FEDERAL STATE BUDGETARY
EDUCATIONAL INSTITUTION OF HIGHER EDUCATION
«AMUR STATE MEDICAL ACADEMY»
MINISTRY OF HEALTH OF THE RUSSIAN FEDERATION

AGREED
Vice-Rector for Academic Affairs,

_____N.V. Loskutova

April 17, 2025

Decision of the CCMC
April 17, 2025

Protocol No. 7

APPROVED
by decision of the Academic Council of the FSBEI HE Amur SMA of the Ministry of Health of the Russian Federation
April 22, 2025

Protocol No. 15

Acting Rector of the FSBEI HE Amur SMA of the Ministry of Health of the Russian Federation

_____I.V. Zhukovets

April 22, 2025

ДОКУМЕНТ ПОДПИСАН
ЭЛЕКТРОННОЙ ПОДПИСЬЮ

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EDUCATIONAL PROGRAM

discipline «IMMUNOLOGY»

Specialty: 31.05.01 General Medicine
Course: 2
Semester: 4
Total hours: 108 hrs.
Total credits: 3 credit units
Control form: credit-test, 4 semester

Blagoveshchensk, 2025

The educational program of the discipline is designed in accordance with the requirements of the Federal State Educational Standard of Higher Education - specialist in specialty 31.05.01 General Medicine, approved by order of the Ministry of Education and Science of Russia dated 08.12.2020 No. 988 (registered with the Ministry of Justice of Russia on 08.26.2020 No. 59493), BPEP HE (2021).

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Associate Professor _____ **I.Yu. Sayapina**

Conclusion of the Expert Commission on the review of the Educational Programs:
Protocol No. 3 dated April 9, 2025

Expert of the expert commission,
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APPROVED at the meeting of the CMC No.2: Protocol No. 7 dated April 10, 2025.
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Associate Professor _____ **I.Yu. Sayapina**

AGREED: Dean of the Faculty of Medicine,
Ph.D. of Medical Sciences _____ **N.G. Brush**
April 17, 2025

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1. EXPLANATORY NOTE

1.1. Characteristics of the discipline

Immunology as an independent scientific branch has currently moved to one of the central places among medical and biological disciplines and, according to the federal state educational standard of higher education (2020), is included in the basic part of the disciplines of specialty 31.05.01 General Medicine.

The increased interest in the problems of immunology in recent decades is determined by a number of factors. One of the features of the health of the population at present is a significant increase in pathology associated with disorders of the immune system (immunodeficiency states, allergic diseases, autoimmune diseases, tumor processes, infections of the immune system, etc.).

New knowledge and research methods developed in this branch of scientific knowledge are widely used in practical health care. The successes of immunology are associated with the solution of such problems as obtaining new highly effective diagnostic and therapeutic drugs using immunobiotechnology, overcoming infectious diseases using fundamentally new approaches (genetically engineered vaccines), deciphering the mechanisms of the most severe human diseases (immunodeficiencies, in particular AIDS, autoimmune, allergic diseases, cancer, infections, etc.). Great hopes are placed on hormones and mediators of the immune system, which are called the drugs of the future.

Considerable attention is paid to the study of the most pressing issues of medical immunology: genetic and cellular-molecular features of the functioning of various links of the immune system, lymphocyte receptors and mechanisms of intercellular interactions, genetic control of the immune response, genetics of tissue incompatibility, mechanisms of formation of immunological tolerance, structure and function of hormones and mediators of the immune system, development of immunodiagnostic methods, etc.

Thus, the achievements of immunology are widely used in medical practice. In this regard, knowledge of immunology will be in demand when studying clinical disciplines, and this knowledge is also necessary for future doctors for their professional activities.

This program involves the study of immunology, taking into account the achievements of genetics and molecular biology, on the one hand, and the needs of theoretical and practical medicine (surgery, oncology, obstetrics, therapy, etc.) on the other.

1.2. The purpose and objectives of the discipline

The purpose of teaching the discipline: deepening basic knowledge and forming systemic knowledge about the structure, general patterns of development and functioning of the body's immune system in normal conditions and in diseases caused by impaired immune mechanisms, as well as diagnostics of immunopathology using modern immunological research methods, and principles of treatment of immunopathology.

Objectives of teaching the discipline:

- to give students a complete and coherent understanding of immunology as a discipline in general, to form an understanding of the immune system as one of the important systems of the human body;
- consider the fundamental sections of general and specific immunology necessary for understanding the pathology of the immune system;
- to develop skills for assessing a person’s immune status, which are necessary for diagnosing immune disorders and establishing an immunological diagnosis;
- to provide modern ideas about the causes of development and pathogenesis of a number of pathologies of the immune system, principles of diagnosis and treatment of immunopathology;
- continue to develop skills in working with educational, scientific, reference medical literature and official statistical reviews, searching for information on the Internet.

1.3. The place of the discipline in the structure of the main professional educational program of higher education

In accordance with the Federal State Educational Standard of Higher Education (2020), the discipline "Immunology" belongs to Block 1, the basic part, and is taught in the 2nd year. The total workload of the discipline is 108 hours (3 credit units). Of these, 72 hours are classroom hours, 36 hours are allocated for independent work of students. The discipline is studied in the 4th semester. Type of control: credit in the 4th semester.

The discipline "Immunology" includes the following sections:

Section 1. General immunology ;

Section 2. Special immunology.

The first section of the discipline is devoted to the study of the fundamentals of immunology in its modern understanding, the main concepts of immunology (antigen, antibody, immunological recognition, etc.). The objective of this section is to study the subject of immunology as a whole, to study the phenomenology and mechanisms of innate and adaptive immunity, which until recently seemed incomparable in volume and significance; the mechanisms of hormonal and cytokine regulation of the immune response, the role of immune mechanisms in protection against two main manifestations of biological aggression - the infectious process and tumor growth, the features of transplant immunity, the immunology of reproduction, including the mechanisms of formation of immunological tolerance in the mother-fetus system are considered.

The second section of the discipline contains modern ideas about " costs" of immunity, mainly adaptive, in the form of breakdowns of the subtle mechanism of recognition of " self-or-other" with the development of autoaggression, as well as excessive manifestations of immune processes (hypersensitivity), causing damage to body tissues, and their insufficiency, manifested in the form of various immunodeficiencies. The issues concerning the direct application in practice of the principles and methods of immunology - immunodiagnostics, immunoprophylaxis and immunotherapy are presented. These rapidly developing areas of clinical immunology have not yet developed into mature sections of science, much in them is based on hasty conclusions dictated by practical demand, but they are extremely important and promising for medical education.

1.4. Requirements for students

To study the discipline, knowledge, skills and abilities formed by previous disciplines are necessary:
Latin language
Knowledge: basic medical and pharmaceutical terminology in Latin.
Skills: be able to apply knowledge for communication and obtaining information from medical literature.
Foreign language. Professional foreign language
Knowledge: Basic medical and pharmaceutical terminology foreign language.
Skills: be able to apply knowledge for communication and obtaining information from foreign sources.
Adaptive information and communication technologies
Knowledge: presentation creation rules, presentation creation programs. Internet browsers. Sites, pages, services, portals. Electronic libraries. Distance learning technologies
Skills: be able to use Internet resources for professional activities, process scientific research data using medical statistics methods
Chemistry. Biochemistry. Bioorganic chemistry in medicine
Knowledge : chemical and biological essence of processes occurring in a living organism at the molecular and cellular levels, structure and biochemical properties of the main classes of

biologically important compounds, the main metabolic pathways of their transformation, general principles of interaction of signaling molecules with their ligands, mechanisms of interaction of humoral factors with target cells.
Skills : be able to analyze the contribution of chemical processes to the functioning of the immune system, the contribution of biochemical processes to the functioning of the immune system systems interpret the results of the most common methods laboratory diagnostics to detect disorders in the immune system.
Biology
Knowledge: laws of genetics and its importance for medicine; patterns of heredity and variability in individual development as the basis for understanding the pathogenesis and etiology of hereditary and multifactorial diseases; the phenomenon of parasitism and bioecological diseases.
Skills: be able to analyze the patterns of heredity and variability in the development of immunopathology.
Story medicine
Knowledge: outstanding figures in medicine and healthcare, Nobel laureates, outstanding medical discoveries in the field of immunology.
Skills: be able to competently and independently present and analyze the contribution of domestic scientists to the development of immunology.
Philosophy
Knowledge: methods and techniques of philosophical analysis of problems; forms and methods scientific knowledge, their evolution, the applicability of the laws of dialectical materialism to medicine.
Skills: be able to competently and independently express, analyze forms and methods of scientific knowledge and laws of dialectical materialism in medicine.
Histology , embryology , cytology
Knowledge: embryogenesis and histological structure of the organs of the immune system, formation, structure and functions of immunocompetent cells (ICC).
Skills: justify age-related patterns of development of the immune system organs, the role of ICC in the immune response; analyze the results of histophysiological research, draw cells of the immune system, work with a light microscope, taking into account the rules of technology security.
Anatomy
Knowledge: Anatomical and physiological features of the immune system.
Skills: be able to analyze age- and gender-related features of the structure of the organs of the immune system.
Normal physiology
Knowledge: Neuroendocrine regulation of biological processes in the body human.
Physiology immune systems .
Skills : be able to analyze the importance of regulation of biological processes in the human body on the functioning of the immune system.
Topographical anatomy , operative surgery
Knowledge: structure, topography of some cells, tissues, organs and systems of the body in interaction with their function in norm and pathology.
Skills: be able to analyze the functional features of the immune system in normal and pathological conditions.
Safety life activities , medicine disasters
Knowledge: Sharp And chronic diseases from exposure to ionizing radiation radiation (radiation sickness).

Skills: Be able to analyze the impact of ionizing radiation on the functioning of the immune system and the development of immunopathology.

1.5. Interdisciplinary links with subsequent disciplines

No. p/p	Name of subsequent disciplines	Sections of the discipline necessary for studying subsequent disciplines	
		1. General immunology	2. Private immunology
1	Infectious diseases	+	+
2	Pediatrics	+	+
3	Pharmacology		+
4	Pathophysiology , clinical pathophysiology	+	+
5	Hygiene		+
6	Dermatovenereology	+	+
7	Oncology , radiation therapy	+	+
8	Phthisiology	+	+
9	Obstetrics and gynecology	+	+
10.	Faculty therapy	+	+
11.	Urgent conditions in therapy	+	+
12.	Propaedeutics internal diseases	+	
13.	Radiation diagnostics		+
13.	Hospital therapy	+	+

1.6 . Requirements for the results of mastering the discipline

The study of the discipline "Immunology" is aimed at the formation/improvement of the following competencies: universal (UC), general professional (GPC)

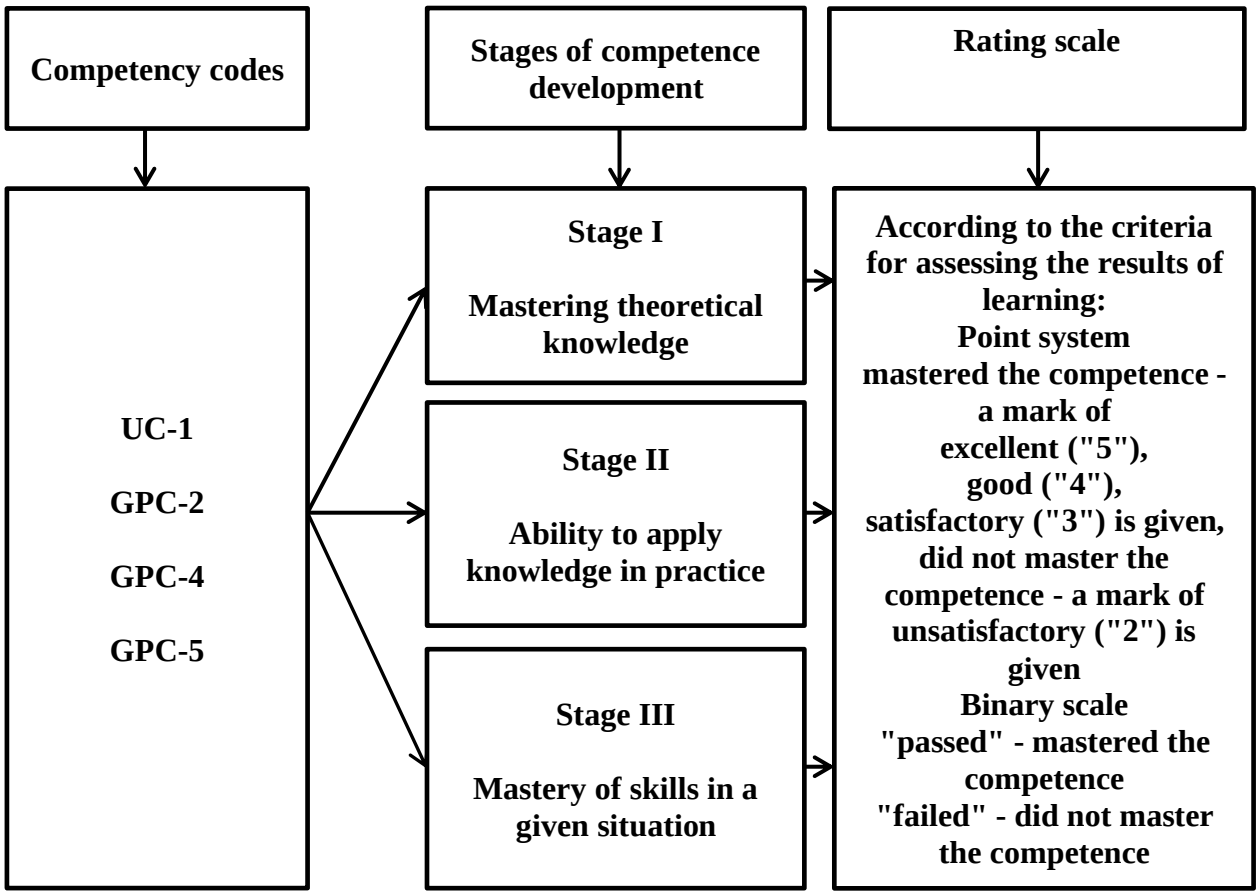
No. p/p	Code and name of competence	Code and the name of the indicator of achievement of competence
Universal competencies		
1	**UC-1** Capable of carrying out critical analysis of problematic situations based on a systems approach, develop a strategy of action	**ID UC-1.1.** Analyzes a problem situation as a system, identifying its components and the connections between them. **ID UC-1.2.** Identifies gaps in information needed to solve problem situations and designs processes to eliminate them . **ID UC-1.6.** Critically evaluates the reliability of information sources.
General professional competencies		
2	**GPC-2** Capable of conducting and monitoring the effectiveness of measures to prevent, promote a healthy lifestyle and educate the population about health and hygiene	**ID GPC-2.2.** Promotes a healthy lifestyle aimed at improving sanitary culture and preventing diseases of patients (the population); organizes events on sanitary and hygienic education and the formation of healthy lifestyle skills. **ID GPC-2.7.** Assesses the need for the use of drug and non-drug prophylaxis, natural healing factors and other methods aimed at preventing the occurrence of infectious and non-infectious diseases and eliminating the factors of their development.
	GPC-4 Capable of using medical devices provided for by the procedure for providing medical care, as well as conducting patient examinations to establish a diagnosis	**ID GPC-4.3.** Interprets the results of the most common methods of instrumental, laboratory and functional diagnostics, thermometry to identify pathological processes.

	GPC-5 Capable of assessing morphofunctional, physiological states and pathological processes in the human body to solve professional problems	**ID GPC-5.1.** Knows the functional systems of the human body, their regulation and self-regulation when interacting with the external environment under normal conditions and during pathological processes. **ID GPC-5.3.** Knows the indicators of the morphofunctional and physiological state of a healthy person and can measure/determine them. **ID GPC-5.4.** Uses indicators of morphofunctional, physiological state and pathological process to examine the human body in order to establish a diagnosis, prescribe treatment and monitor its effectiveness and safety.

Modules of the discipline and codes of the formed competencies

Item No.	Section name	Code of the competence being formed
1	General immunology	UC-1, GPC-2, GPC-4, GPC-5
2	Private immunology	UC-1, GPC-2, GPC-4, GPC-5

1.7 . Stages of competencies formation and description of assessment scales



1.8 Forms of organization of students' training

Forms of organization of students' education	Brief description
Lectures	The lecture material contains key and most problematic issues of the discipline, which are most significant in the training of a specialist.
Practical classes	They are intended for the analysis (reinforcement) of theoretical principles and control over their assimilation with subsequent application of the acquired knowledge in the course of drawing up protocols for methods of assessing immune status and interpreting immunograms.
Work in an educational immunology laboratory	It is carried out to reinforce safety rules when working in biological laboratories with reagents and devices, and to practice practical skills.
Interactive forms of learning	Solving situational problems with subsequent discussion, completing creative tasks, peer review of notes, role-playing games, discussions, conference classes.

Participation in the department's research work, student circle and conferences	Preparation of oral presentations for a circle, abstracts, oral and poster presentations, review of literary and Internet sources
Types of control	**Brief description**
Incoming inspection	Conducted during the first lesson, control is necessary to check the basic knowledge of students obtained during the study of supporting disciplines
Current control	Conducted at each practical lesson, computer testing in the MOODLE system and a frontal survey are used to control the initial level of knowledge, checking workbooks and solving situational problems are used for final control, the degree of assimilation of practical skills is monitored in the process of working with immunograms, in the immunological laboratory.
Border control	It is carried out after studying a certain section of the discipline to generalize and test students' knowledge and monitor the acquisition of practical skills.
Interim assessment	It is presented by a test that students take in the 4th semester. The test includes final testing in the MOODLE system , practical skills, and an oral interview on the ticket questions.

2. STRUCTURE AND CONTENT OF THE DISCIPLINE

2.1. Scope of the discipline and types of academic work

Types of educational work	**Total hours**	**4th semester**
Lectures	20	20
Practical classes	52	52
Independent work of students	36	36
Total labor intensity in hours	108	108
Total workload in credit units	3	3

2.2. Thematic plan of lectures and their brief content

No. p/p	Lecture topics and their summary	Codes of formed competencies	Labor intensity (hour)
1	Subject and tasks of immunology. Organs of the immune system. Types of immunity. Pre-immune mechanisms of resistance. Cellular and humoral link of innate immunity. History of the development of immunology. Main directions of modern immunology. The role of immunology in the development of medicine and biology, its connection with other sciences. The immune system of the body. Primary organs of the immune system: bone marrow, thymus. Secondary organs of the immune system: spleen, lymph nodes, lymphoid tissue associated with the skin (SALT) and mucous membranes (MALT), their role in the immune response. Types of immunity and their characteristics. Non-specific defense factors: physical and chemical barriers, their role in the body's resistance to infections, fundamental difference from specific immune factors. Humoral and cellular factors of non-specific immunobiological protection. Age-related features of natural resistance. Complement system. Activation pathways. Genetics of complement. Phagocytosis. Types. Mechanisms of killing of engulfed bacteria.	UC-1 GPC-2, 4, 5	2
2	Antigens: properties, classification, mechanisms of recognition by the immune system. Antigens – definition, main properties of antigens. Concept of foreignness, immunogenicity and specificity of antigen. Effect of molecular features of antigen on immunogenic properties. Immunochemical specificity of antigens. Antigenic determinants (epitopes). Classification of antigens. Complete and incomplete antigens. Haptens . Thymus-dependent and thymus-independent antigens. Allergens. Immunological tolerance. Mechanisms of antigen recognition by the immune system. Phenomenon of immunological cross-reactivity. Toxins and anatoxins. Autoantigens : CD antigens, erythrocyte antigens. Major histocompatibility complex (MHC) and its products – MHC class I and II molecules, their biological role. Phenomenon of MHC restriction of immune response. Transbarrier antigens. Tumor antigens.	UC-1 GPC-2, 4, 5	2
3	Biology of T-lymphocytes. Adaptive immune response by cellular type. Antigen-independent proliferation and differentiation of T-lymphocytes. Biological essence of positive and negative selection. Formation of immunological tolerance to autoantigens . Populations and subpopulations of T-lymphocytes formed in the thymus. Characteristics of the main differentiation clusters (CD molecules) of T-lymphocytes. Structure of TCR , TCR complex . Coreceptors (molecules CD 4 and CD 8).	UC-1 GPC-2, 4, 5	2

	Antigen-dependent proliferation and differentiation of T-lymphocytes, antigen priming . Characteristics of antigens inducing immune response by cellular type. The role of APC (dendritic cells and macrophages), cytokines triggering immune response by cellular type. Phenomenon of dual recognition (MHC restriction of immune response), concept of Th1 and Th2, their cytokine profile. Activation of cytotoxic T-lymphocytes. Recognition of target cells, main stages of cytotoxic action, role of perforins and granzymes . Cytotoxic activity of macrophages. Formation of immunological memory cells.		
4	Biology of B-lymphocytes. Adaptive immune response of humoral type. Structure and functions of immunoglobulins. Antigen-independent proliferation and differentiation of B-lymphocytes. Characteristics of the main differentiation clusters (CD molecules) of B-lymphocytes. Structure of BCR, BCR complex. Genetic mechanisms of immunoglobulin diversity. Characteristics of the main populations of B-lymphocytes. Thymus-independent proliferation and differentiation of B-lymphocytes, features of antibody formation. Thymus-dependent proliferation and differentiation of B-lymphocytes, change of immunoglobulin classes, formation of memory B-cells. Interaction (cooperation) between T-, B-, APC in the process of immune response. Mechanisms of development and regulation. Main classes of immunoglobulins, their structural and functional features and properties. Structure of active centers of immunoglobulins and their main function. Antibody formation. Dynamics of antibody formation in primary and secondary immune response. Regulation of antibody formation. Biological properties of immunoglobulins in protecting the body from infection.	UC-1 GPC-2, 4, 5	2
5	Cytokines: definition, properties, mechanisms of action. Main functional groups of cytokines, their role in regulating the immune response. Concept of the cytokine system (nature, producer cells, target cells, properties, regulation mechanisms). Principles and mechanisms of control of immunocompetent cells. Classification of cytokines. Characteristics of individual groups of cytokines (interleukins, interferons, chemokines , tumor necrosis factors, colony-stimulating factors). Proinflammatory cytokines are mediators of pre-immune inflammation (producer cells, target cells, biological effects). Proinflammatory cytokines are mediators of immune inflammation (producer cells, target cells, biological effects). Anti-inflammatory cytokines (producer cells, target cells, biological effects). Cytokine network of cell- mediated immune response. Cytokine network of humoral immune response. Neuroendocrine regulation of immune response.	UC-1 GPC-2, 4, 5	2
6	Anti-infective immunity. Features of antibacterial, antiviral, antiparasitic immunity. Antitumor immunity. Features of immunity in bacterial infections. Effect of the antigenic structure of the microorganism on the immune response: features of immunity in infections caused by gram-positive and gram-negative microorganisms. Features of immunity in intracellular infections. Features of antitoxic immunity, the role of antibodies. Ways of	UC-1 GPC-2, 4, 5	2

	microorganisms "escaping" the immune response. Immunity in viral infections, the role of interferons and CTLs. Features of antihelminthic and antiprotozoal immunity. Antitumor immunity, main reasons for failure of antitumor immunity. Concept of tumor markers, types, definition in clinical practice. Main directions of tumor immunotherapy.		
7	Transplantation immunology. Features of transplantation immunity. Immunology of reproduction. Transplantation immunology. Types of transplantation. Selection of donor-recipient pairs, HLA typing. Features of transplantation immunity. Immunological bases of "host versus graft reaction " (HTR) and " graft versus host reaction" (GVHD). Clinical forms of transplant rejection (hyperacute, acute, chronic), immunological mechanisms. Immunological monitoring of the recipient after allotransplantation . Immunosuppressive therapy, drugs for stopping the rejection crisis. Immunology of reproduction . State of mother's immunity during pregnancy. Humoral and cellular mechanisms of maintaining immunity to embryonic alloantigens. Role of HLA antigens in mother-fetus relationships. Rhesus conflict between mother and fetus, diagnostics, prevention, treatment. Immune factors of reproductive organs and tissues. Immunological infertility. Sperm antigens. Antibodies to them, causes of formation in men and women, detection methods.	UC-1 GPC-2, 4, 5	2
8	Immunodiagnostics, immunoprophylaxis, immunotherapy. The concept of human immune status. Principles of formation. Age dynamics. Methods of immune status assessment. Diagnostic tests of levels I and II, indications for use. Determination of T- and B-lymphocyte subpopulations: assessment of mitotic and killer activity of lymphocytes, determination of NK-cell activity. Functional methods: lymphocyte blast transformation reaction , lymphokine production , leukocyte migration inhibition reaction. Skin tests as a method of cellular immunity indication. Determination of the content of the main classes of immunoglobulins. Methods of immunodiagnostics. Main types of antigen-antibody reactions (agglutination, precipitation, neutralization, etc.). Modern methods of immunodiagnostics (ELISA, immunoblotting , laser flow cytometry). Strategy and principles of immunoprophylaxis. Types of vaccines, their characteristics. Requirements for vaccines and quality control . Contraindications for vaccination (absolute and relative). Complications after vaccination. Legislative basis for vaccination. Law of the Russian Federation "On Immunoprophylaxis of Infectious Diseases in Humans", national calendar of preventive vaccinations and vaccinations for epidemiological indications. Immunotherapy and its types. Immunocorrection. Immunostimulating, immunoreplacement , immunosuppressive therapy . Immunotherapeutic drugs. Main groups of immunobiological drugs. Drugs of microbial origin. Immunoglobulins and immune serums, diagnostic drugs, adaptogens.	UC-1 GPC-2, 4, 5	2
9	Immunopathology. Hypersensitivity reactions. Classification of allergic reactions according to Gehl and Coombs : type I - IgE -mediated anaphylactic (atopic) reactions; type II - cytotoxic reactions; type III - immune	UC-1 GPC-2, 4, 5	2

	complex reactions; type IV - cellular, T-lymphocyte-mediated reactions. Mechanisms of allergic reactions. Diagnostic tests for detection of humoral allergy. Immunological bases of prevention and treatment. Desensitization.		
10	Primary and secondary immunodeficiencies. Primary immunodeficiencies. Classification. Deficiency of humoral, cellular immunity, combined immune disorders. Clinical syndromes of immunopathological condition: infectious; autoimmune; allergic; lymphoproliferative . The main stages of establishing an immunological diagnosis: collection of immunological anamnesis; analysis of clinical manifestations of immunopathology; laboratory immunological research methods; establishing an immunological diagnosis indicating the main immunopathological syndrome and establishing the level of immune response impairment. The role of infections in the development of secondary human immunodeficiencies. Secondary immunodeficiencies. The role of environmental factors in the induction of primary and secondary immunodeficiencies.	UC-1 GPC-2, 4, 5	2
	Total hours		20

2.3. Thematic plan of practical classes and their content

Practical classes in the discipline "Immunology" are a mandatory section and represent a type of educational activity directly focused on the professional training of students. During practical classes, students acquire knowledge of general immunology: history of development, contribution of domestic scientists, types of immunity, specific and non-specific protective factors, antigens, the role of hormones and mediators in the immune response, adaptive immunity (cellular, humoral), anti-infective, antitumor, transplant immunity, reproductive immunology, immunopathological conditions (allergy, primary and secondary immunodeficiencies), principles of their diagnosis and treatment, acquire skills in working in an immunology laboratory, and also develop skills in collecting an immunological anamnesis, assessing the results of an immunological examination, establishing an immunological diagnosis, drawing up a plan for examining patients with immunopathology.

In order to activate students' cognitive activity, interactive teaching methods are widely used (watching videos followed by answering questions, discussions, working in small groups), as well as participation in the department's research work.

Item No.	Topics of practical classes	Contents of the practical lesson	Codes of formed competencies and indicators of their achievement	Types of control	Labor intensity (hours)
1	Subject and tasks of immunology. Pre-	**Theoretical part:** Definition and tasks of immunology. Mechanical,	UC-1: AI UC-1.1.	Testing in the Moodle system	3.25

	immune mechanisms of resistance. Primary and secondary organs of the immune system. Types of immunity. Humoral link of innate immunity.	physiological and biochemical factors of protection. Types of immunity. Organs of the immune system. Modern scheme of immunogenesis. Innate immunity. Humoral component of innate immunity. Complement system. Complement activation pathways. Acute phase proteins. **Practical part:** working with handouts, scientific, medical and reference literature, drawing up diagrams, designing a workbook.	AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. GPC-5: AI GPC-5.1. AI GPC-5.3.	Frontal survey Solving situational problems Completing tasks according to the model	
2	Innate immunity. Cellular link of innate immunity. Mechanisms of recognition and destruction of pathogens.	**Theoretical part:** innate immunity. Cellular component of natural immunity. Role of mast cells, granular leukocytes, monocytes/macrophages, dendritic cells, NK cells. Mechanisms of pathogen destruction: intracellular (phagocytosis) and extracellular killing . Types of phagocytosis, assessment methods. **Practical part:** completing exercises and assignments using a model, working with handouts, scientific, medical and reference literature, drawing up diagrams, and completing a workbook.	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3.	Testing in the system " Moodle " Frontal survey Solving situational problems Viewing and discussing the video clip “ Toll -like receptors – a bridge between innate and adaptive immunity”, “Natural killers – the body’s main defense against viruses and tumors”	3.25
3	Antigens, characteristics, types of antigen specificity. Mechanisms of antigen recognition by the immune system. Major histocompatibility complex.	**Theoretical part:** Definition and characteristics of the concepts "antigen", "antibody". Types of antigens. Human isoantigens: the system of antigens of erythrocytes, lymphocytes, granulocytes, platelets. Antigenic structure of bacteria and viruses. Antigen processing in the macroorganism. Definition and characteristics of the major histocompatibility complex (MHC, HLA), role in the immune response. Genetic	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3.	Testing in the system " Moodle " Frontal survey Solving situational problems Completing tasks according to the model	3.25

		determination associated with the HLA system to a number of diseases. HLA typing methods. **Practical part:** completing exercises and assignments using a model, working with handouts, scientific, medical and reference literature, drawing up diagrams, and completing a workbook.	AI GPC-5.4.		
4	Immune response by cellular type. Mechanisms of cell interaction in the immune response.	**Theoretical part:** Populations and subpopulations of ICCs involved in the immune response by cell type, their characteristics. Characteristics of the main differentiation clusters (CD markers). A antigen-independent proliferation and differentiation of T-lymphocytes. Positive and negative selection. The structure of the T-cell receptor. Modern methods of isolating ICC. The concept of cellular immunity. Antigen-dependent differentiation of T-lymphocytes. Phases of cell-mediated immune response. Cytotoxic and inflammatory variants of immune response by cellular type. The importance of determining T-lymphocytes and their subpopulations in clinical practice. **Practical part:** completing exercises and tasks according to the model, working with handouts, scientific, medical and reference literature, workbook design	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	Testing in the system " Moodle " Frontal survey Solving situational problems Viewing and discussing the video "Immune response by cellular type"	3.25
5	Humoral immune response. Antibody formation. Structure and functions of immunoglobulins.	**Theoretical part:** Populations, subpopulations of ICC participating in the immune response of the humoral type. Characteristics of the main differentiation clusters (CD markers). Antigen-independent proliferation and differentiation of B-lymphocytes. Structure of the B-cell receptor.	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. AI GPC-2.7.	Testing in the system " Moodle " Frontal survey Solving situational problems Viewing and discussing the video clip “Humoral	3.25

		Antigen-dependent proliferation and differentiation. Thymus-dependent and thymus- independent pathways of B-lymphocyte activation. Mechanisms of transformation into plasma cells. cells. Structure and immunoglobulins. The process of T-dependent antibody production, the involvement of interleukins, the role of CD4+ T cells; Dynamics of antibody formation. T and B cells of immunological memory. Methods for assessing the state of humoral immunity and their clinical use meaning. **Practical part:** completing exercises and tasks according to the model, working with handouts, scientific, medical and reference literature, drawing up diagrams, designing workbook.	GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	immune response”	
6	Control lesson on the section.	Checking the acquisition of competencies (testing, interview on theoretical issues).	UC-1 GPC-2, 4, 5	Testing in the system " Moodle "	3.25
7	Hormones and cytokines of the immune system. Regulation of the immune response.	**Theoretical part:** The concept of the cytokine system. The main groups of mediators of the immune system. Classification of cytokines , characteristics of individual groups of cytokines, biological characteristics. Proinflammatory and anti-inflammatory cytokines. Cytokines are regulators of cell-mediated immune response and humoral immune response. Neuroendocrine regulation of immune response. Diagnostic value of determining cytokine concentration in blood. Use of cytokine preparations in clinical practice. **Practical part:** completing exercises and tasks according to the model, working with handouts, scientific, medical	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	Testing in the system " Moodle " Frontal survey Solving situational problems Designing a workbook (filling in tables for the main groups of cytokines)	3.25

		and reference literature, drawing up diagrams, designing workbook.			
8	Anti-infective immunity (antibacterial, antiviral, antiparasitic). Anti-tumor immunity.	**Theoretical part:** concept of the infectious process. Classification of anti-infective immunity. Features of immunity in bacterial infections. Antitoxic immunity. Ways of microorganisms "escaping" from the immune response. Features of immunity in viral infections. Features of antihelminthic and antiprotozoal immunity. Antitumor immunity. The concept of tumor markers, types, definition in clinical practice. Main directions of tumor immunotherapy. **Practical part:** completing exercises and tasks according to the model, working with handouts, scientific, medical and reference literature, drawing up diagrams, designing workbook.	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPK-2: AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	Testing in the system " Moodle " Frontal survey Solving situational problems Viewing and discussing the videos “Immune response against tuberculosis”, “Tumor immunotherapy”, “Monoclonal antibodies in tumor immunotherapy”	3.25
9	Transplantation immunology. Features of transplacental immunity. Immunology of reproduction.	**Theoretical part:** Concept Transplantation immunology, immunological incompatibility. The role of HLA antigens in the formation of immunological incompatibility. Mechanisms of host versus graft reactions (HVGR), reaction "graft versus host disease" (GVHD). Methods of overcoming tissue incompatibility. Immunology of reproduction. Immune factors of reproductive organs and tissues. The state of the mother's immunity during pregnancy. Humoral and cellular mechanisms of maintaining embryonic immunity alloantigens. HLA antigens in mother-fetus relationship. Rhesus-	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	Testing in the system " Moodle " Frontal survey Solving situational problems Completing tasks according to the example in the workbook	3.25

		conflict between mother and fetus, diagnostics, prevention, treatment. Immunological infertility. **Practical part:** completing exercises and tasks according to the model, working with handouts, scientific, medical and reference literature, drawing up diagrams, designing workbook.			
10	Control lesson on the section.	Checking the acquisition of competencies (testing, interview on theoretical issues, defense of creative work).	UC-1 GPC-2, 4, 5	Testing in the system " Moodle "	3.25
11	Immunodiagnostics. Modern methods of immune status assessment. Immunoprophylaxis. Immunotherapy. Immunobiological preparations.	**Theoretical part:** Definition of the concept "immune status", factors affecting immunity. Immunological tests of I and II levels, comparative characteristics, indications for prescription. Modern methods of immunodiagnostics. Definition and principles of immunoprophylaxis, immunotherapy, immunocorrection. Types of immunotherapy. Main groups and immunobiological preparations, their characteristics. Vaccines, their characteristics. Methods of vaccine production, evaluation of their effectiveness and complications. Requirements for vaccines and control quality. **Practical part:** completing exercises and tasks according to the model, working with handouts, scientific, medical and reference literature, drawing up diagrams, designing workbook.	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	Testing in the system " Moodle " Frontal survey Solving situational problems Viewing and discussion of videos "ELISA", " Immunoblotting ", presentations "Laser flow cytometry ", "PCR diagnostics"	3.25
12	Immunopathology. Type I hypersensitivity reactions . Allergy. Principles of diagnosis and treatment of allergic	**Theoretical part:** Classification of hypersensitivity reactions. Hypersensitivity reactions of type I. Immunological bases of allergy: stage of sensitization, stage of clinical manifestations.	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2:	Testing in the system " Moodle " Frontal survey Solving situational problems	3.25

	diseases.	Causes of allergy development, classification of allergens. Allergic diseases. Diagnostic tests for allergy detection. Immunological bases of prevention and treatment. Principles of emergency care. Desensitization. **Practical part:** completing exercises and tasks according to the model, working with handouts, scientific, medical and reference literature, drawing up diagrams, designing workbook.	AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	Viewing and discussing the video clips “Type 1 hypersensitivity reactions”, “Causes of allergies: desensitization and sensitization”, “Skin tests in allergy diagnostics”.	
13	Immunopathology. Hypersensitivity reactions of types II , III and IV .	**Theoretical part:** Classification of hypersensitivity reactions. Hypersensitivity reactions of types II , III and IV . Immunological bases. The role of hypersensitivity reactions in the pathogenesis of diseases. Clinical manifestations. Principles of diagnostics and treatment. **Practical part:** completing exercises and tasks according to the model, working with handouts, scientific, medical and reference literature, drawing up diagrams, designing workbook.	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	Testing in the system " Moodle " Frontal survey Solving situational problems Viewing and discussing the video “Hypersensitivity reactions types 1, 2, 3 and 4”	3.25
14	Primary (PID) and secondary (SID) immunodeficiencies. Principles of diagnosis and treatment	**Theoretical part:** Nature and causes of immunodeficiency states (IDS). Definition PID and VID, their differences. Mechanisms of development of IDS. Main clinical syndromes. Principles of diagnosis, treatment, prevention. **Practical part:** completing exercises and tasks according to the model, working with handouts, scientific, medical and reference literature, drawing up diagrams,	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1.	Testing in the system " Moodle " Frontal survey Solving situational problems Viewing and discussing the video "HIV attacks".	3.25

		designing workbook.	AI GPC-5.3. AI GPC-5.4.		
15	Control lesson on the section	Checking the acquisition of competencies (testing, interview on theoretical issues, defense of creative work).	UC-1 GPC-2, 4, 5	Testing in the system " Moodle "	3.25
16	Final lesson (test)	Checking the acquisition of competencies (final testing in the Moodle system , interview on theoretical questions of the ticket and situational tasks, defense of the immunological passport).	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	Final testing in the system " Moodle "	3.25
Total hours					**52**

2. 4. Interactive forms of learning

In order to increase the efficiency of the educational process, strengthen the motivation to study the discipline "Immunology", develop communication skills, skills of analysis and reflexive manifestations, interactive teaching methods (group discussions, creative tasks, small group work method, dramatization method, viewing and discussing video materials) are widely used during practical classes. Students participate in the work of the educational immunology laboratory, educational research and scientific research work of the department.

Interactive forms of learning

No. topics p/p	The topic of practical classes	Labor intensity in hours	Interactive form of learning	Labor intensity in hours, in % of the lesson
		4th semester		
1	Subject and tasks of immunology. Pre-immune mechanisms of resistance. Primary and secondary organs of the immune system. Types of immunity. Humoral link of innate immunity.	3.25	Work in small groups. Filling out the table based on the example “Primary and secondary organs of the immune system” with subsequent peer review .	20 minutes (0.44 hours) 13.8%
2	Innate immunity. Cellular link of innate immunity. Mechanisms of recognition and destruction of pathogens.	3.25		20 minutes (0.44 hours) 13.8%
3	Antigens, characteristics, types of antigen specificity. Mechanisms of antigen recognition by the immune system. Major histocompatibility complex	3.25	Completion of tasks according to the model in the workbooks “Scheme of the immunological synapse” with subsequent peer review .	20 minutes (0.44 hours) 13.8%
4	Immune response by cellular type. Mechanisms of cell interaction in the immune response	3.25	Completion of tasks according to the model in the workbooks “Scheme of the immune response by cellular type” with subsequent peer review .	20 minutes (0.44 hours) 13.8%
5	Humoral immune response. Antibody formation. Structure and functions of immunoglobulins	3.25	Completion of tasks according to the model in the workbooks “Scheme of the immune response by humoral type” with subsequent peer review .	20 minutes (0.44 hours) 13.8%

6	Control lesson on the section	3.25	Interactive technology "Everyone teaches everyone" on the topic "Complement system". Watch the video " TOLL -like receptors - a bridge between innate and adaptive immunity" with answers to questions	40 minutes (0.75 hours) 27.6%
7	Hormones and cytokines of the immune system. Regulation of the immune response	3.25	Small group method. Work on filling in the tables " Pro-inflammatory cytokines", "Anti-inflammatory cytokines".	20 minutes (0.44 hours) 13.8%
8	Anti-infective immunity (antibacterial, antiviral, antiparasitic). Anti-tumor immunity	3.25	Small Group Method. Solving Situational Problems of Increased Complexity with discussion.	20 minutes (0.44 hours) 13.8%
9	Transplantation immunology. Features of transplacental immunity. Immunology of reproduction	3.25	Small Group Method. Solving Situational Problems of Increased Complexity with discussion.	25 minutes (0.55 hours) 17.2%
10	Control lesson on the section	3.25	Small Group Method. Solving Situational Problems of Increased Complexity with discussion.	20 minutes (0.44 hours) 13.8%
11	Immunodiagnostics. Modern methods of immune status assessment . Immunoprophylaxis. Immunotherapy. Immunobiological preparations.	3 ,25	The method of staging (business theater) " Work of the vaccination room", interpretation of immunograms.	25 minutes (0.55 hours) 17.2%
12	Immunopathology. Type I hypersensitivity reactions . Allergy. Principles of diagnosis and treatment of allergic diseases.	3.25	Watch and discuss the video: " Type I hypersensitivity reactions " with answers to questions	30 minutes (0.66 hours) 20.7%
13	Immunopathology. Hypersensitivity reactions of types II , III and IV .	3.25	View and discuss the video: "Hypersensitivity reactions types II , III and IV " with answers to questions	30 minutes (0.66 hours) 20.7%

14	Primary (PID) and secondary (SID) immunodeficiencies. Principles of diagnosis and treatment	3.25	Small Group Method. Solving Situational Problems of Increased Complexity with discussion.	25 minutes (0.55 hours) 17.2%
15	Control lesson on the section	3.25	Small Group Method. Solving Situational Problems of Increased Complexity with discussion.	20 minutes (0.44 hours) 13.8%
16	Final lesson (test)	3.25	Protection of the immunological passport.	30 minutes (0.66 hours) 20.7%

2.5. Criteria for assessing students' knowledge

Developed in accordance with the “Regulations on the system for assessing the learning outcomes of students of the Federal State Budgetary Institution of Higher Education “Amur State Medical Academy” of the Ministry of Health of the Russian Federation”.

The basis for assessing the level of knowledge, skills, and abilities are the assessment criteria - completeness and correctness:

- correct, precise answer;
- correct but incomplete or imprecise answer;
- incorrect answer;
- no answer.

When assessing, it is necessary to take into account the classification of errors and their quality:

- gross errors;
- similar errors;
- minor errors;
- shortcomings.

Criteria for assessing learning outcomes

No. p/p	Topic of the practical lesson	Theoretical part	Practical part	Overall rating	Forms of control
1.	Subject and tasks of immunology. Pre-immune mechanisms of resistance. Primary and secondary organs of the immune system. Types of immunity. Humoral link of innate immunity.	2-5	2-5	2-5	**Theoretical part** - Oral or written survey - Test tasks in the system " Moodle " **Practical part** Situational interview tasks - Working with handouts -Work in immunology laboratory - Registration of an immunological passport - Work with regulatory documents - Performing exercises according to the model
2	Innate immunity. Cellular link of innate immunity. Mechanisms of recognition and destruction of pathogens.	2-5	2-5	2-5	
3	Antigens, characteristics, types of antigen specificity. Mechanisms of antigen recognition by the immune system. Major histocompatibility complex.	2-5	2-5	2-5	
4	Immune response by cellular type. Mechanisms of cell interaction in the immune response.	2-5	2-5	2-5	
5	Humoral immune response. Antibody formation. Structure and functions of immunoglobulins.	2-5	2-5	2-5	
6	**Control lesson on the section**	2-5	2-5	2-5	
7	Hormones and cytokines of the immune system. Regulation of the immune response.	2-5	2-5	2-5	
8	Anti-infective immunity (antibacterial, antiviral, antiparasitic). Anti-tumor immunity	2-5	2-5	2-5	
9	Transplantation immunology. Features of transplacental immunity. Immunology of reproduction	2-5	2-5	2-5	
10	**Control lesson on the section**	2-5	2-5	2-5	
11	Immunodiagnostics. Modern methods of immune status assessment. Immunoprophylaxis. Immunotherapy. Immunobiological preparations.	2-5	2-5	2-5	
12	Immunopathology. Type I hypersensitivity reactions . Allergy. Principles of diagnosis and treatment of allergic diseases.	2-5	2-5	2-5	
13	Immunopathology. Hypersensitivity reactions of types II , III and IV .	2-5	2-5	2-5	
14	Primary (PID) and secondary (SID) immunodeficiencies. Principles of diagnosis and treatment	2-5	2-5	2-5	
15	**Control lesson on the section**	2-5	2-5	2-5	
Immunological passport				2-5	
Abstract				2-5	
Average score					
16	Interim assessment	3-5	3-5	passed	
		2	2	not credited	

Incoming inspection

Conducted during the first lesson, includes: testing in the Moodle system https://educ-amursma.ru/mod/quiz/view.php?id=5355 . The test control includes a number of questions studied during the mastering of supporting disciplines (anatomy, biochemistry, histology, embryology, cytology, physiology).

Criteria for assessing individual types of work (current monitoring)

The success of students in mastering the topics and sections of the discipline "Immunology" is determined by the quality of mastering knowledge, skills and practical abilities; the grade is given on a five-point scale: "5" - excellent, "4" - good, "3" - satisfactory, "2" - unsatisfactory.

Current control rating scale

Quality of development	Mark on a 5-point scale
90-100%	"5"
80-89%	"4"
70-79%	"3"
less than 70%	"2"

Current control includes initial and final control of knowledge.

Initial control is carried out by the teacher at the beginning of each lesson in the form of testing in the Moodle system (https://educ-amursma.ru/course/view.php?id=288), frontal survey, solving problems and exercises.

Final control – includes control over the technique of performing the experiment and drawing up the protocol, written work on the options.

The final grade during the current knowledge assessment is given on the day of the lesson, as the arithmetic mean result for all types of activities provided for by the work program of the discipline.

Criteria for assessing the oral response

“5” (excellent) – the student demonstrates deep and complete knowledge of the educational material, does not allow inaccuracies or distortions of facts when presenting, presents the material in a logical sequence, is well oriented in the presented material, and can provide justification for the judgments expressed.

“4” (good) – the student has mastered the educational material in full, is well oriented in the educational material, presents the material in a logical sequence, but makes inaccuracies when answering.

“3” (satisfactory) – the student has mastered the basic principles of the topic of the practical lesson, but when presenting the educational material, he/she makes inaccuracies, presents it incompletely and inconsistently, requires leading questions from the teacher to present it, and has difficulty substantiating the judgments expressed.

“2” (unsatisfactory) – the student has fragmented and unsystematic knowledge of the educational material, is unable to distinguish between the main and the secondary, makes mistakes in defining basic concepts, distorts their meaning, and cannot independently present the material.

Assessment criteria for the practical part

“5” (excellent) – the student has fully mastered the practical skills and abilities provided by the course work program

"4" (good) - student **–** the student has fully mastered the practical skills and abilities provided for by the course work program, but allows for some inaccuracies.

"3" (satisfactory) - student possesses only some practical skills and abilities.

“2” (unsatisfactory) – the student demonstrates the performance of practical skills and abilities with gross errors.

Essay evaluation criteria

“5” (excellent) – the abstract is complete, detailed, formatted according to requirements, and well presented.

“4” (good) – the abstract is complete, detailed, formatted according to requirements, but poorly presented.
“3” (satisfactory) – the abstract is complete, but formatted with errors and poorly presented.
"2" (unsatisfactory) – the abstract is not submitted or is written with serious errors.

Criteria for assessing the immunological passport

"5" (excellent) – the immunological passport is completed in accordance with the requirements.
"4" (good) – the immunological passport was completed with some errors.
"3" (satisfactory) – the immunological passport is written in illegible handwriting, with errors.
"2" (unsatisfactory) – the immunological passport is written in illegible handwriting, with gross errors.

Working off debts in the discipline "Immunology"

If a student misses a class for a valid reason, he/she has the right to make it up and receive the maximum grade provided for by the work program of the discipline "Immunology" for this class. A valid reason must be documented.

If a student misses a class for an unjustified reason or receives a grade of "2" for all types of activities during a practical class, he/she is required to make it up. In this case, the grade received for all types of activities is multiplied by 0.8.

If a student is exempted from a practical lesson at the request of the dean's office (participation in sports, cultural and other events), then he is given a grade of "5" for this lesson, provided that he submits a report on the completion of mandatory extracurricular independent work on the topic of the missed lesson.

Assessment criteria for midterm assessment

Midterm assessment (credit) is designed to assess the degree of achievement of planned learning outcomes upon completion of the study of a discipline and allows for an assessment of the level and quality of its mastery by students.

The students’ success in mastering the discipline is assessed on a 5-point system: “5” (excellent), “4” (good), “3” (satisfactory), “2” (unsatisfactory).

Interim certification is carried out in 3 stages:

1. Test control in the " Moodle " system.
   https://educ- a mursma.ru/ mod / quiz / view.php?id =19093
2. Passing practical skills (control of the level of development of competencies).
3. Answers to ticket questions.

Midterm assessment grading scale

Stages	**Mark out of 5 point scale**	**Binary scale**
Test control in the system " Moodle "	3-5	Passed
Delivery of practical skills (control of the level of development of competencies)	3-5	
Answers to ticket questions	3-5	
Test control in the system " Moodle "	2	Not accepted
Delivery of practical skills (control of the level of development of competencies)	2	
Answers to ticket questions	2	

"5" (passed) - for the depth and completeness of mastering the content of the educational material, in which the student easily navigates, for the ability to connect theoretical questions with practical ones, express and justify their judgments, correctly and logically present the answer; when testing,

allows up to 10% of erroneous answers. Practical skills and abilities provided for by the working program of the discipline are fully mastered.
"4" (passed) - the student has fully mastered the educational material, is oriented in it, correctly states the answer, but the content and form have some inaccuracies; during testing allows up to 20% of erroneous answers. Completely practical skills and abilities provided by the working program of the discipline, but allows some inaccuracies
"3" (passed) - the student has mastered the knowledge and understanding of the main provisions of the educational material, but presents it incompletely, inconsistently, does not know how to express and justify his/her judgments; during testing, allows up to 30% of erroneous answers. Has only some practical skills and abilities.
"2" (failed) - the student has fragmented and unsystematic knowledge of the educational material, is unable to distinguish between the main and secondary, makes mistakes in defining concepts, distorts their meaning, presents the material in a disorderly and uncertain manner, and makes more than 30% of erroneous answers during testing. Demonstrates the performance of practical skills and abilities with gross errors

2.6. Independent work of students: in-class and out-of-class

Independent classroom work of students

The main didactic tasks of independent work of students under the guidance of a teacher: consolidation of knowledge and skills acquired in the process of studying the academic discipline, in lectures, seminars and practical classes; prevention of their forgetting; expansion and deepening of educational material; formation of the ability and skills of independent work; development of independence of thinking and creative abilities of students.

Students' independent classroom work includes: solving situational problems, working in an immunology laboratory, completing a workbook, working with the department's teaching aids, methodological recommendations, tables, diagrams, writing conclusions on the presented demonstration reactions, conducting training exercises and participating in them.

Extracurricular independent work of students

The following can be used as the main forms of extracurricular independent work: studying lecture material, basic and additional educational literature, scientific literature; solving situational problems, test assignments, working in an online classroom, preparing oral reports; preparing and writing abstracts; observing and self-observing specific clinical and immunological phenomena being studied, etc. This type of educational activity should be based on the activity, initiative, consciousness and independent activity of students.

No. p/p	Topic of the practical lesson	Time for student preparation for the lesson	Forms of extracurricular independent work of a student	
			Mandatory and the same for all students	At the student's choice
1	Subject and tasks of immunology. Pre-immune mechanisms of resistance. Primary and secondary organs of the immune system. Types of immunity. Humoral link of innate immunity.	1.5 h	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the	Report on the topic: "I.I. Mechnikov's contribution to the development of immunology" Making a layout of a tablet in electronic form on the topic: "Natural barriers"

			lesson	
2	Innate immunity. Cellular link of innate immunity. Mechanisms of recognition and destruction of pathogens.	1.5 hours	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the lesson	Production of electronic tablet layouts on the topic: “Activation of complement via the classical pathway”, “Activation of complement via the alternative pathway”, “Activation of complement via the lectin pathway”, “Complete and incomplete phagocytosis”. Report on the topic: "Acute phase proteins of inflammation and their diagnostic significance."
3	Antigens, characteristics, types of antigen specificity. Mechanisms of antigen recognition by the immune system. Major histocompatibility complex	1.5 hours	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the lesson	Computer presentation and report on the topic: "History of the study of the major histocompatibility complex", "Tumor markers. Role in the diagnosis and treatment of tumors"
4	Immune response by cellular type. Mechanisms of cell interaction in the immune response	1.5 hours	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the lesson	Making a tablet in electronic form on the topic: "Cell-cell interactions in the immune response by cell type"
5	Humoral immune response. Antibody formation. Structure and functions of immunoglobulins	1.5 hours	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on	Making a model of a tablet in electronic form on the topic: “The structure of serum immunoglobulins nov", "Biological action of antibodies".

			an abstract, searching in the online class on the topic of the lesson	
6	**Control lesson on the section**	2h	Preparation for a test, defense of an essay, report	
7	Hormones and cytokines of the immune system. Regulation of the immune response	2h	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the lesson	Computer presentation and report on the topic: "Cytokines in the therapy of oncological diseases", "Clinical application of CSF".
8	Anti-infective immunity (antibacterial, antiviral, antiparasitic). Anti-tumor immunity.	2h	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the lesson	Review of Internet sources on the topic: "Non-specific antiviral immunity. The role of interferons"
9	Transplantation immunology. Features of transplacental immunity. Immunology of reproduction.	1.5 hours	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the lesson	Computer presentation and report on the topic: "Bone Marrow Transplant"
10	**Control lesson on the section**	2h	Preparation for a test, defense of an essay, report	
11	Immunodiagnostics. Modern methods of immune status assessment. Immunoprophylaxis. Immunotherapy. Immunobiological preparations.	2h	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the lesson	Making a table or a tablet on the topic: “Scheme of setting up the ELISA reaction” Computer presentation or report on the topic: "Bone marrow stimulants"
12	Immunopathology. Type I	2h	Preparation for a lesson on	Making a layout of a

	hypersensitivity reactions . Allergy. Principles of diagnosis and treatment of allergic diseases.		theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the lesson	tablet in electronic form on the topic "The role of mast cells in the development of type I hypersensitivity reactions " Computer presentation and report on the topic: "Food allergy"
13	Immunopathology. Hypersensitivity reactions of types II , III and IV .	2h	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online classroom on the topic of the lesson	Making a layout of a tablet in electronic form on the topic "The role of immune complexes in the development of type III hypersensitivity reactions " Computer presentation and report on the topic: " Immunological bases and clinical manifestations of reactions of HRT"
1 4	Primary (PID) and secondary (SID) immunodeficiencies. Principles of diagnosis and treatment	2h	Preparation for the lesson on theoretical issues (reading lecture material, basic and additional literature, methodological recommendations, preparation of notes for the lesson in the workbook, drawing up diagrams, algorithms, solving test tasks, situational problems, working on an essay, search work in the Internet class on the topic of the lesson	Making a table or tablet on the topic: “Iatrogenic factors causing the development of immunity nodeficits ".
15.	**Control lesson on the section**	2h	Preparation for the lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, search work in the Internet class on the topic of the test lesson	
16.	Final lesson (test)	3h	Preparation for a credit lesson, defense of an abstract, immunological passport	
Total: 36 hours		**30**		**6**

2.7. Research (project) work of students

Research (project) work (R&D) of students is a mandatory section of the discipline and is aimed at the comprehensive formation of general cultural and professional competencies of students and involves the study of specialized literature and other scientific and technical

information on the achievements of domestic and foreign science and technology in the relevant field of knowledge, participation in scientific research, etc. The topics of R&D can be chosen by students independently in consultation with the teacher or from the list below (taking into account the scientific direction of the department).

Sample topics of students' research work.

1. The contribution of immune disorders to development pneumonia.
2. Immunodeficiencies - Current State problems.
3. Immunorehabilitation of patients with bronchopulmonary diseases systems.
4. The immune system in smokers.

For R&D assessments applies binary scale assessments: "pass", "fail".

3. EDUCATIONAL , METHODOLOGICAL, MATERIAL, TECHNICAL AND INFORMATION SUPPORT OF THE DISCIPLINE

3.1. Primary literature

1. Nedospasov, S. A. Immunology according to Yarilin: textbook / edited by S. A. Nedospasov, D. V. Kuprash . - 2nd ed., corrected . and additional. - Moscow: GEOTAR-Media, 2021. - 808 p. - ISBN 978-5-9704-4552-5. - Text: electronic (date accessed: 05/04/2021). - Access mode: by subscription.
http://www.studmedlib.ru/book/ISBN9785970445525.html
2. Khaitov, R. M. Immunology: textbook / R. M. Khaitov. - 3rd ed., revised . and additional - Moscow: GEOTAR-Media, 2018. - 496 p. - ISBN 978-5-9704-4655-3. - Text: electronic (access date: 05/04/2021). - Access mode: by subscription.
http://www.studmedlib.ru/book/ISBN9785970446553.html

3.2. Further reading

1. Moskalov, A. V. General immunology with the basics of clinical immunology: textbook / A. V. Moskalov, V. B. Sboychakov , A. S. Rudoy. - Moscow: GEOTAR-Media, 2015. - 352 p. - ISBN 978-5-9704-3382-9. - Text: electronic (date accessed: 05.05.2021). - Access mode: by subscription.
http://www.studmedlib.ru/ru/book/ISBN9785970433829.html
2. Kovalchuk, L. V. Immunology: practical: textbook / Ed. by L. V. Kovalchuk, G. A. Ignatyeva, L. V. Gankovskaya . - Moscow: GEOTAR-Media, 2015. - 176 p. - ISBN 978-5-9704-3506-9. - Text: electronic (date accessed: 05.05.2021). - Access mode: by subscription.
http://www.studmedlib.ru/ru/book/ISBN9785970435069.html
3. Khaitov, R. M. Immunology. Atlas / Khaitov R. M., Garib F. Yu. - Moscow: GEOTAR-Media, 2020. - 416 p. - ISBN 978-5-9704-5525-8. - Text: electronic (access date: 05/04/2021). - Access mode: by subscription.
http://www.studmedlib.ru/book/ISBN9785970455258.html
4. Khaitov, R. M. Immunology: structure and functions of the immune system / Khaitov R. M. - Moscow: GEOTAR-Media, 2019. - 328 p. - ISBN 978-5-9704-4962-2. - Text: electronic (access date: 05/04/2021). - Access mode: by subscription.
http://www.studmedlib.ru/book/ISBN9785970449622.html
4. Reshetnikova L.K. Immunology: textbook. - Blagoveshchensk, 2019. - 176 p. - Direct text. Access mode:
https://www.amursma.ru/upload/iblock/981/Uchebnoe_posobie._Immunologiya.pdf

3.3. Educational and methodological support of the discipline prepared by the department

Study guides:

- Cells and organs of the immune system / V.I. Pavlenko, I.Yu. Sayapina, Blagoveshchensk. - 2018, 124 p. Approved by the Coordinating Council for the field of education "Healthcare and Medical Sciences".
  https://www.amursma.ru/upload/iblock/cfe/Uchebnoe_posobie._Organy_i_kletki_immunnoj_sistemy_.pdf
- Immunodeficiencies / V.I. Pavlenko, Blagoveshchensk. - 2016, 136 p. Approved by the Coordinating Council for the field of education "Healthcare and Medical Sciences". Access mode:
  https://www.amursma.ru/upload/iblock/e4a/Uchebnoe_posobie._Diagnostika_i_lechenie_immunodeficitnyx_sostoyanij,_2017_g..pdf

Electronic and digital technologies (educational audio and video films, video fragments, educational visual aids (presentations))

Item No.	Name, title	View
1	"Natural killers are soldiers of immunity against viruses and cancer"	Video in MP4 format
2	" TLR - a bridge between innate and adaptive immunity"	Video in MP4 format
3	"Interferons are proteins with antiviral activity"	Video in MP4 format
4	"Immune response"	Video in MP4 format
5	"Cellular immunity against tuberculosis"	Video in MP4 format
6	"The mechanism of cell infection by a virus"	Video in MP4 format
7	"Hidden Universe"	Video film
8	"Tumor Immunology and Immunotherapy"	Video in MP4 format
9	"Monoclonal antibodies in tumor immunotherapy"	Video in MP4 format
10	"Stem cells as an object of transplantation"	Video in MP4 format
11	"Enzyme immunoassay"	Video in MP4 format
12	" Immunoblotting "	Video in MP4 format
13	"Laser flow cytometry "	Presentation in ppt format .x
14	"Causes and mechanisms of allergy development"	Video in MP4 format
15	"Desensitization and sensitization"	Video in MP4 format
16	"Allergens"	Video in MP4 format
17	"Diagnostics of allergies. Skin testing"	Video in MP4 format
18	"Hypersensitivity reactions types I , II , III and IV "	Video in MP4 format

Electronic library systems (ELS)

Electronic library of the medical university "Student consultant"
http://www.studentlibrary.ru/cgi-bin/mb4x

3.4. Equipment used for the educational process

No. p/p	Name	Quantity	Form use
1	**Educational laboratory (41)**		A room for students to conduct research and practice their practical skills
	Student desks	4	Research work of students, development of practical skills
	Chairs	8	Research work of students, development of practical skills
	Multimedia projector	1	Demonstration of lecture materials, practical classes, educational and scientific video materials
	Screen on a tripod	1	Demonstration of lecture materials, practical classes, educational and scientific videos
	Personal computer with Internet access	2	Access to educational resources during independent work of students, work with multimedia materials in practical classes
	Thermostat	1	Research work of students
	Water distiller	1	Research work of students

	Fume hood	1	Research work of students
	Microscope	1	Research work of students
2	**Audience No. 1 (51)**		A room for practical classes, group and individual consultations, and midterm assessments
	Student desks	7	Conducting practical classes, consultations, midterm assessments
	Chairs	14	Conducting practical classes
	Teacher's desk	1	Conducting practical classes, consultations, midterm assessments
	Microscopes	7	Working with microscopic objects during practical classes, consultations, and midterm assessments
	Classroom board	1	At practical classes, consultations
	Sets of tablets on practical training topics	7	For independent classroom work of students during practical classes
	Sets of tables on the topics of practical classes		For independent classroom work of students
3	**Audience No. 2 (29)**		A room for practical classes, group and individual consultations
	Student desks	14	Conducting practical classes, group and individual consultations
	Chairs	28	Conducting practical classes, consultations, group and individual consultations
	Teacher's desk	1	Conducting practical classes, group and individual consultations
	Microscopes	14	Conducting practical classes, consultations, group and individual consultations
	Classroom board	1	Conducting practical classes, group and individual consultations
	Sets of tablets on practical training topics	14	For independent classroom work of students
	Sets of tables on the topics of practical classes		For independent classroom work of students
4	**Audience No. 3 (27)**		Room for independent work of students
	Student desks	22	For students' independent extracurricular work
	Chairs	45	For students' independent extracurricular work
	Teacher's desk	2	For consultations of students on independent extracurricular work
	Table lamps	12	Independent work of students with microscopic objects
	Classroom board		During practical classes
	A laptop with Internet access	1	Access to educational resources during students' independent work
	Multimedia projector		Demonstration of lecture materials, practical classes, educational and scientific videos
	Screen on a tripod	1	Demonstration of lecture materials, practical classes, educational and scientific videos
	Sets of tablets on practical training topics	12	For students' independent extracurricular work
	Sets of tables on the topics of practical classes		For extracurricular and independent work of students

5	**Audience No. 4 (26)**		A room for practical classes, group and individual consultations
	Student desks	14	Conducting practical classes, group and individual consultations
	Chairs	29	Conducting practical classes, consultations, group and individual consultations
	Teacher's desk	1	Conducting practical classes, group and individual consultations
	Microscopes	12	Work in practical classes with microscopic objects
	Classroom board		During practical classes
	Sets of tablets on practical training topics	12	For students' independent work in and out of class
	Sets of tables on the topics of practical classes		For students' independent work in and out of class
6	**Computer class / Internet class (52)**		
	Computer desks	16	Testing (current control, midterm assessment), access to educational resources during independent extracurricular work
	Chairs	16	Testing (current control, midterm assessment), access to educational resources during independent extracurricular work
	Personal computers with Internet access	16	Testing (current control, midterm assessment), access to educational resources during independent extracurricular work

3.5. Professional databases, information reference systems, electronic educational resources

No. p/p	Resource name	Resource Description	Access	Resource address
Electronic library systems				
1	"Student Consultant" Electronic library of the medical university.	For students and teachers of medical and pharmaceutical universities. Provides access to electronic versions of textbooks, teaching aids and periodicals.	library, individual access	http: // www .studmedlib.ru/
2	"Doctor's Consultant" Electronic Medical Library.	The materials posted in the library have been developed by leading Russian specialists based on modern scientific knowledge (evidence-based medicine). The information has been prepared taking into account the position of the scientific and practical medical society (world, European and Russian) in the relevant specialty. All materials have undergone mandatory independent review.	library, individual access	http://www.rosmedlib.ru/cgi-bin/mb4x
3	PubMed	Free search engine in the largest medical bibliographic database MedLine . Documents medical and biological articles from the specialized literature, and also provides links to full-text articles.	library, free access	http://www. ncbi.nlm.nih . gov/ pubmed /
4	Oxford Medicine Online.	A collection of Oxford medical publications, bringing together over 350 titles into a single, cross-searchable resource. Publications include The Oxford Handbook of Clinical Medicine and The Oxford Textbook of Medicine , the electronic versions of which are constantly updated.	library, free access	http://www.oxfordmedicine.com
5	Human Biology Knowledge Base	Reference information on physiology , cell biology , genetics , biochemistry , immunology , pathology . (Resource of the Institute of Molecular Genetics of the Russian Academy of Sciences .)	library, free access	http://humbio.ru/
Information systems				
6	Russian Medical Association	Professional Internet resource. Objective: to facilitate the implementation of effective professional activities of medical personnel. Contains the charter, personalities, structure, rules of entry, information about the Russian Medical Union.	library, free access	http://www.rmass.ru/

7	Web medicine.	The site presents a catalog of professional medical resources, including links to the most authoritative subject sites, journals, societies, as well as useful documents and programs. The site is intended for doctors, students, employees of medical universities and scientific institutions.	library, free access	http: //webmed.irkutsk.ru/
Databases				
8	World Health Organization	The site contains news, statistics on countries that are members of the World Health Organization, fact sheets, reports, WHO publications and much more.	library, free access	http://www.who.int/ru/
9	Ministry of Science and Higher Education of the Russian Federation.	The website of the Ministry of Science and Higher Education of the Russian Federation contains news, newsletters, reports, publications and more.	library, free access	http://www.minobrnauki.gov.ru
10	Ministry of Education of the Russian Federation.	The website of the Ministry of Education of the Russian Federation contains news, newsletters, reports, publications and much more.	library, free access	https://edu.gov.ru/
11	Federal portal "Russian education"	A single window for access to educational resources. This portal provides access to textbooks on all branches of medicine and health care.	library, free access	http: //www.edu.ru/ http://window.edu.ru/catalog/?p rubr =2.2.81.1
Bibliographic databases				
12	Database "Russian Medicine"	It is created in the Central Scientific and Methodological Library and covers the entire collection, starting from 1988. The database contains bibliographic descriptions of articles from domestic journals and collections, dissertations and their abstracts, as well as domestic and foreign books, collections of institute proceedings, conference materials, etc. Thematically, the database covers all areas of medicine and related areas of biology, biophysics, biochemistry, psychology, etc.	library, free access	http://www.scsml.rssi.ru/
13	eLIBRARY.RU	Russian information portal in the field of science, technology, medicine and education, containing abstracts and full texts of more than 13 million scientific articles and publications. The eLIBRARY.RU platform provides electronic versions of more than 2,000 Russian scientific and technical journals, including more than 1,000 open access journals.	library, free access	http://elibrary.ru/defaultx.asp

14	Portal Electronic library of dissertations	Currently, the Electronic Library of Dissertations of the Russian State Library contains more than 919,000 full texts of dissertations and abstracts.	library, free access	http://diss.rsl.ru/?menu=disscatalog/
15	Medline.ru	Medical and biological portal for specialists. Biomedical journal. Last updated February 7, 2021.	library, free access	http://www.medline.ru

3 .6. Licensed and freely distributed software used in the educational process

I . Commercial software products		
1	MS Operating System Windows 7 Pro	License number 48381779
2	Operating system MS Windows 10 Pro , MS Office	AGREEMENT R No. 142 A dated December 25, 2019
3	MS Office	Number licenses : 43234783, 67810502, 67580703, 64399692, 62795141, 61350919
4	Kaspersky Endpoint Security for business Extended	Agreement No. 977/20 dated 12/24/2020
5	1C: PROF University	LICENSE AGREEMENT No. 2191 dated 15.10.2020
6	1C: PROF Library	LICENSE AGREEMENT No. 2281 dated 11.11.2020
II . Freely distributed software		
1	Google Chrome	Freely distributed Distribution conditions: https://play.google.com/about/play-terms/index.html
2	Browser "Yandex"	Freely distributed License agreement for the use of the Yandex Browser software https :// yandex . ru / legal / browser_agreement /
3	Dr.Web CureIt !	Freely distributed License Agreement: https :// st . drweb . com / static / new - www / files / license _ CureIt _ ru . pdf
4	OpenOffice	Freely distributed License: http :// www . gnu . org / copyleft / lesser . html
5	LibreOffice	Freely distributed License: https :// ru . libreoffice . org / about - us / license /

3. 7. Resources of the information and telecommunications network "Internet"

1. Library of Amur State Medical Academy. Access mode: https://amursma.ru/obuchenie/biblioteki/biblioteka-amurskoy-gma/
2. Electronic library system "Student consultant". Access mode: http://www.studmedlib.ru/cgi-bin/mb4x
3. Electronic library of medical literature. Access mode:

https://www.books-up.ru/ru/entrance/97977feab00ecfbf9e15ca660ec129c0/

4. http://allimmunology.org/ general immunology and immunization;
5. http://humbio.ru/humbio/immunology/imm-gal/000008da.htm immunology;
6. http://www.med-edu.ru/pediatr/allergiimmuno/ lectures on immunology and allergology;
7. http://www.medicum.nnov.ru/nmj/2003/1/38.php catalog of sites on immunology;
8. https://booksmed.info/allergology-immunology/ literature on immunology.

4. ASSESSMENT TOOLS FUND

4.1. Incoming inspection

Conducted during the first lesson, includes: testing in the Moodle system https://educ-amursma.ru/mod/quiz/view.php?id=5355 . The test control includes 316 questions studied during the mastering of supporting disciplines (anatomy, biochemistry, histology, embryology, cytology, physiology).

4.2. Examples of test tasks for current control

Test assignments are located in the Moodle system .
Access mode: https://educ-amursma.ru/course/view.php?id=288

1. IMMUNITY THIS
   1) a way of protecting the body from living bodies and substances that are not part of the structure fabrics
   2) a method of preserving the life of a subject under influence pathogens on it microorganisms
   3) a way of protecting the body from living bodies and substances that carry signs of genetic foreignness
   4) a method of preserving the life of a subject under influence opportunistic pathogens on it microorganisms
2. IMMUNE STATUS IS DETERMINED HOW
   1) quantity and functionality T cell activity
   2) quantity and functional B cell activity
   3) quantity and functional activity phagocytes
   4) state of the non-specific system resistance
3. DURING THE IMMUNE REACTION NOT IT'S HAPPENING
   1) recognition antigen
   2) liberation glucocorticoids
   3) education antibodies
   4) education chemokines
4. MAIN FUNCTION T-KILLERS IS IN
   1) suppression of production antibodies
   2) stimulation of production antibodies
   3) recognition and elimination of cells carrying foreign genetic information
   4) memorization antigen
5. INTRAUTERINE DEVELOPMENT, THE FORMATION OF THE THYMUS IT'S HAPPENING
   1) on 4 month

2) on 2 month
3) on 3 month
4) on 1 month

Answer standards: 1-3, 2-1,2,3,4, 3-2, 4-3, 5-2

4.3 Examples of situational tasks of current control

Task number 1.

The patient was admitted with complaints of weakness and headache, vomiting, and fever. He was admitted from a radioactive contamination site.
After a period of some improvement, the patient developed petechiae on the skin, maceration in places of friction, increased bleeding. There are ulcers on the oral mucosa. Abdominal pain, bloating and rumbling, diarrhea. Hair loss on the head.
In the clinical blood test: anemia, leukopenia, lymphopenia , agranulocytosis, thrombocytopenia.
1. Make a preliminary immunological diagnosis:
1) primary immunodeficiency.
2) acute radiation sickness.
3) acute leukemia.
2. Schedule an examination:
1) immunogram.
2) bone marrow analysis.
3) karyotypic examination of bone marrow cells (a high percentage of chromosomal abnormalities is noted).

Answer key: 1-2, 2-1,2,3.

Task 2.

A 10-year-old child often develops vesicular rashes on the lips and around the nose, which occur after hypothermia. The rashes are often accompanied by malaise, an increase in body temperature to 37.1 ^{0}C. The blisters, having lasted for 2-3 days, burst, forming erosions. After healing (after 7-10 days), pigmentation remains on the skin.

1. Specify the clinical manifestations of immunopathology.
2. Indicate the leading etiological factor.
3. Name the skin cells that provide non-specific immunological resistance.

Sample answer: 1 - recurrent herpes infection;
2- ultraviolet rays; 3- keratinocytes, Langerhans cells

4. 4. Examples of test tasks for the final assessment

Test assignments are located in the Moodle system .
Access mode: https://educ-amursma.ru/mod/quiz/view.php?id=19093

1) INNATE IMMUNITY IS CHARACTERIZED
    1) lack of immunological memory
    2) participation of T- and B-lymphocytes
    3) production of antibodies
    4) antigen specificity

2) THE CELLULAR LINK OF INNATE IMMUNITY CONSISTS OF
   1) macrophages, T and B lymphocytes, NK cells;
   2) macrophages, NK cells, T-killers;
   3) T- and B-lymphocytes, polymorphonuclear (PMN) leukocytes;
   4) macrophages, NK cells, polymorphonuclear (PMN) leukocytes.

3) INNATE IMMUNITY IS CHARACTERIZED
   1) rapid response
   2) participation of T- and B-lymphocytes
   3) production of antibodies
   4) antigen specificity

4) I MOLECULES CLASSES ARE LOCATED ON THE SURFACE
   1) all somatic cells that have a nucleus
   2) macrophages, dendritic cells, B-lymphocytes
   3) T-killers, T-helpers and T-suppressors
   4) neutrophils, eosinophils, basophils

5) ADJUVANT IS A SUBSTANCE
   1) increasing the size of the antigen molecule
   2) enhancing the immunogenic properties of haptens
   3) simplifying the chemical structure of the antigen
   4) enhancing the immune response to an antigen

Answer samples:

question, no.	**1**	**2**	**3**	**4**	**5**
answer	2	1	3	4	2

4.5. List of practical skills that a student should have after mastering the discipline

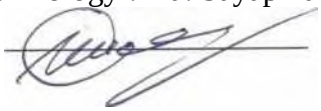
- Display schematically: stages of immunogenesis, phagocytosis, cellular and humoral immune response, complement activation; interaction of cells in the immune response, cytokine regulation of the immune response, structure of T- and B-cell receptors, immunoglobulins, spatial localization of MHC classes 1 and 2, ways of escaping microorganisms and viruses from immune control, types of allergic reactions, RCPT, GVHD reactions, using immunological terminology.
- Collect an immunological/allergic anamnesis (according to sample).
- Analyze complaints, medical history, physical examination data of the patient and, based on the information provided, establish a preliminary immunological/allergological diagnosis (according to sample).
- Evaluate the immunological study results taking into account norms.
- Calculate immunoregulatory index (IRI).
- Make a plan for immunological examination of a patient with suspected immunopathological condition and a plan immunocorrection.
- Apply for an immunological certificate passport.
- Isolate lymphocytes from peripheral blood; count phagocytic neutrophils, measure precipitation rings in gel.
- Conduct a conversation about a healthy lifestyle depending on immunopathology.
- Analyze the results of your activities.

4.6. List of questions for the test

1. The place of immunology in modern medicine. The role of immunology in the training of clinicians.
2. The main stages of development of immunology. Works of domestic scientists.
3. The role of I.I. Mechnikov in the formation of the doctrine of immunity. Non-specific factors of protection organism.
4. Complement, its structure, functions, activation pathways, role in immunity.
5. Interferons, nature. Methods of obtaining and applications.
6. NK cells, functions, membrane markers. KIR receptors.
7. Phagocytosis. Role in the immune system answer.
8. Humoral and cellular factors of non-specific immunobiological defense.
9. Cytokine receptors (structure, types). Interaction of cytokines with specific receptors. Signal transmission inside cells.
10. Cytokine regulation of specific and non-specific immunity.
11. Pro- and anti-inflammatory cytokines. Their role in the immune system answer.
12. The concept of interferons. Classification. Biological properties of interferons.
13. The concept of immunity. Types immunity.
14. Structure and functions of the immune system systems.
15. Immunocompetent cells. T- and B-lymphocytes, APC. Markers and receptors, cooperation.
16. Immunoglobulins. Structure and functions.
17. Classes of immunoglobulins, their characteristic.
18. Antigens: definition, main properties. Antigens of bacteria and viruses.
19. Main complex histocompatibility.
20. Superantigens .
21. Interaction of cells in the immune response.
22. Immunological memory. Immunological tolerance.
23. Theories immunity.
24. The main distinguishing features of immediate and delayed hypersensitivity reactions types.
25. The phenomenon of desensitization and its significance in medicine.
26. Mechanism and conditions of manifestation of anaphylaxis.
27. Features of antiviral and antifungal immunity.
28. Reasons for the ineffectiveness of antitumor immunity.
29. Genetic control of the immune system answer.
30. Features of transplantation immunity.
31. Mechanisms of virus “escape” from immunological control.
32. Immunological memory, immunological tolerance.
33. Antigens, characteristics, classification.
34. Immune status. Modern methods definitions.
35. Complement fixation reaction. Mechanism. Components. Application.
36. Reaction of neutralization of toxin by antitoxin. Mechanism. Methods of setting, application.
37. Enzyme-linked immunosorbent assay, immunoblotting . Mechanism, components, application.
38. Age-related features of the immune system systems.
39. Immunocompetent cells. Receptors.
40. Monoclonal antibodies. Obtaining, application.
41. Factors Affecting Immune Variability status.
42. The concept of primary immunodeficiencies. Causes. Treatment principles.
43. The concept of secondary immunodeficiencies. The role of environmental factors

in
formation of immunological deficiency. Treatment principles.
44. The main groups of immunobiological drugs, their characteristic.
45. Transplantation immunity. Promising methods for overcoming tissue incompatibility.
46. Immune mechanisms of rejection fabrics.
47. Antigen presenting cells. Their characteristic.
48. Concept O positive and negative immunoregulation . Apoptosis of lymphocytes and its initiators factors.
49. The importance of determining T-lymphocytes and their subpopulations in clinical practice.
50. Principles of allergy treatment.

APPROVED
at the meeting of the Department of Histology and Biology
Protocol No. 10 dated May 14, 2026
Head of the Department of Histology and BiologyI. Yu. Sayapina



SUPPLEMENTS AND AMENDMENTS TO THE WORKING PROGRAMME FOR THE DISCIPLINE
«IMMUNOLOGY»
SPECIALTY 31.05.01 GENERAL MEDICINE
FOR THE 2026–2027 ACADEMIC YEAR

1. The volume of contact work for the discipline «Immunology» has been reduced from 70 to 64 hours.
2. The volume of independent work for the discipline «Immunology» has been increased from 38 to 44 hours.
3. **In Clause 2.1 «Scope of the discipline and types of academic work» Section 2 the table shall be stated in the following edition:**

№ п/п	Types of educational work	Total hours	4th semester
1	Lectures	**16**	**16**
2	Practical classes	**48**	**48**
3	Independent work of students	**44**	**44**
Total labor intensity in hours		**108**	**108**
Total workload in credit units		**3**	**3**

4. **In Clause 2.2. «Thematic plan of lectures and their brief content» Section 2 the table shall be stated in the following edition:**

№ п/п	Lecture topics and their summary	Codes of formed competencies	Time commitment (hours)
1	Subject and tasks of immunology. Organs of the immune system. Types of immunity. Pre-immune mechanisms of resistance. Cellular and humoral link of innate immunity. History of the development of immunology. Main directions of modern immunology. The role of immunology in the development of medicine and biology, its connection with other sciences. The immune system of the body. Primary organs of the immune system: bone marrow, thymus. Secondary organs of the immune system: spleen, lymph nodes, lymphoid tissue associated with the skin (SALT) and mucous membranes (MALT), their role in the immune response. Types of immunity and their characteristics. Non-specific defense factors: physical and chemical barriers, their role in the body's resistance to infections, fundamental difference from specific immune factors. Humoral and cellular factors of non-specific immunobiological protection. Age-related features of natural resistance. Complement system. Activation pathways. Genetics of complement. Phagocytosis. Types. Mechanisms of killing of engulfed bacteria.	UC-1 GPC-2, 4, 5	2
2	Antigens: properties, classification, mechanisms of recognition by the immune system. Antigens – definition, main properties of antigens. Concept of foreignness, immunogenicity and specificity of antigen. Effect of molecular features of antigen on immunogenic properties. Immunochemical specificity of antigens. Antigenic determinants (epitopes). Classification of antigens. Complete and incomplete antigens. Haptens . Thymus-dependent and thymus-independent antigens. Allergens. Immunological tolerance. Mechanisms of antigen recognition by the immune system. Phenomenon of immunological cross-reactivity. Toxins and anatoxins. Autoantigens : CD antigens, erythrocyte antigens. Major histocompatibility complex (MHC) and its products – MHC class I and II molecules, their biological role. Phenomenon of MHC restriction of immune response. Transbarrier antigens. Tumor antigens.	UC-1 GPC-2, 4, 5	2
3	Biology of T-lymphocytes. Adaptive immune response by cellular type. Antigen-independent proliferation and differentiation of T-lymphocytes. Biological essence of positive and negative selection. Formation of immunological tolerance to autoantigens . Populations and subpopulations of T-lymphocytes formed in the thymus. Characteristics of the main differentiation clusters (CD molecules) of T-lymphocytes. Structure of TCR , TCR complex . Coreceptors (molecules CD 4 and CD 8). Activation of cytotoxic T-lymphocytes. Recognition of target cells, main stages of cytotoxic action, role of perforins and granzymes . Cytotoxic activity of macrophages. Formation of immunological memory cells. Biology of B-lymphocytes. Adaptive immune response of humoral type. Structure and functions of immunoglobulins.	UC-1 GPC-2, 4, 5	2

	Antigen-independent proliferation and differentiation of B-lymphocytes. Characteristics of the main differentiation clusters (CD molecules) of B-lymphocytes. Structure of BCR, BCR complex. Genetic mechanisms of immunoglobulin diversity. Characteristics of the main populations of B-lymphocytes. Thymus-independent proliferation and differentiation of B-lymphocytes, features of antibody formation. Thymus-dependent proliferation and differentiation of B-lymphocytes, change of immunoglobulin classes, formation of memory B-cells. Interaction (cooperation) between T-, B-, APC in the process of immune response. Mechanisms of development and regulation.		
4	Cytokines: definition, properties, mechanisms of action. Main functional groups of cytokines, their role in regulating the immune response. Concept of the cytokine system (nature, producer cells, target cells, properties, regulation mechanisms). Principles and mechanisms of control of immunocompetent cells. Classification of cytokines. Characteristics of individual groups of cytokines (interleukins, interferons, chemokines , tumor necrosis factors, colony-stimulating factors). Proinflammatory cytokines are mediators of pre-immune inflammation (producer cells, target cells, biological effects). Proinflammatory cytokines are mediators of immune inflammation (producer cells, target cells, biological effects). Anti-inflammatory cytokines (producer cells, target cells, biological effects). Cytokine network of cell- mediated immune response. Cytokine network of humoral immune response. Neuroendocrine regulation of immune response.	UC-1 GPC-2, 4, 5	2
5	Anti-infective immunity. Features of antibacterial, antiviral, antiparasitic immunity. Antitumor immunity. Features of immunity in bacterial infections. Effect of the antigenic structure of the microorganism on the immune response: features of immunity in infections caused by gram-positive and gram-negative microorganisms. Features of immunity in intracellular infections. Features of antitoxic immunity, the role of antibodies. Ways of microorganisms "escaping" the immune response. Immunity in viral infections, the role of interferons and CTLs. Features of antihelminthic and antiprotozoal immunity. Antitumor immunity, main reasons for failure of antitumor immunity. Concept of tumor markers, types, definition in clinical practice. Main directions of tumor immunotherapy.	UC-1 GPC-2, 4, 5	2
6	Transplantation immunology. Features of transplantation immunity. Immunology of reproduction. Transplantation immunology. Types of transplantation. Selection of donor-recipient pairs, HLA typing. Features of transplantation immunity. Immunological bases of "host versus graft reaction " (HTR) and " graft versus host reaction" (GVHD). Clinical forms of transplant rejection (hyperacute, acute, chronic), immunological mechanisms. Immunological monitoring of the recipient after allotransplantation . Immunosuppressive therapy, drugs for stopping the rejection crisis. Immunology of reproduction . State of mother's immunity during pregnancy. Humoral and cellular	UC-1 GPC-2, 4, 5	2

	mechanisms of maintaining immunity to embryonic alloantigens. Role of HLA antigens in mother-fetus relationships. Rhesus conflict between mother and fetus, diagnostics, prevention, treatment. Immune factors of reproductive organs and tissues. Immunological infertility. Sperm antigens. Antibodies to them, causes of formation in men and women, detection methods.		
7	Immunodiagnostics, immunoprophylaxis, immunotherapy. The concept of human immune status. Principles of formation. Age dynamics. Methods of immune status assessment. Diagnostic tests of levels I and II, indications for use. Determination of T- and B-lymphocyte subpopulations: assessment of mitotic and killer activity of lymphocytes, determination of NK-cell activity. Functional methods: lymphocyte blast transformation reaction , lymphokine production , leukocyte migration inhibition reaction. Skin tests as a method of cellular immunity indication. Determination of the content of the main classes of immunoglobulins. Methods of immunodiagnostics. Main types of antigen-antibody reactions (agglutination, precipitation, neutralization, etc.). Modern methods of immunodiagnostics (ELISA, immunoblotting , laser flow cytometry). Strategy and principles of immunoprophylaxis. Types of vaccines, their characteristics. Requirements for vaccines and ¬quality control . Contraindications for vaccination (absolute and relative). Complications after vaccination. Legislative basis for vaccination. Law of the Russian Federation "On Immunoprophylaxis of Infectious Diseases in Humans", national calendar of preventive vaccinations and vaccinations for epidemiological indications. Immunotherapy and its types. Immunocorrection. Immunostimulating, immunoreplacement , immunosuppressive therapy ¬. Immunotherapeutic drugs. Main groups of immunobiological drugs. Drugs of microbial origin. Immunoglobulins and immune serums, diagnostic ¬drugs, adaptogens.	UC-1 GPC-2, 4, 5	2
8	Immunopathology. Hypersensitivity reactions. Classification of allergic reactions according to Gehl and Coombs : type I - IgE -mediated anaphylactic (atopic) reactions; type II - cytotoxic reactions; type III - immune complex reactions; type IV - cellular, T-lymphocyte-mediated reactions. Mechanisms of allergic reactions. Diagnostic tests for detection of humoral allergy. Immunological bases of prevention and treatment. Desensitization.	UC-1 GPC-2, 4, 5	2
	Всего часов		**16**

5. In Clause 2.3. «Thematic plan of practical classes and their content» the table shall be stated in the following edition:

№ п/п	Topics of practical classes	Contents of the practical lesson	Codes of formed competencies and indicators of their achievement	Types of control	Labor intensity (hours)
1	Subject and tasks of immunology. Pre-immune mechanisms of resistance. Primary and secondary organs of the immune system. Types of immunity. Humoral link of innate immunity.	**Theoretical part:** Definition and tasks of immunology. Mechanical, physiological and biochemical factors of protection. Types of immunity. Organs of the immune system. Modern scheme of immunogenesis. Innate immunity. Humoral component of innate immunity. Complement system. Complement activation pathways. Acute phase proteins. **Practical part:** working with handouts, scientific, medical and reference literature, drawing up diagrams, designing a workbook.	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. GPC-5: AI GPC-5.1. AI GPC-5.3.	Testing in the Moodle system Frontal survey Solving situational problems Completing tasks according to the model	3
2	Innate immunity. Cellular link of innate immunity. Mechanisms of recognition and destruction of pathogens.	**Theoretical part:** innate immunity. Cellular component of natural immunity. Role of mast cells, granular leukocytes, monocytes/macrophages, dendritic cells, NK cells. Mechanisms of pathogen destruction: intracellular (phagocytosis) and extracellular killing . Types of phagocytosis, assessment methods. **Practical part:** completing exercises and assignments using a model, working with handouts, scientific, medical and reference literature, drawing up diagrams, and completing a workbook.	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3.	Testing in the system " Moodle " Frontal survey Solving situational problems Viewing and discussing the video clip “ Toll -like receptors – a bridge between innate and adaptive immunity”, “Natural killers – the body’s main defense against viruses and tumors”	3
3	Antigens, characteristics, types of antigen specificity.	**Theoretical part:** Definition and characteristics of the concepts "antigen", "antibody". Types of antigens. Human isoantigens: the system of antigens of erythrocytes, lymphocytes,	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6.	Testing in the system " Moodle " Frontal survey Solving situational	3

	Mechanisms of antigen recognition by the immune system. Major histocompatibility complex.	granulocytes, platelets. Antigenic structure of bacteria and viruses. Antigen processing in the macroorganism. Definition and characteristics of the major histocompatibility complex (MHC, HLA), role in the immune response. Genetic determination associated with the HLA system to a number of diseases. HLA typing methods. **Practical part:** completing exercises and assignments using a model, working with handouts, scientific, medical and reference literature, drawing up diagrams, and completing a workbook.	GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	problems Completing tasks according to the model	
4	Immune response by cellular type. Mechanisms of cell interaction in the immune response.	**Theoretical part:** Populations and subpopulations of ICCs involved in the immune response by cell type, their characteristics. Characteristics of the main differentiation clusters (CD markers). A antigen-independent proliferation and differentiation of T-lymphocytes. Positive and negative selection. The structure of the T-cell receptor. Modern methods of isolating ICC. The concept of cellular immunity. Antigen-dependent differentiation of T-lymphocytes. Phases of cell-mediated immune response. Cytotoxic and inflammatory variants of immune response by cellular type. The importance of determining T-lymphocytes and their subpopulations in clinical practice. **Practical part:** completing exercises and tasks according to the model, working with handouts, scientific, medical and reference literature, workbook design	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	Testing in the system " Moodle " Frontal survey Solving situational problems Viewing and discussing the video "Immune response by cellular type"	3
5	Humoral immune response. Antibody formation. Structure	**Theoretical part:** Populations, subpopulations of ICC participating in the immune response of the humoral type. Characteristics of	UC-1: AI UC-1.1. AI UC-1.2.	Testing in the system " Moodle " Frontal survey	3

	and functions of immunoglobulins.	the main differentiation clusters (CD markers). Antigen-independent proliferation and differentiation of B-lymphocytes. Structure of the B-cell receptor. Antigen-dependent proliferation and differentiation. Thymus-dependent and thymus- independent pathways of B-lymphocyte activation. Mechanisms of transformation into plasma cells. cells. Structure and immunoglobulins. The process of T-dependent antibody production, the involvement of interleukins, the role of CD4+ T cells; Dynamics of antibody formation. T and B cells of immunological memory. Methods for assessing the state of humoral immunity and their clinical use meaning. **Practical part:** completing exercises and tasks according to the model, working with handouts, scientific, medical and reference literature, drawing up diagrams, designing workbook.	AI UC-1.6. GPC-2: AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	Solving situational problems Viewing and discussing the video clip “Humoral immune response”	
6	Control lesson on the section.	Checking the acquisition of competencies (testing, interview on theoretical issues).	UC-1 GPC-2, 4, 5	Testing in the system " Moodle "	3
7	Hormones and cytokines of the immune system. Regulation of the immune response.	**Theoretical part:** The concept of the cytokine system. The main groups of mediators of the immune system. Classification of cytokines , characteristics of individual groups of cytokines, biological characteristics. Proinflammatory and anti-inflammatory cytokines. Cytokines are regulators of cell-mediated immune response and humoral immune response. Neuroendocrine regulation of immune response. Diagnostic value of determining cytokine concentration in blood. Use of cytokine preparations in clinical practice. **Practical part:**	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	Testing in the system " Moodle " Frontal survey Solving situational problems Designing a workbook (filling in tables for the main groups of cytokines)	3

		completing exercises and tasks according to the model, working with handouts, scientific, medical and reference literature, drawing up diagrams, designing workbook.			
8	Anti-infective immunity (antibacterial, antiviral, antiparasitic). Anti-tumor immunity.	**Theoretical part:** concept of the infectious process. Classification of anti-infective immunity. Features of immunity in bacterial infections. Antitoxic immunity. Ways of microorganisms "escaping" from the immune response. Features of immunity in viral infections. Features of antihelminthic and antiprotozoal immunity. Antitumor immunity. The concept of tumor markers, types, definition in clinical practice. Main directions of tumor immunotherapy. **Practical part:** completing exercises and tasks according to the model, working with handouts, scientific, medical and reference literature, drawing up diagrams, designing workbook.	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPK-2: AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	Testing in the system " Moodle " Frontal survey Solving situational problems Viewing and discussing the videos “Immune response against tuberculosis”, “Tumor immunotherapy”, “Monoclonal antibodies in tumor immunotherapy”	3
9	Transplantation immunology. Features of transplacental immunity. Immunology of reproduction.	**Theoretical part:** Concept Transplantation immunology, immunological incompatibility. The role of HLA antigens in the formation of immunological incompatibility. Mechanisms of host versus graft reactions (HVGR), reaction "graft versus host disease" (GVHD). Methods of overcoming tissue incompatibility. Immunology of reproduction. Immune factors of reproductive organs and tissues. The state of the mother's immunity during pregnancy. Humoral and cellular mechanisms of maintaining embryonic immunity alloantigens. HLA antigens in mother-fetus relationship. Rhesus- conflict between mother and fetus,	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	Testing in the system " Moodle " Frontal survey Solving situational problems Completing tasks according to the example in the workbook	3

		diagnostics, prevention, treatment. Immunological infertility. **Practical part:** completing exercises and tasks according to the model, working with handouts, scientific, medical and reference literature, drawing up diagrams, designing workbook.			
10	Control lesson on the section.	Checking the acquisition of competencies (testing, interview on theoretical issues, defense of creative work).	UC-1 GPC-2, 4, 5	Testing in the system " Moodle "	3
11	Immunodiagnostics . Modern methods of immune status assessment. Immunoprophylaxis. Immunotherapy. Immunobiological preparations.	**Theoretical part:** Definition of the concept "immune status", factors affecting immunity. Immunological tests of I and II levels, comparative characteristics, indications for prescription. Modern methods of immunodiagnostics. Definition and principles of immunoprophylaxis, immunotherapy, immunocorrection. Types of immunotherapy. Main groups and immunobiological preparations, their characteristics. Vaccines, their characteristics. Methods of vaccine production, evaluation of their effectiveness and complications. Requirements for vaccines and control quality. **Practical part:** completing exercises and tasks according to the model, working with handouts, scientific, medical and reference literature, drawing up diagrams, designing workbook.	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	Testing in the system " Moodle " Frontal survey Solving situational problems Viewing and discussion of videos "ELISA", " Immunoblotting ", presentations "Laser flow cytometry ", "PCR diagnostics"	3
12	Immunopathology. Type I hypersensitivity reactions . Allergy. Principles of diagnosis and	**Theoretical part:** Classification of hypersensitivity reactions. Hypersensitivity reactions of type I. Immunological bases of allergy: stage of sensitization, stage of clinical manifestations. Causes of allergy development, classification of allergens. Allergic diseases. Diagnostic tests for allergy	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. AI GPC-2.7.	Testing in the system " Moodle " Frontal survey Solving situational problems Viewing and discussing the video clips “Type 1	3

	treatment of allergic diseases.	detection. Immunological bases of prevention and treatment. Principles of emergency care. Desensitization. **Practical part:** completing exercises and tasks according to the model, working with handouts, scientific, medical and reference literature, drawing up diagrams, designing workbook.	GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	hypersensitivity reactions", "Causes of allergies: desensitization and sensitization", "Skin tests in allergy diagnostics".	
13	Immunopathology. Hypersensitivity reactions of types II , III and IV .	**Theoretical part:** Classification of hypersensitivity reactions. Hypersensitivity reactions of types II , III and IV . Immunological bases. The role of hypersensitivity reactions in the pathogenesis of diseases. Clinical manifestations. Principles of diagnostics and treatment. **Practical part:** completing exercises and tasks according to the model, working with handouts, scientific, medical and reference literature, drawing up diagrams, designing workbook.	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	Testing in the system " Moodle " Frontal survey Solving situational problems Viewing and discussing the video "Hypersensitivity reactions types 1, 2, 3 and 4"	3
14	Primary (PID) and secondary (SID) immunodeficiencies. Principles of diagnosis and treatment	**Theoretical part:** Nature and causes of immunodeficiency states (IDS). Definition PID and VID, their differences. Mechanisms of development of IDS. Main clinical syndromes. Principles of diagnosis, treatment, prevention. **Practical part:** completing exercises and tasks according to the model, working with handouts, scientific, medical and reference literature, drawing up diagrams, designing workbook.	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	Testing in the system " Moodle " Frontal survey Solving situational problems Viewing and discussing the video "HIV attacks".	3

15	Control lesson on the section	Checking the acquisition of competencies (testing, interview on theoretical issues, defense of creative work).	UC-1 GPC-2, 4, 5	Testing in the system " Moodle "	3
16	Final lesson (test)	Checking the acquisition of competencies (final testing in the Moodle system , interview on theoretical questions of the ticket and situational tasks, defense of the immunological passport).	UC-1: AI UC-1.1. AI UC-1.2. AI UC-1.6. GPC-2: AI GPC-2.2. AI GPC-2.7. GPC-4: AI GPC-4.3. GPC-5: AI GPC-5.1. AI GPC-5.3. AI GPC-5.4.	Final testing in the system " Moodle "	3
Total hours:					48

6. In Clause 2. 4. «Interactive forms of learning» the table shall be stated in the following edition:

No. topics p/p	The topic of practical classes	Labor intensity in hours	Interactive form of learning	Labor intensity in hours, in % of the lesson
		4th semester		
1	Subject and tasks of immunology. Pre-immune mechanisms of resistance. Primary and secondary organs of the immune system. Types of immunity. Humoral link of innate immunity.	3	Work in small groups. Filling out the table based on the example "Primary and secondary organs of the immune system" with subsequent peer review .	20 minutes (0.44 hours) 14.8%
2	Innate immunity. Cellular link of innate immunity. Mechanisms of recognition and destruction of pathogens.	3		20 minutes (0.44 hours) 14.8%
3	Antigens, characteristics, types of antigen specificity. Mechanisms of antigen recognition by the immune system. Major histocompatibility complex	3	Completion of tasks according to the model in the workbooks "Scheme of the immunological synapse" with subsequent peer review .	20 minutes (0.44 hours) 14.8%
4	Immune response by cellular type. Mechanisms of cell interaction in the immune response	3	Completion of tasks according to the model in the workbooks "Scheme of the immune response by cellular type" with subsequent peer review .	20 minutes (0.44 hours) 14.8%
5	Humoral immune response. Antibody formation. Structure and functions of immunoglobulins	3	Completion of tasks according to the model in the workbooks "Scheme of the immune response by humoral type" with subsequent peer review .	20 minutes (0.44 hours) 14.8%

6	Control lesson on the section	3	Interactive technology "Everyone teaches everyone" on the topic "Complement system". Watch the video " TOLL -like receptors - a bridge between innate and adaptive immunity" with answers to questions	40 minutes (0.75 hours) 29,6%
7	Hormones and cytokines of the immune system. Regulation of the immune response	3	Small group method. Work on filling in the tables " Pro-inflammatory cytokines", "Anti-inflammatory cytokines".	20 minutes (0.44 hours) 14.8%
8	Anti-infective immunity (antibacterial, antiviral, antiparasitic). Anti-tumor immunity	3	Small Group Method. Solving Situational Problems of Increased Complexity with discussion.	20 minutes (0.44 hours) 14.8%
9	Transplantation immunology. Features of transplacental immunity. Immunology of reproduction	3	Small Group Method. Solving Situational Problems of Increased Complexity with discussion.	25 minutes (0.55 hours) 18,5%
10	Control lesson on the section	3	Small Group Method. Solving Situational Problems of Increased Complexity with discussion.	20 minutes (0.44 hours) 14.8%
11	Immunodiagnostics. Modern methods of immune status assessment . Immunoprophylaxis. Immunotherapy. Immunobiological preparations.	3	The method of staging (business theater) " Work of the vaccination room", interpretation of immunograms.	25 minutes (0.55 hours) 18,5%
12	Immunopathology. Type I hypersensitivity reactions . Allergy. Principles of diagnosis and treatment of allergic diseases.	3	Watch and discuss the video: " Type I hypersensitivity reactions " with answers to questions	30 minutes (0.66 hours) 22.2%
13	Immunopathology. Hypersensitivity reactions of types II , III and IV .	3	View and discuss the video: "Hypersensitivity reactions types II , III and IV " with answers to questions	30 minutes (0.66 hours) 22.2%

14	Primary (PID) and secondary (SID) immunodeficiencies. Principles of diagnosis and treatment	3	Small Group Method. Solving Situational Problems of Increased Complexity with discussion.	25 minutes (0.55 hours) 18,5%
15	Control lesson on the section	3	Small Group Method. Solving Situational Problems of Increased Complexity with discussion.	20 minutes (0.44 hours) 14.8%
16	Final lesson (test)	3	Protection of the immunological passport.	30 minutes (0.66 hours) 22.2%

7. In Clause 2.6 «Independent work of students: in-class, out-of-class», the table shall be stated in the following edition:

No. p/p	**Topic of the practical lesson**	**Time for student preparation for the lesson**	**Forms of extracurricular independent work of a student**	
			Mandatory and the same for all students	**At the student's choice**
1	Subject and tasks of immunology. Pre-immune mechanisms of resistance. Primary and secondary organs of the immune system. Types of immunity. Humoral link of innate immunity.	2 hours	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the lesson	Report on the topic: "I.I. Mechnikov's contribution to the development of immunology" Making a layout of a tablet in electronic form on the topic: "Natural barriers"
2	Innate immunity. Cellular link of innate immunity. Mechanisms of recognition and destruction of pathogens.	2 hours	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the lesson	Production of electronic tablet layouts on the topic: “Activation of complement via the classical pathway”, “Activation of complement via the alternative pathway”, “Activation of complement via the lectin pathway”, “Complete and

				incomplete phagocytosis". Report on the topic: "Acute phase proteins of inflammation and their diagnostic significance."
3	Antigens, characteristics, types of antigen specificity. Mechanisms of antigen recognition by the immune system. Major histocompatibility complex	2 hours	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the lesson	Computer presentation and report on the topic: "History of the study of the major histocompatibility complex", "Tumor markers. Role in the diagnosis and treatment of tumors"
4	Immune response by cellular type. Mechanisms of cell interaction in the immune response	2 hours	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the lesson	Making a tablet in electronic form on the topic: "Cell-cell interactions in the immune response by cell type"
5	Humoral immune response. Antibody formation. Structure and functions of immunoglobulins	2 hours	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the lesson	Making a model of a tablet in electronic form on the topic: "The structure of serum immunoglobulins nov", "Biological action of antibodies".
6	**Control lesson on the section**	3 hours	Preparation for a test, defense of an essay, report	
7	Hormones and cytokines of the	2 hours	Preparation for a lesson on theoretical issues (reading	Computer presentation and

	immune system. Regulation of the immune response		lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the lesson	report on the topic: "Cytokines in the therapy of oncological diseases", "Clinical application of CSF".
8	Anti-infective immunity (antibacterial, antiviral, antiparasitic). Anti-tumor immunity.	2 hours	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the lesson	Review of Internet sources on the topic: "Non-specific antiviral immunity. The role of interferons"
9	Transplantation immunology. Features of transplacental immunity. Immunology of reproduction.	2 hours	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the lesson	Computer presentation and report on the topic: "Bone Marrow Transplant"
10	**Control lesson on the section**	3 hours	Preparation for a test, defense of an essay, report	
11	Immunodiagnostics. Modern methods of immune status assessment. Immunoprophylaxis. Immunotherapy. Immunobiological preparations.	2 hours	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on	Making a table or a tablet on the topic: “Scheme of setting up the ELISA reaction” Computer presentation or report on the topic: "Bone marrow stimulants"

			the topic of the lesson	
12	Immunopathology. Type I hypersensitivity reactions . Allergy. Principles of diagnosis and treatment of allergic diseases.	2 hours	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online class on the topic of the lesson	Making a layout of a tablet in electronic form on the topic "The role of mast cells in the development of type I hypersensitivity reactions " Computer presentation and report on the topic: "Food allergy"
13	Immunopathology. Hypersensitivity reactions of types II , III and IV .	2 hours	Preparation for a lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, preparing notes for the lesson in a workbook, drawing up algorithm diagrams, solving test tasks, situational problems, working on an abstract, searching in the online classroom on the topic of the lesson	Making a layout of a tablet in electronic form on the topic "The role of immune complexes in the development of type III hypersensitivity reactions " Computer presentation and report on the topic: " Immunological bases and clinical manifestations of reactions of HRT"
1 4	Primary (PID) and secondary (SID) immunodeficiencies. Principles of diagnosis and treatment	2 hours	Preparation for the lesson on theoretical issues (reading lecture material, basic and additional literature, methodological recommendations, preparation of notes for the lesson in the workbook, drawing up diagrams, algorithms, solving test tasks, situational problems, working on an essay, search work in the Internet class on the topic of the lesson	Making a table or tablet on the topic: “Iatrogenic factors causing the development of immunity nodeficits ".
15.	**Control lesson on the section**	3 hours	Preparation for the lesson on theoretical issues (reading lecture material, primary and secondary literature, methodological recommendations, search work	

			in the Internet class on the topic of the test lesson	
16.	Final lesson (test)	3 hours	Preparation for a credit lesson, defense of an abstract, immunological passport	
Total: 44 hours		**36**		**8**

8. In Clause 3 .6. «Licensed and freely distributed software used in the educational process» the table shall be stated in the following edition:

Commercial software products

1	MS Operating System Windows 7 Pro	License number 48381779
2	Operating system MS Windows 10 Pro , MS Office	AGREEMENT R No. 142 A dated December 25, 2019
3	MS Office	Number licenses : 43234783, 67810502, 67580703, 64399692, 62795141, 61350919
4	Kaspersky Endpoint Security for business Extended	Agreement No. 977/20 dated 12/24/2020
5	1C: PROF University	LICENSE AGREEMENT No. 2191 dated 15.10.2020
6	1C: PROF Library	LICENSE AGREEMENT No. 2281 dated 11.11.2020

Freely distributed software

1	Google Chrome	Freely distributed Distribution conditions: https://play.google.com/about/play-terms/index.html
2	Browser "Yandex"	Freely distributed License agreement for the use of the Yandex Browser software https :// yandex . ru / legal / browser_agreement /
3	Dr.Web CureIt !	Freely distributed License Agreement: https :// st . drweb . com / static / new - www / files / license _ CureIt _ ru . pdf
4	OpenOffice	Freely distributed License: http :// www . gnu . org / copyleft / lesser . html
5	LibreOffice	Freely distributed License: https :// ru . libreoffice . org / about - us / license /

9. In Clause 3.5. «Professional databases, information reference systems, electronic educational resources»

No. p/p	Resource name	Resource Description	Access	Resource address
Electronic library systems				
1	"Student Consultant"	For students and teachers of medical and pharmaceutical universities. Provides	library, individual access	http: // www .studmedlib.ru/

	Electronic library of the medical university.	access to electronic versions of textbooks, teaching aids and periodicals.		
2	"Doctor's Consultant" Electronic Medical Library.	The materials posted in the library have been developed by leading Russian specialists based on modern scientific knowledge (evidence-based medicine). The information has been prepared taking into account the position of the scientific and practical medical society (world, European and Russian) in the relevant specialty. All materials have undergone mandatory independent review.	library, individual access	http://www.rosmedlib.ru/cgi-bin/mb4x
3	PubMed	Free search engine in the largest medical bibliographic database MedLine . Documents medical and biological articles from the specialized literature, and also provides links to full-text articles.	library, free access	http://www. ncbi.nlm.nih . gov/ pubmed /
4	Oxford Medicine Online.	A collection of Oxford medical publications, bringing together over 350 titles into a single, cross-searchable resource. Publications include The Oxford Handbook of Clinical Medicine and The Oxford Textbook of Medicine , the electronic versions of which are constantly updated.	library, free access	http://www.oxfordmedicine.com
5	Human Biology Knowledge Base	Reference information on physiology , cell biology , genetics , biochemistry , immunology , pathology . (Resource of the Institute of Molecular Genetics of the Russian Academy of Sciences .)	library, free access	http://humbio.ru/
Information systems				
6	Russian Medical Association	Professional Internet resource. Objective: to facilitate the implementation of effective professional activities of medical personnel. Contains the charter, personalities, structure, rules of entry, information about the Russian Medical Union.	library, free access	http://www.rmass.ru/
7	Web medicine.	The site presents a catalog of professional medical resources, including links to the most authoritative subject sites, journals, societies, as well as useful documents and programs. The site is intended for doctors, students, employees of medical universities and scientific institutions.	library, free access	http: //webmed.irkutsk.ru/
Databases				
8	World Health Organization	The site contains news, statistics on countries that are members of the World	library, free access	http://www.who.int/ru/

		Health Organization, fact sheets, reports, WHO publications and much more.		
9	Ministry of Science and Higher Education of the Russian Federation.	The website of the Ministry of Science and Higher Education of the Russian Federation contains news, newsletters, reports, publications and more.	library, free access	http://www.minobrnauki.gov.ru
10	Ministry of Education of the Russian Federation.	The website of the Ministry of Education of the Russian Federation contains news, newsletters, reports, publications and much more.	library, free access	https://edu.gov.ru/
11	Federal portal "Russian education"	A single window for access to educational resources. This portal provides access to textbooks on all branches of medicine and health care.	library, free access	http: //www.edu.ru/ http://window.edu.ru/catalog/?p rubr=2.2.81.1
Bibliographic databases				
12	Database "Russian Medicine"	It is created in the Central Scientific and Methodological Library and covers the entire collection, starting from 1988. The database contains bibliographic descriptions of articles from domestic journals and collections, dissertations and their abstracts, as well as domestic and foreign books, collections of institute proceedings, conference materials, etc. Thematically, the database covers all areas of medicine and related areas of biology, biophysics, biochemistry, psychology, etc.	library, free access	http://www.scsml.rssi.ru/
13	eLIBRARY.RU	Russian information portal in the field of science, technology, medicine and education, containing abstracts and full texts of more than 13 million scientific articles and publications. The eLIBRARY.RU platform provides electronic versions of more than 2,000 Russian scientific and technical journals, including more than 1,000 open access journals.	library, free access	http://elibrary.ru/defaultx.asp
14	Portal Electronic library of dissertations	Currently, the Electronic Library of Dissertations of the Russian State Library contains more than 919,000 full texts of dissertations and abstracts.	library, free access	http://diss.rsl.ru/?menu=disscatalog/
15	Medline.ru	Medical and biological portal for specialists. Biomedical journal. Last updated February 7, 2021.	library, free access	http://www.medline.ru