



MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
"Far Eastern Federal University"
(FEFU)

School of biomedicine

Department of Medical Biology and Biotechnology



PROGRAM
State final examination

Direction of tuition
06/04/01 Biology
Academic Master's Program
Molecular and Cellular Biology

Qualification of the graduate - Academic Master

Full-time form of education
Standard term of development programs
(Full-time) 2 years

Vladivostok
2019

SHEET RECONCILIATION
Program of the state final examination

In the direction of tuition 06.04.01 Biology

The educational program "Molecular and Cell Biology"

Program state final examination for the academic graduate "Molecular and Cell Biology" prepared in accordance with the requirements of the educational standard, independently established by the Federal State Autonomous Educational Institution of Higher Education "Far Eastern Federal University," for the direction of implemented training 04/06/01 Biology major professional educational programs, the level of higher education Master approved by order of the rector of 04.04.2016 № 12-13-592.

Reviewed and approved at a meeting of the Academic Council of the School of Biomedicine "10" July 2019 (Minutes № 7)

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explanatory note

The program is designed to meet the educational standards independently established by the Federal State Autonomous Educational Institution of Higher Professional Education "Far Eastern Federal University," for ongoing basic professional educational programs of higher education - undergraduate programs (hereinafter - educational standard FEFU) towards the preparation 06/04/01 Biology (adopted decision FEFU Academic Council, protocol № 28.01.2016 № 01-16 ,, enacted by Order recto pa FEFU from 04.04.2016 number 12-13-592.

For students with disabilities the state final examination is conducted by taking into account the characteristics of their mental and physical development of their individual capabilities and health. Features of the state certification tests for persons with disabilities enshrined in the Statute of the state final certification of graduates of the Federal State Autonomous Educational Institution of Higher Professional Education "Far Eastern Federal University" (approved by the. Order of 11.27.2015 № 12-13-2285 from the city (with seq. rev.).

When conducting state attestation provided the following general requirements:

- carrying out state final examination for persons with disabilities in the same classroom together with the students who do not have limited possibilities of health, if it does not create difficulties for students in passing the state final examination;

- presence in the audience of the assistant (assistants), providing students with disabilities the necessary technical assistance, taking into account their specific features (take a job, move, read and execute the task to communicate with members of the State Examination Commission);

- the use of the necessary technical means tutoring disabled state during the passage of the final certification in accordance with their individual characteristics;

- ensure unimpeded access of students invalids in the classroom, toilet and other facilities, as well as their stay in these areas (presence of ramps, handrails, expanded doorways, elevators, in the absence of lifts the audience must be located on the first floor, the presence of special seats and other accessories) .

1. Characteristics of professional activity of graduates - qualifying characteristic of the graduate

1.1 Scope and objects of professional activity:

The area of professional activity of graduates who have finished the graduate program "Molecular and Cell Biology" includes:

study wildlife and its laws; the use of biological systems in commercial and medical applications; Protection of Nature;

The objects of professional activity of graduates who have mastered the master's program are:

biological systems of various organization levels; processes of their life and evolution; biological, bioengineering, biomedical, nature protection technology, the biological examination and monitoring, assessment and territorial recovery of bio.

1.2 Types of professional activity, which prepare graduates who have completed the Master's "Molecular and Cell Biology":

Main professional activities:

– research and development;

Additional professional activities:

– teaching.

A graduate who has mastered graduate program "Molecular and Cellular Biology" in the direction of tuition 06.04.01 biology should be prepared to address the following professional tasks in research activities:

– independent choice and justification of the purpose, organization and conduct of scientific research on a topical issue in accordance with the orientation (profile) master's program;

– formulation of new problems arising in the course of the study;

– selection, study and development of techniques adequate to the purpose;

– development of new theories, models, methods of research and development of new methodological approaches;

– work with scientific information using new technologies;

– processing and critical evaluation of research results;

– preparation and execution of scientific publications, reports, patents and reports, seminars and conferences.

A graduate who has mastered the direction of tuition 06.04.01 Biology "Molecular and Cellular Biology» Master's program must be ready to perform the following tasks in a professional educational activity:

– implementation of educational activities for the design and implementation of the educational process in educational institutions and educational institutions of higher education in accordance with the direction of the preparation;

– implementation of educational activities in vocational educational institutions in accordance with the direction of training.

2. Requirements for the results of development of the basic professional educational program of academic graduate "Molecular and Cell Biology" in the direction of tuition 06.04.01 Biology

A graduate who has mastered the graduate program "Molecular and Cell Biology", must have the following general cultural competence:

– the ability to adapt creatively achieve foreign science, technology and education to national practice, a high degree of professional mobility (GC-1);

– willingness to show leadership qualities and organize the work of the team, possess effective technology solutions professional problems (GC-2);

– ability to work in interdisciplinary project teams, including as head of (GC- 3);

– the ability to quickly learn new subject areas, identify contradictions, problems and develop alternatives to solve them (GC-4);

– the ability to generate ideas in the scientific and professional activities (GC-5);

– the ability to conduct scientific debate, ownership norms of scientific style of modern Russian language (GC-6);

– the ability to free scientific and professional communication in a foreign language environment (GC-7);

– the ability to think abstractly, analysis, synthesis of (GC-8);

– willingness to act in unusual situations, bear the social and ethical responsibility for decisions made (GC-9);

– willingness to self-development, self-realization, the use of creativity (GC-10).

A graduate who has mastered the graduate program "Molecular and Cell Biology", must have the following general **professional competence**:

– willingness to communicate in oral and written form in the official language of the Russian Federation and foreign language to meet the challenges of professional activity (GPC-1);

- willingness to manage a team in their professional activities, tolerant perceiving social, ethnic, religious and cultural differences (GPC-2);
- willingness to use fundamental biological representation in the professional field for formulating and solving new problems (GPC-3);
- the ability to independently analyze the available information to identify the fundamental problems, and set the task to carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, responsible for the quality of work and the scientific validity of the results (GPC-4);
- the ability to apply knowledge of the history and methodology of biological sciences to address the fundamental professional tasks (GPC-5);
- the ability to use the basic knowledge of theory of the biosphere, the understanding of modern biospheric processes for the systematic assessment of geopolitical events and the forecast impacts of social projects (GPC-6);
- willingness to creatively use modern computer technology in the collection, storage, processing, analysis and transmission of biological information for professional applications (GPC-7);
- the ability to use philosophical concepts of science for the formation of a scientific outlook (GPC-8);
- the ability to draw professionally, present and report the results of scientific research and production and engineering works on the approved forms (GPC-9).

A graduate who has mastered graduate program "Molecular and Cell Biology", must have the following professional competences in accordance with the type of activity:

Research activities:

- the ability to creatively use in scientific and technological activities of production and knowledge of basic and applied sciences sections (modules), determines the direction of (the program) Master's program (PC-1);
- the ability to plan and implement professional activities (in accordance with the orientation (profile) master's program) (PC-2);
- the ability to apply the methodological principles of designing, performing field and laboratory biological, environmental studies, use modern equipment and computer systems (in accordance with the orientation (profile) master's program) (PC-3);
- the ability to generate new ideas and methodological solutions (PC-4);
- the ability to conduct scientific research (according to the direction (profile) master's program) in the field of biology for the development of the

scientific potential of the Russian Far East and the development of ocean resources (according to the program development and competitiveness FEFU) (PC-5);

teaching activities:

– possession of skills formation of teaching material, lectures, willingness to teach in educational institutions, as well as in educational institutions of higher education and the management of research work of students, the ability to present course material in oral, written and graphic forms for various contingents of students (PC-12);

– ready to use in teaching activities of knowledge about the history of marine biology in the Far East, Far Eastern scientists contribution to research and scientific and industrial potential of the country (PC-13).

4. Structure state attestation

4.1 The purpose of the state final examination.The purpose of the state final examination is to establish appropriate training standards and quality of graduate training in the direction of Biology 04/06/01 requirements of the educational standard, independently established by the Federal State Autonomous Educational Institution of Higher Professional Education "Far Eastern Federal University" and employers.

State final examination aims to help systematize and consolidate the knowledge and skills of students in the direction of tuition for solving specific professional problems, to determine the level of preparation of graduates to work independently.

4.2 Tasks of the state final examination.The objectives of the final state certification in the direction of tuition 06.04.01 Biology (program Molecular and Cellular Biology) are:

– assessment of the theoretical training of the graduate program "Molecular and Cell Biology";

– assessment of the practical training of the graduate program "Molecular and Cell Biology";

– assessment of skills of independent work;

– the decision on awarding the qualification as a result of the state final examination and the issuance of the graduate diploma of higher education.

In this case, the aim of the state exam Program "Molecular and Cell Biology" training is:

– assessment of knowledge, skills and competencies acquired in the study of graduate training cycles OP, in accordance with the requirements of the OS IN FEFU.

To prepare and protect the final qualifying work is:

– establishing the level of training graduates to perform professional tasks in accordance with the requirements of the FEFU to the qualifying characteristics and level of training of the graduate program "Molecular and cellular biology."

4.3 Forms of the state final examination

The structure of the state final examination is to protect the graduate qualification work (GQW), including preparations for the protection and defense of procedure, as well as preparation for the delivery and commissioning of the state exam.

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

5.1. According to 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 of the violation, in his opinion, the established procedures of the state certification test and (or) their disagreement with the results of the state certification test (Form Appeal statement is given in Appendix 1).

5.2. The appeal is in studying personally appeal to the Commission not later than the next working day after the announcement of the results of the state certification test. Information about the place of the appeal commission work is brought to graduation qualification defence day.

5.3. To appeal the Secretary of the State Examination Commission shall send to the appeal commission minutes of the meeting of the State Examination Commission, concluded the Chairman of the State Examination Commission on compliance with procedural issues during the state certification test (see Appendix 2), as well as written responses to the student (if any) (for appeal for the state exam) or the final qualifying work, review and review (p Census) (for consideration of the appeal for the protection of final qualifying work).

5.4. The appeal is considered within 2 working days from the date the appeal at a meeting of the Appeal Commission, to which are invited the chairman of the State Examination Commission and the student who has filed an appeal.

5.5. The decision of the appeal commission issued protocol (Annex 3) and communicated to the student who filed the appeal, within 3 working days from the date of the meeting of the Appeal Commission. Fact familiarize the student who

filed the appeal, the decision of the appeal commission to certify the signature of the student.

5.6. On appeal of the violation of the order of the state certification test Appeals Commission shall take one of the following decisions:

- rejecting the appeal, if the information contained in it of violations of procedure of the state final examination the student has not been confirmed and (or) did not affect the result of the state certification test;

- to satisfy the appeal, if contained in it information about violations of procedure of the state final examination the student confirmed and influenced the result of the state certification test.

5.7. In the event of a decision to satisfy the appeal of the violation of the order of the state certification test results of the state certification test to be void, in connection with which a protocol on the appeal no later than the next working day is sent to the state examination board for the implementation of the decision of the appeal commission. Educational opportunity to pass the state certification test in the terms established by the university.

5.8. On appeal of disagreement with the results of the state certification test Appeals Commission shall take one of the following decisions:

- rejecting the appeal and maintaining the results of the state certification tests;

- to satisfy the appeal and exhibiting a different result the state certification test.

5.9. The decision of the appeal commission no later than the next working day is sent to the state examination board. The decision of the appeal commission is grounds for revocation of the previously exposed results of state conformance testing and issuing a new one.

5.10. The decision of the appeal committee is final and not subject to revision.

5.11. Repetition of the state certification tests carried out in the presence of one of the members of the appeal committee no later than 15 July.

5.12. Appeal for re-conducting state qualification test is not accepted.

6. Requirements for the final qualifying work and the procedure for their implementation

Final qualifying work (hereinafter - FQW) is a must view the final certification tests. General requirements for the GQW defined educational standards, the Regulation on the state final examination for educational programs of higher education - undergraduate specialties, graduate of the Federal State Autonomous Educational Institution of Higher Education "Far Eastern Federal

University" from 27.11.2015 №12-13-2285. Final qualifying work is done in the form of a thesis. Master's thesis is an independent analytical research work, policy-relevant research tasks in accordance with the activities envisaged direction06/04/01 Biology (program "Molecular and Cell Biology"). Final qualifying work aims to organize, summarize and consolidate the theoretical knowledge, practical skills, assessment of student competencies formation in accordance with the requirements of the educational standard.

Preparation and defense of the GQW is aimed at solving problems, to determine:

- 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 molecular and cellular biology;
- the ability to design research, conducting scientific debate and defend their scientific ideas and positions.

In the preparation and protection of FQW student must show ownership of the following capabilities:

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

The student must have a broad erudition and rich outlook, own methodology of scientific creativity, modern information technologies, methods of obtaining, processing, storage and use of scientific information to be able to research and teaching activities.

7. Requirements for the final qualifying.

Criteria for evaluation

Master's thesis is performed under the supervision of the supervisor of a complete educational and scientific research relevant for modern biological and medical information systems. The work should include the following sections: rationale for choice of the theme and its relevance, formulation of the problem, the

rationale for the choice and the presentation of research methods and solutions of the problem (if necessary, the feasibility study), analysis of the results, a list of references and conclusions.

Subjects FQW developed scientific director of joint training. The content of the FQW should correspond to the main areas of professional activity defined educational standards. Scientific supervisor appointed from among the student to faculty members who have scientific degree and / or academic titles. When work on the GQW students considered completed, it seems to her supervisor for verification, compilation of written revocation, containing references to:

- matching the results of GQW goals and objectives;
- degree of formation of research skills and professional competencies of students;
- ability to work with scientific, methodical, reference books and electronic information resources;
- personal qualities of the student, manifested in the course of work on the GQW.

The withdrawal of supervisor of formulating an opinion on the work performed, its assessment and recommended to the defense. If the supervisor of the work considers the student is not ready to protect, the discussion shall be submitted to a meeting of the structural unit FEFU.

7.1 Content, volume and structure of final qualification operation.

In the course of the master's thesis the student must:

- explore the literary sources state the question in the direction of the study;
- bring in the analysis of information materials to formulate the purpose and objectives;
- choose and learn research methods, meeting the stated objectives;
- obtain, process and generalize the experimental data, formulate a scientific and practical conclusions, suggestions and recommendations.

The volume of the explanatory note (90-120 pages of typescript).

Content and sections of the explanatory note:

Introduction (objectives and research tasks)

1. A literature review (including the conclusion of a literature review)

2. Objects and research techniques

2.1 Research objects (the general scheme of the job)

2.2 Research Methods

2.3 statistical data processing

3 Experimental results and discussion

findings

Bibliography

apps

It is recommended for demonstration during the defense to present experimental arrangement and results of research on the slides.

7.2 Methods for performing final qualifying scientific work.

Milestones of scientific FQW consists of:

- collect, analyze and summarize scientific and technical literature in the direction of the study;
- clarify the tasks of research, formulating a working hypothesis, specifying the possible ways to achieve the goal set in the work;
- select the objects of research and development of research methods;
- experimental studies;
- analyzing the results;
- formulation of scientific and practical conclusions and recommendations;
- design work.

Making the FQW is performed in accordance with the GOST 7.0.97-2016 Requirements for documents; GOST 7.0.11-2011 SIBID. Dissertation and thesis abstract. The structure and design rules; GOST 7.32-2017 SIBID. Report on research work. The structure and design rules.

8. General Requirements for GQW

- independence and originality;
- absence compilation (loans);
- obtaining new significant results;
- exact match with the content of the wording of the theme;
- logical sequence of presentation;
- the validity of the results and conclusions.

9. Evaluation Criteria final qualifying work

Assessment of "excellent" is set, provided that work:

- an exploratory nature, different novelty, originality and independence, it shows the scientific and methodological maturity of the student;
- It has a positive feedback of the supervisor;
- It shows the ability to work with literary sources, high culture of speech, spelling and literacy;
- It has a specific bottom line, the last tested and the positive external feedback.

Assessment of "good" is set, provided that work:

- an exploratory nature, shows the scientific and methodical literacy learning,
- characterized independence and it contains elements of novelty;
- It has a positive feedback of the supervisor with minor comments and suggestions;
- shows the ability to work with literary sources, a good culture of speech and spelling literacy;
- It has a specific bottom line, the last tested and the positive feedback from the side.

"Satisfactory" assessment is set, provided that work:

- is exploratory in nature with few novel features shows methodical and scientific literacy of students;
- in a review of the supervisor contains serious comments on the content of the work and analysis methodology;
- indicates inadequate ability to work with the references, low culture speech contains spelling mistakes carelessly framed;
- the practical results are not positive feedback from the side.

Evaluation of "unsatisfactory" is set, provided that work:

- not an exploratory nature, is not independent and does not include novelty, shows a lack of scientific and methodical literacy;
- in a review of the supervisor are the principal criticisms;
- shows the lack of ability to work with the references, low culture speech contains spelling mistakes carelessly framed;
- results of the study do not have a practical application.

Final evaluation of the results of the protection of master's thesis entered in the record book and the minutes of the meeting of SEC for the protection of the FQW, which affix the personal signatures of the chairman and members of the examination committee.

According to the results of the state final certification decision on assigning students to qualification (degree) Master toward 06/04/01 Biology (program "Molecular and Cell Biology") and issuance of a master's degree.

In case of unsatisfactory evaluation in the protection of final qualifying work re-protection is carried out in accordance with the Regulation on the state final examination for educational programs of higher education - Bachelor's Degree, Specialty, Master's Federal State Autonomous Educational Institution of Higher Education "Far Eastern Federal University" from 11.27.2015 number 12-13-2285.

10. Requirements for the organization and carrying out defense GQW

Interwoven master's thesis, as well as documentation of the work (task, schedule, review leader, a certificate of introduction -. In the presence of, etc.) should be prepared no later than 3 days before the defense and with the Secretary of SEC.

Protection of master's thesis is conducted in order to verify the quality of training of students and their ability to conduct a public debate and defend the scientific ideas. Protection of master's thesis is held in an open meeting of the State Examination Commission with the participation of at least two thirds of its composition (presence of BSE or deputy chairman of the required), scientific advisor, as well as everyone.

The procedure and the procedure of protection of final qualifying work to determine the position of the state final examination for educational programs of higher education - undergraduate specialties, graduate of the Federal State Autonomous Educational Institution of Higher Education "Far Eastern Federal University" from 27.11.2015 №12-13-2285. Sekretar of the SEC after the opening meeting, the chairman announces the protection of master's thesis, according to title, name of the supervisor and reviewer and gave the floor to the learner, which makes the short message length, usually up to 20 minutes.

After the completion of the report SEC members ask questions directly related to the theme of final qualifying work and closely related to it.

Questions can be specified as members of the Commission, and all those present at the defense. When the defender answering the questions he has the right to use their work. Then shall hear a review of the supervisor of the work (read review secretary SEC). After the final words of a security procedure of final qualifying work is considered ended. The duration of protection of master's thesis is usually 45 minutes.

protection results are discussed at a closed meeting of SEC and evaluated by a simple majority of the commission members. Scientific advisor and reviewer have the right to an advisory vote, unless they are members of the GEC. With an equal number of votes the opinion of the chairman is decisive. Then invited to defend himself, and the Secretary read out the SEC rating items.



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**PROGRAM
STATE EXAM
(Interdisciplinary)
in the direction of graduate Biology 06/04/01
Program "Molecular and Cellular Biology"**

Vladivostok
2019

1. Requirements for carrying out the procedure state exam

Form of the State interdisciplinary examination in the direction of 04.06.01 Biology (program "Molecular and Cell Biology") oral. State interdisciplinary examination questions cover all the theoretical and practical course put to the test subjects.

Disciplines that are brought to the State interdisciplinary examination:

B1.V.01 Molecular Biology;

B1.V.DV.01.01 biomedical cell technologies;

B1.V.DV.02.01 Medical and pharmaceutical biotechnology.

Exam fees must be made in accordance with the requirements stipulated in the Regulation on the state final examination for educational programs of higher education - undergraduate specialties, graduate of the Federal State Autonomous Educational Institution of Higher Professional Education "Far Eastern Federal University" from 27.11.2015 №12-13 -2285.

Original tickets must have the appropriate signatures - PLEU head, deputy director of school on UVR.

Exam fees should be reviewed and updated every 2 years, depending on the specific disciplines.

Each examination card usually contains three questions to test the level of theoretical knowledge and skills test student to apply theoretical knowledge to solve practical problems.

In each ticket interdisciplinary examinations should be included a question on the profile of the graduate.

It is recommended in the design issues of the ticket should be based on the content of courses to the required level of knowledge and skills.

Formulation of the items of the ticket examination is carried out in a narrative form.

One of the main conditions in the preparation of tickets - about the same volume setting of examination material, degree of difficulty and complexity of the issues.

The number of tickets required for the exam depends on the size of the group, passing grades, but not less than 25. In this case, issues tickets must cover the entire amount of academic disciplines, provided didactic units of the educational standard of higher education, self-installed FEFU.

The order of the state exam is approved in the Regulation on the state final examination for educational programs of higher education - undergraduate specialties, graduate of the Federal State Autonomous Educational Institution of

Higher Professional Education "Far Eastern Federal University "from 27.11.2015 №12-13-2285.

By the state exam the student is allowed, not having the academic debts and to fully implement the curriculum or individual curriculum for the educational program of higher education Molecular and cellular biology in the direction of 06.04.01 FEFU Biology. rector of the draft order on the admission of students for the state exam administrator prepares educational programs not later than two calendar days before the date of the state exam.

In carrying out state exam orally trainee is given time to prepare an answer for at least 45 minutes. For students with disabilities receiving state examination is conducted in accordance with their individual characteristics. Upon written request of a learning disability duration putting learners state examination may be increased in relation to the established duration of its delivery: the duration of training of students to answer the public examination, conducted orally - no more than 20 minutes. While responding to the state exam the trainee is permitted to use visual aids, reference, educational literature.

On the day of the state examination before a meeting of the chairman of SEC SEC it provided with a copy of the order of the rector on the admission of students for the state exam. SEC meeting is competent if attended by at least two thirds of the number of persons included in the SEC. SEC solution adopted by a simple majority of votes of those members of the GEC, participating in the meeting, and registered in the minutes of the meeting of SEC. With an equal number of votes the chairman shall have a casting vote.

Regulations of the state exam orally: Presentation of student graduating department head or member of the SEC on the written instructions of the head of the department of issuing; preparation of students for oral answer exam fees; oral response on student examination card (usually no more than 10 minutes); questions of the chairman and members of the SEC in writing and (or) oral form after learning the answer; student answers to questions.

The duration of the state exam in oral form should not normally exceed 20 minutes (excluding the time to prepare a response).

After certification of the last who appeared student held a closed meeting of SEC, which, taking into account the views of the Chairman and members of SEC present at the meeting each student in the minutes of the meeting of SEC and the examination sheet exhibited one estimate, "excellent", "good", "satisfactory", "unsatisfactory ". The gradebook student as a grade obtained on the state exam, in addition to evaluation of "unsatisfactory".

In assessing the results of the state final examination following training of the parties are taken into account:

- 1) understanding and degree of assimilation theory;
- 2) methodical preparation;
- 3) actual knowledge of the material;
- 4) familiarity with the compulsory literature, contemporary publications on this course in domestic and foreign literature;
- 5) the ability to apply theory to practice, to solve problems, etc.
- 6) familiarity with the history of science;
- 7) logic, structure and style of response, ability to defend the proposed (hypothetical) assumption.

Criteria for assessing the results of the state final examination:

1. The mark of "excellent" (in accordance with the good score) is set to learn, deeply and firmly assimilate the program material, the ability to independently critically evaluate the basic concepts of the disciplines, the answer is the theory linked with practice; Student shows familiarity with the relevant literature, correctly gives a definition of the basic concepts of the disciplines, correctly applies the theoretical principles to solve practical issues comprehensively respond to further questions.

2. The mark "good" is set to train, firmly knowing the program material, intelligently and essentially sets out its but allows small inaccuracies in question; student correctly applies the theoretical principles to solve practical questions and problems and is responsible for most of the additional questions.

3. The mark "satisfactory" is set learner who owns the main material, but experienced some difficulties and admits inaccuracies in his account, it is not enough properly formulated the basic concepts of discipline, allowed significant errors in carrying out practical assignments and answers to additional questions.

4. The mark "unsatisfactory" is set learner who does not know the basic material, allowed significant errors, incorrectly answers the majority of additional questions with great difficulty performing practical tasks.

2. Contents of the state exam program

The program of the final exam includes key interdisciplinary and practically important questions on subjects of general professional and specialized training, such as molecular biology; Biomedical cell technologies; Medical and pharmaceutical biotechnology.

2.1 Discipline B1.V.01 Molecular biology

Determining the life and properties of living. Levels of organization of living matter. Cell as the basis of heredity and reproduction. The structure of the nucleus and its role in heredity. Chemical composition of cells (nucleic acids, proteins, polysaccharides, lipids, nucleoproteins, glycoproteins, lipoproteins, peptidoglycan, polyphosphates, mineral components and water). The structure and functions of cells (differences prokaryotic and eukaryotic cells). The structure of the bacterial cell wall.

Metabolism as a set of plastic and energy exchanges. The life cycle of cell division and cell types (amitosis, mitosis, meiosis).

Mendel's laws and their interpretation in terms of the chromosome theory of heredity. Heredity and variability. variability of form. The main provisions of the evolutionary theory of Darwin, its differences from Lamarck's theory. The forms of selection, types of speciation, the evolution of the main ways.

The molecular basis of chromosome organization. histone RNA in cellular metabolism. Clutch Recombination in bacteriophages.

The position of microorganisms to other organisms. Saprophytes, parasites, pathogenic form. Principles of classification of bacteria: eubacteria, cyanobacteria, archaeobacteria. General Biology of protists: algae, protozoa. Mushrooms. Viruses. Viral infections lysogenicity.

Incoming mechanism in eukaryotes and prokaryotes exogenous substances. The physiology of nutrition. Batteries and their importance in the biosynthesis process. Variety types of microorganisms power (autotrophs heterotrophs fotolitotrofiya, fotoorganotrofiya, hemolitotrofov, hemoorganotrofiya). A variety of carbon sources, nitrogen, phosphorous, sulfur, and other elements used by microorganisms. The theory of limiting and inhibiting cell growth nutrients.

Physiology of energy metabolism: the use of cells energodayuschih processes, their efficiency and dependence on environmental conditions. The economic factor and its relationship to growth conditions. Interaction of the cells and the medium, the influence of external physical and physicochemical factors on the growth and biosynthesis in microorganisms. Norma and stress the problem of preserving the ability to overproduction. The physiology of dying.

Communication structure and function. Functional cytology, questions of differentiation and the conditions of its cause.

Methods for cultivation of microorganisms (periodic, continuous and immobilization of cells and enzymes). Mixed culture consortia. The principles of their cultivation.

The metabolism of microorganisms. The relationship of biosynthetic and energy processes. The concept of "biological oxidation." Features of electron transport systems of microorganisms. Anaerobic processes of oxidation. Anaerobic

respiration. Fermentation. Aerobic respiration. A variety of substrates, oxidizing microorganisms (natural biopolymers, hydrocarbons, and other xenobiotics.). Full aerobic oxidation of the substrate, the partial oxidation and transformation of organic substrates. Oxidation of inorganic substrates. Features of bacterial photosynthesis. Biosynthetic processes. Assimilation nitratreduktsiya, sulfate reduction, nitrogen fixation.

Basic monomers constructive metabolism. Ways of formation and their further use. The value of the tricarboxylic acid cycle and glyoxylate shunt in constructive metabolism. Synthesis of lipids, polysaccharides and other cell components. The practical significance of these processes. Education microorganisms biologically active substances: enzymes, antibiotics, vitamins, toxins. Primary and secondary metabolites. Their role in nature. The practical use.

Breeding, the genetic basis of selection. The concept of genotype and phenotype. Heredity, variability, the selection of microorganisms. Recombination. The concept of population genetics and population variability. breeding methods. Selection of microorganisms. The production fermenter as the ecological niche. Biosphere and propagation of microorganisms. The participation of microorganisms in the circulation of carbon, nitrogen, oxygen, sulfur. Microorganisms form relationships.

The notion of a gene in the "classical" and molecular genetics, its evolution. Contribution to the methodology of genetic engineering in the development of molecular genetics. Applied value of genetic engineering to biotechnology.

The molecular basis of heredity. The nature of the genetic material. Features of the structure of the genetic material of pro- and eukaryotes. Transcription is wild, its components. And RNA polymerase promoter. Broadcast, its stages, the function of ribosomes. Genetic code and its properties. Replication wild and its genetic control. Recombination, its types and models. Mechanisms of DNA repair. The relationship replication, recombination, and repair.

Mutation process. The role of biochemical mutants in the formation of the theory of "one gene - one enzyme". Classification of mutations. Spontaneous and induced mutagenesis. Classification of mutagens. The molecular mechanism of mutagenesis. Identification and selection of mutants. Suppression: intragenic, intergenic and phenotypic.

Extrachromosomal genetic elements. Plasmids, their structure and classification. Sex factor F, its structure and life cycle. Role in mobilizing factor F chromosomal transfer. Formation of Hfr-type donors and F. conjugation mechanism. Bacteriophages, their structure and life cycle. Virulent and temperate phages. Migratory genetic elements: transposons and IS-sequences, their role in the genetic exchange. Investigation of the structure and function of the gene.

Elements of genetic analysis. Cis-trans-complementation test. Genetic mapping. Physical analysis of gene structure. Restriction analysis. sequencing methods. Identifying gene function. The regulation of gene expression. The concept of the operon and regulon. Control at the level of transcription initiation. Promoter, operator and regulatory proteins.

Positive and negative control of gene expression. Control at the level of transcription termination. Polar effect and its suppression. Katabolitkontroliruemye operons: lactose operon model. Attenyuatorkontroliruemye operons: tryptophan operon model. Multivalent regulation of gene expression. Post-transcriptional control.

Basics of genetic engineering. The mechanism of gene mutations, genetic control. Restriction enzymes and modification. Isolation and cloning of genes. Vectors for molecular cloning. Principles for the construction of recombinant DNA and its introduction into recipient cells.

2.2 Discipline B1.V.DV.01.01

Biomedical cell technologies

Improvement biosamples used for the manufacture of medicaments and diagnostic agents. breeding methods.

Improvement biosamples used for the manufacture of medicaments and diagnostic agents. Methods for introducing foreign genes: transformation, transduction, conjugation.

Biomedical cell technology - the process of obtaining cell product for restoring structure and function of human tissue and organs by replacing the cells of these tissues and organs cells administered externally or by activation of its own recovery processes of the human body, to create bioengineering techniques (tissue engineering) tissues and organs followed by their use in medical practice, and for targeted drug delivery in the human body.

Biomedical cellular product - a complex consisting of the cell lines (cell lines) and excipients from either cell line (cell lines) and adjuvants in combination with the past state registration of drugs for medical use (hereinafter - drugs) and (or) the medical products.

Implementation of biomedical cell product - the transfer of biomedical cell product on a reimbursable basis, and (or) at no charge.

Autologous cell biomedical product - biomedical cellular product containing in its structure a cell line (cell lines) derived from a particular human biological material, and intended for application to the same person.

Biomedical product Allogeneic cell - cell biomedical product containing in its structure a cell line (cell lines) derived from a particular human biological material and adapted for application to other people.

Combination product biomedical cell - cell biomedical product containing in its structure cell lines derived from several human biological material, and intended for application to one of them.

Sample biomedical cell product - Biomedical cellular product or a part thereof received in order to study its properties, including the assessment of the quality of biomedical cell product and its safety.

The cell line - a standardized population of cells of one cell type with a reproducible composition obtained by removal of the biological material of human organism, followed by culturing cells outside the body.

Excipients - substances of inorganic or organic origin are used in the design and manufacture of biomedical cell product.

Biological material - biological fluid, tissues, cells, secretions and human waste, physiological and pathological discharge, swabs, scrapings, washings, biopsy material;

The donor of the biological material (hereinafter - the donor) - a man who during his lifetime has provided biological material, or a man whose biological material obtained after his death, stated in the order established by the legislation of the Russian Federation.

Donation of biological material - postmortem process of biological material (hereinafter - postmortem donation) or in vivo of the biological material (hereinafter - vivo donation).

Efficacy biomedical cell product - characteristic of the degree of positive influence biomedical cell product for a duration of the disease or condition, or to prevent them for preservation of pregnancy on the patient's medical rehabilitation.

Preclinical studies of biomedical cell product - biological, microbiological, immunological, toxicological, pharmacological, physical, chemical, and other studies of biomedical cell product in order to identify the specific mechanism of action of such a product, getting it evidence of safety, quality and efficacy prior to clinical research biomedical cell product.

Clinical study biomedical cell product - the study of preventive, diagnostic, curative, rehabilitative properties of biomedical cell product in its application to man in order to obtain his evidence of safety and efficacy data on the side effects of such a product, and adverse reactions associated with its use, as well as effect interaction of the test cell biomedical product with other cellular biomedical products, medicinal prep Atami and (or) medical products, food products.

Multicenter clinical study biomedical cell product - clinical research biomedical cell product, carried out in two or more medical organizations on a single clinical study protocol biomedical cell product.

An international multicenter clinical study biomedical cell product - clinical research biomedical cell product, conducted in different countries on a common protocol of clinical research biomedical cell product.

Post-marketing clinical study biomedical cell product - clinical research biomedical cell product, which appeal to the Russian Federation is carried out after the state registration, in order to further data collection on its safety and effectiveness, expansion of indications of data the use of such biomedical cell product, and to identify any adverse reactions to it application.

2.3 Discipline B1.V.DV.02.01

Medical and Pharmaceutical Biotechnology

Medical biotechnology (biotechnology for medicine). Using the methods of immobilization of biological objects in medical biotechnology in the diagnosis of diseases. Fundamentals of Modern immunobiotechnology. Hybridoma technology. Use of antibodies for the purification of biological fluids. Types of vaccines and their construction. Culture and genetically engineered vaccines. Production of antisera. Modern vaccination preparations. Preparations based on living cultures Microorganisms (normal flora and probiotics). Immunosensor. biosensors based on enzyme production. Ip vitro diagnostic means for clinical studies. probiotics production. The production of enzymes for medical purposes. Creation of enzymes using genetic engineering techniques. Production of preparations based on a mixture of L-amino acids per oral and parenteral nutrition. Technology medicinal products on the basis of stable liposomes targeted. Design and production of genetically engineered insulin. Other genetically engineered drugs and medicines. Production of immunomodulators, immunostimulants and immunosuppressants. Microbiological production of antibiotics of different classes to medicine. Semi synthetic antibiotics. Microbiological production of vitamins for health.

Technology transformation products of organic compounds by enzymes of microbial cells: sorbitol in the production of ascorbic acid; hydrocortisone and its conversion to prednisolone; products of dehydrogenation, reduction and hydroxylation of steroids; oxidation products of indole derivatives and pyridine. Ip vitro cell cultivation techniques and plant tissues for herbal remedies and preventive additives.

3. The list of issues
State Exam in the direction of the Magistracy
06/04/01 Biology
Program "Molecular and Cellular Biology"

1. History of molecular biology, objectives and scope of research.
2. The most important achievement of modern theoretical and practical problems of molecular biology. Evidence of genetic function of nucleic acids.
3. Molecular basis of the structure of living matter. Chemical elements contained in living organisms. The chemicals in living organisms.
4. Metabolism as a set of plastic and energy exchanges. The life cycle of cell division and cell types (amitosis, mitosis, meiosis).
5. Proteins. The structure of proteins. Classification of proteins. Properties of proteins. Function of the proteins. Structure function. Catalytic or enzymatic function. The protective function. Regulatory function. Transport function. The energy function. The buffer function. The nutritional function.
6. The main functions of proteins. Principles of classification of proteins, their diversity. Proteins, including non-protein components: metalloproteins, chromoproteids, glycoproteins, lipoproteins.
7. Nucleic acids. The structure of nucleic acids. Organization of genetic material. Classification of genes. The biosynthesis of nucleic acids and proteins.
8. The general structure and properties of nucleic acids. Physicochemical properties of functional groups, the possibility of non-covalent interactions between them. the principle of complementarity.
9. Genomes, their structure and function. The notion of a gene in the "classical" and molecular genetics, its evolution. Contribution to the methodology of genetic engineering in the development of molecular genetics. Applied value of genetic engineering to biotechnology.
10. Molecular biology techniques. restriction analysis
11. Molecular biology techniques. Cloning genes.
12. Molecular biology techniques. Determination of DNA and RNA nucleotide sequences
13. Molecular biology techniques. Chemical synthesis of genes. The creation of artificial genetic programs.
14. The history of evidence of genetic function of DNA. Experiments Avery, Hershey and Chase. Complementary pairs of Watson-Crick base.
15. The physical properties of the DNA molecule, the DNA conformational forms and their physical parameters, denaturation and renaturation of DNA.

16. Circular DNA molecule and the concept of DNA supercoiling. Parameters supercoiled DNA and conformational transitions in supercoiled DNA molecule. Topoisomers DNA. The mechanism of action of topoisomerases.

17. The molecular mechanisms that coordinate cell cycle and DNA replication. The concept of a "checkpoint» (checkpoints). Cyclins and protein kinases.

18. Mobile elements in eukaryotic genomes (types of mobile elements, displacement mechanisms, examples of transposable elements yeast and higher eukaryotes).

19. The transfer of genetic information. DNA replication. DNA repair. Recombination of DNA. Mobile (cell) genetic elements: transposons. Extrachromosomal genetic elements.

20. Implementation of genetic information. Protein synthesis. Transcription of DNA. Synthesis of DNA on a template of RNA (reverse transcription). Broadcast.

21. Heredity and variability. Mutagenesis. Classification of mutations. Mutagenic factors.

22. Current approaches to the determination of DNA nucleotide sequences

23. Basics of genetic engineering. The mechanism of gene mutations, genetic control. Restriction enzymes and modification. Isolation and cloning of genes. Vectors for molecular cloning.

24. Principles for the construction of recombinant DNA and its introduction into recipient cells.

25. RNA Molecule: primary, secondary, tertiary structure and their properties. The principle of complementarity and the deviations from it. The structure of the tRNA. Structure Ribosomal RNA.

26. RNA functions: replication, reverse transcription, protein biosynthesis. The catalytic function. The hypothesis of the occurrence of the primary RNA world.

27. Laws of cyto- and histogenesis, structure and function of cells and tissues.

28. Laws of cell differentiation and tissue regeneration, and their physiological regulation of these processes, as well as differentiation and functioning of undifferentiated cells.

29. System analysis of the relationship of cells, tissues and functional systems of organisms - representatives of all the kingdoms.

30. Adaptation of tissue cells to a variety of biological, physical, chemical, and other factors.

31. Molecular Biology of the Cell. Molecular, immunological and

physiological aspects of the study multicellular cells malokletochnyh and single-celled organisms in health and disease.

32. Plant cells. Use of a biotechnological process for the transformation of drugs.

33. Suspension culture of plant cells: the parameters of the bio-object requiring registration; machines for cultivation.

34. Improvement biosamples used for the manufacture of medicaments and diagnostic agents. breeding methods.

35. Improvement biosamples used for the manufacture of medicaments and diagnostic agents. Methods for introducing foreign genes: transformation, transduction, conjugation.

36. The concept of biotechnology as a reception process of obtaining modified biological objects in order to give them new properties and / or ability to produce new substances.

37. The main applications of modern biotechnology and its main aspects (biological, chemical, processing). Scientific basis of the engineering design of biotechnology.

38. Basic bioobjects Biotechnology: Industrial microorganisms, cells and tissues of plants, animals and humans, biocatalysts including the reconstructed producers of biologically active substances (selection, recombinant DNA technique, hybridoma technology).

39. Culture of plant cells and tissues: concept, types, characteristics, scope of practical application. Phytohormones: auxins and cytokinins and their importance for plant tissue culture.

40. Biological objects of animal origin. Characteristic. Examples of biologically active substances obtained from them.

Рекомендуемая литература и информационно-методическое обеспечение

Основная литература

(электронные и печатные издания)

1. Алексеев, В.И. Прикладная молекулярная биология: учебное пособие для вузов / В.И. Алексеев, В.А. Каминский. – Владивосток: Дальрыбвтуз, 2011. – 238 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:425474&theme=FEFU>

2. Андрусенко, С.Ф. Биохимия и молекулярная биология [Электронный ресурс]: учебно-методическое пособие/ Андрусенко С.Ф., Денисова Е.В. – Электрон. текстовые данные. – Ставрополь: Северо-Кавказский федеральный университет, 2015. – 94 с. – Режим доступа: <http://www.iprbookshop.ru/63077.html> . – ЭБС «IPRbooks»

3. Биология стволовых клеток и клеточные технологии: для медицинских вузов в 2 т.: т. 1 / М. А. Пальцев, Р. С. Акчурин, М. А. Александрова [и др.]; под ред. М. А. Пальцева. – Москва: Медицина, Шико, 2009. – 272 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:779352&theme=FEFU>

4. Биология стволовых клеток и клеточные технологии: для медицинских вузов в 2 т.: т. 2 / М.А. Пальцев, Р.С. Акчурин, М.А. Александрова [и др.]; под ред. М.А. Пальцева. – Москва: Медицина, Шико, 2009. – 455 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:779355&theme=FEFU>

5. Братусь, А.С. Динамические системы и модели биологии / А.С. Братусь, А.С. Новожилов, А.П. Платонов. – Москва: ФИЗМАТЛИТ, 2009. – 400 с. http://e.lanbook.com/books/element.php?pl1_id=2119

1. Глик, Б. Молекулярная и клеточная биология. Принципы и применение / Б. Глик, Дж. Пастернак, пер. с англ. – М.: Мир, 2002. – 589 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:4799&theme=FEFU>

6. Горленко, В.А. Научные основы биотехнологии. Часть 1. Нанотехнологии в биологии [Электронный ресурс]: учебное пособие/ Горленко В.А., Кутузова Н.М., Пятунина С.К. – Электрон. текстовые данные. <http://www.iprbookshop.ru/24003.html> . – М.: Прометей, 2013. – 262 с. – Режим доступа: <http://lib.dvfu.ru:8080/lib/item?id=IPRbooks:IPRbooks-24003&theme=FEFU>

7. Джаксон, М.Б. Молекулярная и клеточная биофизика. – М.: Мир; БИНОМ. Лаборатория знаний, 2009. – 551 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:277656&theme=FEFU>

8. Молекулярная биология клетки [в 3 т.]: т. 1 / Брюс Альбертс, Александр Джонсон, Джулиан Льюис и др.; с задачами Дж. Уилсона, Т. Ханта; пер. с англ. А. А. Светлова, О. В. Карловой. – Москва, Ижевск: Институт компьютерных исследований: Регулярная и хаотическая динамика, 2013. – с.773. <http://lib.dvfu.ru:8080/lib/item?id=chamo:772792&theme=FEFU>

9. Молекулярная биология клетки [в 3 т.]: т. 2 / Брюс Альбертс, Александр Джонсон, Джулиан Льюис и др.; с задачами Дж. Уилсона, Т. Ханта; пер. с англ. А. А. Светлова, О. В. Карловой. – Москва, Ижевск: Институт компьютерных исследований: Регулярная и хаотическая динамика, 2013. – с.775-1736.

<http://lib.dvfu.ru:8080/lib/item?id=chamo:772794&theme=FEFU>

10. Молекулярная биология клетки [в 3 т.]: т. 3 / Брюс Альбертс, Александр Джонсон, Джулиан Льюис [и др.]; с задачами Дж. Уилсона, Т. Ханта; пер. с англ. А.А. Светлова, О.В. Карловой. – Москва, Ижевск: Институт компьютерных исследований: Регулярная и хаотическая динамика, с. 1737-2764. <http://lib.dvfu.ru:8080/lib/item?id=chamo:772786&theme=FEFU>

11. Молекулярная биология: учебник / В.В. Иванищев. – М.: РИОР: ИНФРА-М, 2018. – 225 с. <http://znanium.com/catalog/product/916275>

12. Наноструктуры в биомедицине / под ред. К. Гонсалвес [и др.]; пер. с англ. – Москва: Бином. Лаборатория знаний, 2013. – 519 с. http://e.lanbook.com/books/element.php?pl1_id=8685

13. Пинаев, Г.П. Клеточная биотехнология: учебно-методическое пособие / Г.П. Пинаев, М.И. Блинова, Н.С. Николаенко, Г.Г. Полянская, Т.Н. Ефремова, Н.С. Шарлаимова, Н.А. Шубин. – СПб: Политехнический университет, 2011. – 224 с.

14. Регенеративный потенциал мезенхимных стволовых клеток / Б.В. Попов. – Санкт-Петербург: Медкнига «ЭЛБИ», 2015. – 287 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:803153&theme=FEFU>

15. Спиринов, А.С. Молекулярная биология. Рибосомы и биосинтез белка: учебник для вузов по биологическим специальностям / А.С. Спиринов. – Москва: Академия, 2011. – 496 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:669007&theme=FEFU>

16. Стволинская, Н.С. Цитология [Электронный ресурс]: учебник / Н.С. Стволинская. – Электрон. текстовые данные. – М.: Прометей, 2012. – 238 с. <http://www.iprbookshop.ru/18637.html>

17. Степанов В.М. Молекулярная биология, структура и функция белков / под ред. А.С. Спирина. – М.: МГУ имени М.В.Ломоносова (Московский государственный университет имени М. В. Ломоносова), 2005. – 336 с. http://e.lanbook.com/books/element.php?pl1_id=10123

18. Уэй Т. Физические основы молекулярной биологии: учебное пособие / Т. Уэй; пер. с англ. под ред. Л. В. Яковенко. – Долгопрудный: Издат. Дом «Интеллект», 2010. – 368 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:663865&theme=FEFU>

19. Ченцов, Ю.С. Введение в клеточную биологию: учебник для вузов по биологическим специальностям / Ю.С. Ченцов. – изд. 4-е, перераб. и доп., стер., перепеч. с изд. 2005. – Москва: Альянс, 2015. – 494 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:776847&theme=FEFU>

Дополнительная литература (печатные и электронные издания)

1. Браун, Т.А. Геномы / Терри А. Браун, пер. с англ. А.А. Светлова; под ред. А.А. Миронова. – Москва: Изд-во Института компьютерных исследований, 2011. – 921 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:660961&theme=FEFU>

2. Генетические основы селекции растений. Том 3. Биотехнология в селекции растений. Клеточная инженерия [Электронный ресурс] / В.С. Анохина [и др.]. – Электрон. текстовые данные. <http://www.iprbookshop.ru/29441.html>. – Минск: Белорусская наука, 2012. – 490 с. – Режим доступа:— <http://lib.dvfu.ru:8080/lib/item?id=IPRbooks:IPRbooks-29441&theme=FEFU>

3. Генетические основы селекции растений. Том 4. Биотехнология в селекции растений. Геномика и генетическая инженерия [Электронный ресурс]/ О.Ю. Урбанович [и др.]. – Электрон. текстовые данные. <http://www.iprbookshop.ru/29578.html>. – Минск: Белорусская наука, 2014. – 654 с. – Режим доступа: <http://lib.dvfu.ru:8080/lib/item?id=IPRbooks:IPRbooks-29578&theme=FEFU>

4. Гены и геномы в 2 т.: т. 1 / М. Сингер, П. Берг; под ред. Н. К. Янковского; пер. с англ. Т. С. Ильиной, Ю. М. Романовой. – Москва: Мир, 1998. – 373 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:23576&theme=FEFU>

5. Гистология, эмбриология, цитология: учебник для высшего профессионального образования / Ю.И. Афанасьев, Н.А. Юрина, Б.В. Алешин и [др.] под ред. Ю.И. Афанасьева, Н.А. Юриной. – Москва: ГЭОТАР-Медиа, 2013. – 798 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:695450&theme=FEFU>

6. Жимулев, И.Ф. Общая и молекулярная генетика: учебное пособие. / И.Ф. Жимулев – Новосибирск: Сибирское университетское изд-во, 2006. – 479 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:349217&theme=FEFU>

7. Зенгбуш, П. Молекулярная и клеточная биология: в 3 т. Т.2 / П. Зенгбуш; пер. с нем. Г. И. Лойдиной. – Москва: Мир, 1982. – 438 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:3337&theme=FEFU>
8. Зенгбуш, П. Молекулярная и клеточная биология: в 3 т. Т.3 / П. Зенгбуш; пер. с нем. Л.В. Алексеевой. – Москва: Мир, 1982. – 344 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:46167&theme=FEFU>
9. Зенгбуш, Петер. Молекулярная и клеточная биология: в 3 т. Т.1 / П. Зенгбуш; пер. с нем. Л.В. Алексеевой, Л.С. Шляхтенко. – Москва: Мир, 1982. – 367 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:3337&theme=FEFU>
10. Кони́чев, А.С. Молекулярная биология: учебник для вузов. / А.С. Кони́чев, Г.А. Севастьянова. – Москва: Академия, 2005. – 397 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:290949&theme=FEFU>
11. Ленинджер, А. Биохимия. Молекулярные основы структуры и функций клетки: пер. с англ. / А. Ленинджер. – Москва: Мир, 1974. – 957 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:57029&theme=FEFU>
12. Льюин Б. Гены / Б. Льюин; пер. с англ. А.Л. Гинцбурга. [и др.]. – Москва: Мир, 1987. – 544 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:54059&theme=FEFU>
13. Молекулярная биология [Электронный ресурс]: учебное пособие / О.В. Кригер [и др.]. – Электрон. дан. – Кемерово: КемГУ, 2017. – 93 с. <https://e.lanbook.com/book/103922>
14. Основы клеточной биологии [Электронный ресурс]: учебное пособие / Н.Г. Палеев, И.И. Бессчетновред, Т.П. Шкурат. – Электрон. текстовые данные. – Ростов-на-Дону: Южный федеральный университет, 2011. – 246 с. <http://www.iprbookshop.ru/47054.html>
15. Полевой, В.В. Живое состояние клетки и биология старения / В.В. Полевой, Т.С. Саламатова. – СПб: Изд-во Санкт-Петербургского университета, 2004. – 134 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:235720&theme=FEFU>
16. Регенеративный потенциал мезенхимных стволовых клеток / Б.В. Попов. – Санкт-Петербург: Медкнига «ЭЛБИ», 2015. – 287 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:803153&theme=FEFU>
17. Спи́рин, А.С. Молекулярная биология: структура и биосинтез нуклеиновых кислот: учебник для биологических специальностей вузов / В.И. Агол, А.А. Богданов, В.А. Гвоздев [и др.]; под ред. А.С. Спирина. – Москва: Высшая школа, 1990. – 352 с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:106918&theme=FEFU>

18. Степанов В.М. Молекулярная биология. Структура и функции белков: Учеб. для биол. спец. вузов / Под ред. А.С. Спирина. М.: Высш. Шк., 1996. – 335с. <http://lib.dvfu.ru:8080/lib/item?id=chamo:20639&theme=FEFU>

19. Степанов В.М. Молекулярная биология. Структура и функция белков [Электронный ресурс]: учебник/ Степанов В.М. – Электрон. текстовые данные. – М.: Московский государственный университет имени М.В. Ломоносова, 2005. – 336 с. – Режим доступа: <http://www.iprbookshop.ru/13144.html> . – ЭБС «IPRbooks»

Нормативно-правовые материалы

1. Комплексная программа развития биотехнологий в Российской Федерации на период до 2020 года ВП-П8-2322: утверждена Председателем Правительства Российской Федерации В.Путиным 24 апреля 2012 г. N 1853п-П8 [Электронный ресурс]: // ГАРАНТ: информационно-правовая система. – Режим доступа: <http://www.garant.ru/>.

2. О биомедицинских клеточных продуктах [Электронный ресурс]: Федеральный закон № 180-ФЗ от 15 июня 2016 г.: принят Государственной Думой 08 июня 2016 г (с изменениями на 3 августа 2018 года) // ГАРАНТ: информационно-правовая система. – Режим доступа: <http://www.garant.ru/>.

3. Правила надлежащей практики по работе с биомедицинскими клеточными продуктами (утверждены приказом Министерства здравоохранения Российской Федерации от 8 августа 2018 года N 512н) ГАРАНТ: информационно-правовая система. – Режим доступа: <http://www.garant.ru/>.

4. Об основах охраны здоровья граждан в Российской Федерации [Электронный ресурс]: Федеральный закон № 323-ФЗ от 21 ноября 2011 г.: принят Государственной Думой 1 ноября 2011 г. – посл. изм. 03 июля 2016 г. // ГАРАНТ: информационно-правовая система. – Режим доступа: <http://www.garant.ru/>.

5. Об утверждении порядка уничтожения фальсифицированных биомедицинских клеточных продуктов, недоброкачественных биомедицинских клеточных продуктов и контрафактных биомедицинских клеточных продуктов [Электронный ресурс]: Заключение Министерства экономического развития РФ об оценке регулирующего воздействия на проект Постановления Правительства Российской Федерации от 28 ноября 2016 г. N 36281-СШ/Д26и // ГАРАНТ: информационно-правовая система. – Режим доступа: <http://www.garant.ru/>.

6. Об утверждении Правил надлежащей клинической практики биомедицинских клеточных продуктов. [Электронный ресурс]: Приказ Министерства здравоохранения РФ от 22 сентября 2017 года N 669н (с изменениями на 25 декабря 2017 года) // ГАРАНТ: информационно-правовая система. – Режим доступа: <http://www.garant.ru/>.

7. Об утверждении сроков и этапов аккредитации специалистов, а также категорий лиц, имеющих медицинское, фармацевтическое или иное образование и подлежащих аккредитации специалистов [Электронный ресурс]: Приказ Министерства здравоохранения РФ от 25 февраля 2016 г. № 127н // ГАРАНТ: информационно-правовая система. – Режим доступа: <http://www.garant.ru/>.

Перечень ресурсов информационно-телекоммуникационной сети «Интернет»

1. Министерство здравоохранения Российской Федерации – официальный сайт: <https://www.rosminzdrav.ru/>

2. Центральный НИИ организации и информатизации здравоохранения – официальный сайт: <http://mednet.ru/>

3. НИИ биомедицинской химии им. В.Н. Ореховича – официальный сайт: <http://www.ibmcm.sk.ru/>

4. Министерство здравоохранения Российской Федерации – официальный сайт: <https://www.rosminzdrav.ru/>

5. Центральный НИИ организации и информатизации здравоохранения – официальный сайт: <http://mednet.ru/>

6. НИИ биомедицинской химии им. В.Н. Ореховича – официальный сайт: <http://www.ibmcm.sk.ru/>

7. Технологическая платформа БиоТех2030 – официальный сайт: <http://biotech2030.ru/>

8. Федеральный исследовательский центр «Фундаментальные основы биотехнологии» Российской академии наук» (ФИЦ Биотехнологии РАН) – официальный сайт: <http://fbras.ru/>

9. Международный биотехнологический центр «Генериум» – официальный сайт: <http://ibcgenerium.ru/>

10. Институт молекулярной генетики РАН – официальный сайт: <https://img.ras.ru/>



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

ШКОЛА БИОМЕДИЦИНЫ
Департамент медицинской биологии и биотехнологии

ГОСУДАРСТВЕННЫЙ ЭКЗАМЕН
по направлению подготовки **06.04.01 Биология**
Программа Молекулярная и клеточная биология
_____ учебный год

Экзаменационный билет № 1

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