



MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
FEDERAL STATE AUTONOMOUS EDUCATIONAL INSTITUTION OF HIGHER EDUCATION
FAR EASTERN FEDERAL UNIVERSITY

(FEFU)

ADVANCED ENGINEERING SCHOOL «INSTITUTE OF BIOTECHNOLOGY, BIOENGINEERING AND
FOOD SYSTEMS»

APPROVE

Director of the Advanced
Engineering School
«Institute of Biotechnology,
Bioengineering and Food Systems»



Л.А. Текутьева
«3» ноября 2022 г.

PROGRAM

State final Attestation

Direction of training

19.04.01 Biotechnology

Academic Master's Program

«Agri-Food Biotechnology»

Graduate qualification - master

Full-time form of education

The standard term for the development of the program
(full-time education) 2 years

Starting year of preparation: 2021

The program of the SFA 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 Education and Science of Russia dated 10.08.2021 No. 737. The SFA program was discussed at a meeting of the Department of Food Science and Technology, protocol dated October 4, 2022 No. 1.

Director of the Department of the implementing structural unit Ershova T.A.

Compiled by: Ph.D., Associate Professor Novitckaia E.G.

Vladivostok
2022

Explanatory note

1. Characteristics of the professional activity of graduates

Educational program 19.04.01 Biotechnology Master's program «Agri-Food Biotechnology» provides high-quality training of highly qualified personnel in the field of education for research, design, organizational, managerial, and production and technological professional activities through the development of the profile of the program by students and the mastery of general cultural, universal, general professional and professional competencies that contribute to the social mobility of graduates and their sustainability, competitiveness in the labor market.

1.1 Area of professional activity

The field of professional activity of graduates who have mastered the master's program includes:

- research, production and use of enzymes, viruses, microorganisms, cell cultures of animals and plants, products of their biosynthesis and biotransformation;
- creation of technologies for obtaining new types of products, including products obtained using microbiological synthesis, biocatalysis, genetic engineering and nanobiotechnologies;
- development of scientific and technical documentation and technological regulations for the production of biotechnological products;
- implementation of biotechnological processes and industries in accordance with the observance of legislative and regulatory national and international acts;
- organizing and conducting quality control of raw materials, intermediate products and finished products.

1.2. Types of professional activity. Professional tasks

Master in the field of study 19.04.01 Biotechnology, the master's program «Agri-Food Biotechnology» prepares for the following types of professional activities:

- research;
- organizational and managerial;
- production and technological.

A graduate who has mastered the master's program in the field of study 19.04.01 Biotechnology, the master's program "Agro-Food Biotechnology" should be ready to solve the following professional tasks:

research activities:

- selection, processing and analysis of scientific, technical and patent information on research topics using specialized databases using information technology;
- analysis of technological process indicators for compliance with scientific developments;
- development of research programs, evaluation and analysis of the obtained results;
- search and development of new effective ways to obtain biotechnological products, creation of modern biotechnologies, including nanobiotechnologies, technologies of recombinant deoxyribonucleic acids, cell technologies;
- isolation, identification and analysis of products of biosynthesis and biotransformation, obtaining new strains-producers of biological preparations;
- creation of composite forms and optimal ways of using biological preparations;
- Validation of technological processes and analytical methods;
- study of biochemical and biological regularities of biosynthesis processes, micro- and macrostoichiometry, micro- and macrokinetics of growth of populations of microorganisms and cell cultures, interaction of microorganisms, viruses with cells, metabolic pathways and features of substrate utilization and synthesis of metabolic products;

- creation of theoretical models that allow predicting the nature of changes in the properties of raw materials in the process of its biotransformation and obtaining products with specified quality characteristics;

- experimental study of biological and physico-chemical kinetics at all stages of the technological process and their mathematical description;

- preparation of scientific and technical reporting documentation, analytical reviews and references, documentation for participation in competitions of scientific projects, projects of pharmacopoeial articles (state standards), publication of scientific results, protection of intellectual property;

organizational management activities:

- organizing the work of the team in the conditions of the current production, planning the work of personnel and payroll funds;

- implementation of relations with the leading scientific centers of the industry to optimize the work of the enterprise, development of criteria for evaluating the effectiveness and an action plan to improve it;

- conducting a technical and economic analysis of production and drawing up technical and economic documentation;

- development and implementation of a quality management system for biotechnological products;

- development of a system of local regulations of the enterprise in accordance with the requirements of international standards;

- organization of work on the introduction of innovations in the field of biotechnology;

- organization of material and technical support for biotechnological production, storage and accounting of raw materials, materials and finished products in the prescribed manner;

- ensuring technological discipline, sanitary and hygienic mode of operation of the enterprise, maintenance of technological equipment in proper technical condition;

- organization of compliance with safety regulations at work and environmental protection;
 - ensuring professional confidentiality;
- production and technological activities:
- organization, planning and management of existing biotechnological processes and production;
 - ensuring the stability of production indicators and product quality in accordance with the local acts of the enterprise (technological regulations, job descriptions, analysis methods);
 - ensuring efficient operation of control, automation and automated control of biotechnological production;
 - organization and implementation of measures for energy and resource saving, ensuring environmental safety of biotechnological processes;
 - provision of chemical-technical, biochemical and microbiological control;
 - development of measures to improve the economic and production indicators of the process, ensuring the economic efficiency of production and obtaining a product of the required quality;
 - organization of metrological support of production;
 - organization of the internal and external audit system;
 - coordination of work on the implementation of the results of scientific research in production;
 - operation of experimental and industrial installations;
 - ensuring the operation of instruments and equipment for analytical control and production control in accordance with technical passports and instructions for instruments and equipment;
- pedagogical activity:
- preparation and conduct
- various types of training sessions with students in specialized disciplines;
- development of educational and teaching materials, including in electronic form;

- management of research work of students;
- training of average technical personnel in production.

2. Requirements for the results of the development

A graduate in the direction 19.04.01 Biotechnology (master's level), in accordance with the goals of the master's program, types and tasks of professional activity, must have the following general cultural, general professional and professional competencies, which are formed as a result of mastering the entire content of the EP of the master's program.

The list of competencies tested during the state final certification:

- the ability to creatively adapt the achievements of foreign science, technology and education to domestic practice; high degree of professional mobility (GC-1);
- willingness to show the qualities of a leader and organize the work of the team, to own effective technologies for solving professional problems (GC-2);
- ability to work in project interdisciplinary teams, including as a leader (GC-3);
- the ability to quickly master new subject areas, identify contradictions, problems and develop alternative solutions to them (GC-4);
- the ability to generate ideas in scientific and professional activities (GC-5);
- the ability to conduct a scientific discussion, mastering the norms of the scientific style of the modern Russian language (GC-6);
- ability for free scientific and professional communication in a foreign language environment (GC-7);
- ability for abstract thinking, analysis, synthesis (GC-8);
- willingness to act in non-standard situations, bear social and ethical responsibility for the decisions made (GC-9);
- the ability to improve and develop one's intellectual and general cultural level, gain knowledge in the field of modern problems of science, engineering and technology, humanitarian, social and economic sciences (GC-10);

- the ability for professional growth, for independent learning of new research methods, for changing the scientific and scientific-production profile of one's professional activity (GC-11);
- ability in practice to use skills and abilities in the organization of research and design work and in team management (OK-12);
- willingness to use legal and ethical standards in assessing the consequences of their professional activities, in the development and implementation of socially significant projects (GC-13);
- ability for professional operation of modern biotechnological equipment and scientific instruments (GPC-1);
- readiness for communication in oral and written forms in the state language of the Russian Federation and a foreign language to solve the problems of professional activity (GPC-2);
- willingness to lead a team in the area of their professional activity, tolerantly perceiving social, ethnic, confessional and cultural differences (GPC-3);
- readiness to use methods of mathematical modeling of materials and technological processes, readiness for theoretical analysis and experimental verification of theoretical hypotheses (GPC-4);
- the ability to use modern information technologies to collect, process and disseminate scientific information in the field of biotechnology and related industries, the ability to use databases, software products and resources of the information and telecommunications network «Internet» (hereinafter referred to as the «Internet») to solve the problems of professional activity (GPC-5);
- readiness to protect intellectual property objects and commercialization of intellectual property rights (GPC-6);
- willingness to plan, organize and conduct research work in the field of biotechnology, the ability to correctly process the results of experiments and draw reasonable conclusions and conclusions (SPC-1);
- the ability to analyze scientific and technical information in the field of biotechnology and related disciplines for the purpose of scientific, patent and

marketing support for fundamental research and technological developments (SPC-2);

- the ability to present the results of the work performed in the form of scientific and technical reports, reviews, scientific reports and publications using modern information technology capabilities and taking into account the requirements for the protection of intellectual property (SPC-3);

- readiness to organize the work of a team of performers, make executive decisions in a spectrum of opinions, determine the order of work (SPC-7);

- the ability to conduct a feasibility study of production and prepare technical and economic documentation (SPC-8);

- willingness to use the basic principles of organizing metrological support for the production of agricultural raw materials and food products (SPC-9);

- ability to develop a quality management system for biotechnological products in accordance with the requirements of Russian and international quality standards (SPC-10);

- the ability to ensure technological discipline, sanitary and hygienic mode of operation of the enterprise, maintenance of technological equipment in proper technical condition (SPC-11);

- the ability to plan and carry out activities to ensure safety at work, to monitor and protect the environment (SPC-12);

- readiness for organizing, planning and managing existing biotechnological processes and production (SPC-13);

- the ability to use standard and develop new methods for engineering calculations of technological parameters and equipment for biotechnological production (SPC-14);

- willingness to provide stable indicators of production and quality of products (SPC-15);

- the ability to carry out effective operation of control, automation and automated production control, chemical-technical, biochemical and microbiological control (SPC-16);

- readiness to carry out pilot testing of technology and scaling up processes (SPC-17);
- ability to develop and scientifically substantiate schemes for optimal integrated certification of biotechnological products (SPC-18);
- the ability to analyze the indicators of the technological process for compliance with the original scientific developments (SPC-19);
- the ability to ensure the biological safety of raw materials, semi-finished products, finished products (SPC-20);
- the ability to ensure the metrological state of production and the effective operation of control, automation and automated production control (SPC-21);
- the ability to coordinate work on the implementation of the results of scientific research in production (SPC-22).

List of knowledge, skills and possessions of a master's graduate

Master of the direction of preparation 19.04.01 Biotechnology Master's program «Agri-Food Biotechnology» should know:

- achievements of foreign science, technology and education and apply them in domestic practice;
- organizational work of the team, organization management methods;
- new methods of research, changes in the scientific and research and production profile of their professional activities;
- professional operation of modern biotechnological equipment and scientific instruments;
- communication in oral and written forms in the state language of the Russian Federation and in a foreign language to solve the problems of professional activity;
- methods of mathematical modeling of materials and technological processes, theoretical analysis and experimental verification of theoretical hypotheses;

- modern information technologies for the collection, processing and dissemination of scientific information in the field of biotechnology and related industries, the use of a database, software products and resources of the information and telecommunications network "Internet" (hereinafter referred to as the "Internet") to solve the problems of professional activity;
- protection of objects of intellectual property and commercialization of rights to objects of intellectual property;
- planning, organizing and conducting research work in the field of biotechnology, conducting correct processing of the results of experiments and making reasonable conclusions and conclusions;
- analysis of scientific and technical information in the field of biotechnology and related disciplines for the purpose of scientific, patent and marketing support for ongoing fundamental research and technological developments;
- the basis for presenting the results of the work performed in the form of scientific and technical reports, reviews, scientific reports and publications using modern information technology capabilities and taking into account the requirements for the protection of intellectual property;
- design of experimental, experimental-industrial and industrial installations of biotechnological production;
- basics of technological calculations of equipment, selection of standard equipment and design of non-standard equipment;
- development of project documentation;
- organizing the work of a team of performers, making executive decisions in a spectrum of opinions, determining the order of work;
- carrying out a technical and economic analysis of production and drawing up technical and economic documentation;
- use of the basic principles of organization of metrological support for the production of agricultural raw materials and food products;

- bases for developing a quality management system for biotechnological products in accordance with the requirements of Russian and international quality standards;
- basics for ensuring technological discipline, sanitary and hygienic mode of operation of the enterprise, maintenance of technological equipment in proper technical condition;
- basics of planning and carrying out activities to ensure safety at work, to monitor and protect the environment;
- basics of organization, planning and management of existing biotechnological processes and production;
- standard and bases of development of new methods of engineering calculations of technological parameters and equipment of biotechnological productions;
- ensuring the stability of production indicators and product quality;
- implementation of effective operation of control, automation and automated production control, chemical-technical, biochemical and microbiological control;
- carrying out pilot testing of technology and scaling of processes;
- development and scientific substantiation of schemes for optimal integrated certification of biotechnological products;
- the basic principles of the analysis of indicators of the technological process for compliance with the original scientific developments;
- ensuring the biological safety of raw materials, semi-finished products, finished products;
- ensuring the metrological state of production and the effective operation of control, automation and automated production control;
- implementation of coordination of work on the implementation of the results of scientific research in production.

Master of the direction of preparation 19.04.01 Biotechnology Master's program «Agri-Food Biotechnology» should be able to:

- creatively adapt the achievements of foreign science, technology and education to domestic practice; ensure a high degree of professional mobility;
- show the qualities of a leader and organize the work of the team, own effective technologies for solving professional problems;
- work in project interdisciplinary teams, including as a leader;
- quickly learn new subject areas, identify contradictions, problems and develop alternative solutions to them;
- generate ideas in scientific and professional activities;
- conduct a scientific discussion, master the norms of the scientific style of modern Russian language;
- apply free scientific and professional communication in a foreign language environment;
- apply thinking, analysis, synthesis;
- act in non-standard situations, bear social and ethical responsibility for the decisions made;
- improve and develop their intellectual and general cultural level, gain knowledge in the field of modern problems of science, engineering and technology, humanitarian, social and economic sciences;
- independently learn new methods of research;
- in practice to use the skills and abilities in the organization of research and design work and in the management of the team;
- to use legal and ethical standards in assessing the consequences of their professional activities, in the development and implementation of socially significant projects;
- professionally operate modern biotechnological equipment and scientific instruments;
- interact orally and in writing in the state language of the Russian Federation and in a foreign language to solve the problems of professional activity;
- lead the team in the field of their professional activities, tolerantly perceiving social, ethnic, confessional and cultural differences;

- use methods of mathematical modeling of materials and technological processes, theoretical analysis and experimental verification of theoretical hypotheses;

- use modern information technologies to collect, process and disseminate scientific information in the field of biotechnology and related industries, use databases, software products and resources of the information and telecommunications network "Internet" to solve the problems of professional activity;

- to protect objects of intellectual property and commercialize the rights to objects of intellectual property;

- to plan, organize and conduct research work in the field of biotechnology, conduct correct processing of the results of experiments and make reasonable conclusions and conclusions;

- to analyze scientific and technical information in the field of biotechnology and related disciplines for the purpose of scientific, patent and marketing support for ongoing fundamental research and technological developments;

- present the results of the work performed in the form of scientific and technical reports, reviews, scientific reports and publications using modern information technology capabilities and taking into account the requirements for the protection of intellectual property;

- to design experimental, experimental-industrial and industrial installations of biotechnological production;

- carry out technological calculation of equipment, selection of standard equipment and design of non-standard equipment;

- develop project documentation;

- organize the work of a team of performers, make executive decisions in a spectrum of opinions, determine the order of work;

- conduct a technical and economic analysis of production and draw up technical and economic documentation;

- use the basic principles of organizing metrological support for the production of agricultural raw materials and food products;
- develop quality management systems for biotechnological products in accordance with the requirements of Russian and international quality standards;
- ensure technological discipline, sanitary and hygienic mode of operation of the enterprise, maintenance of technological equipment in proper technical condition;
- the ability to plan and carry out activities to ensure safety at work, to monitor and protect the environment;
- organize, plan and manage existing biotechnological processes and production;
- use standard and develop new methods of engineering calculations of technological parameters and equipment of biotechnological productions;
- ensure the stability of production indicators and product quality;
- to carry out effective operation of means of control, automation and automated production control, chemical-technical, biochemical and microbiological control;
- carry out pilot testing of technology and scaling up processes;
- develop and scientifically substantiate schemes for optimal integrated certification of biotechnological products;
- analyze the indicators of the technological process for compliance with the original scientific developments;
- ensure the biological safety of raw materials, semi-finished products, finished products;
- ensure the metrological state of production and the effective operation of control, automation and automated production control;
- carry out coordination of work on the implementation of the results of scientific research in production.

Master of the direction of preparation 19.04.01 Biotechnology Master's program «Agri-Food Biotechnology» must have:

- achievements of foreign science, technology and education to domestic practice; a high degree of professional mobility;
- the ability to show the qualities of a leader and organization of the work of the team, effective technologies for solving professional problems;
- ability to work in project interdisciplinary teams, including as a leader;
- the ability to quickly master new subject areas, identify contradictions, problems and develop alternative solutions to them;
- the ability to generate ideas in scientific and professional activities;
- the ability to conduct a scientific discussion, mastering the norms of the scientific style of the modern Russian language;
- the ability to free scientific and professional communication in a foreign language environment;
- ability to abstract thinking, analysis, synthesis;
- the ability to act in non-standard situations, bear social and ethical responsibility for the decisions made;
- the ability to improve and develop one's intellectual and general cultural level, gain knowledge in the field of modern problems of science, engineering and technology, humanitarian, social and economic sciences;
- the ability for professional growth, for independent learning of new research methods, for changing the scientific and scientific-production profile of one's professional activity;
- the ability to use skills in practice in organizing research and design work and in managing a team;
- the ability to use legal and ethical standards in assessing the consequences of their professional activities, in the development and implementation of socially significant projects;
- the ability to professionally operate modern biotechnological equipment and scientific instruments;

- the ability to communicate in oral and written forms in the state language of the Russian Federation and in a foreign language to solve the problems of professional activity;

- the ability to lead a team in the area of their professional activity, tolerantly perceiving social, ethnic, confessional and cultural differences;

- ability to use methods of mathematical modeling of materials and technological processes, readiness for theoretical analysis and experimental verification of theoretical hypotheses;

- the ability to use modern information technologies to collect, process and disseminate scientific information in the field of biotechnology and related industries, the ability to use databases, software products and resources of the information and telecommunication network «Internet» to solve the problems of professional activity;

- ability to protect objects of intellectual property and commercialization of rights to objects of intellectual property;

- the ability to plan, organize and conduct research work in the field of biotechnology, the ability to correctly process the results of experiments and draw reasonable conclusions and conclusions;

- the ability to analyze scientific and technical information in the field of biotechnology and related disciplines for the purpose of scientific, patent and marketing support for ongoing fundamental research and technological developments;

- the ability to present the results of the work performed in the form of scientific and technical reports, reviews, scientific reports and publications using modern information technology capabilities and taking into account the requirements for the protection of intellectual property;

- the ability to design experimental, pilot and industrial installations of biotechnological production;

- ability to carry out technological calculation of equipment, selection of standard equipment and design of non-standard equipment;

- ability to develop project documentation;
- the ability to organize the work of a team of performers, make executive decisions in a spectrum of opinions, determine the order of work;
- the ability to conduct a technical and economic analysis of production and drawing up technical and economic documentation;
- the ability to use the basic principles of organization of metrological support for the production of agricultural raw materials and food products;
- ability to develop a quality management system for biotechnological products in accordance with the requirements of Russian and international quality standards;
- the ability to ensure technological discipline, sanitary and hygienic mode of operation of the enterprise, maintenance of technological equipment in proper technical condition;
- the ability to plan and carry out activities to ensure safety at work, to monitor and protect the environment;
- ability to organize, plan and manage existing biotechnological processes and production;
- the ability to use standard and develop new methods for engineering calculations of technological parameters and equipment for biotechnological production;
- the ability to ensure the stability of production indicators and product quality;
- the ability to carry out the effective operation of controls, automatic ization and automated production control, chemical-technical, biochemical and microbiological control;
- ability to conduct pilot testing of technology and scale up processes;
- ability to develop and scientifically substantiate schemes for optimal integrated certification of biotechnological products;
- the ability to analyze the indicators of the technological process for compliance with the original scientific developments;

- the ability to ensure the biological safety of raw materials, semi-finished products, finished products;
- the ability to ensure the metrological state of production and the effective operation of control, automation and automated production control;
- the ability to coordinate work on the implementation of the results of scientific research in production.

Criteria for assessing the development of competencies of a master's graduate in the course of mastering academic disciplines.

At the stage of passing the state final certification, a positive assessment is given to the student with the full development of competencies in the course of mastering academic disciplines.

Grading scale	Evaluation criteria
"excellent"	The student must to: demonstrate deep and lasting knowledge of the material; exhaustively, consistently, competently and logically harmoniously present theoretical material; correctly formulate definitions
"well"	The student must to: demonstrate sufficient knowledge of the material; demonstrate knowledge of basic theoretical concepts; sufficiently consistently, competently and logically harmoniously present the material
"satisfactorily"	The student must to: demonstrate general knowledge of the studied material; know the basic educational literature recommended by the discipline program; be able to build an answer in accordance with the structure of the question being presented
unsatisfactorily	is given in case of: ignorance of a significant part of the program material; not mastering the conceptual apparatus of the discipline; significant errors in the presentation of educational material; inability to build an answer in accordance with the structure of the question being presented

3. The structure of the state final certification

3.1 The purpose of the state final certification

The purpose of the state final certification is: systematization, consolidation and expansion of theoretical and practical knowledge in this area of training, as well as the formation of skills for applying this knowledge in solving specific problems of production, technological and organizational and technological activities of a graduate in accordance with the requirements of the Federal State Educational Standard in the direction preparation 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.

3.2 Tasks of the state final certification

The objectives of the state final certification are:

- establishing the degree of readiness of the graduate to solve professional problems;
- establishing the degree of formation of the graduate's competencies.

3.3 Forms of the state final certification

The state final attestation of students in the field of study 19.04.01 Biotechnology, the master's program "Agricultural Biotechnology" includes the defense of the final qualification work in the form of a master's thesis (hereinafter referred to as the master's thesis), as well as the final interdisciplinary exam in the following disciplines:

- B1.B.02.04 Modern trends in the development of biotechnology;
- B1.V.01.02 Bioproducts quality and safety management systems;
- B1.V.02.02 Agricultural biotechnology and biotechnology of raw materials of animal and plant origin.

The procedure for conducting the state final certification is determined by the Federal Law of the Russian Federation "On Education in the Russian Federation" dated December 29, 2012 No. 273-FZ, Order of the Ministry of Education and Science of the Russian Federation dated June 29, 2015 No. 636 "On Approval of the Procedure for Conducting State Final Attestation for Educational Programs higher education - bachelor's, specialist's and master's programs", the Charter of the Federal State Autonomous Educational Institution of Higher

Professional Education "Far Eastern Federal University" (new edition), the Regulations on the State Final Attestation of Graduates of the Federal State Autonomous Educational Institution of Higher Professional Education «Far Eastern Federal University».

4. The procedure for submission and consideration of appeals on the results of state certification tests

Based on the results of state certification tests, the student has the right to appeal.

The student has the right to submit to the appeal commission a written appeal about the violation, in his opinion, of the established procedure for conducting the state certification test and (or) his disagreement with the results of the state certification test.

The appeal is submitted to the student personally to the appeal commission no later than the next working day after the announcement of the results of the state certification test. Information about the place of work of the appeal commission is communicated to students on the day of the defense of the master's thesis.

To consider the appeal, the secretary of the state examination commission sends to the appeal commission the minutes of the meeting of the state examination commission, the conclusion of the chairman of the state examination commission on the observance of procedural issues during the state certification test, as well as written answers of the student (if any) (for consideration of the appeal on the state examination) or the final qualifying work, feedback and review (reviews) (for consideration of the appeal for the defense of the master's thesis).

The appeal is considered no later than 2 working days from the date of its submission at a meeting of the appeal commission, to which the chairman of the state examination commission and the student who submitted the appeal are invited.

The decision of the appeal commission is drawn up in a protocol and communicated to the student who filed the appeal within 3 working days from the date of the meeting of the appeal commission. The fact of familiarization of the

student who has filed the appeal with the decision of the appeal commission is certified by the student's signature.

When considering an appeal on a violation of the procedure for conducting a state attestation test, the appeal commission makes one of the following decisions:

- on the rejection of the appeal, if the information contained in it about violations of the procedure for conducting the state final certification of the student was not confirmed and (or) did not affect the result of the state certification test;
- on the satisfaction of the appeal, if the information contained in it about the violations of the procedure for conducting the state final certification of the student was confirmed and influenced the result of the state certification test.

If a decision is made to satisfy the appeal on a violation of the procedure for conducting the state certification test, the result of the state certification test is subject to cancellation, in connection with which the protocol on the consideration of the appeal is transferred to the state examination commission no later than the next working day to implement the decision of the appeal commission. The student is given the opportunity to pass the state certification test within the time frame set by the university.

When considering an appeal on disagreement with the results of the state attestation test, the appeal commission makes one of the following decisions:

- on the rejection of the appeal and preservation of the result of the state certification test;
- on satisfying the appeal and setting another result of the state certification test.

The decision of the appeal commission is submitted to the state examination commission no later than the next working day. The decision of the appeal commission is the basis for canceling the previously exposed result of the state attestation test and setting a new one.

The decision of the Appeals Commission is final and not subject to revision.

Re-conducting the state certification test is carried out in the presence of one of the members of the appeal commission no later than July 15.

An appeal for a repeated state certification test is not accepted.

5. Requirements for final qualifying works and the procedure for their implementation

Master's thesis is a mandatory type of final certification tests. The general requirements for a master's thesis are determined by educational standards, the Regulation on the state final certification for educational programs of higher education - bachelor's, specialist's, master's programs of the Federal State Autonomous Educational Institution of Higher Professional Education "Far Eastern Federal University" dated November 27, 2015 No. 12-13-2285, Order No. 12-13-275 of February 25, 2016 On Amendments to the Regulations on State Final Attestation for Educational Programs of Higher Education - Bachelor's, Specialist, Master's Degree Programs of the Federal State Autonomous Educational Institution of Higher Education "Far Eastern Federal University" dated November 27, 2015 No. 12-13-2285, Order No. 12-13-1040 of 06/01/2016 On Amending the Regulations on the State Final Attestation for Educational Programs of Higher Education - Bachelor's, Specialist's, Master's Degree Feder of the State Autonomous Educational Institution of Higher Education "Far Eastern Federal University" dated November 27, 2015 No. 12-13-2285, Order No. 12-13-2136 dated November 8, 2016 On Amending the Regulations on State Final Attestation for Educational Programs of Higher Education - Programs Bachelor's, Specialist, Master's program of the Federal State Autonomous Educational Institution of Higher Education "Far Eastern Federal University" dated November 27, 2015 No. 12-13-2285. The final qualifying work is carried out in the form of a master's thesis. The master's thesis is a completed independent research work related to the solution of an urgent research problem in accordance with the activities provided for by the direction 19.04.01 Biotechnology. The final qualification work is aimed at systematization, generalization and consolidation of theoretical knowledge, practical skills, assessment of the formation of the student's competencies in accordance with the requirements of the educational standard.

Preparation and defense of a master's thesis is aimed at solving problems that allow determining:

- the professional competence of the student in the process of solving research problems;
- the ability to apply theoretical knowledge to solve research problems in the field of biotechnology;
- the ability to formulate research work, conduct scientific discussions and defend their own scientific ideas and positions.

When preparing and defending a master's thesis, the student must show possession of the following skills and abilities:

- systematic consideration of the problem;
- the use of methods of scientific knowledge: the use of planning methods, research and statistical processing of its results;
- high level of logical thinking; substantiation of the relevance of the research topic;
- analysis of literature on the research topic;
- definition of the goals and objectives of the study;
- clear and consistent presentation of research results based on evidence-based reasoning.

The student must have a broad erudition and a rich outlook, master the methodology of scientific creativity, modern information technologies, methods of obtaining, processing, storing and using scientific information, be capable of fruitful research and scientific-pedagogical activities.

The volume of the master's thesis should be 80-100 pages of printed text.

The results of defending a master's thesis are determined by the grades “excellent”, “good”, “satisfactory”, “unsatisfactory”.

The mark "excellent" is given provided that the work:

- is of a research nature, is distinguished by novelty, originality and independence, shows the scientific and methodological maturity of the student;
- has positive feedback from the scientific advisor and reviewer;

- shows the ability to work with literary sources, high culture of speech and spelling literacy;

- has a concrete practical result, tested and positive external feedback.

The mark "good" is given if the work:

- is of a research nature, shows the scientific and methodological literacy of the student,

- differs in independence and contains elements of novelty;

- has positive reviews from the scientific advisor and reviewer with

- minor remarks and wishes;

- shows the ability of the student to work with literary sources, high culture of speech and spelling literacy;

- has a concrete practical result, tested and positive feedback from the outside.

The mark "satisfactory" is given on the condition that the work:

- is of a research nature with minor elements of novelty, shows the scientific and methodological literacy of the student;

- the reviews of the scientific advisor and the reviewer contain serious comments on the content of the work and the analysis method;

- shows insufficient ability to work with literary sources, low culture of speech, contains spelling errors, carelessly framed;

- practical results do not have positive feedback from the outside.

The mark "unsatisfactory" is given provided that the work:

- is not of a research nature, is not a complete independent work, does not contain novelty, shows a lack of scientific and methodological literacy;

- there are fundamental critical remarks in the reviews of the supervisor and reviewer;

- shows the lack of ability to work with literary sources, low culture of speech, contains spelling errors, carelessly framed;

- the research results have no practical application

When scoring a master's thesis, the opinion of the reviewer must be taken into account, and publications of students, copyright certificates (Technical conditions, Technological instructions, Organization standards, etc.), reviews of practitioners of the educational system and scientific institutions on the research topic can also be taken into account.

The final grade based on the results of the defense of the master's thesis is entered in the record book and the minutes of the meeting of the SEC for the defense of the master's thesis, in which the chairman and members of the examination committee sign.

Based on the results of the state final attestation, a decision is made to award students a master's qualification (degree) in the direction 19.04.01 "Biotechnology" and issue a diploma of higher education.

The most interesting in theoretical and practical terms graduation works can be recommended for publication, as well as presented for participation in the competition of scientific works.

In case of receiving an unsatisfactory mark during the defense of a master's thesis, a second defense is carried out in accordance with the Regulations on the state final certification for educational programs of higher education - bachelor's, specialist's, master's programs of the federal state autonomous educational institution of higher professional education "Far Eastern Federal University" dated November 27, 2015 No. 12-13-2285, Order No. 12-13-275 of February 25, 2016 On Amending the Regulations on State Final Attestation for Educational Programs of Higher Education - Bachelor's, Specialist's, Master's Programs of the Federal State Autonomous Educational Institution of Higher Education "Far Eastern Federal University" of November 27, 2015 No. 12-13-2285, Order No. 12-13-1040 of June 1, 2016 On Amending the Regulations on the State Final Attestation for Higher Education Educational Programs - BAK Programs alavriat, specialist, magistracy of the federal state autonomous educational institution of higher education "Far Eastern Federal University" dated November 27, 2015 No. 12-13-2285, Order No. 12-13-2136 dated November 8, 2016 On Amending the

Regulations on the State Final Attestation in Educational higher education programs - bachelor's, specialist's, master's programs of the Federal State Autonomous Educational Institution of Higher Education "Far Eastern Federal University" dated November 27, 2015 No. 12-13-2285.



MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education

Far Eastern Federal University
(FEFU)

**ADVANCED ENGINEERING SCHOOL «INSTITUTE OF BIOTECHNOLOGY, BIOENGINEERING
AND FOOD SYSTEMS**

Approved by decision

Academic Council of the Institute of of
biotechnology, bioengineering and food
systems

Protocol from _____ 20__ No. _

"APPROVE"

Director of the Institute of biotechnology,
bioengineering and food systems

L.A. Tekuteva

"__" _____ 20__

**PROGRAM
STATE EXAMINATION
(interdisciplinary)**

Direction of training

19.04.01 Biotechnology

Academic Master's Program

«Agri-Food Biotechnology»

Vladivostok

2021

I. Requirements for the procedure for conducting a state examination

The purpose of the state exam in the field of preparation 19.04.01 Biotechnology:

- to evaluate theoretical knowledge, practical skills and abilities;
- check the preparedness of the graduate for professional activity.

The form of the state interdisciplinary exam in the field of training 19.04.01 Biotechnology - oral. The questions of the state interdisciplinary exam cover the entire theoretical and practical course in the disciplines to be submitted for the exam.

Disciplines submitted for the state interdisciplinary exam:

B1.V.OD.1.1 Current trends in the development of biotechnology.

B1.C.OD.2.2 Bioproduct quality and safety management systems.

B1.C.OD.3.1 Agricultural biotechnology and biotechnology of raw materials of animal and vegetable origin.

Exam tickets must be issued in accordance with the requirements presented in the Regulations on the state final certification for educational programs of higher education - bachelor's, specialist's, master's programs of the Federal State Autonomous Educational Institution of Higher Professional Education "Far Eastern Federal University" dated November 27, 2015 No. 12-13 -2285.

Originals of tickets must have the appropriate signatures - the head of the EP, the deputy director of the school for EW.

Exam tickets must be reviewed and updated every 2 years, depending on the specifics of the disciplines.

Each exam ticket, as a rule, contains three questions to test the level of theoretical knowledge and to test the students' ability to apply theoretical knowledge in solving practical questions.

It is recommended that when designing ticket questions, one should proceed from the content of the disciplines, taking into account the required level of knowledge and skills.

The wording of the points of the examination card is carried out in a narrative form.

One of the main conditions for drawing up tickets is to establish approximately the same volume of examination material, the degree of complexity and complexity of the questions.

The number of tickets required for the exam depends on the size of the group passing the exam, but not less than 15. At the same time, ticket issues must cover the entire scope of academic disciplines provided for by the didactic units of the state educational standard of higher professional education.

The procedure for conducting the state exam is approved in the Regulations on the state final certification for educational programs of higher education - bachelor's, specialist's, master's programs of the federal state autonomous educational institution of higher professional education "Far Eastern Federal University" dated November 27, 2015 No. 12-13-2285.

A student who does not have academic debt and who has fully completed the curriculum or individual curriculum for the corresponding educational program of higher education is admitted to the state exam. The draft order of the rector on the admission of students to the state exam is prepared by the administrator of the educational program no later than two calendar days before the day of the state exam.

When conducting an oral state examination, the student is given time to prepare an answer of at least 45 minutes. For students from among the disabled, the state examination is carried out taking into account their individual characteristics. At the written request of a student with a disability, the duration of the student's passing of the state exam may be increased in relation to the established duration of its passing: the duration of preparing a student for the answer to the state exam held orally is no more than 20 minutes. When preparing

the answer for the state exam, the student is allowed to use visual aids, reference, educational literature.

On the day of the state examination, before the start of the SEC meeting, the chairman of the SEC is presented with a copy of the rector's order on admitting students to the state exam. A meeting of the SEC is competent if it is attended by at least two thirds of the number of persons making up the SEC. The decision of the SEC is taken by a simple majority of votes from the number of persons who are part of the SEC participating in the meeting, and is drawn up by the minutes of the SEC meeting. With an equal number of votes, the chairman has a casting vote.

Regulations for the oral state examination: presentation of the student by the head of the graduating department or a member of the SEC; preparation of an oral answer to students on the examination card; the student's oral answer on the examination card (usually no more than 10 minutes); questions from the chairman and members of the SEC in written and (or) oral form after the student's answer; the student's answers to the questions asked.

The duration of the oral state examination should not exceed, as a rule, 20 minutes (excluding the time for preparing the answer).

After the attestation of the last student who appeared, a closed meeting of the SEC is held, at which, taking into account the opinion of the chairman and members of the SEC who were present at the meeting, each student is given one of the marks: «excellent», «good», «satisfactory», in the minutes of the SEC meeting and the examination sheet. "Unsatisfactory". In the student's record book, the mark obtained on the state exam is also put forward, in addition to the mark «unsatisfactory».

When assessing the results of passing the state exam, the following aspects of preparation are taken into account:

- understanding and degree of assimilation of the theory;
- methodical training;
- knowledge of factual material;

- acquaintance with the compulsory literature, with modern publications for this course in domestic and foreign literature;

- the ability to apply theory to practice, solve problems, etc.

- acquaintance with the history of science;

the logic, structure and style of the response, the ability to defend the proposed (hypothetical) assumptions.

Criteria for assessing the results of passing the state exam:

1. The mark «excellent» is given to a student who has deeply and firmly mastered the program material, who is able to independently critically evaluate the basic concepts of the disciplines, in whose answer theory is linked with practice; the student shows familiarity with the current literature, correctly defines all the basic concepts of disciplines, correctly applies theoretical principles in solving practical issues, and fully answers additional questions.

2. The mark «good» is given to a student who is firmly aware of the program material, competently and to the point, expounding it, but admitting minor inaccuracies in answering the question; the student correctly applies theoretical principles in solving practical questions and problems and answers most of the additional questions.

3. The mark «satisfactory» is given to a student who owns the basic material, but experiences some difficulties and admits inaccuracies in its presentation, does not correctly formulate the basic concepts of disciplines, and makes significant mistakes when performing practical tasks and answering additional questions.

4. The mark «unsatisfactory» is given to a student who does not know the basic material, makes significant mistakes, incorrectly answers most of the additional questions, and performs practical tasks with great difficulty.

The results of the state exam are announced on the day of its holding, after the minutes of the meetings of the examination commissions are drawn up in the prescribed manner.

Undergraduates who have received an unsatisfactory mark on the interdisciplinary exam are not allowed to further pass the final attestation tests, on

the basis of the protocol of the examination committee and the explanatory note of such a student, they are subject to expulsion from the FEFU, as they did not pass the state interdisciplinary exam.

II. Content of the state examination program

Disciplines submitted for the state interdisciplinary exam:

B1.V.OD.1.1 Current trends in the development of biotechnology.

B1.C.OD.2.2 Bioproduct quality and safety management systems.

B1.C.OD.3.1 Agricultural biotechnology and biotechnology of raw materials of animal and vegetable origin.

1. Discipline "Modern trends in the development of biotechnology"

The discipline is one of the integral ones in the fundamental training of undergraduates of this profile and is closely related to such disciplines as «Agricultural biotechnology and biotechnology of raw materials of animal and plant origin», «Biotechnological features of the production of products of plant origin».

The program of the discipline includes the study of the application of modern and promising biotechnological methods, including agriculture; study of biotechnology as a significant factor in the development of the agro-industrial complex.

Questions on the discipline «Modern trends in the development of biotechnology»

1. Main trends in the meat, dairy, fish processing industries; production of plant agricultural products, their storage and processing, modern biotechnology; world and Russian centers of agricultural biotechnology.

2. Goals and objectives of agro-food biotechnology. Stages of formation of agro-food biotechnology. The concept of a bioobject and a biotechnological process.

3. Food safety. Regulatory and legal support of food safety (TR TS, GOSTs, MUK, etc.).

4. Agro-food biotechnology. Use for food purposes of products of microbial synthesis and genetically modified raw materials.

5. Tasks and role of industrial biotechnology. Industrial use of microorganisms and products of microbial synthesis.

6. Zoobiotechnology. Its goals and objectives. Biotechnological methods in animal husbandry.

7. Phyto-biotechnology. The main directions of genetic modification of plants.

8. Features and stages of agrobacterial transformation of plants.

9. Methods and essence of direct transformation of plants.

10. Methods for obtaining transgenic animals. The main directions of their use.

11. Biotechnology of fertilizers. Obtaining organic fertilizers in the processing of agricultural products.

12. Microbiological technologies for obtaining feed during the processing of agricultural products.

13. Technologies for storage and processing of crop products, fruits and vegetables.

14. Agro-food biotechnology of products from raw materials of animal origin.

15. Biotechnological processes in the production of meat and fish products.

16. Biotechnological processes in the production of milk and dairy products.

17. Agro-food biotechnology of products from raw materials of plant origin.

18. Basic technologies of food additives and biotechnologically obtained ingredients.

19. Classification of fruit and berry raw materials of the Far East. Basic information about dietary supplements produced from fruit and berry raw materials of the Far East.

20. Food products of a new generation (based on raw milk).

21. New generation food products (based on meat raw materials).

22. New generation food products (based on raw fish and seafood).
23. New generation food products (based on vegetable raw materials).
24. Use of waste processing of the main raw materials in the creation of new food products (dairy raw materials).
25. Use of waste processing of the main raw materials in the creation of new food products (raw meat).

2. Discipline «Quality and safety management systems for bioproducts»

The discipline is one of the integral ones in the fundamental training of masters of this profile and is closely related to such disciplines as "Administration and management of agriculture and agro-industrial complex", "Safety and biosafety of agro-food raw materials and food products", "Technical regulation and regulatory support of agro-food production".

The discipline is aimed at the formation of knowledge about the systemic representation of product quality, methods of its formation, evaluation and provision, the ability to solve the main tasks of optimizing technological processes.

Questions on the discipline «Quality and safety management systems for bioproducts»

1. Normative documents regulating the quality of food products. The main groups of quality indicators. Quality indicators applied to the products of food enterprises.
2. Name and describe the main methods for assessing the level of food quality.
3. Qualimetry and its role in quality assessment. Give the sequence of qualimetric quality assessment using a specific product as an example.
4. The role of control in the quality management system, its essence.
5. Fundamental differences between continuous and selective quality control. The advantages and disadvantages inherent in these types of controls.
6. Formulate the concept of a control plan. Types of control plans and their implementation.

7. List seven basic tools and methods for quality control, analysis and management. Give a brief description of each of them, reveal their content and indicate the purpose.
8. System of international standards ISO 9000 family.
9. The concept of a quality management system. Objectives and benefits of a quality management system.
10. Principles of building a quality management system in accordance with international standards ISO 9000.
11. Quality policy in the food company. Principles for the formation of quality policy at a food company.
12. Mandatory documented procedures for quality management systems. The principle of operation of quality management systems.
13. Actions to manage nonconforming products in food establishments.
14. Normative documents on the basis of which certification of quality management systems is carried out. Expand the content of its stages.
15. Regulatory documents that establish mandatory and voluntary requirements for food products.
16. Normative documents regulating the conformity of the quality management system at the food enterprise.
17. Groups of costs that are included in the total cost of implementing the quality management system at the enterprise.
18. The relationship between the costs of a food company on the quality of products and the level of its provision.
19. The content of the stages of preparation and implementation of the quality management system at the enterprise.
20. The main methods of comparative assessment of the level of food quality.
21. Types of food defects. The main ways to prevent defective food products.

22. The essence of control methods for the physical and chemical assessment of meat freshness.

23. Frequency of control of organoleptic and physicochemical indicators of meat freshness.

24. The reasons causing the discrepancy between the physical and chemical parameters. Ways to prevent or eliminate defects.

25. The need for standardization of sanitary and hygienic indicators and their list.

3. Discipline «Agricultural biotechnology and biotechnology of raw materials of animal and plant origin»

The discipline "Agricultural biotechnology and biotechnology of raw materials of animal and plant origin" is logically and closely related to the study of disciplines: «Research methods in biotechnology», «Modern trends in the development of biotechnology», «Enzymatic and microbial conversion».

The content of the discipline covers a range of issues related to the study of chemical, biotechnological and biological processes, biotechnological equipment, problems of saving and rational use of resources, modern achievements in the field of biological technology of food products, familiarization with the basics of biological engineering, directions for improving the design, operation and operation of biotechnological equipment.

Questions on the discipline «Agricultural biotechnology and biotechnology of raw materials of animal and plant origin»

1. Directions of using the culture of isolated cells and plant tissues in biotechnology. The main stages in the history of the development of the method of culture of isolated cells and plant tissues.

2. Characteristics of the main stages of clonal micropropagation of plants. Methods for interspecific hybridization of plants.

3. Agrobiotechnology of plant transformation. Stages of obtaining plants with stable signs of survival and development.

4. Transgenesis, its main stages and features in obtaining various types of transgenic animals. Methods for detecting the integration of a foreign gene into a DNA molecule. Features of its inheritance in transgenic animals.

5. Restrictions on the use of recombinant microorganisms and lines of genetically engineered animal cells when obtaining valuable biologically active substances for medical and technological purposes.

6. Advantages of transgenic animals in comparison with recombinant microorganisms and mammalian cell lines in obtaining pharmacologically valuable substances.

7. Genetically modified raw materials of plant origin. Advantages and disadvantages of modified crops. The main types of genetically modified plants in agricultural production.

8. The essence of the concept of gene regulation of biochemical reactions. Biochemical regulation of the formation of the quality of crop production.

9. Classification of enzymes by the type of catalyzed reaction. Enzyme producers. Purpose, directions of use, examples. Enzyme immobilization methods. Why is enzyme immobilization carried out?

10. Enzyme systems of cultural strains of microorganisms-fermentation pathogens, producers of organic acids, amino acids, vitamins, enzymes, food protein.

11. The main types of vegetable raw materials, its classification. Biochemical processes that occur in plant raw materials during storage.

12. Modern trends in storage and processing of grain, fruit and vegetable crops and viticulture products.

13. Characteristics of the mineral composition of milk. The role of milk minerals in the stability of the colloidal system of milk.

14. Milk production, modern technologies for its production. Ensuring the biological safety of milk.

15. Modes of intermediate storage of milk. Methods for cleaning milk from mechanical and microbiological impurities. Bactofugation as a way of cleaning milk from microbiological contaminants. Description of the process.

16. Modes of pasteurization of raw milk in the production of various dairy products. Their rationale. Changes in milk constituents during heat treatment.

17. Characterization of various meat tissues. Distinctive features of their structure, composition, properties. The ripening process of meat.

18. Biotechnology for obtaining fermented milk products. Product quality management at all stages of production.

19. Modern methods of obtaining and storing raw meat. Classification of meat according to the methods of its heat treatment.

20. Meat and meat products as the main component of preventive and therapeutic nutrition. Changes in some natural properties of meat by modern biotechnological methods.

21. Obtaining chilled meat. Establishing shelf life and commodity examination of meat.

22. Technologies for processing raw meat. Products of mass, specialized, functional purposes based on meat.

23. Fundamental and applied scientific problems of raw meat processing. The latest biotechnology for the production of functional meat-based foods.

24. Designing products with specified properties and composition. Ways to improve the efficiency of using meat, fish, dairy and vegetable raw materials.

25. Biochemical processes in food technology. The principles of optimization and targeted regulation of the rate of technological processes.

III. List of questions of the state exam in the direction 19.04.01 Biotechnology Master's Program «Agri-Food Biotechnology»

1. Major trends in the meat, dairy, fish processing industries; production of vegetable agricultural products, their storage and processing, modern biotechnology; world and Russian centers of agricultural biotechnology.

2. Goals and objectives of agri-food biotechnology. Formation stages of agri-food biotechnology. The concept of a bio-object and biotechnological process.
3. Food safety. Regulatory and legal support for food safety (TR CU, GOST, MUK, etc.).
4. Agro-food biotechnology. Use for food purposes of products of microbial synthesis and genetically modified raw materials.
5. Objectives and role of industrial biotechnology. Industrial use of microorganisms and products of microbial synthesis.
6. Zoobiotechnology. Its goals and objectives. Biotechnological techniques in animal husbandry.
7. Phyto-biotechnology. The main directions of genetic modification of plants.
8. Features and stages of agrobacterial transformation of plants.
9. Methods and essence of direct plant transformation.
Methods for obtaining transgenic animals. The main directions of their use.
10. Methods for obtaining transgenic animals. The main directions of their use.
11. Biotechnology of fertilizers. Obtaining organic fertilizers in the processing of agricultural products.
12. Microbiological technologies for obtaining feed in the processing of agricultural products.
13. Technologies for storage and processing of crop products, fruits and vegetables.
14. Agro-food biotechnology of products from raw materials of animal origin.
15. Biotechnological processes in the production of meat and fish products.
16. Biotechnological processes in the production of milk and dairy products.
17. Agro-food biotechnology of products from raw materials of plant origin.
18. Basic technologies of food additives and ingredients obtained by biotechnology.

19. Classification of fruit and berry raw materials of the Far East. Basic information about dietary supplements produced from the fruit and berry raw materials of the Far East.

20. New generation food products (based on raw milk).

21. New generation food products (based on raw meat).

22. New generation food products (based on fish raw materials and seafood).

23. New generation food products (based on vegetable raw materials).

24. The use of waste products from the processing of basic raw materials in the creation of new food products (raw milk).

25. Use of waste products from the processing of basic raw materials when creating new food products (raw meat).

26. Normative documents regulating the quality of food products. The main groups of quality indicators. Quality indicators applied to the products of food enterprises.

27. Name and describe the main methods for assessing the level of food quality.

28. Qualimetry and its role in quality assessment. Give the sequence of qualimetric quality assessment using a specific product as an example.

29. The role of control in the quality management system, its essence.

30. Fundamental differences between continuous and selective quality control. The advantages and disadvantages inherent in these types of controls.

31. Formulate the concept of a control plan. Types of control plans and their implementation.

32. List seven basic tools and methods for quality control, analysis and management. Give a brief description of each of them, reveal their content and indicate the purpose.

33. System of international standards ISO 9000 family.

34. The concept of a quality management system. Objectives and benefits of a quality management system.

35. Principles of building a quality management system in accordance with international standards ISO 9000.

36. Policy in the field of quality in a food company. Principles for the formation of quality policy at a food company.

37. Mandatory documented procedures for quality management systems. The principle of operation of quality management systems.

38. Actions to manage non-conforming products in food establishments.

39. Normative documents on the basis of which the certification of quality management systems is carried out. Expand the content of its stages.

40. Regulatory documents that establish mandatory and voluntary requirements for food products.

41. Normative documents regulating the conformity of the quality management system at the food enterprise.

42. Groups of costs that are included in the total cost of the implementation of the quality management system at the enterprise.

43. The relationship between the costs of a food company on the quality of products and the level of its provision.

44. The content of the stages of preparation and implementation of the quality management system at the enterprise.

45. The main methods of comparative assessment of the level of food quality.

46. Types of food defects. The main ways to prevent defective food products.

47. The essence of control methods for physical and chemical assessment of meat freshness.

48. Frequency of control of organoleptic and physicochemical indicators of meat freshness.

49. The reasons causing the inconsistency of physical and chemical indicators. Ways to prevent or eliminate defects.

50. The need for standardization of sanitary and hygienic indicators and their list.

51. Directions of using the culture of isolated cells and plant tissues in biotechnology. The main stages in the history of the development of the method of culture of isolated cells and plant tissues.

52. Characteristics of the main stages of clonal micropropagation of plants. Methods for interspecific hybridization of plants.

53. Agrobiotechnology of plant transformation. Stages of obtaining plants with stable signs of survival and development.

54. Transgenesis, its main stages and features in obtaining various types of transgenic animals. Methods for detecting the integration of a foreign gene into a DNA molecule. Features of its inheritance in transgenic animals.

55. Restrictions on the use of recombinant microorganisms and lines of genetically engineered animal cells in obtaining valuable biologically active substances for medical and technological purposes.

56. Advantages of transgenic animals in comparison with recombinant microorganisms and mammalian cell lines in obtaining pharmacologically valuable substances.

57. Genetically modified raw materials of plant origin. Advantages and disadvantages of modified crops. The main types of genetically modified plants in agricultural production.

58. The essence of the concept of gene regulation of biochemical reactions. Biochemical regulation of the formation of the quality of crop production.

59. Classification of enzymes by the type of catalyzed reaction. Enzyme producers. Purpose, directions of use, examples. Enzyme immobilization methods.

60. Enzyme systems of cultured strains of microorganisms-fermentation pathogens, producers of organic acids, amino acids, vitamins, enzymes, food protein.

61. The main types of vegetable raw materials, its classification. Biochemical processes that occur in plant raw materials during storage.

62. Modern trends in storage and processing of grain, fruit and vegetable crops and viticulture products.

63. Characteristics of the mineral composition of milk. The role of milk minerals in the stability of the colloidal system of milk.

64. Milk production, modern technologies for its production. Ensuring the biological safety of milk.

65. Modes of intermediate storage of milk. Methods for cleaning milk from mechanical and microbiological impurities. Bactofugation as a way of cleaning milk from microbiological contaminants. Description of the process.

66. Modes of pasteurization of raw milk in the production of various dairy products. Their rationale. Changes in milk constituents during heat treatment.

67. Characteristics of various meat tissues. Distinctive features of their structure, composition, properties. The ripening process of meat.

68. Biotechnology for obtaining fermented milk products. Product quality management at all stages of production.

69. Modern methods of obtaining and storing raw meat. Classification of meat according to the methods of its heat treatment.

70. Meat and meat products as the main component of preventive and therapeutic nutrition. Changes in some natural properties of meat by modern biotechnological methods.

71. Obtaining chilled meat. Establishing shelf life and commodity examination of meat.

72. Technologies for processing raw meat. Products of mass, specialized, functional purposes based on meat.

73. Fundamental and applied scientific problems of raw meat processing. The latest biotechnology for the production of functional meat-based foods.

74. Designing products with specified properties and composition. Ways to improve the efficiency of using meat, fish, dairy and vegetable raw materials.

75. Biochemical processes in food technology. The principles of optimization and targeted regulation of the rate of technological processes.

IV. Recommendations for students on preparation for the state exam

In preparation for the state exam graduates must:

- have a sufficient amount of theoretical knowledge obtained in the course of training in compulsory disciplines of general scientific and professional cycles, as well as in the study of optional disciplines within the limits provided for by the curriculum;
- be able to solve practical problems.

The preparation process for the state exam must begin in the autumn-winter of the last course of study. At the same time, students are encouraged to read the recommended educational, methodological and scientific literature on the studied and previously studied disciplines, filling possible gaps in knowledge, as well as remembering the studied educational material. When preparing for the state exam, special attention should be paid to the counseling provided by teachers during the hours established by the curriculum.

Recommended literature and information and methodological support

Main literature

(printed and electronic editions)

1. Food biotechnology of products from raw materials of plant origin: Proc. / O. A. Neverova, G. A. Gorelikova, A. Yu. Prosekov, V. M. Poznyakovsky - M.: SIC INFRA-M, 2014. - 318 p

<http://lib.dvfu.ru:8080/lib/item?id=IPRbooks:IPRbooks-4160&theme=FEFU>

2. Modeling food recipes and technologies for their production. Theory and practice: textbook for universities / O. N. Krasulya, S. V. Nikolaeva, A. V. Tokarev et al. - St. Petersburg: GIOR, 2015. Access mode:

<http://lib.dvfu.ru:8080/lib/item?id=chamo:783701&theme=FEFU>

3. Methods of quality management. Process approach / P.S. Serenkov, A.G. Kuryan, V.P. Volontey. – M.: NITs INFRA-M; Mn.: Nov. knowledge, 2014. - 441 p.: ill.; 60x90 1/16. – (Higher education: Master). Access mode:

<http://lib.dvfu.ru:8080/lib/item?id=Znanium:Znanium-891167&theme=FEFU>

4. Standards and product quality: Educational and practical guide / Yu.N. Bernovsky. - M.: Forum: NIC INFRA-M, 2014. - 256 p. Access mode:

<http://lib.dvfu.ru:8080/lib/item?id=Znanium:Znanium-527632&theme=FEFU>

5. Biological safety of biotechnological productions: [Electronic resource] / N. B. Gradova, E. S. Babusenko, V. I. Panfilov. - M.: DeLi plus, 2013. - (CD-ROM). <http://lib.dvfu.ru:8080/lib/item?id=chamo:732079&theme=FEFU>

6. Visual biotechnology and genetic engineering / R. Schmid; per. with him. A. A. Vinogradova, A. A. Sinyushina. Moscow: BINOM. Knowledge Laboratory, 2014. - 324 p., (10 copies) Access mode:

<http://lib.dvfu.ru:8080/lib/item?id=chamo:797469&theme=FEFU>

7. Biotechnology: a textbook for universities / S. N. Orekhov, I. I. Chakaleva; ed. A. V. Katlinsky. Moscow: Academy, 2014. - 282 p. Access mode:

<http://lib.dvfu.ru:8080/lib/item?id=chamo:785446&theme=FEFU>

8. Koryachkina, S.Ya. Functional food ingredients and additives for bakery and confectionery products / S.Ya. Koryachkina, T.V. Matveev. - St. Petersburg: Giord, 2013. - 528 p. Access mode: <http://lib.dvfu.ru:8080/lib/item?id=Lan:Lan-58738&theme=FEFU>

9. Scientific basis for the formation of an assortment of food products with desired properties. Technologies for obtaining and processing plant raw materials / Menyailo L.N., Baturina I.A., Veretnova O.Yu. etc. – Krasnoyarsk: SFU, 2015. – 212 p. Access mode: <http://lib.dvfu.ru:8080/lib/item?id=Znanium:Znanium-550153&theme=FEFU>

Additional literature

(printed and electronic editions)

1. Management in the food industry: a textbook for universities / E. B. Gafforova, T. E. Shusharina, M. V. Tsyplenkova [and others]; Moscow: Academy of Natural Sciences, 2011. - 195 p. <http://lib.dvfu.ru:8080/lib/item?id=chamo:662163&theme=FEFU>

2. Biotechnology: a textbook for universities / S. M. Klunova, T. A. Egorova, E. A. Zhivukhina. Moscow: Academy, 2010. - 256 p. <http://lib.dvfu.ru:8080/lib/item?id=chamo:416005&theme=FEFU>

3. Fundamentals of biotechnology: textbook for universities / T. A. Egorova, S. M. Klyunova, E. A. Zhivukhina. Moscow: Academy, 2006. - 208 p. 3rd ed., ster. <http://lib.dvfu.ru:8080/lib/item?id=chamo:255141&theme=FEFU>

4. Biotechnology: textbook / Yu. O. Sazykin, S. N. Orekhov, I. I. Chakaleva; ed. A. V. Katlinsky. Moscow: Academy, 2006. - 255 p. <http://lib.dvfu.ru:8080/lib/item?id=chamo:257572&theme=FEFU>

5. Biotechnology of combined food products and their analogues based on raw materials of animal origin: method. instructions for performing laboratory work for students special. 240902 "Food biotechnology" / comp. L.M. Povoyko, L.A. Tekutyeva, T.A. Shepel, Vladivostok: Publishing House of the Pacific

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