

GC-11 Ability to professional growth, to independently learn new research methods, to change the scientific and production profile of their professional activities.

GC-12 Ability in practice to use the skills and abilities in the organization of research and design work and in team management.

GPC-6 Readiness for the protection of intellectual property and the commercialization of intellectual property rights.

SPC-1 Readiness for planning, organizing and conducting research in the field of biotechnology, the ability to correctly process the results of experiments and make informed conclusions and conclusions.

Course description: This discipline is the link between humanitarian disciplines and application areas, provides a competent perception of practical problems related to nutrition of different population groups, drawing evidence-based daily food rations, the design food; It has a certain importance in the training of specialists in the field of food biotechnology is a key element in the complex organizational and technological sciences that study human nutrition and health of the patient

Main course literature:

1. Methodology of scientific research: a textbook for masters / M. S. Moky, A. L. Nikiforov, V. S. Moky; by ed. M.S. Mokiya; State University of Management. Moscow: Yurayt, 2016. - 255 p. (2 copies) <http://lib.dvfu.ru:8080/lib/item?id=chamo:811893&theme=FEFU>

2. Methodology of scientific research: textbook for magistracy / M. S. Moky, A. L. Nikiforov, V. S. Moky; by ed. M.S. Mokiya; State University of Management, Russian Economic University. Moscow: Yurayt, 2015. - 255 p. (3 copies.) <http://lib.dvfu.ru:8080/lib/item?id=chamo:785084&theme=FEFU>

3. Methodology of scientific research: textbook for bachelor and master / N. A. Gorelov, D. V. Kruglov; St. Petersburg State University of Economics.

Moscow: Yurayt, 2016. - 290 p. (3 copies.)

<http://lib.dvfu.ru:8080/lib/item?id=chamo:811895&theme=FEFU>

Form of final knowledge control: credit

Annotation to the work program of the discipline
«Research scientific methodology in biotechnology»

The discipline «Research scientific methodology in biotechnology» is included in the variable part of the disciplines of the choice of the educational program of the master's program «Agri-food biotechnology» of the training direction 19.04.01 «Biotechnology». The total complexity of mastering the discipline is 3 credits, 108 hours. The curriculum includes lecture classes (18 hours), practical work (0 hours), independent work of the student (90 hours). Discipline is implemented on 1 course in 1 semester.

Discipline is included in the variable part of the block «Disciplines (modules)» B1.B.02 and is mandatory for study.

The discipline «Research scientific methodology in biotechnology» is based on knowledge of such courses as «Philosophical problems of science and technology», «Biotechnology of combined foods», «Fundamentals of general and technical biochemistry» and is interconnected with such disciplines as «Research work», «History World and Domestic Biotechnology», «Industrial Microbiology», «Engineering Enzymology», «Research Techniques in Biotechnology».

This discipline is the link between the disciplines of the humanitarian and applied areas, provides a competent perception of practical problems associated with the nutrition of various groups of the population, the preparation of scientifically based daily food rations, food design; it has a certain value in the training of specialists in the field of food biotechnology; it occupies a key place in the complex of organizational and technological sciences that study the nutrition of a healthy and sick person.

The purpose of studying the discipline is to form students' ideas about the methodology of scientific research in agri-food biotechnology; gaining knowledge in the field of methodology of theoretical and experimental research; the formation of skills in planning and performing research work in biotechnology, presenting the results in the form of scientific and technical documentation.

Objectives of the discipline:

- the study and development of new research methods, the implementation of planning and research in the field of biotechnology;

- the formation of skills to present the results of work performed in the form of reports, reviews, scientific reports, publications, taking into account new information technologies;

- the formation of skills in the field of methods of chemical-technological, biochemical and microbiological control.

To successfully study the discipline "Research methods in biotechnology", the following preliminary competencies should be formed in students:

- the ability to creatively perceive and use the achievements of science and technology in the professional sphere in accordance with the needs of the regional and world labor market;

- the ability to use modern methods and technologies (including information) in professional activities;

- ability and willingness to use the basic laws of science in professional activities;

- the ability to use knowledge about the modern physical picture of the world, spatio-temporal patterns, the structure of matter to understand the world and natural phenomena;

- ability to work with scientific and technical information, use Russian and international experience in professional activities

- knowledge of the basic methods and techniques of conducting experimental research in their professional field; ability to conduct standard and certification tests of raw materials, finished products and processes

- mastery of the methods of experiment planning, processing and presentation of the results

As a result of studying this discipline, students form the following competencies:

Code and wording of competency	Competency Stages	
GC-5 Ability to generate ideas in scientific and professional activities	Knows	<ul style="list-style-type: none"> - principles of scientific knowledge; - methods of concrete scientific knowledge at both empirical and theoretical levels; - theoretical foundations of modern research methods in the field of nutrition sciences; - the current state of nutrition science, technological, technical aspects of its development; - outstanding scientific discoveries in biotechnology.
	Is able	<ul style="list-style-type: none"> - analyze information and scientific data - logically true, reasoned and clear to build oral and written speech; - use the basic principles and methods of the social, humanitarian and economic sciences in solving social and professional problems, the ability to analyze socially significant problems and processes; - to evaluate the achievements of the global food market, conduct market research and offer new competitive products for development by the manufacturer; - offer non-standard solutions to problems.
	Owns	<ul style="list-style-type: none"> - setting priorities and setting goals for research activities; - skills in organizing creative activities.
GC-6 Ability to conduct a scientific discussion, knowledge of the standards of the scientific style of the modern Russian language	Knows	<ul style="list-style-type: none"> - basic rules for the production of convincing and relevant scientific speech; rules of speech behavior; - the system of modern Russian language at its different levels; - usage standards; grammar norms; punctuation standards and their possible variation; - ability of introspection of communicative tasks and functions - how to conduct a scientific discussion, knowledge of the standards of the scientific style of the modern Russian language.
	Is able	<ul style="list-style-type: none"> - actively operate with the "dictionary of a cultured person", - use linguistic dictionaries, as well as reference literature on the Russian language and culture of speech; - perform introspection of communicative situations during a scientific discussion; - lead a scientific discussion, knowledge of the

		standards of the scientific style of the modern Russian language
	Owns	<ul style="list-style-type: none"> - ways of constructing speech based on the effective use of the communicative qualities of speech and compliance with language standards; - skills for conducting scientific discussion, polemics, - reading skills of reports with knowledge of the Russian language, ensuring the construction of oral and written speech, logically correct, reasoned and clear;
GC-7 Ability for free scientific and professional communication in a foreign language environment	Knows	<ul style="list-style-type: none"> - forms of scientific and professional communication in a foreign language environment; - rules and norms of free scientific and professional communication in a foreign language environment;
	Is able	<ul style="list-style-type: none"> - communicate in a scientific and professional foreign language environment; - engage in free scientific and professional communication in a foreign language environment;
	Owns	<ul style="list-style-type: none"> - skills of free scientific and professional communication in a foreign language environment.
GC-11 Ability to professional growth, to self-study new research methods, to change the scientific and scientific-industrial profile of their professional activities	Knows	<ul style="list-style-type: none"> - requirements for modern scientific research in agri-food biotechnology; - research methods in biotechnology; - equipment for research in biotechnology; - theoretical foundations of biotechnological processes for processing food raw materials;
	Is able	<ul style="list-style-type: none"> - conduct research on the basis of knowledge of the modern methodology of scientific knowledge; - use and develop the theoretical foundations of implemented and promising biotechnologies for processing food raw materials; - adapt existing methods and independently develop new methods for conducting experimental research; - implement new research methods in the process of professional activity
	Owns	<ul style="list-style-type: none"> - research methods in the field of nutrition science, including using modern information technologies; - terminology, definitions and provisions of the studied discipline; - setting priorities and setting goals for research activities; - skills of searching and applying new research methods; - skills to solve problems of theoretical analysis of biotechnological processes of food processing and experimental implementation of

		recommended solutions;
GC-12 ability in practice to use skills in organizing research and design work and in team management	Knows	<ul style="list-style-type: none"> - requirements for research team; - methodology for organizing collective scientific research; - how to lead a team in the field of their professional activity
	Is able	<ul style="list-style-type: none"> - analyze the information and scientific data of the team; - evaluate the effectiveness of the results of their activities and the activities of the team; - lead a team in the field of their professional activity, tolerantly perceiving social, ethnic, religious and cultural differences
	Owns	<ul style="list-style-type: none"> - skills to manage the team in the field of their professional activities, - the ability to choose this or such methods and research techniques from the variety of methods of modern science, based on scientific principles that lead to the most successful solution of the problem of the whole team.
GPC-6 Readiness to protect intellectual property and commercialize intellectual property rights	Knows	<ul style="list-style-type: none"> - legal aspects of intellectual property management; - how to work with patent documentation, independently classify any search subject (according to a given topic) according to the IPC, make a choice of original solutions close in technical essence.
	Is able	<ul style="list-style-type: none"> - collect and interpret economic and legal information in the field of modern entrepreneurial activity in the field of high technologies; - perform patent research, draw up the claims of the invention, description of the invention.
	Owns	<ul style="list-style-type: none"> - patent filing skills; - skills to protect intellectual property and commercialization of intellectual property rights.
SPC-1 Willingness to plan, organize and conduct research in the field of biotechnology, the ability to correctly process the results of experiments and make informed conclusions and conclusions	Knows	<ul style="list-style-type: none"> - research requirements; - methodology for organizing scientific research; - types and forms of research activities and registration of its results; - foundations of the methodology of scientific research, including the method of analysis and construction of scientific theories in biotechnology.
	Is able	<ul style="list-style-type: none"> - conduct research on the basis of knowledge of the modern methodology of scientific knowledge; - conduct scientific research, including the method of analysis and construction of scientific hypotheses and theories, methods for testing, confirming and refuting scientific hypotheses and theories and implementing the results in specific biotechnological processes.

	Owns	<ul style="list-style-type: none"> - setting priorities and setting goals for research activities; - planning the entire action to study the object of study and effectively organize the selection of information; - the methodology of registration of scientific results (in the form of articles, abstracts, dissertations) on the topic of biotechnology.
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To form the above competencies in the framework of the discipline «Research scientific methodology in biotechnology» the following methods of active / interactive training are used:

- The seminar in the form of a “round table” is a method of organizing joint collective activity, which allows direct communication to influence the opinions, positions and attitudes of the participants in the discussion. The purpose of the discussion is an intensive and productive solution to the group problem. The method of group discussion provides a deep study of the available information, the possibility of students expressing different points of view on the problem posed by the teacher, thereby contributing to the development of an adequate solution in this situation. The method of group discussion increases the involvement of participants in the process of this decision, which increases the likelihood of its implementation.

- A report (presentation) is a public message, which is a detailed statement of a certain topic, a program issue. The report can be presented by various participants in the learning process: teacher, invited expert, student, group of students. The reports are aimed at a deeper study by students of lecture material or consideration of issues for further study..

I. STRUCTURE AND CONTENT OF THE THEORETICAL PART OF THE COURSE

Section 1. Development of food sciences, technologies and food biotechnology. Fundamental and applied research in the development of the nutrition industry and food biotechnology (10 hours).

Topic 1. Introduction. The purpose and objectives of the discipline. The concept of "Methodology of scientific research in the field of food and biotechnology." Methodology - as a set of research methods used in the scientific knowledge of the world. The subject and objectives of the course, the relationship with other nutritional sciences. The main directions and prospects for the development of modern science **(2 hours)**.

Topic 2. A brief historical review of the development of methodology as a science. Definition of science. Science and other forms of mastering reality. The main stages of the development of science. The concept and need for scientific knowledge. The role of science in human society. Methods of scientific knowledge. The functions of science. Classification of Sciences. The development of science in various countries of the world. Indicators of research results. Ethical and aesthetic foundations of the methodology **(2 hours)**.

Topic 3. Science and other forms of mastering reality. The choice of the direction of scientific research. Statement of a scientific and technical problem and stages of research work. Methods of choice and purpose of the direction of scientific research. Statement of a scientific and technical problem. The relevance and scientific novelty of the study. Nomination of a working hypothesis **(4 hours)**.

Topic 4. Search, accumulation and processing of scientific information about technologies in the field of food. Documentary sources of information. Analysis of documents. Search and accumulation of scientific information. Electronic forms of information resources. Processing of scientific information, its fixation and storage **(2 hours)**.

Section 2. Methodology of scientific research of food technology and biotechnology (8 hours).

Topic 5. Theoretical and experimental research in the development of technologies and biotechnologies of food products. Methods and features of theoretical research. The structure and models of theoretical research. General information about experimental studies. Methodology and design of the experiment. Metrological support of experimental studies. Organization of the experimenter's workplace **(2 hours)**

Topic 6. Processing the results of experimental studies in the development of food and biotechnology. Fundamentals of the theory of random errors and methods for evaluating random errors in measurements. Interval evaluation of measurements using confidence probability. Methods of graphic processing of measurement results. Presentation of the results of scientific research in the development of food and biotechnology. Oral presentation of information. Presentation and argumentation of the conclusions of a scientific work **(2 hours)**

Topic 7. Objects of the invention in food technology. The patentability conditions of the invention. The concept and structure of the master's thesis. The concept and features of a master's thesis. The structure of the master's thesis. Formulation of the purpose and objectives of the study **(4 hours)**

II. STRUCTURE AND CONTENT OF THE PRACTICAL PART OF THE COURSE

not provided by the curriculum

III. TRAINING AND METHODOLOGICAL SUPPORT OF STUDENTS'S INDEPENDENT WORK

Educational and methodological support for the independent work of students in the discipline "Research methods in biotechnology" is presented in Appendix 1 and includes:

- 1) a schedule of independent work on the discipline, including approximate norms of time to complete each task;
- 2) characteristics of tasks for independent work of students and guidelines for their implementation;
- 3) requirements for the presentation and presentation of the results of independent work;
- 4) criteria for evaluating the performance of independent work.

IV. CONTROL OF ACHIEVING COURSE OBJECTIVES

№	Supervised sections / topics of discipline	Codes and stages of formation of competencies	Evaluation Tools	
			current control	intermediate certification
1	Section 1. Development of food sciences, technologies and food biotechnology. Fundamental and applied research in the development of the food industry and food biotechnology.	GC-5 GC-6 GC-7	UO-1 Interview	Credit Questions 1-6

	<p>Topic 1. Introduction. The purpose and objectives of the discipline. The concept of "Methodology of scientific research in the field of food and biotechnology." Methodology - as a set of research methods used in the scientific knowledge of the world. The subject and objectives of the course, the relationship with other nutritional sciences. The main directions and prospects of development of modern science.</p>		<p>nutrition science, technological, technical aspects of its development; outstanding scientific discoveries in biotechnology.</p>		
			<p>able to: analyze information and scientific data logically true, reasoned and clear to build oral and written speech; use the basic principles and methods of the social, humanitarian and economic sciences in solving social and professional problems, the ability to analyze socially significant problems and processes; to evaluate the achievements of the global food market, conduct market research and offer new competitive products for development by the manufacturer; offer non-standard solutions to problems.</p>	Test	Credit tasks for the credit 1-3
			<p>owns setting priorities and setting goals for research activities; skills in organizing creative activities.</p>	Essay	Credit tasks for the credit 4-7
	<p>Topic 2. A brief historical review of the development of methodology as a science. Definition of science. Science and other forms of mastering reality. The main stages of the</p>	<p>GC-5 GC-6 GC-11</p>	<p>knows principles of scientific knowledge; methods of concrete scientific knowledge at both empirical and theoretical levels; theoretical foundations of modern research methods in the field of nutrition sciences; the current state of</p>	<p>UO-1 Interview</p>	<p>Credit Questions 7-12</p>

	development of science. The concept and need for scientific knowledge. The role of science in human society. Methods of scientific knowledge. The functions of science. Classification of Sciences. The development of science in various countries of the world. Indicators of research results. Ethical and aesthetic foundations of the methodology		nutrition science, technological, technical aspects of its development;		
			Able to: analyze information and scientific data logically true, reasoned and clear to build oral and written speech; use the basic principles and methods of the social, humanitarian and economic sciences in solving social and professional problems, the ability to analyze socially significant problems and processes; to evaluate the achievements of the global food market, conduct market research and offer new competitive products for development by the manufacturer; quickly master new subject areas; use the basics of knowledge in the history of science and philosophy of science to solve problems in interdisciplinary fields;	Test	Credit tasks for the credit 8-11
			Owns the: determination of priorities and the setting of the goal of research activity; terminology, definitions and provisions of the studied discipline; critical analysis of their work; planning the entire action to study the object of study and effectively organize the selection of	Essay	Credit tasks for the credit 8-11

		information;		
<p>Topic 3. Science and other forms of mastering reality. The choice of the direction of scientific research.</p> <p>Statement of a scientific and technical problem and stages of research work.</p> <p>Methods of choice and purpose of the direction of scientific research.</p> <p>Statement of a scientific and technical problem.</p> <p>Relevance and scientific novelty of the study.</p> <p>Hypothesis</p>	<p>GC-11</p> <p>GPC-6</p> <p>SPC - 1</p>	<p>knows research requirements; methodology for organizing scientific research;</p> <p>types and forms of research activities and registration of its results;</p>	UO-1 interview	Credit Questions 13-16
		<p>Able to conduct research on the basis of knowledge of the modern methodology of scientific knowledge;</p>	Test	Credit tasks for the credit 12-15
		<p>owns setting priorities and setting goals for research activities;</p> <p>planning the entire action to study the object of study and effectively organize the selection of information;</p>	Essay	Credit tasks for the credit 12-15
<p>Topic 4. Search, accumulation and processing of scientific information about technologies in the field of food.</p> <p>Documentary sources of information.</p> <p>Analysis of documents.</p> <p>Search and accumulation of scientific information.</p> <p>Electronic forms</p>	<p>GPC-6</p> <p>GC-11</p>	<p>knows research requirements;</p> <p>types and forms of research activities and registration of its results;</p> <p>methodology for organizing scientific research;</p> <p>theoretical foundations of modern research methods in the field of nutrition sciences;</p> <p>the current state of nutrition science, technological, technical aspects of its development;</p>	UO-1 interview	Credit Questions 11-13
		<p>Able to conduct research on</p>	Test	

	of information resources. Processing of scientific information, its fixation and storage		the basis of knowledge of the modern methodology of scientific knowledge;		
			owns research methods in the field of nutrition science, including using modern information technologies; terminology, definitions and provisions of the studied discipline; setting priorities and setting goals for research activities; the ability to choose such or such methods and research techniques from the variety of methods of modern science, based on scientific principles that lead to the most successful solution of the problem;	Test	
2	Section 2. Methodology of scientific research of food technology and biotechnology Topic 5. Theoretical and experimental research in the development of technologies and biotechnologies of food products. Methods and features of theoretical research. The structure and models of	GC-12	knows requirements for research team; methodology for organizing collective scientific research; how to lead a team in the field of their professional activity	UO-3 Report, Message	Credit Questions 16-20
			Able to analyze the information and scientific data of the team; evaluate the effectiveness of the results of their activities and the activities of the team; lead a team in the field of their professional activity, tolerantly perceiving social, ethnic, religious and cultural differences	Test	Credit Questions 16-20

<p>theoretical research. General information about experimental studies. Methodology and design of the experiment. Metrological support of experimental studies. Organization of the experimenter's workplace</p>		<p>owns skills to manage the team in the field of their professional activities, the ability to choose this or such methods and research techniques from the variety of methods of modern science, based on scientific principles that lead to the most successful solution of the problem of the whole team.</p>	<p>Essay</p>	<p>Credit Questions 16-20</p>
<p>Topic 6. Processing the results of experimental studies in the development of food and biotechnology. Fundamentals of the theory of random errors and methods for evaluating random errors in measurements. Interval evaluation of measurements using confidence probability. Methods of graphic processing of measurement results. Presentation of the results of scientific research</p>	<p>SPC-1</p>	<p>knows research requirements; methodology for organizing scientific research; types and forms of research activities and registration of its results; theoretical foundations of modern research methods in the field of nutrition sciences; the current state of nutrition science, technological, technical aspects of its development;</p>	<p>UO-2 Colloquium</p>	<p>Credit Questions 17-21</p>
		<p>Able to conduct research on the basis of knowledge of the modern methodology of scientific knowledge;</p>	<p>Test</p>	<p>Credit Questions 17-21</p>
		<p>owns setting priorities and setting goals for research activities; planning the entire action to study the object of study and effectively organize the selection of</p>	<p>Essay</p>	<p>Credit Questions 17-21</p>

<p>in the development of food and biotechnology. Oral presentation of information. Presentation and argumentation of the conclusions of scientific work</p>		<p>information; terminology, definitions and provisions of the studied discipline; the ability to choose such or such methods and research techniques from the variety of methods of modern science, based on scientific principles that lead to the most successful solution of the problem;</p>		
<p>Topic 7. Objects of the invention in food technology. The patentability conditions of the invention. The concept and structure of the master's thesis. The concept and features of a master's thesis. The structure of the master's thesis. Formulation of the purpose and objectives of the study</p>	<p>SPC-1</p>	<p>knows research requirements; methodology for organizing scientific research; types and forms of research activities and registration of its results; theoretical foundations of modern research methods in the field of nutrition sciences; the current state of nutrition science, technological, technical aspects of its development;</p>	<p>UO-1 interview</p>	<p>Credit Questions 22-30</p>
		<p>Able to conduct research on the basis of knowledge of the modern methodology of scientific knowledge;</p>	<p>Test</p>	<p>Credit Questions 22-30</p>
		<p>owns setting priorities and setting goals for research activities; planning the entire action to study the object of study and effectively organize the selection of information; terminology, definitions and provisions of the</p>	<p>Essay</p>	<p>Credit Questions 22-30</p>

		studied discipline; the ability to choose such or such methods and research techniques from the variety of methods of modern science, based on scientific principles that lead to the most successful solution of the problem;		
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Typical control tasks, methodological materials that determine the procedures for assessing knowledge, skills and (or) experience, as well as criteria and indicators necessary for assessing knowledge, skills, and characterizing the stages of formation of competencies in the process of mastering an educational program are presented in the Appendix 2.

V. LIST OF TRAINING LITERATURE AND INFORMATION AND METHODOLOGICAL SUPPORT OF DISCIPLINE

Main literature

(print and electronic publications)

1. Methodology of scientific research: a textbook for masters / M. S. Moky, A. L. Nikiforov, V. S. Moky; under the editorship of M.S. Mokia; State University of Management. Moscow: Yurayt, 2016 .-- 255 p. (2 copies)

<http://lib.dvfu.ru:8080/lib/item?id=chamo:811893&theme=FEFU>

2. The methodology of scientific research: a textbook for graduate studies / M. S. Moky, A. L. Nikiforov, V. S. Moky; under the editorship of M.S. Mokia; State University of Management, Russian University of Economics. Moscow: Yurayt, 2015 .-- 255 p. (3 copies)

<http://lib.dvfu.ru:8080/lib/item?id=chamo:785084&theme=FEFU>

3. The methodology of scientific research: a textbook for undergraduate and graduate programs / N. A. Gorelov, D. V. Kruglov; St. Petersburg State University of Economics. Moscow: Yurayt, 2016 .-- 290 p. (3 copies)

<http://lib.dvfu.ru:8080/lib/item?id=chamo:811895&theme=FEFU>

Additional literature

(print and electronic publications)

1. Anufriev A.F. Scientific research. Coursework, theses and dissertations. - M.: Axis-89, 2002. -- 112 p.
<http://lib.dvfu.ru:8080/lib/item?id=chamo{98674&theme=FEFU>
2. Volkov, Yu.G. How to write a diploma, coursework, abstract / Yu.G. Volkov. 2nd ed. - Rostov n / a: Phoenix, 2003. -- 127 p.
<http://lib.dvfu.ru:8080/lib/item?id=chamo:234777&theme=FEFU>
3. Luchenkova, E.S. History of science and technology [Electronic resource]: textbook. allowance / E.S. Luchenkova, A.P. Myadel. - Minsk: Higher School, 2014. -- 175 p. <http://znanium.com/go.php?id=509492>
4. Nadezhdin, N.Ya. History of science and technology / N.Ya. Nadezhdin. - Rostov-on-Don: Phoenix, 2006. -- 621 p.
<http://lib.dvfu.ru:8080/lib/item?id=chamohaps84281&theme=FEFU>
5. Introduction to the history and philosophy of science: General history of science; The relationship of philosophy and science; The structure and development of scientific knowledge, etc.: Textbook for universities / S.A. Lebedev, V.V. Ilyin, F.V. Lazarev □ and others □; under the editorship of S.A. Lebedev. - Ed. 2nd, rev., Add. - M.: Academic project. 2007. -- 384 p.
<http://lib.dvfu.ru:8080/lib/item?id=chamo:276165&theme=FEFU>
6. Philosophy of science: Textbook for graduate students and applicants for a degree / T.G. Leshkevich. - M.: SIC INFRA-M, 2014. -- 272 p.
<http://znanium.com/go.php?id=427381>
7. Methodology of scientific research: Textbook / A.O. Ovcharov, T.N. Ovcharova. - M.: SIC INFRA-M, 2014. -- 304 p.
<http://znanium.com/go.php?id=427047>
8. Ruzavin G.I. Methodology of scientific research. Textbook for university students. - M.: UNITI, 1999. -- 317 p.
<http://lib.dvfu.ru:8080/lib/item?id=chamo{35357&theme=FEFU>

The list of resources of the information and telecommunication network

"Internet"

1. <http://elibrary.ru> Scientific Electronic Library eLIBRARY.RU
2. The electronic library system "Doe" <http://e.lanbook.com/>
3. The electronic library system "IPRBOOK" <http://www.iprbookshop.ru>
4. Scopushttp database: <http://www.scopus.com/home.url>
5. Web of Science Database <http://apps.webofknowledge.com/>
6. Database of full-texting academic journals in China <http://oversea.cnki.net/>
7. The electronic library of dissertations of the Russian State Library <http://diss.rsl.ru/>
8. EBSCO Electronic Databases <http://search.ebscohost.com/>

List of information technology and software

- Microsoft Office Professional Plus 2010; a software package that includes software for working with various types of documents (texts, spreadsheets, databases, etc.);
- 7Zip 9.20 - a free file archiver with a high degree of data compression;
- ABBYY FineReader 11 - a program for optical character recognition;
- Adobe Acrobat XI Pro - a software package for creating and viewing electronic publications in PDF format;
- ESET Endpoint Security - comprehensive protection of Windows-based workstations. Virtualization support + new technologies;
- WinDjView 2.0.2 - a program for recognizing and viewing files with the same format DJV and DjVu;
- Local network resources:
- ConsultantPlus Computer Help Legal System - Microsoft Windows, Linux (with WINE), Apple iOS Android, Windows Phone;
- Tekhnekspert professional help system - Microsoft Windows, Linux, FreeBSD operating systems.

VI. METHODOLOGICAL INSTRUCTIONS FOR THE DEVELOPMENT OF THE DISCIPLINE

Recommendations for planning and organizing the time allotted for the study of the discipline «Research scientific methodology in biotechnology»:

- study of the lecture notes on the same day after the lecture - 10-15 minutes;
- repetition of a lecture the day before the next lecture - 15-20 minutes;
- the study of theoretical material on recommended literature and compendium - 1 hour per week;

The total time spent on mastering the course «Research scientific methodology in biotechnology» by students will be about 3 hours a week.

The educational process of a student in the discipline «Research scientific methodology in biotechnology» is reduced to the consistent study of the topics of classroom lecture classes. For in-depth study of a specific topic, students independently perform the task in accordance with the guidelines for the CDS.

Mastering the discipline «Research scientific methodology in biotechnology» includes several components of educational activity.

1. A careful reading of the work program of the discipline (helps to holistically see the structure of the questions studied).

2. The study of guidelines for independent work of students.

3. The most important component of mastering the discipline is attending lectures (mandatory) and taking notes. Preliminary preparation, including reading the previous lecture, working with economic dictionaries, study guides and scientific materials, contributes to the deep mastery of lecture material.

4. Regular preparation for seminars and active work in the classroom, including:

- repetition of the lecture material on the topic of the seminar;
- familiarity with the lesson plan and the list of basic and additional literature, with the recommendations of the teacher in preparation for the lesson;

- the study of scientific information on this topic in various textbooks and scientific materials;
- reading of primary sources and the proposed additional literature;
- writing out basic terms on a topic, finding their explanations in economic dictionaries and encyclopedias, and maintaining a glossary;
- drawing up an abstract, text of the report, if necessary, a plan for answering the basic questions of the practical lesson, drawing up diagrams, tables;
- visiting the teacher's consultations in order to clarify the complex issues that have arisen in preparing for the lesson, retaking control tasks.

5. Preparation for oral interviews, independent and control work.

6. Independent study of topics not presented in lectures. Writing a compendium according to the sources recommended by the teacher.

7. Preparation for the test (during the semester), repetition of the material of the entire course of the discipline «Research scientific methodology in biotechnology».

When students fail to attend certain classes, for good reason, the student works out the material in the classroom, while the points for this lesson are not reduced. If the respectfulness of the missed lesson by the student is not documented, in such cases, grades are reduced, according to the discipline policy. In order to clarify the material on a specific topic, the student can visit the teacher's consultation hours, according to the schedule approved by the department. At the end of the course, the student passes an intermediate control of knowledge in this discipline in the form of an exam.

Thus, when studying the course «Research scientific methodology in biotechnology», you should carefully listen to and outline the material presented in the classroom. For his understanding and quality assimilation, the following sequence of actions is recommended:

1. After completing training sessions, to consolidate the material, review and ponder the text of the lecture, analyze the examples considered (15-25 minutes).

2. In preparation for the lecture, repeat the text of the previous lecture, think about the next topic (15-25 minutes).

3. During the week, choose the time to work with the recommended literature (1 hour each).

The theoretical part of the discipline «Research scientific methodology in biotechnology» is revealed at lectures, the lecture is the main form of training, where the teacher gives the basic concepts of the discipline.

The sequence of presentation of the material at the lecture classes is aimed at forming an indicative basis for students for the subsequent assimilation of the material during independent work.

When writing essays, it is recommended that you independently find the literature for it. The abstract reveals the content of the investigated problem. Work on the essay helps to deepen understanding of individual issues of the course, to form and defend your point of view, to acquire and improve independent creative work skills, to conduct active cognitive work.

The main types of students' independent work are working with literary sources and methodological recommendations, Internet resources for more in-depth familiarization with certain problems of the research methodology. The results of the work are drawn up in the form of abstracts or reports with subsequent discussion.

VII. MATERIAL AND TECHNICAL SUPPORT OF DISCIPLINE

The material and technical support for the implementation of the «Research scientific methodology in biotechnology» discipline includes lecture halls equipped with multimedia equipment and complying with sanitary and opposing rules and norms. To conduct classes, individual laptops are used according to the number of masters for carrying out calculations, solving problems, drawing technological schemes.

Name of equipped classrooms, facilities for practical training with a list of basic equipment	Address (location) of classrooms, facilities for
Training furniture for 25 workplaces, teacher's place	Animal Product

<p>(table, chair). Analytical and technological equipment (M312): IRF-454 B2 M refractometer; Planix 5 Planimeter; PE-6110 magnetic stirrer with heating; Refrigerator "Ocean-RFD-325B"; Cooker Gorenje E52102 AW (for preparation and heat treatment of food products) 2 pcs.; Libra; Stainless steel distiller steel (5 l / h, power. 4,5 kW); Meat grinder "Unit-ugr-452"; Dishwasher Hansa ZIM416H; Moulinex HM 550 mixer (for grinding products) 101-277950; Blender BRAUN MX-2050; Tripod PE-2710 lab. for burettes.</p> <p>Multimedia equipment: Monoblock Lenovo C360G-i34164G500UDK with Uninterruptible power supply Powercom SKP-1000A; Screen with electric 236 * 147 cm Trim Screen Line; DLP projector, 3000 ANSI Lm, WXGA 1280x800, 2000: 1 EW330U Mitsubishi; Subsystem of specialized hardware mounts CORSA-2007 Tuarex; Video Switching Subsystem: DVI DXP 44 DVI Pro Extron matrix switcher; Extender DVI over twisted pair DVI 201 Tx / Rx; Subsystem of audio switching and sound reinforcement; ceiling mount speaker SI 3CT LP Extron; Sennheiser EW 122 G3 UHF Microphone Lavalier Radio System with a wireless microphone and receiver; DMP 44 LC Extron digital audio processor; Extron IPL T S4 Network Management Controller; Wireless LANs for students are provided with a system based on 802.11a / b / g / n 2x2 MIMO (2SS) access points.</p>	<p>Technology Laboratory Vladivostok, Russian Island, 10 Ajax, Building 25.1, aud. M 312.</p> <p>The classroom for lectures, practical and laboratory classes, group and individual consultations, ongoing monitoring and interim certification.</p>
<p>Training furniture for 10 jobs.</p> <p>Amplifier automatic model 4-channel RT-PCR Eco Real-Time PCR / USA; Fluorate - 02-05M liquid analyzer; IR-Fourier spectrometer, model IRaffinity-1 Manufacturer 'Shimadzu'; Spectrophotometer for the analysis of the microquantity of nucleins. acids, model BioSpec-nano; Spectrophotometer scanning model UV-1800. Manufacturer 'Shimadzu', Monoblock MSI AE1920-093 Atom D525 / 2G / 250GB; polarimeter automatic PoAAr.</p>	<p>Biosafety and Biosecurity Laboratory Vladivostok, Russian Island, Ajax d.10, Building 25.1, aud. M309.</p> <p>The classroom for practical and laboratory studies of group and individual consultations, current monitoring and intermediate certification.</p>
<p>For independent work</p>	
<p>Training furniture for 17 workplaces, teacher's place (table, chair), Monoblock Lenovo C360G-i34164G500UDK 19.5 "Intel Core i3-4160T 4GB DDR3-1600 SODIMM (1x4GB) 500GB Windows Seven Enterprise - 17 pcs; Wired LAN - Cisco 800 series; Wireless LAN for students with a system based on 802.11a / b access points / g / n 2x2 MIMO (2SS).</p>	<p>Computer class Vladivostok, Russian Island, 10 Ajax, Building 25.1, aud. M621.</p> <p>The classroom for lectures, practical exercises, group and individual consultations, ongoing monitoring and interim certification.</p>
<p>Reading room equipment for the FEFU Scientific Library: HP All-in-One 400 All-in-One Monoblock 400 All-in-One 19.5 (1600x900), Core i3-4150T, 4GB DDR3-1600 (1x4GB), 1TB HDD 7200 SATA, DVD +/- RW, GigEth, Wi- Fi, BT, usb kbd / mse, Win7Pro (64-bit) + Win8.1Pro (64-bit), 1-1-1 Wty Internet access speed of 500 Mbps. Workplaces for people with</p>	<p>Reading rooms of the FEFU Scientific Library with open access to the fund (building A - level 10)</p>

disabilities are equipped with braille displays and printers; equipped with: portable devices for reading flat-printed texts, scanning and reading machines with a video enlarger with the ability to control color spectra; magnifying electronic magnifiers and ultrasonic markers	
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МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РОССИЙСКОЙ ФЕДЕРАЦИИ
Федеральное государственное автономное образовательное учреждение
высшего образования
«Дальневосточный федеральный университет»
(ДВФУ)

ИНСТИТУТ НАУК О ЖИЗНИ И БИОМЕДИЦИНЫ (ШКОЛА)

**УЧЕБНО-МЕТОДИЧЕСКОЕ ОБЕСПЕЧЕНИЕ САМОСТОЯТЕЛЬНОЙ
РАБОТЫ ОБУЧАЮЩИХСЯ**

по дисциплине «Research scientific methodology in biotechnology»

Направление подготовки

19.04.01 Биотехнология

Магистерская программа «Agri-food biotechnology»

Форма подготовки очная

Владивосток

2021

Schedule of independent work on the discipline

№	Date / Deadline	Type of independent work	Estimated time to complete	Form of control
1	Methodological foundations of scientific knowledge			
	2nd week	Abstract Methodology as an integral part of culture and scientific knowledge of the world	7	presentation of abstract
2	Methods of scientific knowledge			
	4th week	Abstract Classification of methods of scientific knowledge. Characterization of methods.	7	presentation of abstract
3	The conceptual apparatus of scientific research			
	6th week	Settlement and graphic work Algorithm for creating the conceptual apparatus of research. PR-7 Abstract Features of the choice of topics, contradictions, problem, object and subject of study.	7	protection of graphic design work presentation of abstract
4	Stages of Scientific Research			
	8th week	Settlement and graphic work Research plan for the development of a targeted food product. Criteria for evaluating the results of scientific research.	7	defense of graphic design work
5	Research Methodology			
	10th week	Settlement and graphic work The idea, structure and logic of scientific research.	7	defense of graphic design work
6	Culture and Mastery of Research			
	12th week	abstract The main professionally significant personal qualities of the researcher.	5	presentation of abstract
7	Methodology of science as a social - technological process			
	14th week	Research program, general requirements, topic and problem selection. Levels and structure of the methodology of scientific research.	7	presentation of abstract
8	Preparation of a scientific article for publication			
	16th week	abstract Definition of the topic of the article, selection of sources, grouping of authors. Citation rules, links and footnotes.	7	presentation of abstract

Description of tasks for independent work of students and guidelines for their implementation

Independent work of students should have the following characteristics:

- to be personally performed by a student or to be independently performed part of a team work according to the assignment of the teacher;
- represent a completed development (completed development stage), which reveals and analyzes relevant problems on a particular topic and its individual aspects (actual problems of the discipline being studied and the corresponding sphere of practical activity);
- demonstrate sufficient competence of the author in the issues addressed;
- have educational, scientific and / or practical orientation and significance (if it comes to educational research);
- contain certain elements of novelty (if the CDS is carried out as part of research work).

Performing combined tasks. Task 1.

1. Methodology - as a set of research methods used in the scientific knowledge of the world. Preparation of a supporting abstract based on the materials of the relevant sections of textbooks:

- Kanke, V.A. The methodology of scientific knowledge: a textbook for masters / V.A. Kanke, 2nd ed., Erased. - M.: Omega-L, 2014. -- 255 p. <http://lib.dvfu.ru:8080/lib/item?id=chamo:732617&theme=FEFU>
- □ Methodology of science: problems and history. Collection of scientific papers. - M.: IF RAS, 2003. -- 343 p. <http://znanium.com/go.php?id=346634>
- □ Ruzavin, G.I. The methodology of scientific knowledge: a textbook for universities / G.I. Ruzavin. - Moscow: Unity-Dana, 2009. -- 287 p. <http://znanium.com/go.php?id=392013>

2. The concept and structure of the master's thesis. Drawing up a supporting abstract on the materials of the corresponding sections of textbooks, drawing up options for the structure of a master's thesis on selected relevant topics:

– Ugryumova, S.D. History and methodology of science in the food industry: a textbook for universities / S.D. Ugryumova, N.A. Bartashevich; Far Eastern State Technical University of Fisheries. - Vladivostok: Publishing House of the Far Eastern Technical Fisheries University, 2012. - 111 p. <http://lib.dvfu.ru:8080/lib/item?id=chamo:796187&theme=FEFU>

– Volkov, Yu.G. How to write a diploma, coursework, abstract / Yu.G. Volkov. 2nd ed. - Rostov n / a: Phoenix, 2003 .-- 127 p. <http://lib.dvfu.ru:8080/lib/item?id=chamo:234777&theme=FEFU>

3. Health and nutrition. Nutrition as one of the main factors in the formation of health. Preparation of a supporting abstract based on the materials of the relevant sections of textbooks:

– Ugryumova, S.D. History and methodology of science in the food industry: a textbook for universities / S.D. Ugryumova, N.A. Bartashevich; Far Eastern State Technical University of Fisheries. - Vladivostok: Publishing House of the Far Eastern Technical Fisheries University, 2012. - 111 p. <http://lib.dvfu.ru:8080/lib/item?id=chamo:796187&theme=FEFU>

Performing combined tasks. Task 2.

1. The main directions and prospects of development of modern science. Preparation of a supporting abstract based on the materials of the relevant sections of textbooks:

Luchenkova, E.S. History of science and technology [Electronic resource]: textbook. allowance / E.S. Luchenkova, A.P. Myadel. - Minsk: Higher School, 2014 .-- 175 p. <http://znanium.com/go.php?id=509492>

Ugryumova, S.D. History and methodology of science in the food industry: a textbook for universities / S.D. Ugryumova, N.A. Bartashevich; Far Eastern State Technical University of Fisheries. - Vladivostok: Publishing House of the Far

Eastern Technical Fisheries University, 2012. - 111 p.
<http://lib.dvfu.ru:8080/lib/item?id=chamo:796187&theme=FEFU>

2. Formulation of the goals and objectives of the study. Drawing up a supporting abstract in the form of a typical structure based on the materials of the corresponding sections of textbooks

Kravtsova, E. D. Logic and methodology of scientific research [Electronic resource]: textbook. allowance / E. D. Kravtsova, A. N. Gorodishcheva. - Krasnoyarsk: Sib. Feder. Univ., 2014 .-- 168 p. - ISBN 978-5-7638-2946-4 - Access mode: <http://znanium.com/catalog.php?bookinfo=507377>

Gerasimov, B.I. Fundamentals of scientific research: a training manual / B.I. Gerasimov, V.V. Drobysheva, N.V. Zlobin et al. - M.: Forum: SIC Infra-M, 2013. - 272 p. <http://lib.dvfu.ru:8080/lib/item?id=chamo:752201&theme=FEFU>

Kuznetsov, I.N. Abstracts, term papers and dissertations. Methods of preparation and design [Electronic resource]: Educational-methodical manual. - 7th ed. - M .: Publishing and trading corporation "Dashkov and Co.", 2013. - 340 p. <http://znanium.com/go.php?id=415062>

Requirements for the presentation and presentation of the results of independent work

The results of independent work are made out in accordance with the Procedure «Requirements for the execution of written works» (GNI FEFU) performed by students and students of FEFU in order to establish common approaches to the design of written works performed by students and students in FEFU in various areas (specialties) and training levels .

Criteria for evaluating the performance of independent work

✓ 100-86 points are set if the student expressed his opinion on the formulated problem, argued for it, accurately determining its content and components. The data of domestic and foreign literature, statistical information, regulatory information. Demonstrated knowledge and skills of independent research work on the topic of research; methods and techniques of analysis of

international political practice. There are no actual errors related to understanding the problem.

✓ 85-76 points - the student's work is characterized by semantic integrity, coherence and consistency of presentation; no more than 1 mistake was made in explaining the meaning or content of the problem. For argumentation, data from domestic and foreign authors are given. Demonstrated research skills. There are no actual errors related to understanding the problem.

✓ 75-61 points - a fairly independent analysis of the main stages and semantic components of the problem was carried out; understanding of the basic foundations and theoretical justification of the chosen topic. The main sources on this topic were brought. No more than 2 errors are made in the meaning or content of the problem.

✓ 60-50 points - if the work is a retransmitted or completely rewritten source text without any comments, analysis. The structure and theoretical component of the topic is not disclosed. Three or more than three errors of semantic content of the disclosed problem are allowed.

Essay topics (abstracts, reports, messages)

1. The history of the development of nutrition science. Domestic and foreign founders of modern nutritional science.

2. The history of the development of the science of food and nutrition in conjunction with the fundamental sciences.

3. The history of the development of the science of food and nutrition in conjunction with the fundamental sciences.

4. Trophology as a new philosophy of nutrition.

5. The main content of the modern theory of adequate nutrition.

6. Current status and development prospects of the science of nutrition.

7. Status and development prospects of the concept of "functional nutrition in Russia".

8. History and content of the section of the science of nutrition, “functional nutrition”.

9. The role of discoveries in the field of protein chemistry for the development of nutrition science. The first descriptions of proteins. Chronology of the discovery of proteinogenic amino acids.

10. The role of discoveries in the field of protein chemistry. The discovery of simple and complex proteins, their role in human nutrition.

11. The history of the development of fermentology. The first evidence of the material basis of enzymes.

12. The history of the development of fermentology. The discovery of the catalytic function of enzymes and their mechanism of action.

13. Discoveries in the structure and properties of carbohydrates. Establishing a general formula for carbohydrates. Discovery of the oxide cycle of monosugars.

14. The role of discoveries in the field of vitaminology. The role of prominent scientists in the development of the science of vitamins.

15. Discoveries in the field of the structure and properties of lipids. The first elemental analysis of fats. The discovery of saponifiable and unsaponifiable lipids.

16. Discoveries in the field of the structure and properties of lipids. Detection of oil hydrolysis products. The role of chromatographic methods in the study of fats.

17. The development of science and technology of the living microcosm. Creation of industrial microbiology. Microbial synthesis products.

18. The history of the development of food industry sectors, their inextricable connection with the scientific process.

Requirements for the presentation and presentation of the results of independent work

The results of independent work are made out in accordance with the Procedure «Requirements for the execution of written works» (GNI FEFU)

performed by students and students of FEFU in order to establish common approaches to the design of written works performed by students and students in FEFU in various areas (specialties) and training levels .

Evaluation criteria (written / oral report, abstract, message, essay, including those made in the form of presentations):

✓ 100-86 points are awarded to the student if the student expressed his opinion on the formulated problem, argued for it, accurately determining its content and components. The data of domestic and foreign literature, statistical information, regulatory information. The student knows and possesses the skill of independent research work on the topic of research; methods and techniques of analysis of theoretical and / or practical aspects of the study area. There are no factual errors related to understanding the problem; graphically, the work is framed correctly

✓ 85-76 points - the work is characterized by semantic integrity, coherence and sequence of presentation; no more than 1 mistake was made in explaining the meaning or content of the problem. For argumentation, data from domestic and foreign authors are given. Demonstrated research skills. There are no actual errors related to understanding the problem. One or two errors in the design of the work

✓ 75-61 points - the student conducts a fairly independent analysis of the main stages and semantic components of the problem; understands the basic foundations and theoretical justification of the chosen topic. The main sources on this topic were brought. No more than 2 errors were made in the meaning or content of the problem, the design of the work

✓ 60-50 points - if the work is a retransmitted or completely rewritten source text without any comments, analysis. The structure and theoretical component of the topic is not disclosed. Three or more than three errors were made in the semantic content of the problem being revealed and in the design of the work.



МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РОССИЙСКОЙ ФЕДЕРАЦИИ
Федеральное государственное автономное образовательное учреждение
высшего образования
«Дальневосточный федеральный университет»
(ДФУ)

ИНСТИТУТ НАУК О ЖИЗНИ И БИОМЕДИЦИНЫ (ШКОЛА)

ФОНД ОЦЕНОЧНЫХ СРЕДСТВ
по дисциплине **«Research scientific methodology in biotechnology»**
Направление подготовки – 19.04.01 Биотехнология
Магистерская программа **«Agri-food biotechnology»**
Форма подготовки очная

Владивосток
2021

Passport of the fund of appraisal funds for discipline (practice)

“Research scientific methodology in biotechnology”

Code and wording of competency	Competency Stages	
GC-5 Ability to generate ideas in scientific and professional activities	Knows	<ul style="list-style-type: none"> - principles of scientific knowledge; - methods of concrete scientific knowledge at both empirical and theoretical levels; - theoretical foundations of modern research methods in the field of nutrition sciences; - the current state of nutrition science, technological, technical aspects of its development; - outstanding scientific discoveries in biotechnology.
	Is able	<ul style="list-style-type: none"> - analyze information and scientific data - logically true, reasoned and clear to build oral and written speech; - use the basic principles and methods of the social, humanitarian and economic sciences in solving social and professional problems, the ability to analyze socially significant problems and processes; - to evaluate the achievements of the global food market, conduct market research and offer new competitive products for development by the manufacturer; - offer non-standard solutions to problems.
	Owns	<ul style="list-style-type: none"> - setting priorities and setting goals for research activities; - skills in organizing creative activities.
GC-6 Ability to conduct a scientific discussion, knowledge of the standards of the scientific style of the modern Russian language	Knows	<ul style="list-style-type: none"> - basic rules for the production of convincing and relevant scientific speech; rules of speech behavior; - the system of modern Russian language at its different levels; - usage standards; grammar norms; punctuation standards and their possible variation; - ability of introspection of communicative tasks and functions - how to conduct a scientific discussion, knowledge of the standards of the scientific style of the modern Russian language.
	Is able	<ul style="list-style-type: none"> - actively operate with the "dictionary of a cultured person", - use linguistic dictionaries, as well as reference literature on the Russian language and culture of speech; - perform introspection of communicative situations during a scientific discussion; - lead a scientific discussion, knowledge of the standards of the scientific style of the modern

		Russian language
	Owns	<ul style="list-style-type: none"> - ways of constructing speech based on the effective use of the communicative qualities of speech and compliance with language standards; - skills for conducting scientific discussion, polemics, - reading skills of reports with knowledge of the Russian language, ensuring the construction of oral and written speech, logically correct, reasoned and clear;
GC-7 Ability for free scientific and professional communication in a foreign language environment	Knows	<ul style="list-style-type: none"> - forms of scientific and professional communication in a foreign language environment; - rules and norms of free scientific and professional communication in a foreign language environment;
	Is able	<ul style="list-style-type: none"> - communicate in a scientific and professional foreign language environment; - engage in free scientific and professional communication in a foreign language environment;
	Owns	<ul style="list-style-type: none"> - skills of free scientific and professional communication in a foreign language environment.
GC-11 Ability to professional growth, to self-study new research methods, to change the scientific and scientific-industrial profile of their professional activities	Knows	<ul style="list-style-type: none"> - requirements for modern scientific research in agri-food biotechnology; - research methods in biotechnology; - equipment for research in biotechnology; - theoretical foundations of biotechnological processes for processing food raw materials;
	Is able	<ul style="list-style-type: none"> - conduct research on the basis of knowledge of the modern methodology of scientific knowledge; - use and develop the theoretical foundations of implemented and promising biotechnologies for processing food raw materials; - adapt existing methods and independently develop new methods for conducting experimental research; - implement new research methods in the process of professional activity
	Owns	<ul style="list-style-type: none"> - research methods in the field of nutrition science, including using modern information technologies; - terminology, definitions and provisions of the studied discipline; - setting priorities and setting goals for research activities; - skills of searching and applying new research methods; - skills to solve problems of theoretical analysis of biotechnological processes of food processing and experimental implementation of

		recommended solutions;
GC-12 ability in practice to use skills in organizing research and design work and in team management	Knows	<ul style="list-style-type: none"> - requirements for research team; - methodology for organizing collective scientific research; - how to lead a team in the field of their professional activity
	Is able	<ul style="list-style-type: none"> - analyze the information and scientific data of the team; - evaluate the effectiveness of the results of their activities and the activities of the team; - lead a team in the field of their professional activity, tolerantly perceiving social, ethnic, religious and cultural differences
	Owns	<ul style="list-style-type: none"> - skills to manage the team in the field of their professional activities, - the ability to choose this or such methods and research techniques from the variety of methods of modern science, based on scientific principles that lead to the most successful solution of the problem of the whole team.
GPC-6 Readiness to protect intellectual property and commercialize intellectual property rights	Knows	<ul style="list-style-type: none"> - legal aspects of intellectual property management; - how to work with patent documentation, independently classify any search subject (according to a given topic) according to the IPC, make a choice of original solutions close in technical essence.
	Is able	<ul style="list-style-type: none"> - collect and interpret economic and legal information in the field of modern entrepreneurial activity in the field of high technologies; - perform patent research, draw up the claims of the invention, description of the invention.
	Owns	<ul style="list-style-type: none"> - patent filing skills; - skills to protect intellectual property and commercialization of intellectual property rights.
SPC-1 Willingness to plan, organize and conduct research in the field of biotechnology, the ability to correctly process the results of experiments and make informed conclusions and conclusions	Knows	<ul style="list-style-type: none"> - research requirements; - methodology for organizing scientific research; - types and forms of research activities and registration of its results; - foundations of the methodology of scientific research, including the method of analysis and construction of scientific theories in biotechnology.
	Is able	<ul style="list-style-type: none"> - conduct research on the basis of knowledge of the modern methodology of scientific knowledge; - conduct scientific research, including the method of analysis and construction of scientific hypotheses and theories, methods for testing, confirming and refuting scientific hypotheses and theories and implementing the results in specific biotechnological processes.

	Owns	<ul style="list-style-type: none"> - setting priorities and setting goals for research activities; - planning the entire action to study the object of study and effectively organize the selection of information; - the methodology of registration of scientific results (in the form of articles, abstracts, dissertations) on the topic of biotechnology.
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№	Supervised sections / topics of discipline	Codes and stages of formation of competencies			Evaluation Tools	
					current control	intermediate certification
1	<p>Section 1. Development of food sciences, technologies and food biotechnology. Fundamental and applied research in the development of the food industry and food biotechnology. Topic 1. Introduction. The purpose and objectives of the discipline. The concept of "Methodology of scientific research in the field of food and biotechnology." Methodology - as a set of research methods used in the scientific knowledge of the world. The subject and objectives of the course, the relationship with other nutritional</p>	GC-5 GC-6 GC-7	Knows:		UO-1 Interview	Credit Questions 1-6
			<p>principles of scientific knowledge; methods of concrete scientific knowledge at both empirical and theoretical levels; theoretical foundations of modern research methods in the field of nutrition sciences; the current state of nutrition science, technological, technical aspects of its development; outstanding scientific discoveries in biotechnology.</p>			

	sciences. The main directions and prospects of development of modern science.		problems and processes; to evaluate the achievements of the global food market, conduct market research and offer new competitive products for development by the manufacturer; offer non-standard solutions to problems.		
			owns setting priorities and setting goals for research activities; skills in organizing creative activities.	Essay	Credit tasks for the credit 4-7
	Topic 2. A brief historical review of the development of methodology as a science. Definition of science. Science and other forms of mastering reality. The main stages of the development of science. The concept and need for scientific knowledge. The role of science in human society. Methods of scientific knowledge. The functions of science. Classification of Sciences. The development of science in various countries of the world. Indicators of research results. Ethical and aesthetic foundations of the	GC-5 GC-6 GC-11	knows principles of scientific knowledge; methods of concrete scientific knowledge at both empirical and theoretical levels; theoretical foundations of modern research methods in the field of nutrition sciences; the current state of nutrition science, technological, technical aspects of its development;	UO-1 Interview	Credit Questions 7-12
			Able to: analyze information and scientific data logically true, reasoned and clear to build oral and written speech; use the basic principles and methods of the social, humanitarian and economic sciences in solving social and professional problems, the ability to analyze socially significant problems and processes; to evaluate the achievements of the	Test	Credit tasks for the credit 8-11

methodology		global food market, conduct market research and offer new competitive products for development by the manufacturer; quickly master new subject areas; use the basics of knowledge in the history of science and philosophy of science to solve problems in interdisciplinary fields;		
		Owns the: determination of priorities and the setting of the goal of research activity; terminology, definitions and provisions of the studied discipline; critical analysis of their work; planning the entire action to study the object of study and effectively organize the selection of information;	Essay	Credit tasks for the credit 8-11
Topic 3. Science and other forms of mastering reality. The choice of the direction of scientific research. Statement of a scientific and technical problem and stages of research work. Methods of choice and purpose of the direction of scientific	GC-11 GPC-6 SPC - 1	knows research requirements; methodology for organizing scientific research; types and forms of research activities and registration of its results;	UO-1 interview	Credit Questions 13-16
		Able to conduct research on the basis of knowledge of the modern methodology of scientific knowledge;	Test	Credit tasks for the credit 12-15
		owns setting priorities and setting goals for research activities; planning the entire action to study the	Essay	Credit tasks for the credit 12-15

<p>research. Statement of a scientific and technical problem. Relevance and scientific novelty of the study. Hypothesis</p>		<p>object of study and effectively organize the selection of information;</p>		
<p>Topic 4. Search, accumulation and processing of scientific information about technologies in the field of food. Documentary sources of information. Analysis of documents. Search and accumulation of scientific information. Electronic forms of information resources. Processing of scientific information, its fixation and storage</p>	<p>GPC-6 GC-11</p>	<p>knows research requirements; types and forms of research activities and registration of its results; methodology for organizing scientific research; theoretical foundations of modern research methods in the field of nutrition sciences; the current state of nutrition science, technological, technical aspects of its development;</p>	<p>UO-1 interview</p>	<p>Credit Questions 11-13</p>
		<p>Able to conduct research on the basis of knowledge of the modern methodology of scientific knowledge;</p>	<p>Test</p>	
		<p>owns research methods in the field of nutrition science, including using modern information technologies; terminology, definitions and provisions of the studied discipline; setting priorities and setting goals for research activities; the ability to choose such or such methods and research techniques from the variety of</p>	<p>Test</p>	

			methods of modern science, based on scientific principles that lead to the most successful solution of the problem;		
2	Section 2. Methodology of scientific research of food technology and biotechnology Topic 5. Theoretical and experimental research in the development of technologies and biotechnologies of food products. Methods and features of theoretical research. The structure and models of theoretical research. General information about experimental studies. Methodology and design of the experiment. Metrological support of experimental studies. Organization of the experimenter's workplace	GC-12	knows requirements for research team; methodology for organizing collective scientific research; how to lead a team in the field of their professional activity	UO-3 Report, Message	Credit Questions 16-20
			Able to analyze the information and scientific data of the team; evaluate the effectiveness of the results of their activities and the activities of the team; lead a team in the field of their professional activity, tolerantly perceiving social, ethnic, religious and cultural differences	Test	Credit Questions 16-20
			owns skills to manage the team in the field of their professional activities, the ability to choose this or such methods and research techniques from the variety of methods of modern science, based on scientific principles that lead to the most successful solution of the problem of the whole team.	Essay	Credit Questions 16-20
	Topic 6. Processing the results of	SPC-1	knows research requirements; methodology for organizing scientific	UO-2 Colloquium	Credit Questions 17-21

<p>experimental studies in the development of food and biotechnology. Fundamentals of the theory of random errors and methods for evaluating random errors in measurements. Interval evaluation of measurements using confidence probability. Methods of graphic processing of measurement results. Presentation of the results of scientific research in the development of food and biotechnology. Oral presentation of information. Presentation and argumentation of the conclusions of scientific work</p>		<p>research; types and forms of research activities and registration of its results; theoretical foundations of modern research methods in the field of nutrition sciences; the current state of nutrition science, technological, technical aspects of its development;</p>		
		<p>Able to conduct research on the basis of knowledge of the modern methodology of scientific knowledge;</p>	Test	Credit Questions 17-21
		<p>owns setting priorities and setting goals for research activities; planning the entire action to study the object of study and effectively organize the selection of information; terminology, definitions and provisions of the studied discipline; the ability to choose such or such methods and research techniques from the variety of methods of modern science, based on scientific principles that lead to the most successful solution of the problem;</p>	Essay	Credit Questions 17-21
<p>Topic 7. Objects of the invention in food technology. The patentability conditions of the invention. The</p>	SPC-1	<p>knows research requirements; methodology for organizing scientific research; types and forms of research activities and registration of its</p>	UO-1 interview	Credit Questions 22-30

<p>concept and structure of the master's thesis. The concept and features of a master's thesis. The structure of the master's thesis. Formulation of the purpose and objectives of the study</p>	<p>results; theoretical foundations of modern research methods in the field of nutrition sciences; the current state of nutrition science, technological, technical aspects of its development;</p>		
	<p>Able to conduct research on the basis of knowledge of the modern methodology of scientific knowledge;</p>	Test	Credit Questions 22-30
	<p>owns setting priorities and setting goals for research activities; planning the entire action to study the object of study and effectively organize the selection of information; terminology, definitions and provisions of the studied discipline; the ability to choose such or such methods and research techniques from the variety of methods of modern science, based on scientific principles that lead to the most successful solution of the problem;</p>	Essay	Credit Questions 22-30

Competency Level Assessment Scale

Code and wording of competency	Competency Stages		Criteria	Indicators	Points
OK-5 Ability to generate ideas in scientific and professional activities	knows (threshold level)	basic principles underlying scientific knowledge; methods of concrete scientific knowledge at both empirical and theoretical levels;	The theoretical foundations of modern research methods in the field of nutrition sciences; outstanding scientific discoveries in biotechnology;	the ability to define the current state of nutrition science, biotechnological, technical aspects of its development;	50-64
	able (advanced)	analyze information and scientific data; logically true, reasoned and clear to build oral and written speech;	use the basic principles and methods of the social, humanitarian and economic sciences in solving social and professional problems, the ability to analyze socially significant problems and processes;	to evaluate the achievements of the global food market, conduct market research and offer new competitive products for development by the manufacturer; offer non-standard solutions to problems.	65-84
	owns (high)	setting research priorities;	defining and setting the goal of research activities;	skills in organizing creative, scientific and professional activities.	85-100
OK-6 Ability to conduct a scientific discussion, knowledge of the standards of the scientific style of the modern Russian language	knows (threshold level)	basic rules for the production of convincing and relevant scientific speech; rules of speech behavior;	the system of modern Russian language at its different levels; usage standards; grammar norms; punctuation standards and their possible variation;	ability of introspection of communicative tasks and functions how to conduct a scientific discussion, knowledge of the standards of the scientific style of the modern Russian language;	50-64
	able (advanced)	use and actively operate with the "dictionary of a	perform introspection of communicative	ability to conduct a scientific discussion,	65-84

		cultured person", use linguistic dictionaries, as well as reference literature on the Russian language and culture of speech;	situations during a scientific discussion;	knowledge of the standards of the scientific style of the modern Russian language	
	owns (high)	ways of constructing speech based on the effective use of the communicative qualities of speech and compliance with language standards;	skills for conducting scientific discussion, debate	the ability to read reports with knowledge of the Russian language, ensuring the construction of oral and written speech, logically correct, reasoned and clear;	85-100
OK-7 Ability for free scientific and professional communication in a foreign language environment	knows (threshold level)	forms of scientific and professional communication in a foreign language environment;	knowledge of the basic rules and norms of free scientific and professional communication in a foreign language environment;	ability to use the rules and norms of free scientific and professional communication in a foreign language environment	50-64
	able (advanced)	communicate in a scientific and professional foreign language environment;	ability to use the rules and norms of free scientific and professional communication in a foreign language environment;	the ability to engage in free scientific and professional communication in a foreign language environment;	65-84
	owns (high)	skills of free scientific and professional communication in a foreign language environment;	possession of free scientific and professional communication in a foreign language environment;	ability for free scientific and professional communication in a foreign language environment	85-100
OK-11 Ability to professional growth, to self-study new research	knows (threshold level)	modern research methods in agri-food biotechnology	knowledge of research methods in biotechnology	ability to conduct research in biotechnology	50-64
	able (advanced)	apply modern research methods	implement new research methods	ability to self-learn new methods	65-84

methods, to change the scientific and scientific-industrial profile of their professional activities		in agri-food biotechnology	in the process of professional activity		
	owns (high)	methods and means of ensuring the implementation of technological processes and production in accordance with sanitary and hygienic norms and rules; methods and means of developing normative and technical documentation for observing technological discipline in the conditions of existing production	possession of methods and means of ensuring technological processes and production in accordance with sanitary and hygienic norms and rules; methods and means of developing normative and technical documentation for observing technological discipline in the conditions of existing production	ability to organize and conduct the process; application new research methods to solve modern problems in professional activities	85-100
OK-12 ability in practice to use skills in organizing research and design work and in team management	knows (threshold level)	requirements for research team;	methodology for organizing collective scientific research;	ability to lead a team in the field of their professional activity	85-100
	able (advanced)	analyze the information and scientific data of the team;	evaluate the effectiveness of the results of their activities and the activities of the team;	lead a team in the field of their professional activity, tolerantly perceiving social, ethnic, religious and cultural differences	50-64
	owns (high)	management skills in the field of their professional activity	skills in managing a team in the field of their professional activity, tolerantly perceiving social, ethnic, religious	the ability to choose this or such methods and research techniques from the variety of methods of modern science, based on	65-84

			and cultural differences	scientific principles that lead to the most successful solution of the problem of the whole team.	
OPK-6 Readiness to protect intellectual property and commercialize intellectual property rights	knows (threshold level)	legal aspects of intellectual property management;	how to work with patent documentation, independently classify any search subject (according to a given topic) according to the IPC,	how to make a selection of original solutions close in technical essence.	85-100
	able (advanced)	to collect and interpret economic and legal information in the field of modern entrepreneurial activity in the field of high technologies	evaluate the significance of the information received in the field of modern entrepreneurial activity in the field of high technology	perform patent research, draw up the claims of the invention, description of the invention	50-64
	owns (high)	skills for compiling a description of the subject of patenting;	patent filing skills;	skills to protect intellectual property and commercialization of intellectual property rights	65-84
PK-1 Willingness to plan, organize and conduct research in the field of biotechnology, the ability to correctly process the results of experiments and make informed conclusions and	knows (threshold level)	research requirements;	methodology of planning and organizing scientific research;	foundations of the methodology of scientific research, including the method of analysis and construction of scientific theories in biotechnology.	85-100
	able (advanced)	conduct research on the basis of knowledge of the modern methodology of scientific knowledge;	use the types and forms of research activities and registration of its results	conduct scientific research, including the method of analysis and construction of scientific hypotheses and	50-64

conclusions				theories, methods for testing, confirming and refuting scientific hypotheses and theories and implementing the results in specific biotechnological processes.	
	owns (high)	setting priorities and setting goals for research activities;	planning the entire action to study the object of study and effectively organize the selection of information;	the methodology of registration of scientific results (in the form of articles, abstracts, dissertations) on the topic of biotechnology.	65-84

Evaluation tools for intermediate certification

Interim certification evaluates the student's answer to the questions indicated in the questions to prepare for the test.

Questions for the credit

1. Methodology - as a set of research methods used in the scientific knowledge of the world.
2. The main directions and prospects of development of modern science.
3. Science and other forms of mastering reality. The main stages of the development of science.
4. The concept and need for scientific knowledge. The role of science in human society.
5. Methods of scientific knowledge.
6. The functions of science. Classification of Sciences.
7. Statement of a scientific and technical problem and stages of research work.
8. Methods of choice and purpose of the direction of scientific research.
9. The relevance and scientific novelty of the study. Hypothesis

10. Search, accumulation and processing of scientific information about technologies in the field of food.
11. Documentary sources of information. Analysis of documents.
12. Electronic forms of information resources. Processing of scientific information, its fixation and storage
13. Theoretical and experimental studies in the development of food and biotechnology.
14. Methods and features of theoretical research.
15. The structure and models of theoretical research.
16. General information about experimental studies. Methodology and design of the experiment.
17. Metrological support of experimental studies.
18. Processing the results of experimental studies in the development of food and biotechnology.
19. Fundamentals of the theory of random errors and methods for estimating random errors in measurements.
20. Presentation of the results of scientific research in the development of food and biotechnology.
21. Oral presentation of information. Presentation and argumentation of the conclusions of scientific work
22. Objects of the invention in food technology. The patentability conditions of the invention.
23. The concept and structure of the master's thesis.
24. Formulation of the goals and objectives of the study
25. The role of nutrition in the life of human society.
26. The history of the development of the science of food and nutrition in conjunction with the fundamental sciences.
27. The history of the development of the science of food and nutrition in conjunction with the fundamental sciences.
28. Nutrition science methodology. Forms of scientific knowledge.

29. Nutrition science methodology. Methods of scientific knowledge.
30. Nutrition science methodology. Basic concepts.
31. Rationalization of nutrition. Ways and methodology.
32. Trophology as a new philosophy of nutrition.
33. The role of biochemistry in the development of food science and the food industry.
34. The role of chemistry in the development of food science and the food industry.
35. The role of microbiology in the development of nutrition science and the product industry.
36. The role of biotechnology in the development of nutrition science and the product industry.
37. The role of food engineering in the development of the nutrition industry.
38. The role of genetic bioengineering in the development of the science of nutrition and the provision of food to the world's population.
39. The main content of the modern theory of adequate nutrition.
40. Current status and development prospects of the science of nutrition.
41. The concept of state policy in the field of healthy nutrition of the population of the Russian Federation.
42. Status and prospects of the development of the concept of “functional nutrition in Russia”
43. The history and content of the section of the science of nutrition, functional nutrition
44. The classical theory of balanced nutrition. Assessment of its positive and negative results.
45. Health and nutrition. Nutrition as one of the main factors in the formation of health.
46. Health and nutrition. Food policy in the world in the twentieth century, its negative consequences (illness from malnutrition).

47. The role of discoveries in protein chemistry for the development of nutrition science. The first descriptions of proteins. Chronology of the discovery of proteinogenic amino acids.

48. The role of discoveries in the field of protein chemistry. The discovery of simple and complex proteins, their role in human nutrition.

49. The history of the development of fermentology. The first evidence of the material basis of enzymes.

50. The history of the development of fermentology. The discovery of the catalytic function of enzymes and their mechanism of action.

51. Discoveries in the structure and properties of carbohydrates. Establishing a general formula for carbohydrates. Discovery of the oxide cycle of monosugars.

52. The role of discoveries in the field of vitaminology. The role of prominent scientists in the development of the science of vitamins.

53. Development of ideas about the role of minerals in nutrition. The relationship between the position of an element in the periodic table with its physiological value in the body.

54. Discoveries in the field of the structure and properties of lipids. The first elemental analysis of fats. The discovery of saponifiable and unsaponifiable lipids.

55. Discoveries in the field of the structure and properties of lipids. Detection of oil hydrolysis products. The role of chromatographic methods in the study of fats.

56. The development of science and technology of the living microcosm. Creation of industrial microbiology. Microbial synthesis products.

57. Stages and prospects for the development of biotechnology.

58. Stages and prospects for the development of biotechnology "Era of antibiotics."

59. Stages and prospects for the development of biotechnology. "The era of controlled biosynthesis."

60. Prospects for the development of biotechnology. "The era of new biotechnology." Genetic and cellular engineering.

61. The history of the development of food industries, their inextricable connection with the scientific process.

62. Methods of scientific knowledge. Experiment. Analogy. Modeling.

63. Demographic changes in society and their impact on the development of nutrition science and the food industry.

64. Status and prospects of the development of the concept of “functional nutrition in Russia”

65. The history and content of the section of the science of food and nutrition “functional nutrition”

66. The development of science and technology of the living microcosm. Creation of industrial microbiology. Microbial synthesis products.

67. The history of the development of food industries, their inextricable connection with the scientific process.

Task kits for the credit

Task 1

1. Methodology - as a set of research methods used in the scientific knowledge of the world

2. The concept and structure of the master's thesis.

3. Health and nutrition. Nutrition as one of the main factors in the formation of health.

Task 2

1. The main directions and prospects of development of modern science.

2. The formulation of the goals and objectives of the study

3. Health and nutrition. Food policy in the world in the twentieth century, its negative consequences (illness from malnutrition).

Task 3

1. Science and other forms of mastering reality. The main stages of the development of science.

2. The role of nutrition in the life of human society.
3. The role of discoveries in protein chemistry for the development of nutritional science

Task 4

1. The concept and need for scientific knowledge. The role of science in human society.
2. The history of the development of the science of food and nutrition in conjunction with the fundamental sciences
3. The role of discoveries in the field of protein chemistry. The discovery of simple and complex proteins, their role in human nutrition.

Task 5

1. Methods of scientific knowledge.
2. The history of the development of the science of food and nutrition in conjunction with the fundamental sciences.
3. The history of the development of fermentology. The first evidence of the material basis of enzymes.

Task 6

1. The functions of science. Classification of Sciences.
2. The methodology of nutrition science. Forms of scientific knowledge.
3. The history of the development of fermentology. The discovery of the catalytic function of enzymes and their mechanism of action.

Task 7

1. The statement of the scientific and technical problems and stages of research work.
2. The methodology of nutrition science. Methods of scientific knowledge.
3. Discoveries in the structure and properties of carbohydrates.

Task 8

1. Methods of choice and purpose of the direction of scientific research.
2. The methodology of nutrition science. Basic concepts.

3. The role of discoveries in the field of vitaminology. The role of prominent scientists in the development of the science of vitamins.

Task 9

1. The relevance and scientific novelty of the study. Hypothesis

2. Rationalization of nutrition. Ways and methodology.

3. The development of ideas about the role of minerals in nutrition. The relationship between the position of an element in the periodic table with its physiological value in the body.

Task 10

1. Search, accumulation and processing of scientific information about technologies in the field of food.

2. Trophology as a new philosophy of nutrition.

3. Discoveries in the field of the structure and properties of lipids. The first elemental analysis of fats. The discovery of saponifiable and unsaponifiable lipids.

Task 11

1. Documentary sources of information. Analysis of documents.

2. The role of biochemistry in the development of food science and the food industry.

3. Discoveries in the field of the structure and properties of lipids. Detection of oil hydrolysis products. The role of chromatographic methods in the study of fats.

Task 12

1. Electronic forms of information resources. Processing of scientific information, its fixation and storage

2. The role of chemistry in the development of food science and the food industry.

3. The development of science and technology of the living microcosm. Creation of industrial microbiology. Microbial synthesis products.

Task 13

1. Theoretical and experimental research in the development of biotechnology of food products.

2. The role of microbiology in the development of nutrition science and the product industry.

3. Stages and prospects for the development of biotechnology.

Task 14

1. Methods and features of theoretical research

2. The role of biotechnology in the development of nutrition science and the product industry.

3. Stages and prospects for the development of biotechnology "Era of antibiotics."

Task 15

1. The structure and models of theoretical research.

2. The role of food engineering in the development of the food industry.

3. Stages and prospects for the development of biotechnology. "The era of controlled biosynthesis."

Task 16

1. General information about experimental studies. Methodology and design of the experiment.

2. The main content of the modern theory of adequate nutrition.

3. Prospects for the development of biotechnology. "The era of new biotechnology." Genetic and cellular engineering.

Task 17

1. Metrological support of experimental studies.

2. The role of genetic bioengineering in the development of the science of nutrition and the provision of food to the world's population.

3. The history of the development of food industry sectors, their inextricable connection with the scientific process.

Task 18

1. Processing the results of experimental studies in the development of food biotechnology.

2. Current status and development prospects of the science of nutrition.

3. Methods of scientific knowledge. Experiment. Analogy. Modeling.

Task 19

1. Fundamentals of the theory of random errors and methods for estimating random errors in measurements.

2. The concept of state policy in the field of healthy nutrition of the population of the Russian Federation.

3. Demographic changes in society and their impact on the development of nutrition science and the food industry.

Task 20

1. Objects of the invention in food technology. The patentability conditions of the invention.

2. The history of the development of food industries, their inextricable link with the scientific process.

3. The state and prospects for the development of the concept of "functional nutrition in Russia"

Task 21

1. Presentation of the results of scientific research in the development of food biotechnology.

2. The state and prospects for the development of the concept of "functional nutrition in Russia"

3. The development of science and technology of the living microcosm. Creation of industrial microbiology. Microbial synthesis products.

Criteria for grading a student in the standings in the discipline

«Research scientific methodology in biotechnology»

Points (rating)	Exam grade (standard)	Requirements for formed competencies
100-85	“excellent”	The student is given an “excellent” mark if he has deeply and firmly grasped the program material, sets out it comprehensively, consistently, clearly and logically harmoniously, knows how to closely relate theory to practice, freely copes with tasks, questions and other types of application of knowledge, and does not have difficulty the answer when modifying tasks, uses the material of monographic literature in the answer, correctly substantiates the decision made, has versatile skills and techniques for performing practical tasks.
85-76	“good”	The student is rated “good” if he knows the material firmly, correctly and essentially sets out it, avoiding significant inaccuracies in answering the question, correctly applies theoretical principles, and possesses the necessary skills and techniques for their implementation.
75-61	“satisfactory”	The student is rated as “satisfactory” if he has knowledge of only the basic material, but has not learned its details, admits inaccuracies, insufficiently correct wording, violations of the logical sequence in the presentation of program material, has difficulty answering additional questions.

Evaluation tools for ongoing certification

Questions for colloquiums, interviews

Section 1

1. Master's thesis, the relevance of the topic, the choice of objects and subject of research, research methods, expected results and conclusions.
2. The history of the development of agri-food biotechnology. Scientific aspects of methodology in agri-food biotechnology, the basics of its improvement.

Section 2

1. The history and content of the section of science "Biotechnology of food products".
2. The history and main provisions of the "Biotechnology of food products." Theories and concepts of nutrition.

Evaluation Criteria (oral response)

- ✓ 100-85 points - if the answer shows strong knowledge of the main processes of the studied subject area, it differs in the depth and completeness of the topic; knowledge of the terminological apparatus; the ability to explain the essence of phenomena, processes, events, draw conclusions and generalizations, give reasoned answers, give examples; fluency in monologue, logical and consistent response; ability to give examples of modern problems of the studied area.
- ✓ 85-76 points - an answer that reveals strong knowledge of the main processes of the studied subject area, differs in depth and completeness of the topic; knowledge of the terminological apparatus; the ability to explain the essence of phenomena, processes, events, draw conclusions and generalizations, give reasoned answers, give examples; fluency in monologue speech, logical and consistent response. However, one or two inaccuracies in the answer are allowed.
- ✓ 75-61 points - the answer is evaluated, testifying mainly to knowledge of the processes of the studied subject area, characterized by insufficient depth and completeness of the topic; knowledge of the basic questions of theory; poorly formed skills in the analysis of phenomena, processes, insufficient ability to give

reasoned answers and give examples; lack of fluency in monological speech, logical and consistent response. There are several errors in the content of the response; inability to give an example of the development of the situation, to communicate with other aspects of the study area.

✓ 60-50 points - an answer that reveals ignorance of the processes of the studied subject area, characterized by a shallow disclosure of the topic; ignorance of the basic questions of the theory, unformed skills in the analysis of phenomena, processes; inability to give reasoned answers, poor knowledge of monological speech, lack of logic and consistency. Serious errors are made in the content of the response; ignorance of the contemporary problems of the studied area.

**Roundtable discussion topics
(discussions, controversy, dispute, debate)**

1. Objects of the invention in food biotechnology. The patentability conditions of the invention.

2. Innovations in the field of technology and biotechnology of food products for special purposes.

Evaluation Criteria:

✓ 100-86 points are awarded to the student if the student expressed his opinion on the formulated problem, argued for it, accurately determining its content and components. The data of domestic and foreign literature, statistical information, regulatory information. The student knows and possesses the skill of independent research work on the topic of research; methods and techniques of analysis of theoretical and / or practical aspects of the study area. There are no factual errors related to understanding the problem; graphically, the work is framed correctly

✓ 85-76 points - the work is characterized by semantic integrity, coherence and sequence of presentation; no more than 1 mistake was made in explaining the meaning or content of the problem. For argumentation, data from domestic and

foreign authors are given. Demonstrated research skills. There are no actual errors related to understanding the problem. One or two errors in the design of the work

✓ 75-61 points - the student conducts a fairly independent analysis of the main stages and semantic components of the problem; understands the basic foundations and theoretical justification of the chosen topic. The main sources on this topic were brought. No more than 2 errors were made in the meaning or content of the problem, the design of the work

✓ 60-50 points - if the work is a retransmitted or completely rewritten source text without any comments, analysis. The structure and theoretical component of the topic is not disclosed. Three or more than three errors were made in the semantic content of the problem being revealed and in the design of the work.

Themes of group and / or individual creative tasks / projects

Group creative tasks (projects):

1. The scientific basis of biotechnology integrated processing of aquatic organisms.
2. The scientific basis of biotechnology integrated processing of plant materials.

Individual creative tasks (projects):

1. Innovative solutions in the field of engineering and technology for the production of meat and meat and vegetable products.
2. The scientific approach to the substantiation of technological methods for processing collagen-containing raw materials.

Evaluation criteria for a creative assignment performed in a practical lesson:

✓ 100-86 points are set if the student / group expressed their opinion on the formulated problem, argued for it, accurately determining its content and components. The data of domestic and foreign literature, statistical information, regulatory information. Demonstrated knowledge and skills of independent research work on the topic of research; methods and techniques of analysis of international political practice. There are no actual errors related to understanding the problem.

✓ 85-76 points - the work of the student / group is characterized by semantic integrity, coherence and consistency of presentation; no more than 1 mistake was made in explaining the meaning or content of the problem. For argumentation, data from domestic and foreign authors are given. Demonstrated research skills. There are no actual errors related to understanding the problem.

✓ 75-61 points - a fairly independent analysis of the main stages and semantic components of the problem was carried out; understanding of the basic foundations and theoretical justification of the chosen topic. The main sources on this topic were brought. No more than 2 errors are made in the meaning or content of the problem

✓ 60-50 points - if the work is a retransmitted or completely rewritten source text without any comments, analysis. The structure and theoretical component of the topic is not disclosed. Three or more than three errors of semantic content of the disclosed problem are made

Methodological materials that determine the procedures for assessing knowledge, skills and (or) experience, characterizing the stages of formation of competencies

The approximate content of the guidelines defining the procedures for assessing the results of mastering the discipline (practice)

Current certification of students. The current certification of students in the discipline «Research scientific methodology in biotechnology» is carried out in accordance with local regulations of the FEFU and is mandatory.

The current certification in the discipline «Research scientific methodology in biotechnology» is carried out in the form of control measures to assess the actual results of student learning and is carried out by a leading teacher.

The objects of evaluation are:

- academic discipline (activity in the classroom, timeliness of various types of tasks, attendance of all types of classes in the certified discipline);
- degree of assimilation of theoretical knowledge;
- level of mastery of practical skills in all types of educational work;
- results of independent work.

Interim certification of students. Interim certification of students in the discipline «Research scientific methodology in biotechnology» is carried out in accordance with the local regulatory acts of FEFU and is mandatory.

**Criteria for grading a student in the standings in the discipline
«Research scientific methodology in biotechnology»**

Points (rating)	Exam/Credit Rating	Requirements for formed competencies
100-86	<i>”Credited”/</i> “excellent”	The student is rated as “excellent” if he has deeply and firmly grasped the program material, sets out comprehensively, consistently, clearly and logically in harmony with him, knows how to closely relate theory to practice, freely copes with tasks, questions and other types of application of knowledge, and does not the answer when modifying tasks, uses the material of monographic literature in the answer, correctly substantiates the decision made, has versatile skills and techniques for performing practical tasks.
85-76	<i>”Credited”/</i> “good”	The student is rated “good” if he knows the material well, correctly and essentially sets out it, avoiding significant inaccuracies in answering the question, correctly applies theoretical principles when solving practical questions and tasks, and possesses the necessary skills and techniques for their implementation.
75-61	<i>”Credited”/</i> “satisfactory”	A student is rated “satisfactory” if he has knowledge of only the basic material, but has not learned its details, admits inaccuracies, insufficiently correct wording, violations of the logical sequence in the presentation of program material, and has difficulty in performing practical work.
60-50	<i>”Not credited”/</i> "unsatisfactory"	Evaluation of "unsatisfactory" is given to a student who does not know a significant part of the program material, makes significant mistakes, hesitates, with great difficulty performs practical work. As a rule, the rating “unsatisfactory” is given to students who cannot continue their studies without additional classes in the relevant discipline.