




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

Far Eastern Federal University
(FEFU)

INSTITUTE OF LIFE SCIENCES AND BIOMEDICINE (SCHOOL)

AGREED


Head of Educational
Program


V.V. Kumeiko

(Signed) (Surname)

CLAIM

Director of the Production Company
Structural subdivision


V.V. Kumeiko

(Signed) (Surname)
April 12, 2023

DISCIPLINE WORK PROGRAM (RAP)

Immunology

Area of study 06.03.01 Biology

Form of training: full-time

The work program is drawn up in accordance with the requirements of the Federal State Educational Standard in the field of training 06.03.01 Biology, approved by the order of the Ministry of Education and Science of the Russian Federation dated 07.08.2020 No. 9 20

The work program was discussed at the meeting of the Department of Medical Biology and Biotechnology, Minutes No. 3 dated April 12, 2023.

Director of the Department of Medical Biology and Biotechnology V.V. Kumeiko
Authors: Candidate of Biological Sciences, Associate Professor Kumeiko V.V.

Vladivostok
2023

1. *The work program was revised at the meeting of the Department/Department/Division (implementing the discipline) and approved at the meeting of the Department/Department/Division (graduating structural unit), minutes of "*

_____ 202 No.

2. *The work program was revised at the meeting of the Department/Department/Division (implementing the discipline) and approved at the meeting of the Department/Department/Division (graduating structural unit), minutes of "*

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Abstract of the discipline

Immunology

The total labor intensity of the discipline is 3 credits/ 108 academic hours. It is a discipline of the compulsory part of the EP, studied in the 3rd year and ends *with a test*. The curriculum provides for 18 hours of lectures, 18 hours of laboratory work, 36 hours of practical work, and 36 hours of independent work for the student.

Language: Russian.

Objective: to study the structural and functional organization of the immune system, the mechanisms of recognition, memorization and elimination of genetically foreign structures, methods for studying the immune status.

Tasks:

- 1) study of systemic, organ, tissue, cellular and molecular levels of innate and adaptive immunity reactions, individual forms of the immune process;
- 2) acquaintance with the mechanisms of recognition, memorization and elimination of genetically foreign structures, methods of studying the immune status;
- 3) to teach how to use the knowledge of the fundamental foundations of immunology and allergology in the pedagogical process and scientific research.

For successful study of the discipline, students should have the following preliminary competencies:

- has an idea of the features of the structure, vital activity, classification of viruses and microorganisms;
- applies methods of virological, microbiological and epidemiological analysis;
- understands the molecular features of the structure of viruses and microorganisms, knows the mechanisms of their interaction with cells and their role in pathological processes.

Competencies are obtained as a result of studying the disciplines of *general biology, microbiology, molecular and cellular biology*, the student should be ready to study such disciplines as virology, methods of clinical diagnostics, forming competencies:

- investigates the mechanisms of molecular interaction of cells, tissues and functional systems of organisms, studies the physiological processes occurring in them;

- uses fundamental knowledge and biophysical methods to diagnose pathological conditions.

General professional competencies of graduates and indicators of their achievement:

Competency code and name (result of mastering)	Code and name of the competency indicator
OPK-2 is able to apply the principles of structural and functional organization, use physiological, cytological, biochemical, biophysical methods of analysis to assess and correct the state of living objects and monitor their habitat	OPK-2.3 Analyzes the pharmacokinetics and pharmacodynamics of the studied objects based on knowledge of morphofunctional features, physiological states and pathological processes in the body

Code and name of the competency indicator	Name of the assessment indicator (the result of learning in the discipline)
OPK-2.3 Analyzes the pharmacokinetics and pharmacodynamics of the studied objects based on knowledge of morphofunctional features, physiological states and pathological processes in the body	Knows about morphofunctional features, physiological states and pathological processes in the body. Can to analyze the pharmacokinetics and pharmacodynamics of the objects under study based on knowledge of morphofunctional features, physiological states and pathological processes in the body. Owns the ability to analyze the pharmacokinetics and pharmacodynamics of the objects under study based on knowledge of morphofunctional features, physiological states and pathological processes in the body.

Professional competencies of graduates and indicators of their achievement:

Competency code and name (result of mastering)	Code and name of the competency indicator
PC-4 Able to understand and analyze, and apply the principles of cellular and tissue organization of biological objects, biochemical and molecular-biological mechanisms of the development of pathological processes in cells and tissues of the human body to preserve the health of the	PC-4.1 Analyzes biochemical and molecular-biological mechanisms of development of pathological processes in cells and tissues of the human body and applies the principles of cellular organization of biological objects
	PC-4.2 Understands the biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body

population	PC-4.3 Understands and investigates the physical processes underlying the functioning of the body in normal and pathological conditions, understands the influence of physical factors on the functioning of biological systems, is able to study the physical structure of biologically important molecules in order to identify the relationship between the structure of substances and their biological activity
	PC-4.4 Able to develop and apply health-saving technologies
PC-1 is able to carry out fundamental and applied projects to study physiological processes and phenomena occurring at the molecular, cellular, organ and systemic levels in the human and animal bodies	PC-1.1 Investigates the mechanisms of molecular interaction of cells, tissues and functional systems of organisms, studies the physiological processes occurring in them
	PC-1.2 Uses methods of molecular-genetic, cellular and physiological research to study physiological processes in the body

Code and name of the competency indicator	Name of the assessment indicator (the result of learning in the discipline)
PC-4.1 Analyzes biochemical and molecular-biological mechanisms of development of pathological processes in cells and tissues of the human body and applies the principles of cellular organization of biological objects	Knows biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body. Can apply the principles of cellular organization of biological objects. Owns skills of determining the biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body.
PC-4.2 Understands the biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body	Knows biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body. Can to apply biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body. Owns skills in the use of biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body
PC-4.3 Understands and	Knows

investigates the physical processes underlying the functioning of the body in normal and pathological conditions, understands the influence of physical factors on the functioning of biological systems, is able to study the physical structure of biologically important molecules in order to identify the relationship between the structure of substances and their biological activity	the physical structure of biologically important molecules and the physical processes underlying their functioning. Can determine the relationship between the physical structure and properties and the functions that perform them in the body. Owns skills in the study of the physical structures of biologically important molecules and the physical processes underlying their functioning
PC-4.4 Able to develop and apply health-saving technologies	Knows technologies aimed at preserving the health of the population. Can apply health-saving technologies. Owns Ability to develop health-saving technologies
PC-1.1 Investigates the mechanisms of molecular interaction of cells, tissues and functional systems of organisms, studies the physiological processes occurring in them	Knows interactions of cells, tissues and functional systems of organisms. Can distinguish between the physiological processes that take place in cells and tissues. Owns skills in studying the mechanisms of molecular interaction of cells, tissues and functional systems of organisms.
PC-1.2 Uses methods of molecular-genetic, cellular and physiological research to study physiological processes in the body	Knows methods of molecular-genetic, cellular and physiological research. Can apply methods of molecular-genetic, cellular and physiological research. Owns methods of molecular-genetic, cellular and physiological research

To form the above competencies within the discipline "Immunology", the following educational technologies and methods of active/interactive learning are used: a business game, work in small groups, a round table.

I. Goals and objectives of mastering the discipline

Objective: to study the structural and functional organization of the immune system, the mechanisms of recognition, memorization and elimination of genetically foreign structures, methods for studying the immune status.

Tasks:

- 1) study of systemic, organ, tissue, cellular and molecular levels of innate and adaptive immunity reactions, individual forms of the immune process;
- 2) acquaintance with the mechanisms of recognition, memorization and elimination of genetically foreign structures, methods of studying the immune status;
- 3) to teach to use the knowledge of the fundamental foundations of immunology and allergology in the pedagogical process and scientific research.

General professional competencies of graduates and indicators of their achievement:

Code and name of professional competence (result of mastering)	Code and name of the competency indicator
OPK-2 is able to apply the principles of structural and functional organization, use physiological, cytological, biochemical, biophysical methods of analysis to assess and correct the state of living objects and monitor their habitat	OPK-2.3 Analyzes the pharmacokinetics and pharmacodynamics of the studied objects based on knowledge of morphofunctional features, physiological states and pathological processes in the body

Code and name of the competency indicator	Name of the assessment indicator (the result of learning in the discipline)
OPK-2.3 Analyzes the pharmacokinetics and pharmacodynamics of the studied objects based on knowledge of morphofunctional features, physiological states and pathological processes in the body	<p>Knows about morphofunctional features, physiological states and pathological processes in the body.</p> <p>Can to analyze the pharmacokinetics and pharmacodynamics of the objects under study based on knowledge of morphofunctional features, physiological states and pathological processes in the body.</p> <p>Owens the ability to analyze the pharmacokinetics and pharmacodynamics of the objects under study based on knowledge of morphofunctional features, physiological states and pathological processes in the body.</p>

Professional competencies of graduates and indicators of their achievement:

Competency code and name (result of mastering)	Code and name of the competency indicator
PC-4 Able to understand and analyze, and apply the principles of cellular and tissue organization of biological objects, biochemical and molecular-biological mechanisms of the development of pathological processes in cells and tissues of the human body to preserve the health of the population	PC-4.1 Analyzes biochemical and molecular-biological mechanisms of development of pathological processes in cells and tissues of the human body and applies the principles of cellular organization of biological objects
	PC-4.2 Understands the biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body
	PC-4.3 Understands and investigates the physical processes underlying the functioning of the body in normal and pathological conditions, understands the influence of physical factors on the functioning of biological systems, is able to study the physical structure of biologically important molecules in order to identify the relationship between the structure of substances and their biological activity
	PC-4.4 Able to develop and apply health-saving technologies
PC-1 is able to carry out fundamental and applied projects to study physiological processes and phenomena occurring at the molecular, cellular, organ and systemic levels in the human and animal bodies	PC-1.1 Investigates the mechanisms of molecular interaction of cells, tissues and functional systems of organisms, studies the physiological processes occurring in them
	PC-1.2 Uses methods of molecular-genetic, cellular and physiological research to study physiological processes in the body

Code and name of the competency indicator	Name of the assessment indicator (the result of learning in the discipline)
PC-4.1 Analyzes biochemical and molecular-biological mechanisms of development of pathological processes in cells and tissues of the human body and applies the principles of cellular organization of biological objects	Knows biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body. Can apply the principles of cellular organization of biological objects. Owns skills of determining the biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body.
PC-4.2 Understands the	Knows

<p>biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body</p>	<p>biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body.</p> <p>Can to apply biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body.</p> <p>Owens skills in the use of biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body</p>
<p>PC-4.3 Understands and investigates the physical processes underlying the functioning of the body in normal and pathological conditions, understands the influence of physical factors on the functioning of biological systems, is able to study the physical structure of biologically important molecules in order to identify the relationship between the structure of substances and their biological activity</p>	<p>Knows the physical structure of biologically important molecules and the physical processes underlying their functioning.</p> <p>Can determine the relationship between the physical structure and properties and the functions that perform them in the body.</p> <p>Owens skills in the study of the physical structures of biologically important molecules and the physical processes underlying their functioning</p>
<p>PC-4.4 Able to develop and apply health-saving technologies</p>	<p>Knows technologies aimed at preserving the health of the population.</p> <p>Can apply health-saving technologies.</p> <p>Owens Ability to develop health-saving technologies</p>
<p>PC-1.1 Investigates the mechanisms of molecular interaction of cells, tissues and functional systems of organisms, studies the physiological processes occurring in them</p>	<p>Knows interactions of cells, tissues and functional systems of organisms.</p> <p>Can distinguish between the physiological processes that take place in cells and tissues.</p> <p>Owens skills in studying the mechanisms of molecular interaction of cells, tissues and functional systems of organisms.</p>
<p>PC-1.2 Uses methods of molecular-genetic, cellular and physiological research to study physiological processes in the body</p>	<p>Knows methods of molecular-genetic, cellular and physiological research.</p> <p>Can apply methods of molecular-genetic, cellular and</p>

	physiological research. Owns methods of molecular-genetic, cellular and physiological research
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II. Labor intensity of the discipline and types of training in the discipline

The total labor intensity of the discipline is 3 credit units (108 academic hours), (1 credit corresponds to 36 academic hours).

The types of training and work of the student in the discipline are:

Designation	Types of Study Sessions and Student Work
Mild	Lecture
Lex electric.	
Ave	Practical exercises
Pp electric.	
Lab	Labs
WED:	Student's independent work during the period of theoretical training And other types of work

III. Structure of the discipline

The form of study is full-time.

№	Section Name Discipline	S e m e s t e r	Number of hours by type of training and work of the student						Forms of intermediate attestation
			Mild	Lab	Ave	OK	WE D	Contr ol	
1	Topic 1. Introduction to Immunology. Structural and Functional Organization of the Immune System	6	1	1	7	-	7	-	Questions for the test
2	Topic 2. Innate Immunity		5	5	7	-	7	-	Questions for the test
3	Topic 3. Adaptive Immunity		5	5	7	-	7	-	Questions for the test

4	Topic 4. Humoral immunity. Immunological memory. Cell-mediated immunity		5	5	7	-	7	-	Questions for the test
5	Topic 5. The Relationship between the Mechanisms of Innate and Adaptive Immunity		2	2	8	-	8	-	Questions for the test
Total:		6	18	18	36	-	36	-	Credit

IV. CONTENT OF THE THEORETICAL PART OF THE COURSE

Lectures

Topic 1. Introduction to Immunology. Structural and Functional Organization of the Immune System

History of Immunology

Organs of the immune system

Purpose of the immune system

The Basic Workings of Immunity

Topic 2. Innate Immunity

Myeloid cells as the basis of innate immunity.

Recognition of the Alien in the Innate Immune System.

Cellular mechanisms of innate immunity.

Contribution of Lymphoid Cells to Innate Immunity. Natural killers.

Humoral Factors of Innate Immunity.

Topic 3. Adaptive Immunity

Molecules that recognize antigens.

Antigens.

Lymphoid cells.

Organs of the immune system.

Activation of lymphocytes and triggering of the immune response.

Immune response.

Topic 4. Humoral immunity. Immunological memory. Cell-mediated immunity

Immune response via the humoral pathway

Structure and types of antibodies

Genetic Mechanisms of Antibody Diversity

Immunological memory.

Serological phenomena of antibody-antigen interaction (precipitation and agglutination)

Cellular Immune Response

Immune response through the cellular pathway.

Biological Role and Mechanism of Cytotoxicity and Apopt.

Topic 5. The Relationship between the Mechanisms of Innate and Adaptive Immunity

Links of the innate and adaptive immune response of the immune system

Signal transduction between adaptive and innate immune cells

The role of cytokines in the regulation of the immune response.

V. THE CONTENT OF THE PRACTICAL PART OF THE COURSE AND INDEPENDENT WORK

Practical exercises

Section 1 Introduction to Immunology. Structural and Functional Organization of the Immune System

Structural and functional organization of the immune system. Study of the structural organization of the immune system. Organs, tissues, cells, molecules, and the functional organization of the immune system. Immunity factors.

Section 2 Innate Immunity

Receptor surface molecules of innate immune cells. Signaling cascades of cytotoxicity and activation of the innate immune response.

Section 3 Adaptive Immunity

Receptor surface molecules of adaptive immunity cells. Signaling cascades of cytotoxicity and activation of the innate immune response. Antibody production.

Section 4 Humoral Immunity. Immunological memory. Cell-mediated immunity

Assembly of antibodies in the cell. Extraction of antibodies from B lymphocytes. Selection of T and B lymphocytes.

Section 5 Relationship between the Mechanisms of Innate and Adaptive Immunity

Analysis of the strategy of the immune response in various infectious diseases. Inflammation. Immunological surveillance of carcinogenic cells.

Labs

Topic No. 1: Introduction to Immunology. Structural and functional organization of the immune system.

Topic No. 2 Innate immunity.

Topic No. 3 Adaptive immunity.

Topic No. 4 Humoral immunity. Immunological memory. Cellular immunity.

Topic No. 5 Relationship between the mechanisms of innate and adaptive immunity.

Self-paced work

Sample essay topics:

1. Merits of Russian scientists in the development of immunology
2. Immunological memory and its role.
3. Myeloid cells as the basis of innate immunity.
4. Innate immune cells.
5. Humoral factors of innate immunity.
6. Modern vaccines.
7. Immunoprophylaxis.
8. Methods of studying various parts of the immune system.
9. Phagocytosis.
10. Complement system.
11. Cytokines.
12. Genomic organization of the main histocompatibility complex and its antigens.
13. Mechanisms of formation of antigenic diversity of antibodies and antigen-recognition receptors.
14. Monoclonal antibodies: production and application.

VI. MONITORING THE ACHIEVEMENT OF THE COURSE OBJECTIVES

Item No.	Supervised sections/topics of the discipline	Code and name of the indicator of achievement	Learning Outcomes	Evaluation Tools	
				Current control	Intermediate Certification
1.	Topic 1. Introduction to Immunology. Structural and Functional Organization of the Immune System	OPK-2.3 Analyzes the pharmacokinetics and pharmacodynamics of the studied objects based on knowledge of morphofunctional features, physiological states and pathological processes in the body	<p>Knows about morphofunctional features, physiological states and pathological processes in the body.</p> <p>Can to analyze the pharmacokinetics and pharmacodynamics of the objects under study based on knowledge of morphofunctional features, physiological states and pathological processes in the body.</p> <p>Owns the ability to analyze the pharmacokinetics and pharmacodynamics of the objects under study based on knowledge of morphofunctional features, physiological states and pathological processes in the body.</p>	Test	Questions for the test
		PC-4.1 Analyzes biochemical and molecular-biological mechanisms of development of pathological processes in cells and tissues of the human body and applies the principles of cellular organization of biological objects	<p>Knows biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body.</p> <p>Can apply the principles of cellular organization of biological objects.</p> <p>Owns skills of determining the biochemical and molecular-biological mechanisms of the development of</p>		

			pathological processes in the cells and tissues of the human body.		
2.	Topic 2. Innate Immunity	PC-4.2 Understands the biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body	<p>Knows biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body.</p> <p>Can to apply biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body.</p> <p>Owens skills in the use of biochemical and molecular-biological mechanisms of the development of pathological processes in the cells and tissues of the human body</p>	At thePoll	Questions for the test
		PC-4.3 Understands and investigates the physical processes underlying the functioning of the body in normal and pathological conditions, understands the influence of physical factors on the functioning of biological systems, is able to study the physical structure of biologically important molecules in	<p>Knows the physical structure of biologically important molecules and the physical processes underlying their functioning.</p> <p>Can determine the relationship between the physical structure and properties and the functions that perform them in the body.</p> <p>Owens skills in the study of the physical structures of biologically</p>		

		order to identify the relationship between the structure of substances and their biological activity	important molecules and the physical processes underlying their functioning		
3	Topic 3. Adaptive Immunity	PC-4.4 Able to develop and apply health-saving technologies	Knows technologies aimed at preserving the health of the population. Can apply health-saving technologies. Owns Ability to develop health-saving technologies	At the Poll	Questions for the test
4	Topic 4. Humoral immunity. Immunological memory. Cell-mediated immunity	PC-1.1 Investigates the mechanisms of molecular interaction of cells, tissues and functional systems of organisms, studies the physiological processes occurring in them	Knows interactions of cells, tissues and functional systems of organisms. Can distinguish between the physiological processes that take place in cells and tissues. Owns skills in studying the mechanisms of molecular interaction of cells, tissues and functional systems of organisms.	Test	Questions for the test

5	Topic 5. The Relationship between the Mechanisms of Innate and Adaptive Immunity	PC-1.2 Uses methods of molecular-genetic, cellular and physiological research to study physiological processes in the body	<p>Knows methods of molecular-genetic, cellular and physiological research.</p> <p>Can apply methods of molecular-genetic, cellular and physiological research.</p> <p>Owens methods of molecular-genetic, cellular and physiological research</p>	Test	Questions for the test
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VII. EDUCATIONAL AND METHODOLOGICAL SUPPORT OF STUDENTS' INDEPENDENT WORK

Guidelines for writing and formatting an abstract

Abstracting of educational and scientific literature involves an in-depth study of individual scientific works, which should ensure the development of the necessary skills for working on the book. All this will contribute to the expansion of scientific horizons, the improvement of their theoretical training, and the formation of scientific competence.

Textbooks, individual monographic studies and articles on issues provided for by the program of the academic discipline are offered for abstracting. When selecting literature on the chosen issue, it is necessary to cover the most important areas of development of this science at the present stage. Particular attention should be paid to those literary sources that (directly or indirectly) can help the specialist in his practical activities. However, this section also includes works and individual studies on issues that go beyond the discipline being studied. It is recommended to use this literature if you want to expand your knowledge in any branch of science.

Along with literature on general issues, students are supposed to read literature taking into account the profile of their professional activity, obtained independently. Not all the proposed literature is equal in content and volume, so different approaches to its study are possible. In one case, it can be a general abstract of several literary sources of different authors devoted to the consideration of the same issue, in the other case, it can be a detailed study and abstract of one of the recommended works or even its separate sections, depending on the degree of complexity of the issue (problematic). In order to decide what to do in each case, you should consult with the teacher.

The choice of a specific work for the abstract should be preceded by a detailed acquaintance with the list of all literature given in the curriculum of the discipline. It is recommended to first familiarize yourself with the selected work by looking at the subheadings, highlighted texts, diagrams, tables, and general conclusions. Then it is necessary to read it carefully and thoughtfully (delving into the ideas and methods of the author), making notes on a separate sheet of paper about the main provisions and key issues. After reading, you should think over the content of the article or a separate chapter, paragraph (if we are talking about a monograph) and briefly write it down. Only strict definitions and formulations of laws should be written out verbatim. Sometimes it's helpful to include one or two examples to illustrate. In the event that there are unclear passages, it is recommended to read the following exposition, as it can help to understand the previous material, and then return to the comprehension of the previous exposition.

The result of the work on literary sources is an abstract.

When preparing an abstract, it is necessary to highlight the most important theoretical provisions and substantiate them independently, paying attention not only to the result, but also to the methodology used in the study of the problem. Reading scientific literature should be critical. Therefore, it is necessary to strive not only to assimilate the main content, but also the method of proof, to reveal the features of different points of view on the same issue, to assess the practical and theoretical significance of the results of the reviewed work. A very desirable element of the abstract is the expression by the listener of his own attitude to the ideas and conclusions of the author, supported by certain arguments (personal experience, statements of other researchers, etc.).

As mentioned above, abstracts of monographs and journal articles of a research nature must contain a definition of the problem and specific objectives of the research, a description of the methods used by the author, as well as the conclusions that he came to as a result of the research. The proposed literature for abstracting is constantly updated.

Instructions for writing essays:

General requirements for the abstract:

The abstract should be written according to the standard scheme, including:

- Title page
- contents
- introduction
- Main part
- Conclusion of the E
- List of references.

It is desirable to include tables and (or) figures in the text of the abstract: diagrams, graphs. The volume of the abstract: 10-20 pages of A4 format computer layout in the Times New Roman editor, with 1.5 intervals, in 14 fonts. The title of the topic of the essay should fully correspond to the chosen option.

The structure of the abstract should meet the standard requirements for writing essays: introduction, justification for the choice of topic, presentation of the topic, conclusion. More detailed requirements for the written design of the abstract are presented in the Procedure "Requirements for the design of written works performed by FEFU students and listeners" http://law.wl.dvgu.ru/docs/treb_2012.pdf

Approximate list of abstract topics:

1. Mechanisms of energy production in mitochondria.
2. The liver is its role in the human body.
3. Alcoholism and drug addiction are metabolic disorders.
4. Influence of trace elements on enzyme activity.

5. Metabolic connections of the Krebs cycle.
6. Types of jaundice.
7. Biotransformation of xenobiotics in the body.
8. Cholesterol fund in the human body and ways of its consumption.
9. Biological role of iron, molybdenum and zinc.

Criteria and Indicators Used in the Evaluation of the Educational Essay

Criteria	Indicators
1. Novelty of the abstracted text Max. – 5 points	- relevance of the problem and topic;- novelty and independence in the formulation of the problem, in the formulation of a new aspect of the problem selected for analysis;- the presence of the author's position, independence of judgments.
2. Degree of disclosure of the essence of the problem Max. – 5 points	- correspondence of the plan to the topic of the abstract;- correspondence of the content to the topic and plan of the abstract;- completeness and depth of disclosure of the main concepts of the problem;- validity of ways and methods of working with the material;- ability to work with literature, systematize and structure the material;- ability to generalize, compare different points of view on the issue under consideration, argue the main provisions and conclusions.
3. Reasonableness of the choice of sources Max. – 5 points	- the range and completeness of the use of literary sources on the problem;- attraction of the latest works on the problem (journal publications, materials of collections of scientific papers, etc.).
4. Compliance with Registration Requirements Max. – 5 points	- correct formatting of references to the literature used;- literacy and culture of presentation;- knowledge of terminology and conceptual apparatus of the problem;- compliance with the requirements for the volume of the abstract;- culture of design: highlighting paragraphs.
5. Literacy Max. - 5 points	- absence of spelling and syntax errors, stylistic errors;- absence of typos, abbreviations of words, except for generally accepted ones;- literary style.

Guidelines for Maintenance, Submission Requirements and Criteria for Evaluating the Outline

A synopsis (from the Latin conspectus – review) is a written text in which the content of the main source of information is briefly and consistently stated. To take notes is to bring to some order the information gleaned from the original. The process is based on the systematization of what has been read or heard. Notes can be made both in the form of precise excerpts, quotations, and in the form of a free presentation of meaning. The manner of writing the synopsis, as a rule, is close to the style of the original source. If the synopsis is written correctly, it should reflect the logic and semantic connection of the information being recorded.

In well-made notes, it is easy to find specialized terminology that is clearly explained and clearly highlighted for memorizing the meanings of various words.

Using the outline information, it is easier to create meaningful creative or scientific works, various essays and articles.

Note-taking rules

1. Read the text carefully. Along the way, mark incomprehensible places, new words, names, dates.
2. Make inquiries about the persons and events mentioned in the text. When recording, do not forget to put reference data in the fields.
3. When reading the text for the first time, make a simple outline. When re-reading, try to summarize the main points of the text, noting the author's arguments.
4. The final stage of note-taking consists of re-reading the previously marked passages and writing them down consecutively.
5. When taking notes, you should try to express the author's thought in your own words.
6. Strive to ensure that one paragraph of the author's text is conveyed in one, maximum two sentences.

When taking notes of lectures, it is recommended to adhere to the following basic rules.

1. Do not start writing down the material from the first words of the teacher, first listen to his thought to the end and try to understand it.
2. Start writing at the moment when the teacher, having finished the presentation of one idea, begins to comment on it.
3. In the synopsis, it is necessary to highlight individual parts. It is necessary to distinguish between headings, subheadings, conclusions, to separate one topic from another. Selection can be done with an underline or a different color (just don't turn the text into colorful pictures). It is recommended to indent paragraphs and points of the plan, white lines to separate one thought from another, and numbering. If definitions, formulas, rules, and laws can be made more visible in the text, they are framed. Over time, you'll have your own selection system.
4. Create your entries using accepted conventions. When taking notes, be sure to use a variety of signs (they are called signal signs). These can be pointers and directional arrows, exclamation and question marks, combinations PS (afterword) and NB (pay attention). For example, you can denote the word "therefore" with a mathematical arrow \Rightarrow . Once you've developed your own character set, it's easier and faster to create an outline and then study it.
5. Don't forget about abbreviations (abbreviated words), equal and inequality signs, more and less.
6. Abbreviations are very useful for creating a correct outline. Be careful, though. Connoisseurs believe that abbreviations such as "d-t" (to think) and similar

ones should not be used, since later a large amount of time is spent on deciphering, and after all, the reading of the synopsis should not be interrupted by extraneous actions and reflections. The best thing to do is to develop your own system of abbreviations and use them to denote the same words (and nothing else) in all entries. For example, the abbreviation "g-t" will always and everywhere be the word "to speak," and the capital "P" will be the word "work."

7. Undoubtedly, foreign words will help to organize a good synopsis. The most common among them are English. For example, the abbreviated "ok" successfully denotes the words "excellent", "wonderful", "good".

8. Complex and lengthy reasoning should be avoided.

9. When taking notes, it is better to use declarative sentences, avoid independent questions. Questions are appropriate in the margins of the outline.

10. Do not try to record the material verbatim, in this case the main idea is often lost, and it is difficult to keep such a record. Discard secondary words, without which the main idea is not lost.

11. If there are terms in the lecture that you do not understand, leave a place, clarify their meaning with the teacher after the lesson.

Evaluation criteria:

86-100 points are given to the student if the abstract is presented in the most understandable form, has a plan, schemes and drawings in the structure, reveals all the basic concepts and questions given above;

76-85 points are given to the student if the abstract is presented in a sufficiently understandable form, has schemes and/or drawings in the structure, reveals more than half of the main concepts and questions;

75-61 points are given to the student if the abstract is presented in a relatively understandable form and reveals half of the main concepts and questions;

60-50 points are given to the student if the outline is presented in an incomprehensible form and reveals less than half of the main concepts and questions.

VIII. LIST OF REFERENCES AND INFORMATIONAL AND METHODOLOGICAL SUPPORT OF THE DISCIPLINE

Reference citations

1. Anokhina N. V. Obshchaya i klinicheskaya immunologiya: uchebnoe posobie [General and clinical immunology: textbook]. — 2nd ed. — Saratov : Nauchnaya kniga, 2019. — 159 c. — ISBN 978-5-9758-1755-6. — Text : electronic // Digital educational resource IPR SMART : [site]. — URL: <https://www.iprbookshop.ru/81032.html>

2. Churilov L. P., Vasil'ev A. G. Patophysiology of the Immune System: Textbook. St. Petersburg: Foliant, 2014. — 664 c. — ISBN 978-5-93929-251-1. — Text : electronic // Digital educational resource IPR SMART : [site]. — URL: <https://www.iprbookshop.ru/60938.html>

3. Zamorina S. A., Raev M. B., Khramtsov P. V. Immunology: myeloid suppressor cells: textbook. — Perm: Perm State National Research University, 2019. — 88 c. — ISBN 978-5-7944-3413-2. — Text : electronic // Digital educational resource IPR SMART : [site]. — URL: <https://www.iprbookshop.ru/123058.html>

4. Novikov D. K., Novikov P. D., Titova N. D. Klinicheskaya immunologiya i allergologiya: uchebnik [Clinical immunology and allergology: textbook]. - Minsk: Vysheishaya shkola, 2019. — 496 c. — ISBN 978-985-06-3057-5. — Text : electronic // Digital educational resource IPR SMART : [site]. — URL: <https://www.iprbookshop.ru/119986.html>

5. Clinical Immunology, Allergology. Basic Methods: Practicum / compiled by E. V. Saidakova. — Perm: Perm State National Research University, 2020. — 40 p. — Text : electronic // Digital educational resource IPR SMART : [site]. — URL: <https://www.iprbookshop.ru/123059.html>

6. Markova M. P. Osnovy immunologii: uchebno-metodicheskoe posobie [Fundamentals of immunology: educational and methodological manual]. - Tula: Tula State Pedagogical University named after L.N. Tolstoy, 2021. — 47 c. — ISBN 978-5-6047371-8-7. — Text : electronic // Digital educational resource IPR SMART : [site]. — URL: <https://www.iprbookshop.ru/119705.html>

7. Zemskov A.M., Zemskov V.M., Zemskova V.A. Klinicheskaya immunologiya i allergologiya: uchebnik [Clinical immunology and allergology: textbook]. Moscow: INFRA-M, 2023. — 420 p. + Add. materials [Elektronnyi resurs]. — (Higher education: Specialist). — DOI 10.12737/1048793. - ISBN 978-5-16-015737-5. - Text : electronic. - URL: <https://znanium.com/catalog/product/1048793>

8. Mechnikov, I. I. Immunology. Selected works / I. I. Mechnikov. - Moscow: Yurayt Publishing House, 2023. — 274 p. — (Anthology of Thought). — ISBN 978-5-534-12700-3. — Text : electronic // Educational platform Urait [site]. — URL: <https://urait.ru/bcode/514419>

Further reading

1. Martin, S. J., Delves, P. J., Roitt, I. M., Burton, D. R. (2017). Essential Immunology. Великобритания: Wiley.

2. Paul, W. E. (2013). Fundamentals of Immunology. Великобритания: Wolters Kluwer Health.

3. Malik, V. S. (2013). Antibody Techniques. United States of America: Elsevier Science.

4. Abbas, A. K., Pillai, S., Lichtman, A. H. (2011). Cellular and Molecular Immunology E-Book. Великобритания: Elsevier Health Sciences.

List of resources of the information and telecommunication network "Internet"

1. <http://elibrary.ru/> - Scientific Electronic Library
2. <http://science.km.ru/> - electronic resource on different sections of biology
3. <http://elementy.ru/> is an informational and educational resource dedicated to natural sciences.
4. <http://www.iprbookshop.ru/> is the IPRbooks electronic library system.
5. <http://znanium.com/> - EBS "Znanium".
6. <https://nplus1.ru/> - N+1, a popular science online publication about science, engineering and technology
7. <http://antropogenez.ru/> is a popular science information resource about human evolution
8. <http://web.a.ebscohost.com/ehost/search/basic?sid=851485f8-6200-4b3e-aaab-df4ba7be3576@sessionmgr4008&vid=1&tid=2003EB> is a collection of books on various sections from the EBSCOhost database.
9. <http://rosalind.info/problems/locations/> - resource for self-study of bioinformatics Rosalind.
10. <http://www.ncbi.nlm.nih.gov/> website of the National Center for Biotechnology Information (NCBI).
11. <http://www.mendeley.com/> - Mendeley: Free reference manager and PDF organizer; Librarian Program.
12. [http:// www.ebi.ac.uk](http://www.ebi.ac.uk) – website of the European Bioinformatics Institute
13. [http:// www.scopus.com](http://www.scopus.com) – Scopus bibliographic database and citation index
14. <http://thomsonreuters.com/thomson-reuters-web-of-science/> Web of Science bibliographic database and citation index

List of information technologies and software

1. Microsoft Office Professional Plus 2013 is an office suite that includes software for working with various types of documents (texts, spreadsheets, databases, etc.);
2. 7Zip 16.04 is a free file archiver with a high compression ratio;

3. Adobe Acrobat XI Pro – a software package for creating and viewing electronic publications in PDF format;
4. AutoCAD Electrical 2015 – three-dimensional computer-aided design and drafting system;
5. ESET Endpoint Security 5 – comprehensive protection for Windows-based workstations. Virtualization support + new technologies;
6. WinDjView 2.0.2 – a program for recognizing and viewing files with the same DJV and DjVu formats; SolidWorks 2016 is a CAD software package for automating the work of an industrial enterprise at the stages of design and technological preparation of production
7. Compass-3D LT V12 – Three-Dimensional Simulation System
8. Notepad++ 6.68 – Text Editor

IX. METHODOLOGICAL INSTRUCTIONS FOR MASTERING THE DISCIPLINE

Lecture

A lecture is the main active form of classroom classes, an explanation of the fundamental and most difficult theoretical sections of molecular biology and the theory of genetic engineering, which involves intensive mental activity of the student and is especially important for mastering the subject. A lecture should always be cognitive, developmental, educational and organizing. Lecture notes help to assimilate the theoretical material of the discipline. When listening to a lecture, you need to Take notes of the main information, preferably with your own wording, which allows you to remember the material better. An outline is useful when it is written by the student independently.

In the lecture, the teacher gives only a small part of the material on certain topics that are presented in the textbooks. In addition, the instructor informs students about what additional information can be obtained on the topics discussed, and from what sources. Therefore, when working with lecture notes, it is always necessary to use the main textbooks, additional literature and other recommended sources on this discipline. It is this serious work of the student with the lecture material that allows him to achieve success in mastering new knowledge.

To present a lecture course on the discipline "Immunology" as forms of active learning, the following are used: lecture-conversation, lecture-visualization, which are built on the basis of knowledge received by students in the framework of subjects preceding the course. Electronic presentations, tables, video files, and blackboard diagrams are used to illustrate verbal information. In the course of the lecture material, problematic questions or questions with elements of discussion are posed.

Lecture – visualization

The lecture is accompanied by the demonstration of tables, electronic presentations, video files - such a combination of ways of presenting information significantly simplifies its mastering by students. Verbal presentation of the material should be accompanied and combined with the visual form. The information presented in the form of diagrams on the board, tables, slides allows you to form problematic questions, and contribute to the development of professional thinking of future specialists.

Lecture-conversation

Lecture-conversation, "dialogue with the audience", is the most common form of active learning and allows students to be involved in the educational process, since there is direct contact between the teacher and the audience. Such contact is achieved during the lecture, when students are asked questions of a problematic or informational nature, or when they are invited to ask the teacher questions themselves. Questions are offered to the entire audience, and any of the students can offer their own answer; another can complement it. In the course of the educational process, this allows you to identify the most active students and activate those who do not participate in the work. This form of lecture allows you to involve students in the work process, attract their attention, stimulate thinking, gain collective experience, and learn how to form questions. The advantage of a lecture-conversation is that it allows you to draw students' attention to the most important issues of the topic, determine the content and pace of the presentation of educational material, as well as determine the topics that are most interesting to students, in order to possibly adjust the form of the material taught.

An extended conversation involves the preparation of students on each issue of the lesson plan with a single list of recommended mandatory and additional literature. Reports are prepared by students on a pre-proposed topic.

A dispute in a group has a number of advantages. A dispute can be caused by the teacher during the lesson or planned by him in advance.

Press conference. The teacher assigns several students to prepare short (thesis) reports. After the presentations, students ask questions, which are answered by the speakers and other members of the expert group. Based on the questions and answers, a creative discussion unfolds together with the teacher.

Case study method. The case-study method is a method of active problem-situational analysis based on learning by solving specific problems (case solving). The method of specific situations (case-study method) refers to non-game imitation active teaching methods and is considered as a tool that allows you to apply theoretical knowledge to solving practical problems. At the end of the lesson, the teacher tells a series of situations and offers to find solutions for those problems that

are voiced in them. At the same time, the problem itself does not have unambiguous solutions. Students must analyze the situation, understand the essence of the problems, propose possible solutions and choose the best one. Thanks to the knowledge gained at the lecture, it is easy for the student to correlate the theoretical knowledge received with a real practical situation. As an interactive teaching method, it gains a positive attitude from students, who see it as an opportunity to take the initiative, feel independent in mastering theoretical provisions and mastering practical skills. No less important is the fact that the analysis of situations has a strong impact on the professionalization of students, contributes to their maturation, forms interest and positive motivation for learning. The method is aimed not so much at mastering specific knowledge or skills, as at developing the general intellectual and communicative potential of the student and the teacher.

It is a learning method designed to improve skills and gain experience in the following areas:

- identifying, selecting and solving problems;
- working with information – comprehending the meaning of the details described in the situation;
- analysis and synthesis of information and arguments;
- working with assumptions and conclusions;
- evaluation of alternatives;
- decision-making;
- Listening to and understanding other people is a group work skill. The main function of the case method is to teach students to solve complex unstructured problems that cannot be solved in an analytical way. The case activates students, develops analytical and communicative skills, leaving students face to face with real situations.

The case study is designed to increase the effectiveness of educational activities: as an illustration for solving a certain problem, explaining a particular phenomenon, studying the features of its manifestations in real life, developing competence aimed at solving various life and work situations (the use of the case involves individual and group work of students).

Brainstorming is a widely used way of generating new ideas to solve scientific and practical problems. Its goal is to organize collective thinking to find non-traditional ways to solve problems.

The use of the brainstorming method in the educational process allows you to solve the following tasks:

- creative assimilation of educational material by students;
- connection of theoretical knowledge with practice;

- • activation of educational and cognitive activities of students;
- formation of the ability to concentrate attention and mental efforts on the solution of an urgent task;
- formation of the experience of collective thinking activity.

The problem formulated in the brainstorming class should have theoretical or practical relevance and arouse the active interest of students. A common requirement that must be taken into account when choosing a problem for brainstorming is the possibility of many ambiguous solutions to the problem, which is put forward to students as a learning task.

Quizzes & Testing

Current control of material assimilation is assessed by oral answers, tests, as well as paper testing.

Assessments of laboratories, colloquiums, tests and testing mainly form the grade for this discipline.

LOGISTICAL SUPPORT FOR DISCIPLINE

Training sessions on the discipline are held in rooms equipped with appropriate equipment and software.

The list of logistical and software of the discipline is given in the table.

Logistical and software of the discipline

Name of special rooms and rooms for independent work	Equipment special rooms and rooms for self-study	List of licensed software. Details of the supporting document
690922, Primorsky Krai, Vladivostok, Russky Island, Saperny Peninsula, Ajax village, 10, aud. M 605	Multimedia audience: Electric Screen 236*147cm Trim Screen Line; DLP Projector, 3000 ANSI Lm, WXGA 1280x800, 2000:1 EW330U Mitsubishi; CORSA-2007 Tuarex Specialized Equipment Fastening Subsystem; Video Switching Subsystem: Extron DXP 44 DVI Pro DVI Matrix Switcher; Extron DVI 201 Tx/Rx twisted-pair DVI extender Audio switching and sound amplification subsystem; Extron SI 3CT LP ceiling mount speaker system; Extron DMP 44 LC Digital Audio Processor; Extension for IPL T CR48 control controller; Wireless LAN for students is provided by a system based	-

	<p>on 802.11a/b/g/n 2x 2 MIMO (2SS) access points.</p> <p>Моноблок HP ProOne 400 All-in-One 19.5 (1600x900), Core i3-4150T, 4GB DDR3-1600 (1x4GB), 1TB HDD 7200 SATA, DVD+/-RW, GigEth, Wi-Fi, BT, usb kbd/mse, Win7Pro (64-bit) +Win8.1Pro(64-bit), 1-1-1 Wty</p>	
<p>690922, Primorsky Krai, Vladivostok, Russky Island, Saperny Peninsula, Ajax village, 10, aud. M 422</p>	<p>Multimedia audience:</p> <p>HP ProOne 400 G1 AiO 19.5" Intel Core i3-4130T 4GB DDR3-1600 SODIMM (1x4GB)500GB; Projection screen Projecta Elpro Electrol, 300x173 cm; Multimedia projector, Mitsubishi FD630U, 4000 ANSI Lumen, 1920x1080; Mortise interface with TLS TAM 201 Stan automatic cable retraction; Avervision CP355AF visualizer; Sennheiser EW 122 G3 UHF microphone lavalier radio system consisting of wireless microphone and receiver; Video conferencing codec LifeSizeExpress 220- Codeonly-Non-AES; Multipix MP-HD718 Network Video Camera; Two 47" Full HD LG M4716CCBA LCD panels; Audio switching and sound reinforcement subsystem; Centralized uninterrupted power supply</p>	-
<p>690922, Primorsky Krai, Vladivostok, Russky Island, Saperny Peninsula, Ajax village, 10, aud. M 627</p>	<p>Light microscope Carl Zeiss GmbH Primo Star 3144014501 (13 pcs.); Light microscope with digital camera Altami BIO8 (2 pcs.).</p>	-
<p>Computer class of the School of Biomedicine aud. M723, 15 workplaces</p>	<p>Electric Screen 236*147cm Trim Screen Line; DLP projector, 3000 ANSI Lm, WXGA 1280x800, 2000:1 EW330U Mitsubishi; CORSA-2007 Tuarex Specialized Equipment Fastening Subsystem; Video Switching Subsystem: Extron DXP 44 DVI Pro DVI Matrix Switcher; Extron DVI 201 Tx/Rx twisted-pair DVI extender Audio switching and sound amplification subsystem; Extron SI 3CT LP Ceiling Mount Speaker System Extron DMP 44 LC Digital Audio Processor; extension for IPL T CR48 control controller; Wireless LAN for students is provided by a system based on 802.11a/b/g/n 2x2 MIMO(2SS) access points.</p>	-

	Monoblock HP RgoOpe 400 All-in-One 19.5 (1600x900), Core and3-4150T, 4GB DDR3-1600 (1x4GB), 1TB HDD 7200 SATA, DVD+/-RW, GigEth, Wi- Fi, VT, usb kbd/mse, Win7Pro (64-bit)+Win8.1Pro(64-bit), 1-1-1 Wty	
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