

**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

**WORK PROGRAM  
discipline "Normal Physiology"**

**Specialty: 31.05.01 General Medicine**

**Course: 2**

**Sem ester: 3, 4**

**Total hours: 252 hours**

**Total credits: 7 credits.**

**Form of control: exam, 4th sem ester**

The course work program is compiled in accordance with the requirements of the Federal State Educational Standard of Higher Education - Specialist in specialty 31.05.01 General Medicine, approved by the order of the Ministry of Education and Science of Russia dated August 12, 2020 No. 988 (registered with the Ministry of Justice of Russia on August 26, 2020 No. 59493), OPOP VO (2021).

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**APPROVED** at the meeting of the Department of Physiology and Pathophysiology, protocol no. 10 from « 13 » May 2021

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**T.A.**

**Conclusion of the Expert Commission for the review of the Work Programs:  
Protocol No. 2 dated May 17, 2021**

**Expert of the Expert Commission Ph.D.  
Utochkina**



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**E.A.**

**APPROVED** at the meeting of the Central Monitoring Committee No. 1: minutes No. 8 of May 17, 2021.

**Chairman of the Central Committee No. 1**

**Doctor of Medical Sciences, Professor  
Borodin**



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**E.A.**

**AGREED:** Dean of the Faculty of Medicine,

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## 1. EXPLANATORY NOTE

### 1.1.Characteristics of the discipline

Normal physiology, as a science about the vital activity of a healthy person and the physiological foundations of a healthy lifestyle, is the methodological foundation of medicine, primarily its preventive direction, as well as the scientific basis for diagnosing health and predicting the functional activity of the human body.

As the final academic discipline in preclinical biomedical education and a fundamental stage of student training, physiology is organically linked to biology, biophysics, chemistry, biochemistry, anatomy, histology, and embryology, on the one hand, and to pathological physiology, pharmacology, and propaedeutic clinical disciplines, on the other. Physiology integratively encompasses all levels of the study of the body's vital functions—molecular, cellular, tissue, organ, organismal, and population. Modern human physiology focuses on the dynamics of the body's fundamental life processes, the complex mechanisms and types of regulation of all vital processes occurring in the body at all levels, while being based on a materialistic worldview, thereby developing this fundamental scientific principle.

### 1.2. The purpose and objectives of the discipline.

**Objective.** To develop students' systematic knowledge of the vital functions of the whole organism and its individual parts, the fundamental patterns of physiological functions and their regulatory mechanisms as they interact with each other and with environmental factors, and their characteristics in children and adolescents; the physiological foundations of clinical and physiological research methods used in functional diagnostics and in the study of human integrative activity; and the physiological foundations of a healthy lifestyle .

#### Learning objectives of the course:

- developing students' skills in analyzing the functions of the whole organism from the perspective of integral physiology, analytical methodology, and the fundamentals of holistic medicine;
- developing in students a systematic approach to understanding the physiological mechanisms underlying interactions with environmental factors and the implementation of adaptive strategies of the human body and animals for the implementation of normal functions of the human body from the perspective of the concept of functional systems;
- study the methods and principles of research into the assessment of the state of the body's regulatory and homeostatic systems in an experiment, taking into account their applicability in clinical practice;
- students' study of the patterns of functioning of various systems of the human body and the characteristics of intersystem interactions in the context of performing targeted activities from the perspective of the theory of adaptation;
- teaching students methods of assessing the functional state of a person, the state of regulatory and homeostatic factors in various types of targeted activities;
- students study the role of higher nervous activity in the regulation of human physiological functions and the targeted management of the body's reserve capacities under normal and pathological conditions;
- familiarizing students with the basic principles of modeling physiological processes and existing computer models (including biofeedback) for the study and targeted control of the visceral functions of the body;

- developing students' basic clinical thinking skills based on an analysis of the nature and structure of interorgan and intersystem relationships from the perspective of integrated physiology for the future practical activities of a physician.

### 1.3. The place of the discipline in the structure of the OPEP HE :

The discipline "Normal Physiology" refers to Block 1.B. Basic part. The total coursework time is 252 hours (7 credits). Of these, 144 hours are in the classroom, and 72 hours are allocated for independent student work. Assessment is by exam.

The main sections of the discipline studied:

- 1) general physiology,
- 2) private physiology,
- 3) integrative physiology.

### 1.4. Requirements for students

To study this discipline, knowledge, skills and abilities formed by previous disciplines/practices are required:
<b>Latin</b>
<b>Knowledge :</b> Basic medical and pharmaceutical terminology in Latin.
<b>Skills:</b> be able to apply knowledge to communication and obtaining information from medical literature.
<b>Professional foreign language</b>
<b>Knowledge:</b> Basic medical and pharmaceutical terminology in a foreign language.
<b>Skills :</b> be able to apply knowledge for communication and obtaining information from foreign sources.
<b>History of medicine</b>
<b>Knowledge:</b> Outstanding figures in medicine and healthcare, Nobel laureates, outstanding medical discoveries in the field of physiology, the influence of humanistic ideas on medicine.
<b>Skills:</b> be able to competently and independently present and analyze the contribution of Russian scientists to the development of physiology.
<b>Philosophy</b>
<b>Knowledge:</b> Methods and techniques of philosophical analysis of problems; forms and methods of scientific knowledge, their evolution; basic patterns and trends in the development of the world historical process; laws of dialectical materialism in medicine.
<b>Skills:</b> be able to competently and independently present and analyze the forms and methods of scientific knowledge and the laws of dialectical materialism in medicine.
<b>Histology, embryology, cytology</b>
<b>Knowledge:</b> embryogenesis, structure and function of tissues, organs and body systems.
<b>Skills:</b> be able to draw cells of various body tissues, show their main organelles, work with a light microscope taking into account safety regulations .
<b>Modern problems of regeneration</b>
<b>Knowledge:</b> biological essence, main forms and phases of the main types of regeneration - physiological and reparative ; general ideas about the possibility of stimulating regenerative processes occurring in the body; main types of stem cells, sources of their acquisition, application in medicine.
<b>Skills:</b> be able to analyze the patterns of physiological and reparative regeneration and the importance of the immune system.
<b>Physics, mathematics. Medical informatics.</b>
<b>Knowledge:</b> Mathematical methods for solving intellectual problems and their application in medicine; theoretical foundations of computer science, collection, storage, retrieval, processing, transformation, and dissemination of information in medical and biological systems, and the use of information computer systems in medicine; principles of operation and design of equipment

used in physiology and medicine, the basics of physical and mathematical laws that are reflected in physiology.
<b>Skills:</b> be able to use educational, scientific, popular science literature, a personal computer, the Internet for professional activities, work with equipment taking into account safety regulations.
<b>Chemistry. Bioinorganic and biophysical chemistry in medicine</b>
<b>Knowledge :</b> the chemical and biological essence of the processes occurring in a living organism at the molecular and cellular levels.
<b>Skills :</b> be able to analyze the contribution of chemical processes to the functioning of the body's physiological systems.
<b>Biochemistry. Bioorganic chemistry in medicine</b>
<b>Knowledge:</b> The structure and biochemical properties of the main classes of biologically important compounds, the main metabolic pathways of their transformation; the role of cell membranes and their transport systems in metabolism.
<b>Skills:</b> be able to analyze the contribution of biochemical processes to the functioning of the body's physiological systems, interpret the results of the most common laboratory diagnostic methods to identify disorders in the body's physiological systems.
<b>Biology</b>
<b>Knowledge:</b> The laws of genetics and its importance for medicine; the patterns of heredity and variability in individual development as the basis for understanding the pathogenesis and etiology of hereditary and multifactorial diseases; the biosphere and ecology, and bioecological diseases.
<b>Skills:</b> be able to analyze the patterns of heredity and variability in the development of the body's physiological systems.
<b>Anatomy</b>
<b>Knowledge:</b> Anatomical and physiological characteristics of various organs and systems of the body during ontogenesis.
<b>Skills:</b> be able to analyze the structure and establish connections between the structural features and functions of various organs and systems of the body.

### 1.5. Interdisciplinary links with subsequent disciplines

No. p / p	Name of subsequent disciplines	Sections of the discipline		
		1.	2.	3.
1	Propaedeutics of internal diseases	+	+	+
2	Pharmacology	+	+	+
3	Clinical pharmacology	+	+	+
4	Pathophysiology, clinical pathophysiology	+	+	+
5	Pathological anatomy, clinical pathological anatomy	+	+	+
6	General surgery	+	+	+
7	Public health and healthcare, health economics	+	+	+
8	Otorhinolaryngology	+	+	+
9	Faculty therapy	+	+	+
10	Neurology, neurosurgery	+	+	+
11	Obstetrics and gynecology	+	+	+
12	Psychiatry, medical psychology	+	+	+
13	Faculty surgery, urology	+	+	+

14	Infectious diseases	+	+	+
15	Dermatovenereology	+	+	+
16	Traumatology orthopedics	+	+	+
17	Hospital surgery, pediatric surgery	+	+	+
18	Anesthesiology, resuscitation, intensive care	+	+	+
19	Hospital therapy, endocrinology	+	+	+
20	Medical rehabilitation	+	+	+
21	Oncology, radiation therapy	+	+	+
22	Phthisiology	+	+	+
23	Outpatient therapy	+	+	+
24	Forensic medicine	+	+	+
25	Dentistry	+	+	+
26	Pediatrics	+	+	+
27	Hygiene	+	+	+
28	Physical culture	+	+	+

### 1.6. Requirements for the results of mastering the discipline

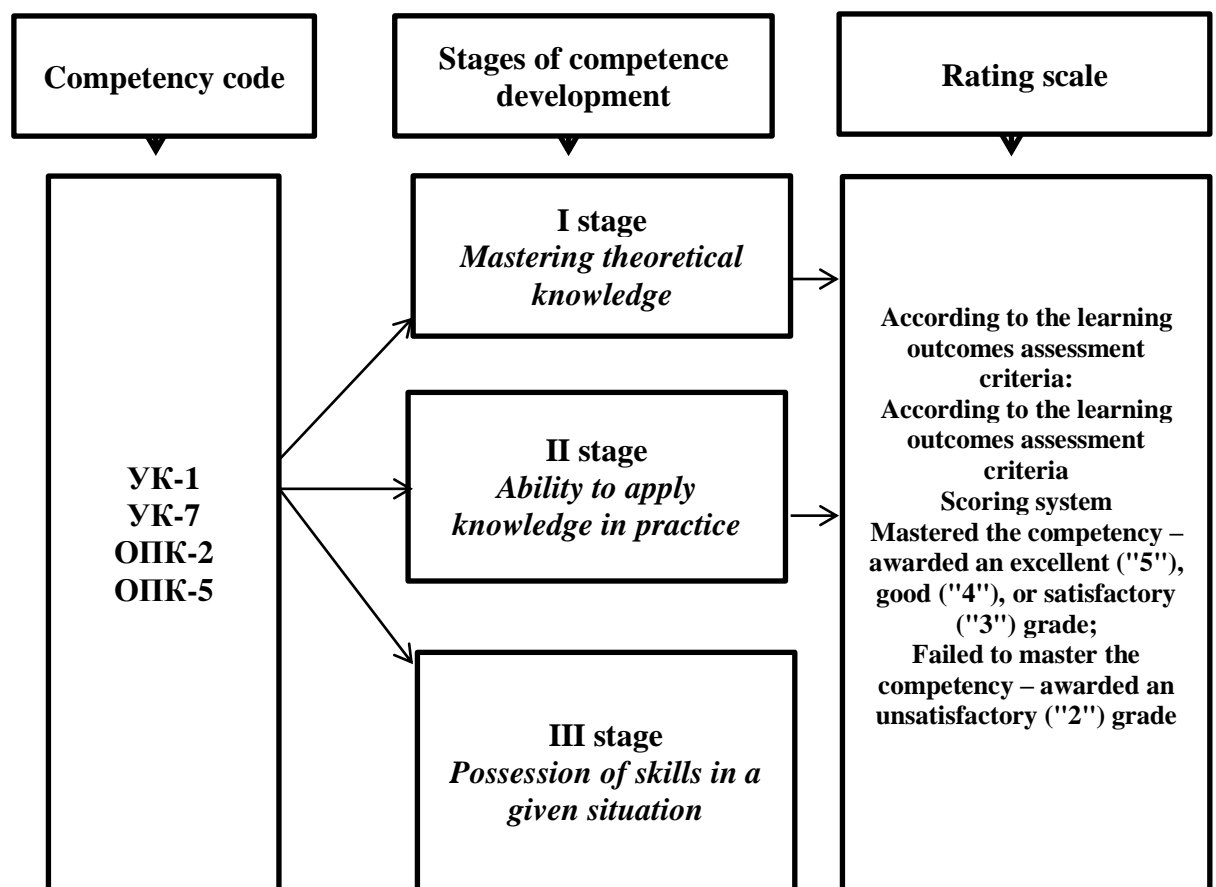
The study of the discipline "Normal Physiology" is aimed at the formation/improvement of the following competencies: universal (UK), general professional (GPK)

No. p / p	Code and name of competence	Code and name of the competency achievement indicator
<b>Universal competencies</b>		
1	UK-1. Capable of critically analyzing problematic situations based on a systems approach and developing an action strategy.	ID UK 1.1 And analyzes the problem situation as a system, identifying its components and the connections between them  ID UK 1.2 Identifies gaps in the information needed to solve problem situations and designs processes to eliminate them .
	UK-7. Able to maintain an adequate level of physical fitness to ensure full social and professional functioning	ID UK-7.1. Observes and promotes healthy lifestyle standards in various life situations and in professional activities
<b>General professional competencies</b>		
2	OPK-2. Capable of implementing and monitoring the effectiveness of measures to prevent infectious and non-infectious diseases in children, promote a healthy lifestyle, and educate the population about public health and hygiene.	ID OPK-2.2. Promotes a healthy lifestyle aimed at improving sanitary culture and disease prevention among patients (the population); organizes events for sanitary and hygiene education and the development of healthy lifestyle skills.
	OPK-5. Capable of assessing morpho-functional, physiological states and pre-pathological processes in the body to solve professional problems	ID OPK-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 OPK-5.3. Knows the indicators of the morphofunctional and physiological state of a healthy person and can measure/determine them.

## 1.7 . Stages of competence development and description of the assessment scale

Sections of the discipline and the code of the competence being developed

Item No.	Section name	Code of the competence being formed
1	general physiology	UK-1, UK-7, OPK-2, OPK-5
2	private physiology	UK-1, UK-7, OPK-2, OPK-5
3	integrative physiology	UK-1, UK-7, OPK-2, OPK-5



## 1.8. Forms of training organization and types of control.

Forms of organization of student training: lectures, practical classes, seminars.

To implement a competency-based approach, alongside traditional teaching methods, active and interactive learning methods are included, including computer simulations, situational and computational problem solving, and practical skills training. Specifically, a competitive element is introduced when solving situational problems, encouraging students to be more proactive. The first student or group of students to propose the correct solution to a problem is rewarded with a higher grade for the lesson.

### Types of control:

- **input** : testing on the Moodle portal in the course “Normal Physiology” at the beginning of the training;
- **current control**:

- initial control is carried out during an interactive survey on questions about preparation for classes, checking the completion of written homework;
- final control: control over the implementation of practical work, solving situational and computational problems, computer simulations, checking protocols of practical classes with an explanation of the mechanism of the processes being studied, conclusions, testing.

Traditional assessment methods allow students to assess their understanding of the course material. Students' ability to apply their knowledge can be assessed by solving situational problems, predicting research results in the Physiology Simulator program, and discussing the results of experimental studies, where students are required to explain their findings and draw conclusions.

- **midterm control:** control acquisition of knowledge of a specific section - oral interactive survey, interview on situational tasks, test control;

- **midterm assessment:** oral survey, test control.

The student's level of mastery of practical skills is assessed during the course of practical work, in final classes, including the final class on practical skills, and in the exam.

## **2. STRUCTURE AND CONTENT OF THE DISCIPLINE.**

### **2.1. Scope of the course and types of academic work:**

<b>Types of educational work</b>	<b>Total hours</b>	<b>Semesters</b>	
		<b>3</b>	<b>4</b>
Lectures	40	20	20
Practical classes (seminars)	104	52	52
Independent work of students	72	36	36
Exam	36		36
<b>Total labor intensity in hours</b>	<b>252</b>	<b>108</b>	<b>144</b>
<b>Total workload in credit units</b>	<b>7</b>	<b>3</b>	<b>4</b>

## 2.2. Thematic plan of lectures and their summary

No. p / p	Lecture topics	Codes of formed competencies	Labor intensity (hours)
1	2	3	4
<b>3rd semester</b>			
1.	<p><i>Fundamental concepts of physiology. General physiology of excitable tissues.</i> Understanding integrative and disintegrative processes in the body as the basis for clinical thinking. Health diagnostics and prognosis of functional state and human performance. Basic physiological properties and processes in cells and tissues. Excitability, conductivity, contractility, secretion , and automaticity . Laws of stimulus action in homogeneous and heterogeneous systems and excitation conduction.</p>	UK-1.7, OPK-2.5	2
2.	<p><i>Neuromuscular physiology.</i> <i>Regulation of physiological functions of the body.</i> Physical and chemical mechanisms of excitation conduction in systems. Contractile function and neuromotor units. Physiological and physical properties of muscles. The concept of regulation. Types of nervous, humoral and neurohumoral regulation. Self-regulation . The principle of the nervous system's activity, its development in the works of I. M. Sechenov, I. P. Pavlov. The reflex pathway. Disadvantages of reflex regulation. The concept of management effectiveness and efficiency. Feedback. Afferentation and its significance. The concept of adaptive outcome. Principles of reflex theory.</p>	UK-1.7, OPK-2.5	2
3.	<p><i>Systemic principle of regulation of physiological functions</i> P.K. Anokhin's theory of functional systems and self-regulation of functions. A cybernetic approach to regulatory processes. Classification of functional systems. Schematic diagram of the structural organization of a functional homeostatic system, a system-forming factor. Regulation of functions by discrepancies and disturbances. Principles of multi-coupled regulation. Feedback as one of the leading mechanisms in regulating functions. Principles of coding physiological information. The concept of homeostasis and homeokinesis . Self-regulating principles for maintaining the constancy of the body's internal environment and its physiological constants. The significance of the theory of functional systems for physiology, biology, medicine, and other disciplines. Age-related features of the formation and regulation of physiological functions. Systemogenesis .</p>	UK-1.7, OPK-2.5	2
4.	<i>Excitation and inhibition in the central nervous system. The theory of nerve centers.</i>	UK-1.7,	2

	<p>The neuron as a structural and functional unit of the central nervous system. General outline of the nervous system's structure. Brain and spinal cord. Nerve centers in the narrow and broad sense. Basic properties of nerve centers. Inhibition in the central nervous system: characteristics, classification at various levels of this process, and its mechanisms. Types of inhibition at the membrane, synapse, small neural circuit, and organism levels. General principles of central nervous system coordination. Interaction between excitation and inhibition. Principles of reciprocity , feedback, a common "final path," and dominance. Interaction between various levels of the central nervous system during function regulation . Features of excitation and inhibition processes in early ontogenesis.</p>	OPK-2.5	
5.	<p><i>Physiology of motor activity. Mechanisms regulating muscle tone and movement.</i></p> <p>Types of motor activity. Lower and higher motor regulation centers. The pyramidal and extrapyramidal systems and their influence on the lower motor centers. Mechanisms of muscle tone regulation at the spinal level. Brongest's experiment .</p> <p>Supraspinal mechanisms of muscle tone regulation. Decerebrate rigidity and the mechanism of its development. Descending influences of the reticular formation (inhibitory and facilitatory) on spinal cord reflex activity. The role of the reticular formation in maintaining and redistributing muscle tone.</p> <p>Tonic reflexes of the brainstem (R. Magnus ). The role of the spinal cord, medulla oblongata, and midbrain in the implementation of phasic -tonic muscle activity.</p>	UK-1.7, OPK-2.5	2
6.	<p><i>Physiology of the autonomic nervous system.</i></p> <p>Structural and functional features of the somatic and autonomic nervous systems. Sympathetic and parasympathetic divisions of the autonomic nervous system. Principles of organization of the efferent link of autonomic reflexes. Autonomic ganglia and their functions. Preganglionic and postganglionic nerve fibers and their functional differences. Mechanism of excitation transmission in the autonomic ganglia. Autonomic nervous system mediators. Main types of receptive substances. Influence of the sympathetic and parasympathetic divisions of the autonomic nervous system on the innervated organs. Synergism and relative antagonism of influences. Higher and lower autonomic centers. Participation of the autonomic nervous system in the integration of functions during the formation of holistic behavioral acts. Autonomic components of behavior. Features of the autonomic nervous system in children.</p>	UK-1.7, OPK-2.5	2
7.	<p><i>Blood as part of the body's internal environment. Its basic physical and chemical properties.</i></p> <p>Homeostasis of formed elements of the blood. Basic functions of the blood. Basic physiological constants of the blood. Osmotic and oncotic pressure. Hemoglobin, structure, properties, amount in the blood. Hemoglobin compounds. Color index of blood. The concept of erythron . Physiological erythrocytosis, conditions and mechanisms of its development. The concept of leukocytosis and leukopenia. Functions of leukocytes. Functional system regulating the number of formed elements in the blood. Nervous and humoral mechanisms</p>	UK-1.7, OPK-2.5	2

	regulating the number of erythrocytes. Features of the blood system in children: formed elements, blood plasma, immunity.		
8.	<p><i>Immunological properties of blood. The RASK system.</i></p> <p>Characteristics of the physiological immune systems of the blood. Innate and acquired immunity. Cellular and humoral, specific and nonspecific. The concept of immunization. Blood groups. The importance of knowledge of blood group affiliation. Classification and characteristics of blood groups according to the ABO system and according to Rh factors . Blood transfusion rules. Blood group formation during ontogenesis. Physiology of hemostasis. The process of stopping bleeding, its stages and significance. The coagulation and anticoagulation systems of the blood. Features of hemostasis in children. The functional system regulating the state of aggregation. Regulation of hemostasis.</p>	UK-1.7, OPK-2.5	2
9.	<p><i>Physiology of respiration.</i></p> <p>The Importance of Breathing for the Body. The Main Stages of the Respiration Process. The Mechanism of External Respiration. Biomechanics of Inhalation and Exhalation. The Pleural Cavity and Its Role in the Mechanism of External Respiration. Elastic Properties of the Lungs and Chest Walls. Surfactants. Gas Exchange in the Lungs. Relative Constancy of the Alveolar Air Composition. Tensions of Gases Dissolved in the Blood and Methods of Measurement. Partial Pressure of Oxygen and Carbon Dioxide in the Alveolar Air. Properties of the Pulmonary Membrane. Diffusion Capacity of the Lungs. Gas Transport (O<sub>2</sub> , CO<sub>2</sub> ) by the Blood. Hemoglobin and Its Forms. Dissociation of Oxyhemoglobin. O<sub>2</sub> and CO<sub>2</sub> Content in Arterial and Venous Blood. Formation and Dissociation of Bicarbonates and Carboxyhemoglobin. The Importance of Carbonic Anhydrase. Gas Exchange between Blood and Tissues.</p> <p>CNS structures that regulate respiratory cycles. Neuronal organization of the bulbar respiratory center. Mechanisms of respiratory rhythm formation . Mechanoreceptors of the lungs and their role in the self-regulation of respiratory rate and depth. Hering and Breuer reflexes . Conditioned and voluntary regulation of breathing.</p> <p>The influence of arterial blood gas composition and pH on respiratory rate and depth. Central and peripheral chemoreceptors and their role in maintaining gas homeostasis. The functional system regulating external respiration. Changes in pulmonary ventilation during hypercapnia and hypoxia. The functional system maintaining blood gas composition.</p> <p>The mechanism of a newborn's first breath. Features of breathing in children .</p>	UK-1.7, OPK-2.5	2
10.	<p><i>Physiological properties of the myocardium and their characteristics. The cardiac cycle.</i></p> <p>The importance of blood circulation for the body. General structure of the circulatory system. Blood circulation as a component of various functional systems that determine homeostasis. The heart, the importance</p>	UK-1.7, OPK-2.5	2

	of its chambers and valve apparatus. The cardiac cycle and its structure. Cardiac automaticity . Modern concepts of the substrate, nature, and gradient of automaticity . Ionic mechanisms of the action potential of cardiomyocytes . The relationship between excitation, excitability, and contraction in different phases of the cardiac cycle . Extrasystoles. Phase analysis. Changes in pressure and blood volume in the cavities of the heart in different phases of the cardiac cycle . Systolic and minute blood volume as a quantitative result of cardiac activity. External manifestations of cardiac activity, their origin, and research methods.		
<b>4th semester</b>			
11	<p><i>Physiological basis of hemodynamics.</i></p> <p>Systemic hemodynamics. Functional classification of blood and lymphatic vessels. Fundamental laws of hemodynamics. Total peripheral vascular resistance. Mechanism of vascular tone formation. Factors ensuring blood movement through high- and low-pressure vessels. Blood flow velocity in various parts of the circulatory system. Blood circulation time. Blood pressure and its types. Factors determining blood pressure. Blood storage organs. Blood pressure, linear and volumetric blood flow velocities in various parts of the circulatory system. Regional circulation. Morphofunctional characteristics of the main components of the microcirculatory bed.</p> <p>Features of blood circulation in the fetus and children. The fetal circulation pattern and its restructuring after birth.</p>	UK-1.7, OPK-2.5	2
12.	<p><i>Regulation of cardiac function and vascular tone. Functional system for maintaining optimal blood pressure.</i></p> <p>Functional system of cardiac regulation. Myogenic regulatory mechanisms: Frank- Starling law, Bowditch ladder , Anrep phenomenon , chrono -inotropic dependence. Neurogenic regulatory mechanism, peripheral cardiac reflexes: receptors, reflex arcs, significance. Influence of extracardiac nerves on the heart. Reflex regulation of cardiac activity: classification, reflexogenic zones, significance. Influence of humoral factors on cardiac function. Mechanisms of vascular tone regulation: local and central. The role of the endothelium in vascular tone regulation. Influence of efferent nerves and humoral factors on vessels. Vascular regulatory phenomena: autoregulation , functional and reactive hyperemia.</p> <p>The vascular system in children of different ages. Development of vagal tone and changes in heart rate during ontogenesis.</p>	UK-1.7, OPK-2.5	2
1 3.	<p><i>Digestion is a systemic process of metabolic saturation</i></p> <p><i>Mechanisms and basic patterns of regulation of digestive functions.</i></p> <p>Physiological foundations of hunger and satiety. I. P. Pavlov's concept of the food center. Functional nutrition. Digestion, basic principles and regulatory mechanisms. The essence of digestion. Types of digestion. Basic principles and mechanisms of digestion regulation. Phases of secretion of the main digestive glands. Methods for studying the functions of the digestive tract.</p>	UK-1.7, OPK-2.5	2

14.	<p><i>Metabolic basis of physiological functions.</i></p> <p>Biological thermodynamics or bioenergetics. The laws of thermodynamics and their applicability to living organisms. The body's energy balance and its regulation. The body as an open thermodynamic system. The exchange of substances and energy between the organism and the external environment as the fundamental conditions of life and the maintenance of homeostasis. The body's energy balance. Accounting for energy intake and expenditure: physical calorimetry, the caloric value of various substances (physical and physiological). Direct and indirect calorimetry (complete and incomplete gas analysis). The caloric coefficient of oxygen. Respiratory quotient. Basal metabolic rate, its value, and the factors determining it. The specific dynamic effect of food. Work metabolism. Energy expenditure of the body during different types of work and at different ages. Features of metabolism and energy in children.</p>	UK-1.7, OPK-2.5	2
15.	<p><i>Physiology of thermoregulation. The system that maintains a constant body temperature.</i></p> <p>Homeothermy and poikilothermy . Body temperature scheme. Constancy of internal body temperature as a prerequisite for normal metabolic processes. Metabolism as a source of heat generation. Centers of physical and chemical thermoregulation. Heat production and heat loss. The functional system that maintains a constant internal temperature despite changes in external temperature. Age-related characteristics of thermoregulation.</p>	UK-1.7, OPK-2.5	2
16.	<p><i>Functional system of allocation and characteristics of its main elements.</i></p> <p>The executive elements of the excretory system (kidneys, lungs, skin, digestive tract), their participation in maintaining the body's homeostasis. Skin as an excretory organ. Functions of the sebaceous and sweat glands and regulation of their activity.</p> <p>The main processes of urine formation (glomerular filtration, tubular Reabsorption and secretion). Mechanisms of glomerular filtration, composition of primary urine. Countercurrent system. Reabsorption in the tubules and mechanisms of its regulation. Secretory processes in the tubules. Final urine and its composition. Neurohumoral mechanisms of regulation of urine formation, the role of the nervous system and hormones (ADH, aldosterone, catecholamines, etc.). Methods for quantitative assessment of the processes of filtration, reabsorption , secretion, plasma flow and blood flow in the kidneys. The role of the kidneys in the regulation of nitrogen balance. Adaptive changes in kidney function under various environmental conditions</p> <p>Nervous and humoral regulation of renal blood supply. Regulation of glomerular filtration in the kidneys. The importance of arterial pressure in the systemic circulation, effective and ineffective filtration pressure. The regulatory significance of the tone of the afferent and efferent vessels. Obligatory and facultative reabsorption in the proximal and distal segments of the nephron. Regulation of the renal concentrating mechanism. Humoral regulation of reabsorption . Na and water in the kidneys.</p>	UK-1.7, OPK-2.5	2

	Features of the excretory system in the fetus and children: maturation of the urine-forming function of the kidney, composition and volume of urine, urination Features of regulation of kidney function.		
17 .	<p><i>General physiology of sensory systems.</i></p> <p>The concept of sensory organs, analyzers, and sensory systems. I. P. Pavlov's theory of analyzers. The importance of analyzers in understanding the world.</p> <p>Functional organization of analyzers. Peripheral (receptor) section of analyzers. Classification, main properties, and characteristics of receptors. Mechanism of excitation in receptors. Functions of the peripheral section of analyzers. Functional mobility. Conduction section of analyzers. Characteristics of afferent impulse conduction. Specific and nonspecific pathways. Participation of subcortical structures in the conduction and processing of afferent impulses.</p> <p>The cortical part of the analyzer. Localization of afferent functions. Processes of higher cortical analysis and synthesis of afferent excitations. Interaction of analyzers. Coding of information in different parts of the analyzers. Adaptation of analyzers. Features of analyzer activity in children.</p>	UK-1.7, OPK-2.5	2
18.	<p><i>Physiology of pain.</i></p> <p>Systemic mechanisms of pain. The concept of pain. Classification of pain types. Theories of pain. Nociceptors . Conduction section of the nociceptive analyzer. Central mechanisms of pain. Antinociceptive systems of the body. Gate theory of pain conduction. Afferentation . Neurochemical mechanisms of antinociception . Opiate receptors and their ligands . Systemic concepts and biological significance of pain. Physiological basis of pain relief and anesthesia. Biologically active points and the principle of reflexology.</p>	UK-1.7, OPK-2.5	2
19 .	<p><i>Concept of higher brain functions. Functional system of goal-directed behavioral act.</i></p> <p>Unconditioned reflexes and instincts, their classification, characteristics, and significance for the adaptive activity of the organism.</p> <p>Conditioned reflexes as a form of adaptation in animals and humans to changing conditions. Patterns of formation and manifestation of conditioned reflexes. Physiological mechanisms of conditioned reflex formation. Their structural and functional basis. Analytical and synthetic activity of the cerebral cortex. Dynamic stereotypes, their physiological essence, and their significance for learning and the acquisition of work skills.</p> <p>Needs and motivations, their classification and neurophysiological mechanism of origin. Architecture of the integral behavioral act (P.K. Anokhin). The main stages of the functional system of behavior and their neurophysiological mechanisms. Physiology of memory and learning. Memory, its types from the standpoint of psychology and neurophysiology. Physiological classification of memory types and their mechanisms. Brain structures responsible for memory formation. Clinical neurophysiology (J. Penfield , B. Milner ). Implicit and</p>	UK-1.7, OPK-2.5	2

	explicit memory (procedural and declarative). Types of learning (training): obligatory, facultative and cognitive. Forms of behavior corresponding to these types. Features of higher nervous activity in ontogenesis.		
20.	<i>Physiological foundations of human mental activity.</i> The structure of the human psyche: mental processes, mental states and mental properties. Objective methods of psychophysiological research. Electrophysiological research techniques. Electroencephalogram and its rhythms. Evoked potentials. Basic functional states of the brain. Physiological basis of hypnotic states. Wakefulness. Neurophysiological mechanisms of activation of the cerebral cortex and maintenance of wakefulness. Emotions and their biological role. Classification. Theory of emotions. The role of brain structures in the formation of emotional states. Vegetative and motor components of emotional stress. The role of emotions in purposeful human activity. Emotional tension (emotional stress). The role of emotional stress in the emergence of neuroses, the development of various psychosomatic diseases in humans. Types of higher nervous activity. Pavlov's doctrine of the first and second signal systems. Figurative and verbal thinking. Functional asymmetry of human mental functions. Suggestion, self-hypnosis, psychotherapy. The role of genotype and upbringing in the formation of typological characteristics of higher nervous activity in children. Sleep, emotions, and the development of speech and thinking during ontogenesis.	UK-1.7, OPK-25	2
<b>Total hours</b>			<b>40</b>

### 2.3. Thematic plan of practical classes and their content

Practical classes in the discipline "Normal Physiology" are a mandatory section and represent a type of educational activity focused on the general theoretical training of students.

Topic No.	Name of the topics of practical classes	Contents of practical classes	Codes of the developed competencies and indicators of their achievement	Types of control	By hard work - bone (watch)
1	2	3	4	5	
1	Introduction to normal physiology. Physiological	<b>Theoretical part:</b> Introduction to the department. Introduction to the organization of practical classes at the department. Study of safety measures. Physiological properties	UK-1. ID: 1.1, 1.2, OPK-5	Interactive survey, discussion of the	3.25

	properties and processes of excitable tissues.	of excitable tissues and the corresponding processes. Laws of stimulation of excitable systems. The mechanism and laws of conduction. Features of membrane potentials in early ontogenesis. <b>Practical part</b> Entrance test control Determining threshold strength and threshold time using chronoximetry. Experiment in the Physiology Simulator program.	ID: 5.3	results of the experiment, conclusions	
2.	Physiology of the neuromuscular junction, skeletal and smooth muscles	<b>Theoretical part:</b> Physical and physiological properties of muscles. The mechanism of excitation conduction at the neuromuscular junction. Muscle work and strength. Types of muscle contractions. Functional characteristics of smooth muscles. Changes in excitation velocity in early life. Ontogenesis of the neuromuscular junction. Characteristics of the neonatal motor system and its development with age. <b>Practical part</b> Electromyography. Dynamometry. Experiment in the Physiology Simulator program	UK-1 ID: 1.1, 1.2, OPK-5 ID: -5.3	Interactive survey, monitoring of the practical task, discussion of the experimental results and conclusions	3.25
3.	Final lesson "General physiology of excitable tissues"	<b>Theoretical part:</b> Assessment of mastery of the competencies " General physiology of excitable tissues" <b>Practical part</b> testing solving situational problems	UK-1 ID: 1.1, 1.2, OPK-5 ID: 5.3	Testing, frontal survey, interactive survey, situational task interview	3.25
4.	The main types, principles, mechanisms and levels of regulation of physiological functions	<b>Theoretical part:</b> Reflex and systemic principles of regulation. Classification of reflexes. Reflex arc. Cybernetic principles of regulation based on discrepancies and deviations. Schematic diagram of a homeostatic functional system. Systemogenesis . Heterochronic maturation of various functional systems. <b>Practical part</b> Conjunctival conditioned and unconditioned reflexes (illustration of the principles of regulation by discordance and disturbance).	UK-1 ID: 1.1, 1.2, OPK-5 ID: 5.1, 5.3	Interactive survey, discussion of the results of the experiment, conclusions	3.25

		A study of the activity of the functional system regulating gas homeostasis in the body during various functional tests that deviate blood gas constants.			
5.	Physiology of the nerve center.	<p><b>Theoretical part:</b> Neuron physiology. The concept of a nerve center in a broad and narrow sense. Physiological properties of nerve centers. Inhibition: types, mechanisms, and significance. Principles of coordination of nerve centers. Features of excitation and inhibition in the central nervous system during ontogenesis.</p> <p><b>Practical part</b> Temporal summation in sensory nerve centers. Working with the Physiology Simulator program. Coupled inhibition in sensory cortical centers of various projection locations. Removal of the inhibitory effect on spinal tendon extensor reflexes.</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.3	Interactive survey, monitoring of the execution of tendon reflexes, discussion of the experimental results, conclusions	3.25
6.	Physiology of motor activity	<p><b>Theoretical part:</b> Types and significance of motor activity. Spinal and supraspinal mechanisms of maintaining muscle tone. Functional features of the pyramidal and extrapyramidal systems. Decerebrate rigidity. Development of postural tonic reflexes .</p> <p><b>Practical part</b> Observation of some motor reflexes in humans. Inducing various postural (tonic) reflexes in a rabbit.</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.3	Interactive survey, monitoring of the execution of tendon reflexes, discussion of the experimental results, conclusions	3.25
7.	Physiology of the autonomic nervous system	<p><b>Theoretical part:</b> Comparative characteristics of the somatic and autonomic nervous systems. The sympathetic and parasympathetic divisions of the autonomic nervous system and their adaptive and trophic roles. Higher and lower centers of the autonomic nervous system. Immaturity of the autonomic nervous system in newborns and heterogeneity in its maturation.</p> <p><b>Practical part</b> Adaptive pupillary response to light (direct and consensual ). Pupil response to pain.</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.3	Interactive survey, discussion of the results of the experiment, conclusions	3.25

		Working with the Physiology Simulator program			
8	Final lesson "Physiology of the Central Nervous System"	<b>Theoretical part:</b> Assessment of the assimilation of competencies based on the topic "Physiology of the Central Nervous System" <b>Practical part</b> Testing Solving situational problems	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Testing, frontal survey interactive survey, situational task interview	3.25
9 .	Physiology of endocrine glands	<b>Theoretical part:</b> General characteristics of humoral regulation. Classification of hormones. Physiological effects of hormones. Mechanisms regulating hormone levels in the human body. Development of the endocrine system in early ontogenesis. The hormonal channel of communication between mother and child through breast milk. <b>Practical part</b> Testing Working with the Physiology Simulator program	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.3	Testing, interactive survey, discussion of the experiment results, conclusions	3.25
10.	Erythrocyte and leukocyte systems of blood	<b>Theoretical part:</b> Blood functions. Blood system. Blood groups: ABO system , Rh system. Leukocyte functions. Physiological leukocytosis. Blood system characteristics in children: formed elements, immunity, blood group formation during ontogenesis. <b>Practical part</b> Determining the number of red blood cells in 1 liter of blood. Determining the number of white blood cells in 1 liter of blood. Determination of blood group according to the ABO system. Determination of blood Rh factor .	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Interactive survey, monitoring the completion of a practical task, discussion of the results of the experiment, conclusions	3.25

11.	Physicochemical properties of blood	<p><b>Theoretical part:</b> Hemoglobin, its types, functions. Color index. ESR as an integral indicator of homeostasis. Vascular- platelet and coagulation hemostasis. Anticoagulant system. Features of the physicochemical properties of blood in children.</p> <p><b>Practical part</b> Determining the amount of hemoglobin in the blood using the Sali method . Calculating the color index of blood. Determining bleeding time using the Duke method . Determining clotting time using the Sukhov method. Determining the erythrocyte sedimentation rate.</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Interactive survey, monitoring of the practical task, discussion of the experimental results and conclusions	3.25
12.	External respiration	<p><b>Theoretical part:</b> The respiratory system. External respiration. Tidal volumes and capacities. The mechanism of inhalation and exhalation. Alveolar ventilation. Features of external respiration in the pre- and postnatal periods.</p> <p><b>Practical part:</b> Spirometry. Spirography. Pneumotachometry . Peak flowmetry . Working with the Physiology Simulator program</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Interactive survey, monitoring of the practical task, discussion of the experimental results and conclusions	3.25
13.	Regulation of breathing	<p><b>Theoretical part:</b> Structural organization of the respiratory center. Mechanisms of rhythm formation : interneuronal , intercentral , reflex. Humoral mechanisms of respiratory regulation.</p> <p><b>Practical part</b> A study of the mechanisms of changes in pulmonary ventilation during physical exercise. A study of the mechanisms by which changes in blood gas composition influence external respiration parameters. Respiratory function tests to assess human reserve capacity. The mechanism of the first breath in a newborn.</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Interactive survey, monitoring of the practical task, discussion of the experimental results and conclusions	3.25
14.	Final lesson "Physiology of the blood system" and	<p><b>Theoretical part:</b> Assessment of the acquisition of competencies based on the studied topics "Physiology of the Blood System" and "Physiology of Respiration".</p>	UK-1 ID: 1.1, 1.2, UK-7	Testing, Frontal survey, interactive	3.25

	"Physiology of respiration".	<b>Practical part</b> Testing Solving situational problems	ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	survey , situational task interview	
15	Physiological properties of the cardiac muscle .	<b>Theoretical part:</b> Physiological properties of the working myocardium and atypical myocardium. Automaticity and its substrate. Action potential of the pacemaker, working cardiomyocyte . Extrasystole. The cardiac cycle and its phases. Key cardiac parameters in newborns and their dynamics during ontogenesis. <b>Practical part:</b> Stannius's experiment . Solving situational problems	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.3	Interactive survey, discussion of the experimental results, conclusions, interview on situational tasks	3.25
16	Regulation of cardiac activity	<b>Theoretical part:</b> Intracardiac and extracardiac mechanisms of cardiac regulation. Reflex and humoral mechanisms of regulation. Development of vagal tone in children. <b>Practical part:</b> Danini-Aschner oculocardiac reflex . The influence of body position on heart rate.	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.3	Interactive survey, discussion of the results of the experiment, conclusions	3.25
17	Methods of studying cardiac activity	<b>Theoretical part:</b> The essence of the ECG method. The origin of ECG elements. The information value of the ECG method. Heart sounds and their origin. Research methods and information value. Principles of methods for determining CO and IOC. Features of the ECG and heart sounds in children. <b>Practical part:</b> Registration and analysis of electrocardiogram. Listening to heart sounds. Introduction to phonocardiography	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.3	Interactive survey, monitoring the completion of a practical task, discussion of the results of the experiment, conclusions	3.25

18	Vascular physiology. Blood pressure and mechanisms regulating it.	<p><b>Theoretical part:</b> Factors determining blood flow through the vessels. Types of blood pressure and factors determining its optimal value. Basal vascular tone. Mechanisms regulating vascular tone. The vasomotor center.</p> <p><b>Practical part:</b> Measurement of blood pressure according to Korotkov and Riva- Rocchi . Using the Physiology Simulator program. Studying the effects of physical activity on blood pressure and heart rate.</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Interactive survey, monitoring the completion of a practical task, discussion of the results of the experiment, conclusions	3.25
19	Final lesson "Physiology of blood circulation"	<p><b>Theoretical part:</b> Assessment of mastery of competencies based on the studied topics "Physiology of Circulation"</p> <p><b>Practical part:</b> Testing Solving situational problems</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Testing, frontal survey, interactive survey , situational task interview	3.25
20	Digestion in the mouth and stomach.	<p><b>Theoretical part:</b> The nature and importance of digestion. Methods for studying the secretory function of the salivary glands and stomach. Digestion in the oral cavity and stomach. Functional nutrition.</p> <p><b>Practical part:</b> Study of the secretory activity of the salivary glands at rest and under the influence of various stimuli. Study of the absorptive function of the stomach and the excretory function of the salivary glands</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Interactive survey, discussion of the results of the experiment, conclusions	3.25
21	Digestion in the intestine. Motor activity and absorption functions of the digestive tract	<p><b>Theoretical part:</b> Chewing, swallowing. Types of motility of the stomach, small intestine, and large intestine. Vomiting. Defecation. Mechanisms regulating gastrointestinal motility. Intestinal absorption. The role of the liver and pancreas in digestion.</p> <p><b>Practical part:</b> The effect of bile on fats.</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5	Interactive survey, discussion of experimental results, conclusions, educational	3.25

		Solving situational problems. Demonstration of the video film "Motor function of the digestive tract.	ID: 5.3	film, solution of situational problems.	
22	Metabolic basis of physiological functions.	<b>Theoretical part:</b> The plastic and energetic role of nutrients. Basal metabolism. Total energy metabolism . Energy expenditure during different types of labor. Methods for determining energy expenditure. Physiological norms of nutrition. Regulation of metabolism and energy. <b>Practical part:</b> Calculation of energy expenditure based on indirect respiratory calorimetry data. Calculation of daily energy balance	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Interactive survey, discussion of the results of calculation tasks, conclusions	3.25
23	Excretory function of the kidneys and methods of its study	<b>Theoretical part:</b> Pathways for the elimination of metabolic products from the body. Modern theory of urine formation . Regulation of kidney function. Method for quantitative assessment of filtration, reabsorption , secretion, plasma and blood flow. Functional urinary system. <b>Practical part:</b> Working with the Physiology Simulator program Solving situational and computational problems.	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Interactive survey, discussion of experimental results, calculation tasks, conclusions	3.25
24	Final lesson (seminar) "Physiology of digestion, metabolism and energy, excretion and thermoregulation"	<b>Theoretical part:</b> Assessment of mastery of competencies based on the studied topics "Physiology of digestion, metabolism and energy, excretion and thermoregulation" <b>Practical part:</b> Testing Solving situational problems	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Testing, interactive survey , interview on situational tasks	3.25
25	General properties and patterns of functioning of sensory systems (analyzers).	<b>Theoretical part:</b> I.P. Pavlov's theory of analyzers. Functional properties of analyzers. Functions of the optical system of the eye. Theories of light perception. Conductive and cortical sections of the visual analyzer. Adaptation of the visual analyzer.	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2	Interactive survey, monitoring the completion of a practical task,	3.25

	Physiology of the visual analyzer.	<b>Practical part:</b> Determination of visual acuity. Determination of visual fields (perimetry). Color vision test.	ID: 2.2, OPK-5 ID: 5.1, 5.3	discussion of the results of the experiment, conclusions	
26	Physiology of the auditory, vestibular and cutaneous analyzers	<b>Theoretical part:</b> The structure and functions of the auditory, vestibular, and cutaneous analyzers. The physiology of pain. Antinociceptive systems of the brain. <b>Practical part:</b> Air and bone conduction studies. Study of binocular hearing characteristics. Study of the body's autonomic responses to pain.	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Interactive survey, monitoring the completion of a practical task, discussion of the results of the experiment, conclusions	3.25
27	Final lesson (seminar) "Physiology of sensory systems (analyzers)".	<b>Theoretical part:</b> Testing the acquisition of competencies based on the studied topics "Physiology of sensory systems (analyzers)". <b>Practical part:</b> Testing. Solving situational problems	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Testing, interactive survey, interview on situational tasks	3.25
28	Innate and acquired forms of behavior.	<b>Theoretical part:</b> The structure of a holistic behavioral act from the perspective of TFS. Innate forms of behavior. Learning and its types. Conditioned reflexes, inhibition of conditioned reflexes. The concept of a dynamic stereotype. <b>Practical part:</b> Demonstration of experimental methods for studying higher nervous activity in small laboratory animals and recording of experiments on studying search activity in a problem chamber. The influence of the goal on the result of the activity.	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Interactive survey, discussion of the experimental results, conclusions, and educational film	3.25
29	Physiological foundations of higher mental	<b>Theoretical part:</b> The theory of the first and second signaling systems. Typological features of the higher nervous activity. Needs, motivations, emotions. Speech and	UK-1 ID: 1.1, 1.2, UK-7	interactive survey, discussion of the	3.25

	functions of a person.	speech functions. Sleep and its physiological mechanisms. Memory, its types, and physiological mechanisms. Thinking. <b>Practical part:</b> Tapping test. Study of personality psychotype using testing method. Study of short-term memory capacity	ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	experiment results, conclusions.	
30	Final lesson "Physiology of higher nervous activity".	<b>Theoretical part:</b> Testing the acquisition of competencies based on the studied topics "Physiology of Higher Nervous Activity" <b>Practical part</b> Testing Solving situational problems	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Testing, interactive survey, interview on situational tasks	3.25
31	Final lesson on practical skills.	<b>Practical part</b> Checking the acquisition of competencies (monitoring the acquisition of practical skills in written form).	OPK-5 ID: 5.1, 5.3	Frontal survey, interview based on results	3.25
32	Pre-exam testing	<b>Practical part</b> Checking the acquisition of competencies (testing).	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Testing	3.25

#### 2.4. Interactive forms of learning

In order to enhance students' cognitive activity, **interactive teaching methods** (interactive surveys, computer simulations, discussions, work in small groups, computer testing with elements of training, etc.) are widely used in practical classes, as well as participation in the work of the psychophysiological laboratory, educational and research work of the department, and the scientific circle of the department.

<b>Item No.</b>	<b>Topic of the practical lesson</b>	<b>Trudoem - bone in hours</b>	<b>Interactive learning</b>	<b>Labor intensity per minute, in % of the session</b>
1	2	3	4	5
1	Introduction to normal physiology. Physiological properties and processes of excitable tissues.	3.25	Interactive survey. Computer simulations.	90 minutes (2 hours) / 62%
2	Physiology of the neuromuscular junction, skeletal and smooth muscles	3.25	Interactive survey. Computer simulations.	90 minutes (2 hours) / 62%
3	Final lesson "General physiology of excitable tissues"	3.25	Computer testing, interactive survey	60 min (1.33 hours)/ 41%
4	The main types, principles, mechanisms and levels of regulation of physiological functions	3.25	Interactive survey. Small group method.	90 minutes (2 hours) / 62%
5	Physiology of the nerve center.	3.25	Interactive survey. Computer simulations.	90 minutes (2 hours) / 62%
6	Physiology of motor activity	3.25	Interactive survey. Small group method.	65 minutes (1.4 hours) / 44%
7	Physiology of the autonomic nervous system	3.25	Interactive survey. Small group method.	90 minutes (2 hours) / 62%
8	Final lesson: "Regulation of body functions. Physiology of the central nervous system."	3.25	Computer testing, interactive survey	60 min (1.33 hours) / 41%
9	Physiology of endocrine glands	3.25	Interactive survey. Computer simulations. Computer testing.	120 min (2.67 hours)/ 82%
10	Erythrocyte and leukocyte systems of the blood	3.25	Interactive survey. Small group method	90 minutes (2 hours) / 62%
11	Physicochemical properties of blood	3.25	Interactive survey. Small group method	90 minutes (2 hours) / 62%
12	External respiration	3.25	Computer simulations Interactive survey. Small group method	120 min (2.67 hours)/82%
13	Regulation of breathing	3.25	Interactive survey Computer simulations Small group method	120 min (2.67 hours)/82%
14	Final lesson "Physiology of the blood system" and "Physiology of respiration".	3.25	Computer testing Interactive survey	120 min (2.67 hours)/82%

15	Physiological properties of the cardiac muscle. Methods for studying cardiac activity.	3.25	Interactive survey Small group method	90 minutes (2 hours) / 62%
16	Regulation of cardiac activity	3.25	Small group method. Interactive survey	90 minutes (2 hours) / 62%
17	Methods of studying cardiac activity	3.25	Interactive survey. Small group method	90 minutes (2 hours) / 62%
18	Vascular physiology. Blood pressure and mechanisms regulating it.	3.25	Small group method. Interactive survey	90 minutes (2 hours) / 62%
19	Final lesson "Physiology of blood circulation"	3.25	Interactive survey. Computer testing	120 min (2.67 hours)/82%
20	Digestion in the mouth and stomach.	3.25	Interactive survey Small group method	100 min (2.2 hours)/ 68%
21	Digestion in the intestines. Motility and absorptive functions of the digestive tract	3.25	Interactive survey. Small group method. Working with an educational film.	90 minutes (2 hours) / 62%
22	Metabolic basis of physiological functions.	3.25	Interactive survey. Small group method	120 min (2.67 hours)/82%
23	Excretory function of the kidneys and methods of its study	3.25	Interactive survey. Computer simulations. Small group method.	120 min (2.67 hours)/82%
24	Final lesson (seminar) "Physiology of digestion, metabolism and energy, excretion and thermoregulation"	3.25	Interactive survey. Computer testing	120 min (2.67 hours)/82%
25	General properties and patterns of functioning of sensory systems (analyzers). Physiology of the visual analyzer.	3.25	Interactive survey. Small group method	90 minutes (2 hours) / 62%
26	Physiology of the auditory, vestibular and cutaneous analyzers	3.25	Interactive survey. Small group method	120 min (2.67 hours)/82%
27	Final lesson "Physiology of sensory systems (analyzers)".	3.25	Computer testing. Interactive survey	120 min (2.67 hours)/82%
28	Innate and acquired forms of behavior.	3.25	Interactive survey. Work in the psychophysiological laboratory. Working with an educational film.	60 min (1.33 hours)/ 41%
29	Physiological foundations of higher mental functions of a person.	3.25	Interactive survey	60 min (1.33 hours)/ 41%
30	Final lesson "Physiology of higher nervous activity".	3.25	Computer testing, interactive survey	120 min (2.67 hours)/82%
31	Final lesson on practical skills.	3.25	Interactive conversation	120 min (2.67 hours)/82%
32	Pre-exam testing	3.25	Computer testing	120 min (2.67 hours)/82%

## 2.5. Criteria for assessing students' knowledge

The basis for determining 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 assigning marks, the classification of errors and their quality are taken into account:

- 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
1-30, 32	All practical classes	2-5	2-5	2-5
31	Credit lesson		2-5	2-5
Average score		<b>2-5</b>		

### – *Assessment scales for ongoing knowledge control*

Students' success in mastering the "Normal Physiology" course, as well as practical skills and abilities, is assessed qualitatively and graded on a five-point scale: "5" for excellent, "4" for good, "3" for satisfactory, and "unsatisfactory." The grade is converted to a point scale using the following formula:

Success rate	Mark on a 5-point scale
90-100%	"5"
80-89%	4
70-79%	3
Below 70%	"2"

#### – *Working off disciplinary debts.*

If a student misses a class for a valid reason, they have the right to make up the missed class and receive the maximum grade allowed for that class as stipulated by the course syllabus. A valid reason must be documented.

If a student misses a class without an excuse or receives a "2" grade for all activities during the class, they are required to make up the missed class. The grade received for all activities is multiplied by 0.8.

If a student is excused from a class 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 class, provided that he submits a report on the completion of mandatory extracurricular independent work on the topic of the missed class.

### *Assessment criteria for midterm assessment*

1. Test control in the Moodle system

2. In-person testing control.
3. Answers to exam questions.

### **Criteria for final assessment (midterm assessment)**

**Excellent** – for the depth and completeness of the student's understanding of the course material, which the student navigates easily, for their ability to connect theoretical and practical questions, express and justify their judgments, and present their answers clearly and logically; Allows up to 10% incorrect answers during testing. Practical skills and abilities required by the course curriculum are fully mastered.

**Good** – the student has fully mastered the course material, is familiar with it, and presents answers clearly, but the content and format contain some inaccuracies; during testing, the student makes up to 20% incorrect answers. The student has mastered all the practical skills and abilities required for the course, but still makes some inaccuracies.

**Satisfactory** – the student has mastered the knowledge and understanding of the main concepts of the course material, but presents it incompletely, inconsistently, and is unable to express and justify their opinions; during testing, the student makes up to 30 incorrect answers. The student possesses only some practical skills and abilities.

**Unsatisfactory** – the student has fragmented and unsystematic knowledge, is unable to distinguish between essential and non-essential concepts, makes errors in defining concepts, distorts their meaning, presents material in a disorderly and uncertain manner, and makes more than 30% incorrect answers during testing. Performs practical skills and abilities with significant errors.

Based on the results of various assessments, an average grade is given in favor of the student.

A student may be eligible for an automatic "excellent" grade if they have won a prize in a disciplinary or interdisciplinary Olympiad (university or regional) and have an average grade point average of at least 4.8 based on their current academic performance. A student may opt out of this automatic grade and take the exam with their group on a standard basis.

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

### *Independent classroom work of students.*

The organization of independent classroom work of students is carried out with the help of methodological instructions for students, which contain educational goals, a list of the main theoretical issues for study, a list of practical work and the methodology for conducting it, instructions for the presentation of the obtained results, their discussion and conclusions, assignments for self-control with standard answers, a list of recommended literature.

Between  $\frac{1}{4}$  and  $\frac{1}{2}$  of the practical lesson time is allocated to students' independent work: conducting research, recording results, discussing them, formulating conclusions, and completing individual assignments. The preparatory stage, or the formation of a tentative basis for action, begins outside of class time in preparation for the practical or seminar lesson and is completed during class. All subsequent stages are completed during class. The stage of materialized actions (solving situational problems) is carried out independently. The instructor provides consultations and assistance as needed, while simultaneously monitoring the quality of students' knowledge and their ability to apply this knowledge to solve assigned problems.

### *Extracurricular independent work of students.*

No. p / p	Topic of the practical lesson (seminar)	Time to prepare	Forms of independent extracurricular work	
			Mandatory and the same for all students	At the student's choice

		<b>student to class</b>		
1.	Introduction to Normal Physiology. Physiological Properties and Processes of Excitable Tissues	2	Reading a text (textbook, lecture, additional literature), solving tests	Making notes on the topic
2.	Physiology of the neuromuscular junction, skeletal and smooth muscles	2	Reading a text (textbook, lecture, additional literature); solving tests	Making notes on the topic
3.	Final lesson (seminar) on the section "General physiology of excitable tissues"	3	Reading a text (textbook, lecture, additional literature); solving tests	Preparing a presentation for a seminar (1. Problems of fatigue 2. The theory of parabiosis), drawing up notes on the topic
4.	The main types, principles, mechanisms and levels of regulation of physiological functions	2	Reading a text (textbook, lecture, additional literature); completing written homework; solving tests	Making notes on the topic
5.	Physiology of the nerve center.	2	Reading a text (textbook, lecture, additional literature); solving tests	Making notes on the topic
6.	Physiology of motor activity	2	Reading a text (textbook, lecture, additional literature); completing written homework; solving tests	Making notes on the topic
7.	Physiology of the autonomic nervous system	2	Reading a text (textbook, lecture, additional literature); completing written homework; solving tests	Making notes on the topic
8.	Final lesson (seminar) on the sections "Regulation of body functions. Physiology of the central nervous system.	3	Reading a text (textbook, lecture, additional literature); solving tests , watching a film on the department's Moodle page	Preparing reports for presentation in class (1. Cybernetics and the central nervous system, 2. The influence of the cortex on vegetative functions ), drawing up notes on the topic
9 .	Physiology of endocrine glands.	3	Reading a text (textbook, lecture, additional literature); solving tests, completing written homework.	Preparing presentations for class (1. Regulation of blood calcium levels. 2. Regulation of blood glucose levels), video presentations , studying tables on the

				department's Moodle page ; creating notes on the topic
10.	Erythrocyte and leukocyte systems of the blood	2	Reading a text (textbook, lecture, additional literature); solving tests	Making notes on the topic, viewing the material on the department's Moodle page
11.	Physicochemical properties of blood	2	Reading a text (textbook, lecture, additional literature); solving tests, watching a film on the department's Moodle page	Making notes on the topic
12.	External respiration	2	Reading a text (textbook, lecture, additional literature); solving tests, watching a film on the department's Moodle page	Completing written homework
13.	Regulation of breathing	2	Reading a text (textbook, lecture, additional literature, solving tests)	Making notes on the topic
14.	Final lesson (seminar) on the sections "Physiology of the blood system" and physiology of respiration."	3	Reading a text (textbook, lecture, additional literature); solving tests	Drawing up notes on the topic, preparing a presentation for a seminar (1. Donation is an honorable duty of a citizen. 2. Artificial blood)
15.	Physiological properties of the cardiac muscle. A single cardiac cycle .	2	Reading a text (textbook, lecture, additional literature); solving tests	Making notes on the topic
16	Regulation of cardiac activity	2	Reading a text (textbook, lecture, additional literature); solving tests; completing written homework	Making notes on the topic
17.	Methods of studying cardiac activity	2	Reading a text (textbook, lecture, additional literature); solving tests, completing written homework	Drawing up notes on the topic, preparing a report for a presentation 1. Echocardiography as a modern research method. 2. Heart transplantation and its alternatives)
18	Vascular physiology. Blood pressure and mechanisms regulating it.	2	Reading a text (textbook, lecture, additional literature); solving tests	Making notes on the topic

19	Final lesson (seminar) on the section "Physiology of Blood Circulation"	3	Reading a text (textbook, lecture, additional literature); solving tests	Making notes on the topic
20.	Digestion in the mouth and stomach	2	Reading a text (textbook, lecture, additional literature); solving tests	Making notes on the topic
21.	Digestion in the intestines. Motility and absorptive functions of the digestive tract	2	Reading a text (textbook, lecture, additional literature); solving tests, completing written homework	Making notes on the topic
22.	Metabolic basis of physiological functions.	2	Reading a text (textbook, lecture, additional literature); solving tests	Making notes on the topic
23.	Excretory function of the kidneys and methods of its study	3	Reading a text (textbook, lecture, additional literature); solving tests	Taking notes on the topic and watching films on the department's Moodle page
24.	Final lesson (seminar) on the sections "Physiology of digestion, metabolism and energy, excretion and thermoregulation"	3	Reading a text (textbook, lecture, additional literature); solving tests	Drawing up notes on the topic, preparing a report for presentation at a seminar ( 1. Artificial kidney. 2. Proper nutrition as the basis of health)
25	General properties and patterns of functioning of sensory systems (analyzers). Physiology of the visual analyzer.	2	Reading a text (textbook, lecture, additional literature); solving tests	Making notes on the topic
26.	Physiology of the auditory, vestibular and cutaneous analyzers	2	Reading a text (textbook, lecture, additional literature); completing written homework; solving tests	Making notes on the topic
27.	Final lesson (seminar) on the section "Physiology of sensory systems" (analyzers)".	3	Reading a text (textbook, lecture, additional literature); solving tests	Drawing up notes on the topic, preparing a report for presentation at a seminar (1. Features of the visceral analyzer. 2. Physiology vomeron (sal organ)
28.	Innate and acquired forms of behavior.	2	Reading a text (textbook, lecture, additional literature); solving tests	Making notes on the topic
29.	Physiological foundations of higher	2	Reading a text (textbook, lecture, additional literature), solving tests	Drawing up notes on the topic , studying materials on the

	mental functions of a person.			department's Moodle page
30.	Final lesson (seminar) on the section "Physiology of higher nervous activity".	3	Reading a text (textbook, lecture, additional literature); solving tests	Completing written homework, Preparing a report for a presentation at a seminar (1. R. Sperry's contribution to the study of the brain. 2. Somnology as a modern science)
31	Test session on practical skills	3	Reading a text (textbook, lecture, methodological instructions, additional literature)	
32	Pre-exam testing	2	Reading a text (textbook, lecture, methodological instructions, additional literature)	
<b>Total labor intensity (in hours)</b>			<b>72</b>	

### 2.7. Project (research) work.

Students are given the opportunity to participate in the research work of the Department of Physiology, "Experimental studies of the physiological mechanisms of behavioral (rapid) adaptation in a dynamically changing anthropogenic environment."

Areas of work:

- mastering experimental methods for studying the behavior of laboratory animals;
- statistical processing of experimental results;
- collection and analysis of modern literature on physiological mechanisms of behavioral adaptation and other current issues of physiology.

The results of the work are reported at :

- meeting of the normal physiology circle;
- the final student conference of the academy;
- student conference in foreign languages.

## 3. EDUCATIONAL, METHODOLOGICAL, LOGISTIC AND INFORMATIONAL SUPPORT OF THE DISCIPLINE:

### 3.1. Primary Literature

1. Brin , V. B. Normal Physiology: textbook / edited by B. I. Tkachenko. - 3rd ed . corr . and add. - Moscow: GEOTAR-Media, 2016. - 688 p. - ISBN 978-5-9704-3664-6. - Text : electronic (date accessed: 05.05.2021). - Access mode : by subscription. <http://www.studmedlib.ru/ru/book/ISBN9785970436646.html>
2. . Nozdrachev , A. D. Normal Physiology : textbook / A. D. Nozdrachev , P. M. Maslyukov. - Moscow : GEOTAR-Media, 2021. - 1088 p .: ill. - 1088 p. - ISBN 978-5-9704-5974-4. - Text : electronic (date accessed: 05/03/2021). - Access mode : by subscription. <http://www.studmedlib.ru/book/ISBN9785970459744.html>
3. 3. Degtyarev, V. P. Normal physiology : textbook / Degtyarev V. P., Sorokina N. D. - Moscow: GEOTAR-Media, 2019. - 480 p. - ISBN 978-5-9704-5130-4. - Text : electronic (date accessed: 05/03/2021). - Access mode : by subscription.

<http://www.studmedlib.ru/book/ISBN9785970451304.html>

### 3.2. Further reading

1. Agadzhanyan N.A., Smirnov V.M. Hormonal physiology. – M., 2007. – 520 p.
2. Anokhin P.K. Essays on the physiology of functional systems. - M., "Medicine", 1975. - 446 p.
3. Gaivoronsky , I. V. Human anatomy and physiology : textbook / Gaivoronsky I. V. [et al.] - Moscow: GEOTAR-Media, 2019. - 672 p. - ISBN 978-5-9704-4594-5. - Text : electronic (date accessed: 05.05.2021). - Access mode : by subscription.  
<http://www.studmedlib.ru/book/ISBN9785970445945.html>
4. .Degtyarev, V. P. Normal Physiology. Typical Test Tasks : A Tutorial / edited by V. P. Degtyarev. - Moscow: GEOTAR-Media, 2020. - 528 p. - ISBN 978-5-9704-5280-6. - Text: electronic (accessed: 03.05.2021). - Access mode : by subscription.  
<http://www.studmedlib.ru/book/ISBN9785970452806.html>
5. Jeremy Ward , Roger Linden , Rob Clarke. Visual physiology. – M.: Publishing house Geotar -Media, 2010. – 136 p.
6. Kamkin, A.G. “Atlas of Physiology” in 2 volumes / A.G. Kamkin, I.S. Kiseleva. - M.: Publishing house GEOTAR-Media, 2010. T. 1. – 408 p.
7. Kuznik B.I. Physiology and pathology of the blood system. – Chita: Stepanov M.A., 2002. – 320 p.
8. Kuznik B.I., Maksimova O.G. General Hematology. Pediatric Hematology. Study Guide. Rostov-on-Don: Phoenix Publishing House, 2007. – 573 p.
9. Morman D., Heller R. Physiology of the cardiovascular system. - St. Petersburg , 2000. - 256 p.
10. Normal Physiology. In 3 volumes. / Ed. by V.N. Yakovlev. 2006. – V. 1 – 240 p., V. 2 – 288 p., V. 3 – 224 p.
11. Normal physiology. / Ed. by V.M. Smirnov - M., Publishing Center Academy, 2010, 2012. - 480 p.
12. Normal Physiology. / Ed. by G.I. Kositsky . Moscow: OOO Izd. Dom Alliance, 2009. – 544 p.
13. Orlov R.S., Nozdrachev A.D. Normal physiology. M.: Publishing house GEOTAR-Media, 2005. – 696 p.
14. Sidorkina A.N., Sidorkina V.G., Presnyakova M.V. Biochemical bases of hemostasis and disseminated intravascular coagulation. - Nizhny Novgorod, 2001. - 92 p.
15. Smirnov V.M., Budyлина S.M. Physiology of sensory systems and higher nervous activity. - M., 2004. - 304 p.
16. Smirnov V.M., Sveshnikov D.S., Yakovlev V.N. Physiology of the central nervous system. Study guide. - M., 2006. - 368 p.
17. Smirnov V. M., K. V. Sudakov. Dictionary and reference book on physiology. – Moscow, MIA Publishing House, 2010. – 504 p.
18. Modern course of classical physiology. Ed. Natochina Yu.R., Tkachuka Yu.A., M., ed. house "GEOTAR - Media", 2005. – 384 p.
19. Sudakov, K. V. Human Physiology. Atlas of Dynamic Schemes: a tutorial / K. V. Sudakov [et al.]; edited by K. V. Sudakov. - 2nd ed . rev . and additional - Moscow: GEOTAR-Media, 2020. - 416 p.: ill. - 416 s. - ISBN 978-5-9704-5880-8. - Text : electronic (date of access: 05/03/2021). - Access mode : by subscription.  
<http://www.studmedlib.ru/book/ISBN9785970458808.html>
20. Physiological Foundations of Human Health. Ed. by B.I. Tkachenko. - St. Petersburg - Arkhangelsk, 2001. - 728 p.
21. Physiology and Fundamentals of Anatomy. Textbook / edited by A.V. Kotov, T.N. Loseva. – Moscow: Medicine, 2011. – 1056 p.

22. Physiology. Fundamentals and Functional Systems. Lecture Course. Edited by K. V. Sudakov. Moscow, 2000, 784 p.
23. Human Physiology. In 2 volumes. Edited by V. M. Pokrovsky and G. F. Korotko . Moscow, "Medicine", 2001, 2002, 2007. – 656 p.
24. Human Physiology. Textbook / edited by B.I. Tkachenko. - M.: GEOTAR-Media Publishing House, 2009. - 496 p.
25. Fundamental and Clinical Physiology. Edited by Kamkin A.G. and Kamensky A.A. – Moscow, “Akademiya”, 2004. – 1072 p.

### **3.3. Educational and methodological support for the discipline prepared by the department staff**

1. Grigoriev, N.R. Higher Brain Functions and Fundamentals of Behavioral Physiology. (Selected Lectures). Textbook. - Blagoveshchensk, 2006.
2. Grigoriev N.R. Physiology of respiration. Pp. 50–72. Chapter from the book by S.S. Tseluyko et al. “The Respiratory System”. Study guide. Blagoveshchensk, 2011. – 126 p.
3. Dorovskikh V.A., Batalova T.A., Sergievich A.A., Urazova G.E. " Glucocorticoids : from theory to practice." Blagoveshchensk, 2007.
4. Dorovskikh V.A., Batalova T.A., Sergievich A.A., Urazova G.E. "Nitrogen oxide in chemistry, biology and medicine." Blagoveshchensk, 2008.
5. "Methods for Studying Physiological Functions" (Study Guide). N.R. Grigoriev, G.E. Cherbikova , E.F. Kirichenko. Blagoveshchensk, 2006, 2010.
6. The Normal Physiology course on the Moodle portal  
<https://educ-amursma.ru/course/view.php?id=135>
7. Methodological guidelines for students for practical classes in the sections:
  - 6.1. "Physiology of excitable tissues and physiology of the central nervous system"
  - 6.2. "Physiology of Respiration and Physiology of the Blood System"
  - 6.3. "Physiology of blood circulation"
  - 6.4. "Physiology of metabolism and energy, digestion and excretion."
  - 6.5. "Physiology of sensory systems (analyzers) and physiology of higher nervous activity"

#### Multimedia materials, electronic library

1. Computer program "Physiology Simulator".
2. Multimedia materials on electronic media:
  1. "Physiology of the nerve cell"
    2. “Physiology of the central nervous system”
    3. "Physiology of the autonomic nervous system"
    4. "Physiology of motivations and emotions"
    5. "Physiology of excretion"
    6. "Physiology of thermoregulation"
    7. "Methodology of operations on the organs of the digestive tract"
    8. "Motor function of the digestive tract"
    9. Demonstration of experiments to study the cognitive abilities of rats in a problem chamber.

#### Electronic library:

1. Lectures for students. 2nd year. Physiology.
2. Orlov R.S., Nozdrachev A.D. Normal Physiology (supplement to the textbook). Moscow, 2006.
2. Physiology with the Basics of Morphology. / Comp. K.V. Sudakov. Moscow, Publishing House "Russian Doctor", 2005.
3. Modern course of classical physiology. / Ed. Yu.V. Natochina , V.A. Tkachuk. – M., GEOTAR – Media, 2007.

Student Electronic Library: <http://old.studmedlib.ru/ru/index.html>

1. Modern course of classical physiology. Selected lectures. Ed. Yu.V. Natochina , V.A. Tkachuk. - M.: GEOTAR - Media, 2007. – 384 p. - ISBN 978-5-9704-0495-9 – Access mode: <http://old.studmedlib.ru/book/ISBN9785970404959.html>
2. Sudakov K.V., Andrianov V.V., Vagin Yu.E., Kiselev I.I. Human Physiology: Atlas of Dynamic Systems. / Ed. by K.V. Sudakov. 2009. – 416 p. ISBN 978-5-9704-1394-4 . – Access mode: <http://old.studmedlib.ru/book/ISBN9785970413944.html>
3. R.S. Orlov, A.D. Nozdrachev . Normal Physiology / M., 2010. – 832 p. - ISBN 978-5-9704-1662-4 . – Access mode: <http://old.studmedlib.ru/book/ISBN9785970416624.html>
4. Normal Physiology: textbook. / Edited by K.V. Sudakov. 2012. – 880 p. - ISBN 978-5-9704-1965-6 . - Access mode: <http://old.studmedlib.ru/book/ISBN9785970419656.html>
5. Normal Physiology : textbook / S. M. Budylnina [et al.]; edited by V. P. Degtyarev, S. M. Budylnina . - M.: GEOTAR-Media, 2012. - ISBN 978-5-9704-2144-4 . Access mode: <http://old.studmedlib.ru/book/ISBN9785970421444.html> .
6. Physiology: a guide to experimental work: textbook . n individual / edited by A. G. Kamkin, I. S. Kiseleva. - M.: GEOTAR-Media, 2011. - 384 p.: ill - ISBN 978-5-9704-1777-5 . – Access mode: <http://old.studmedlib.ru/book/ISBN9785970417775.html>
7. Atlas of Physiology. In two volumes. Volume 1: textbook / Kamkin A.G., Kiseleva I.S. - M.: GEOTAR-Media, 2013. - 408 p. - ISBN 978-5-9704-2418-6 . - Access mode: <http://old.studmedlib.ru/book/ISBN9785970424186.html>
8. Atlas of Physiology. In two volumes. Volume 2: study guide / Kamkin A.G., Kiseleva I.S. - M.: GEOTAR-Media, 2013. - 448 p. - ISBN 978-5-9704-2419-3 . Access mode: <http://old.studmedlib.ru/book/ISBN9785970424193.html>
9. Normal Physiology: textbook. / Ed. B.I. Tkachenko. - M.: GOETAR - Media, 2014. - 688 p. - ISBN 978-5-9704-2861-0 . –Access mode: <http://old.studmedlib.ru/book/ISBN9785970428610.html>
10. Normal Physiology. Typical Test Tasks: A Tutorial / edited by V.P. Degtyarev. - Moscow: GEOTAR-Media, 2014. – 672 p. ISBN 978-5-9704-2932-7 . - Access mode: <http://old.studmedlib.ru/book/ISBN9785970429327.html>
11. Normal Physiology: Textbook. / Ed. by K.V. Sudakov. - M.: GEOTAR - Media, 2015. - 880 p. ISBN 978-5-9704-3528-1 – Access mode: <http://old.studmedlib.ru/book/ISBN9785970435281.html>
12. Normal physiology with a course in physiology of the maxillofacial region: textbook / Ed . by V.P. Degtyarev, S.M. Budylnina . - M.: GEOTAR-Media, 2015. - 848 p. ISBN 978-5-9704-3351-5 . – Access mode: <http://old.studmedlib.ru/book/ISBN9785970433515.html>
13. Normal Physiology: Textbook. / Edited by L.Z. Tel, N.A. Agadzhanyan . – M.: Litterra , 2015. – 768 p. - ISBN 978-5-4235-0167-9 . – Access mode: <http://old.studmedlib.ru/book/ISBN9785423501679.html>
14. Sudakov K.V., Andrianov V.V., Vagin Yu.E., Kiselev I.I. Human Physiology: Atlas of Dynamic Systems. / Ed. by K.V. Sudakov. Moscow: GEOTAR-Media, 2015. – 416 p. ISBN 978-5-9704-3234-1 . – Access mode: <http://old.studmedlib.ru/book/ISBN9785970432341.html>
15. Normal Physiology : textbook / V.B. Brin [et al.]; edited by B.I. Tkachenko. - 3rd ed., corrected . and additional. - M.: GEOTAR-Media, 2016. - 688 p.: ill. - ISBN 978-5-9704-3664-6 . – Access mode: <http://old.studmedlib.ru/book/ISBN9785970436646.html>

16. Normal Physiology : textbook / V. P. Degtyarev, N. D. Sorokina. - M.: GEOTAR-Media, 2016. - 480 p.: ill. - ISBN 978-5-9704-3547-2 . - Access mode: <http://old.studmedlib.ru/book/ISBN9785970435472.html>

### 3.4. Equipment used for the educational process.

1. Computer complex Bio pac Student Lab – 1 pc.
2. Multimedia projector – 1 pc.
3. Personal computers – 13 pcs.
4. Laptops – 2 pcs.
5. Behavioral testing chamber – 1
6. Elevated Plus Maze – 1 pc.
7. Henderson installation – 1 pc.
8. Open Field Installation - 1 pc.
9. Microscopes – 10 pcs.
10. Neurological hammers - 12 pcs.
11. Tuning forks – 12 pcs.
12. Tonometers – 11 pcs.
13. Stethoscopes – 11 pcs.
14. Electrocardiographs – 5 pcs.
15. Pneumotachometers – 2 pcs.
16. Peak flow meters – 3 pcs.
17. Spirograph – 1 pc.
18. Spirometers - 4 pcs.
19. Perimeter – 1 pc.
20. Deadlift dynamometer – 1 pc.
21. Wrist dynamometer – 1 pc.
22. Laboratory glassware - miscellaneous

Visual aids: 1. Educational stands "Digestion",  
 "Higher nervous activity"  
 Physiology of Circulation and Respiration  
 "Basic physiological constants"  
 "Domestic physiologists"  
 "Foreign Physiologists"  
 "Pain. Physiology of Pain Relief"  
 "Educational and methodological work".  
 2. Educational tables – 240.

### 3.5 Professional databases, information and 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 faculty of medical and pharmaceutical universities. Provides access to electronic versions of textbooks, teaching aids, and periodicals.	library, individual access	<a href="http://www.studmedlib.ru/">http://www.studmedlib.ru/</a>

2.	"Doctor's Consultant" Electronic Medical Library.	The materials in the library were developed by leading Russian specialists based on modern scientific knowledge (evidence-based medicine). The information was prepared taking into account the position of the scientific and practical medical community (global, European, and Russian) in the relevant specialty. All materials have undergone mandatory independent peer review.	library, individual access	<a href="http://www.rosmedlib.ru/cgi-bin/mb4x">http://www.rosmedlib.ru/cgi-bin/mb4x</a>
3.	PubMed	MedLine, the largest medical bibliographic database . It documents medical and biological articles from specialized literature and provides links to full-text articles.	library, free access	<a href="http://www.ncbi.nlm.nih.gov/pubmed/">http://www.ncbi.nlm.nih.gov/pubmed/</a>
4.	Oxford Medicine Online .	Oxford Medical Press's collection of medical publications, bringing together over 350 titles into a single, cross-searchable resource. include The Oxford Handbook of Clinical Medicine and The Oxford Textbook of Medicine, electronic versions which are constantly updated.	library, free access	<a href="http://www.oxfordmedicine.com">http://www.oxfordmedicine.com</a>
5.	Human Biology Knowledge Base	Reference information on physiology , cell biology , genetics , biochemistry , immunology , and pathology . (Source: Institute of Molecular Genetics, Russian Academy of Sciences .)		<a href="http://humbio.ru/">http://humbio.ru/</a>
6.	Medical online library	Free reference books, encyclopedias, books, monographs, essays, English-language literature, tests.		<a href="http://med-lib.ru/">http://med-lib.ru/</a>
Information systems				
7.	Russian Medical Association	Professional Internet resource. Goal: to facilitate the implementation of effective professional activities of medical personnel. Contains the charter, personnel, Structure, rules of entry, information about the Russian Medical Union.	library, free access	<a href="http://www.rmass.ru/">http://www.rmass.ru/</a>
8.	Web medicine.	The site provides a directory of professional medical resources, including links to The most authoritative topical websites, journals, societies, as well as useful documents and programs. The site is intended for physicians, students, and staff of medical universities and research institutions.	library, free access	<a href="http://webmed.irkutsk.ru/">http://webmed.irkutsk.ru/</a>
Databases				
9.	World Health Organization.	The site contains news, statistics on countries that are members of the World	library, free access	<a href="http://www.who.int/ru/">http://www.who.int/ru/</a>

		Health Organization, fact sheets, reports, WHO publications, and much more.		
10.	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 much more.	library, free access	<a href="http://www.minobrnauki.gov.ru">http://www.minobrnauki.gov.ru</a>
11.	Ministry of Education of the Russian Federation.	The website of the Ministry of Education of the Russian Federation contains news, information bulletins, reports, publications and much more.	library, free access	<a href="https://edu.gov.ru/">https://edu.gov.ru/</a>
12.	Federal Portal "Russian Education"	A single point of access to educational resources. This portal provides access to textbooks on all areas of medicine and healthcare.	library, free access	<a href="http://www.edu.ru/">http://www.edu.ru/</a> <a href="http://window.edu.ru/catalog/?p_rubr=2.2.81.1">http://window.edu.ru/catalog/?p_rubr=2.2.81.1</a>
<b>Bibliographic databases</b>				
13.	Database "Russian Medicine"	Created at the Central Scientific and Methodological Library, it covers the entire collection since 1988. The database contains bibliographic descriptions of articles from Russian journals and collections, dissertations and their abstracts, as well as Russian and foreign books, institute proceedings, conference materials, etc. Thematically, the database covers all areas of medicine and related fields of biology, biophysics, biochemistry, psychology, etc.	library, free access	<a href="http://www.scsm1.rssi.ru/">http://www.scsm1.rssi.ru/</a>
14.	eLIBRARY.RU	A Russian information portal in science, technology, medicine, and education, containing abstracts and full texts of over 13 million scientific articles and publications. The eLIBRARY.RU platform offers electronic versions of over 2,000 Russian scientific and technical journals, including over 1,000 open-access journals.	library, free access	<a href="http://elibrary.ru/defaultx.asp">http://elibrary.ru/defaultx.asp</a>
15.	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	<a href="http://diss.rsl.ru/?menu=disscatalog/">http://diss.rsl.ru/?menu=disscatalog/</a>
16.	Medline .r u	Biomedical portal for specialists. Biomedical journal. Last updated February 7, 2021.	library, free access	<a href="http://www.medline.ru">http://www.medline.ru</a>

### 3.6. Licensed and freely distributed software used in the educational process

<b>I. Commercial software products</b>		
1.	Windows 7 Pro operating system	License number 48381779
2.	Operating system: MS Windows 10 Pro , MS Office	AGREEMENT No. 142 A dated December 25, 2019
3.	MS Office	License numbers: 43234783, 67810502, 67580703, 64399692, 62795141, 61350919
4.	Kaspersky Endpoint Business Security Advanced	Agreement No. 977/20 dated 12/24/2020
5.	1C : University PROF	LICENSE AGREEMENT No. 2191 dated October 15, 2020
6.	1C: PROF Library	LICENSE AGREEMENT No. 2281 dated November 11, 2020
<b>II. Freely distributable software</b>		
1.	Google Chrome	Freely distributed Distribution Terms: <a href="https://play.google.com/about/play-terms/index.html">https://play.google.com/about/play-terms/index.html</a>
2.	Yandex Browser	Freely distributed License Agreement for the Use of Yandex Browser Software <a href="https://yandex.ru/legal/browser_agreement/">https://yandex.ru/legal/browser_agreement/</a>
3.	Dr.Web CureIt !	Freely distributed License Agreement: <a href="https://st.drweb.com/static/new-www/files/license_CureIt_ru.pdf">https://st.drweb.com/static/new-www/files/license_CureIt_ru.pdf</a>
4.	OpenOffice	Freely distributed License: <a href="http://www.gnu.org/copyleft/lesser.html">http://www.gnu.org/copyleft/lesser.html</a>
5.	LibreOffice	Freely distributed License: <a href="https://ru.libreoffice.org/about-us/license/">https://ru.libreoffice.org/about-us/license/</a>

### 3.7. Resources of the information and telecommunications network "Internet"

- 1) The "Normal Physiology" page on the Moodle portal  
<https://educ-amursma.ru/course/view.php?id=135>
- 2) <http://meduniver.com/Medical/Book/44.html>
- 3) <https://www.brainfacts.org/>
- 4) the department's page on the academy's website  
<https://www.amursma.ru/obuchenie/kafedry/teoreticheskie/fiziologii-i-patofiziologii/o-kafedre/>
- 5) the department's page on the closed part of the website <https://www.amursma.ru/zakrytaya-chast-sayta/2-kurs/>

## 4. ASSESSMENT TOOLS FUND

### 4.1. Test tasks for current and final assessment

#### Incoming inspection

Conducted in the Moodle system

<https://educ-amursma.ru/mod/quiz/view.php?id=3173>

number of questions - 51

#### Current control

Conducted in the Moodle system

- Muscle physiology  
number of questions - 18  
Regulation of body functions  
<https://educ-amursma.ru/mod/quiz/view.php?id=18573>  
number of questions - 36  
Properties of nerve centers  
<https://educ-amursma.ru/mod/quiz/view.php?id=18869>  
number of questions – 35  
Physiology of motor activity  
<https://educ-amursma.ru/mod/quiz/view.php?id=21199>  
number of questions – 28  
Physiology of the autonomic nervous system  
<https://educ-amursma.ru/mod/quiz/view.php?id=19086>  
number of questions – 11  
Physiology of endocrine glands  
<https://educ-amursma.ru/mod/quiz/view.php?id=19284>  
number of questions – 42  
Erythrocyte and leukocyte systems of blood  
<https://educ-amursma.ru/mod/quiz/view.php?id=19518>  
number of questions – 60  
Physicochemical properties of blood  
<https://educ-amursma.ru/mod/quiz/view.php?id=19583>  
number of questions – 46  
External respiration  
<https://educ-amursma.ru/mod/quiz/view.php?id=19697>  
number of questions – 55  
Regulation of breathing  
<https://educ-amursma.ru/mod/quiz/view.php?id=19848>  
number of questions – 62  
Myocardium. Cardiac cycle  
<https://educ-amursma.ru/mod/quiz/view.php?id=20004>  
number of questions – 64  
Heart regulation  
<https://educ-amursma.ru/mod/quiz/view.php?id=20069>  
number of questions – 31  
Methods of studying cardiac activity  
<https://educ-amursma.ru/mod/quiz/view.php?id=20142>  
number of questions – 26  
Vascular Physiology. Blood Pressure  
<https://educ-amursma.ru/mod/quiz/view.php?id=20192>  
number of questions – 54  
Digestion in the mouth and stomach  
<https://educ-amursma.ru/mod/quiz/view.php?id=20833>  
number of questions – 52  
Digestion in the intestines. Motor and absorptive functions  
<https://educ-amursma.ru/mod/quiz/view.php?id=13400>  
number of questions 40  
Metabolic basis of physiological functions  
<https://educ-amursma.ru/mod/quiz/view.php?id=13722>  
number of questions – 49  
Excretory function of the kidneys  
<https://educ-amursma.ru/mod/quiz/view.php?id=13731>

number of questions – 69

General properties and patterns of functioning of sensory systems (analyzers). Physiology of the visual analyzer.

<https://educ-amursma.ru/mod/quiz/view.php?id=14688>

number of questions – 73

Physiology of the auditory, vestibular, and cutaneous analyzers

<https://educ-amursma.ru/mod/quiz/view.php?id=14790>

number of questions – 61

Innate and acquired forms of behavior

<https://educ-amursma.ru/mod/quiz/view.php?id=14797>

number of questions – 78

Physiological basis of human mental functions

<https://educ-amursma.ru/mod/quiz/view.php?id=14798>

number of questions – 96

### **Border control**

Conducted in the Moodle system

Physiology of excitable tissues, central nervous system

<https://educ-amursma.ru/mod/quiz/view.php?id=4658>

number of questions – 155

Physiology of blood. Physiology of respiration.

<https://educ-amursma.ru/mod/quiz/view.php?id=5396>

number of questions - 131

Circulation

<https://educ-amursma.ru/mod/quiz/view.php?id=7136>

number of questions – 163

Final test "Physiology of digestion, metabolism and energy, excretion"

<https://educ-amursma.ru/mod/quiz/view.php?id=14396>

number of questions – 127

Final "Physiology of Analyzers"

<https://educ-amursma.ru/mod/quiz/view.php?id=14414>

number of questions – 175

Final "Physiology of Higher Nervous Activity"

<https://educ-amursma.ru/mod/quiz/view.php?id=14449>

number of questions – 160

### **Final testing**

<https://educ-amursma.ru/mod/quiz/view.php?id=8718>

number of questions – 434

Conducted in the Moodle system

## **4.2. Situational tasks, exercises, etc.**

**Problem 1.** A suprathreshold stimulus was applied to a frog's heart during systole. Will an extra cardiac contraction occur? Why?

**Sample answer:** An extra cardiac contraction will not occur, since the heart is in a state of absolute refractoryness throughout systole .

**Problem 2.** A sham feeding experiment is performed on a fasted , esophagotomized dog. How will the duration of feeding be determined under these conditions?

**Sample answer:** Since the animal doesn't reach satiety, the duration of the meal will be determined by how quickly the dog's chewing muscles tire.

**Problem 3.** An experimental animal has decreased urine output. Its blood is also found to have a vasoconstrictive effect. Explain the mechanism by which low urine output occurs.

**Sample answer.** The hormone vasopressin (ADH) has both vasoconstrictive and reabsorbent properties in high concentrations. Consequently, the animal has increased secretion of this hormone by the posterior pituitary gland.

For a complete set of assignments, see the current certification FOS

#### **4.3. List of practical skills that a student should possess after mastering the discipline.**

##### **List of basic clinical and physiological techniques to be mastered by students at the KNOWLEDGE level**

1. Determination of osmotic resistance of erythrocytes.
2. Technique of blood collection.
3. Determination of hematocrit.
5. Determination of blood clotting time and bleeding cessation.
6. Electrocardiography.
7. Phonocardiography.
9. Phase analysis of the cardiac cycle.
10. Determination of blood circulation time.
11. Cardiac output study.
12. Sphygmography.
13. Determination of pulse wave propagation velocity.
14. Blood method of recording blood pressure.
15. Plethysmography.
16. Rheography.
17. Thermometry.
18. Spirometry.
19. Study of gastrointestinal tract motility.
20. Study of digestion and absorption in the gastrointestinal tract.
21. Methods for studying salivation in animals and humans.
22. Study of human energy expenditure.
23. Principles of preparing food rations.
24. Methods for quantitative assessment of urine formation mechanisms (clearance of various substances).
25. Methods for assessing the functions of human endocrine glands.
26. Stereotactic method.
27. Electroencephalography.
28. Audiometry.
29. Study of taste sensitivity.
30. Esthesiometry .
31. Electromyography.
32. Chronaximetry.
33. Methodology for developing conditioned reflexes.
34. Testing human psychological properties.

##### **List of physiological techniques to be mastered by students at the SKILL level**

1. Clinical blood test:
  - 1.1. Determination of hemoglobin.
  - 1.2. Red blood cell count.
  - 1.3. Leukocyte count.
  - 1.4. Determination of blood groups in the ABO system.
  - 1.5. Determination of the Rh factor of blood.
  - 1.6. Determination of ESR.
2. Palpation of the pulse rate.
3. Determination of blood pressure by indirect method.
4. Analysis of the electrocardiogram of a healthy person.

5. Spirometry.
  6. Pneumotachometry .
  7. Dynamometry.
  8. Study of proprioceptive reflexes.
  9. Determination of visual acuity.
  10. Perimetry.
  11. Study of color vision.
- Rinne auditory tests
13. Study of binocular hearing.
  14. Listening to heart sounds

#### **4.4 List of exam questions**

##### **Section 1. General Physiology.**

1. The role of I.M. Sechenov and I.P. Pavlov in the creation of materialistic foundations in physiology. The principle of nervism.
2. The concept of normalcy and health. Physiology as a scientific basis for health diagnostics and predicting the body's functional state and performance.
3. Levels of regulation of functions. Types and mechanisms of regulation. The concept of self-regulation .
4. The reflex principle of nervous system activity. The history of the development of the theory of reflexes. Philosophical principles of reflex theory. Definition of a reflex. The structural basis of a reflex and characteristics of its components.
5. P.K. Anokhin's theory of functional systems and self-regulation of functions. Classification of functional systems. Schematic diagram of a homeostatic functional system and analysis of its elements.
6. Age-related features of the formation and regulation of physiological functions. Systemogenesis .
7. Types of humoral regulation, characteristics and classification of physiologically and biologically active substances. The relationship between neural and humoral regulatory mechanisms.
8. The concept of homeostasis and homeokinesis . Principles of self-regulation of the constancy of the body's internal environment.
9. The structure and functions of excitable membranes. Membrane ion channels. Cellular ion gradients and the mechanisms of their formation.
10. Irritability and excitability as the basis of tissue response to stimulation. Irritants, their types, and characteristics. Other physiological properties of excitable tissues.
11. Membrane potentials and their classification. Resting potential and the mechanism of its occurrence.
12. Action potential, its phases and biophysical mechanisms of origin.
13. Excitability. Measures of excitability. Electrophysiological mechanisms of excitability changes. Relationship between excitability phases and action potential phases.
14. Laws of irritation of excitable tissues.
15. The mechanism of excitation conduction along myelinated and unmyelinated nerve fibers. Functional classification of nerve fibers. Laws of excitation conduction through various excitable tissues.
16. The structure and classification of synapses. The mechanism of excitation transmission in synapses (electrical and chemical). Ionic mechanisms of postsynaptic potential formation. Features of the structure and transmission of excitation in neuromuscular synapses.
17. Modern theory of muscle contraction and relaxation. Physical and physiological properties of muscles. Types of muscle contractions. Muscle strength and function.

18. Single muscle contraction and its phases. Tetanus and its types. Optimum and pessimum stimulation frequency. Lability.
19. Motor units and their classification. The mechanism of tetanus development in natural conditions.
20. Features of the structure and functions of smooth muscles.
21. The neuron as a structural and functional unit of the central nervous system. Classification of neurons and their functional structures. The mechanism of excitation. The integrative function of the neuron.
22. Types of neural circuits and the basic principles of excitation propagation along them. Types of irradiation and convergence of the excitation process.
23. Broad and narrow concepts of the nerve center and its basic physiological properties.
24. Inhibition in the central nervous system, its types and mechanisms.
25. Modern concepts of the integrative function of the central nervous system. Interactions between different levels of the central nervous system in the regulation of bodily functions. General principles of central nervous system coordination.
26. The main functions of the spinal cord and their morphofunctional characteristics. Cutaneous and tendon reflexes in humans and their clinical significance. The main spinal autonomic reflexes.
27. Spinal mechanisms regulating muscle tone and phasic movements. The role of proprioceptive reflex arcs in the self-regulation of these functions.
28. Supraspinal mechanisms of muscle tone regulation. Decerebrate rigidity and its mechanism of occurrence.
29. Static and statokinetic reflexes (R. Magnus ). Self-regulatory mechanisms for maintaining body balance.
30. The reticular formation of the brainstem and its descending influence on the reflex activity of the spinal cord.
31. The ascending activating influence of the brainstem reticular formation on the cerebral cortex. The role of the reticular formation in shaping the overall functioning of the body.
32. The physiology of the cerebellum and its influence on motor and autonomic functions. Impaired motor function due to cerebellar damage.
33. The limbic system of the brain. Pape's circuits and their role in the formation of motivations and emotions.
34. The hypothalamus. The role of the hypothalamus in integrating the body's autonomic, somatic, and endocrine functions, and its relationship to the organization of motivations, emotions, and biorhythms.
35. Modern concepts of the localization of functions in the cerebral cortex. Dynamic localization of functions.
36. Comparative characteristics of the somatic and autonomic nervous system.
37. Comparative morpho-functional characteristics of the sympathetic and parasympathetic divisions of the autonomic nervous system. Synergism and antagonism of their effects. Concept of adrenergic and cholinergic receptors.
38. Hormones, their characteristics, and mechanisms of action at the cellular level. Self-regulation of the endocrine system .
39. Hormonal regulation of calcium levels in the blood.
40. Hormonal regulation of blood glucose levels.
41. Physiology of the adrenal glands. The role of hormones of the cortex and medulla in regulating body functions.
42. Hormones of the pituitary gland, its functional connections with the hypothalamus and endocrine glands.
43. The hypothalamic-pituitary system and its role in the body's adaptation to changes in the external environment.
44. Physiology of the thyroid gland.

45. Sex glands. Male and female sex hormones and their physiological role in sex development and regulation of reproduction.

### **Section 2. Special physiology.**

1. Characteristics of the physiological properties of the myocardium and the processes determined by these properties.
2. Action potential of cardiomyocytes and cells of the cardiac conduction system ( pacemakers ). Mechanism of automaticity .
3. The heart and its hemodynamic function. The cardiac cycle and its main phases. Systolic and minute blood volumes.
4. Phase analysis of cardiac function.
5. Electromechanical coupling in the myocardium, the relationship between the phases of excitation, excitability, and contraction. Extrasystole.
6. Self-regulation of cardiac activity. Myogenic and neurogenic mechanisms of self-regulation .
7. Reflex regulation of cardiac activity and its types. Intrinsic and associated cardiac reflexes and their characteristics.
8. Humoral regulation of cardiac function. Which regulatory mechanisms are disrupted during heart transplantation?
9. The fundamental laws of hemodynamics and their use to explain blood flow through vessels. The various parts of the vascular bed and their functional significance in hemodynamics.
10. Blood pressure and hemodynamic factors determining optimal arterial and venous pressure. Physiological basis and causes of hypertension. Age-related changes in myocardial contractility, arterial and venous pressure.
11. Capillary blood flow and its characteristics. Microcirculation and its role in the exchange of fluid and various substances between blood and tissues.
12. Features of cerebral, pulmonary and coronary circulation.
13. The lymphatic system. Lymph formation and its mechanisms. Functions of lymph and the characteristics of lymph formation and lymph drainage .
14. Myogenic, neural, and humoral mechanisms regulating vascular tone. The vasomotor center and its efferent effects.
15. Blood pressure as a flexible constant of the body. Analysis of peripheral and central components of the functional system of blood pressure self-regulation .
16. The human respiratory function and its components. The mechanism of external respiration. The biomechanics of inhalation and exhalation. The mechanism of respiratory failure in pneumothorax.
17. Gas exchange in the lungs. Partial pressure of gases ( $O_2$  and  $CO_2$  ) in the alveolar air and gas tension in the blood. Oxygen capacity of the blood. Oxygen transport by the blood. Oxyhemoglobin dissociation curve.
18. Gas exchange in tissues. Gas tension ( $O_2$  and  $CO_2$  ) in tissue fluid and cells. Carbon dioxide transport in the blood. The role of carbonic anhydrase.
19. The respiratory center, modern concepts of its structure and location. Its cellular composition and automaticity .
20. Mechanisms of respiratory rhythm formation and its reflex self-regulation . Chemo- and mechanoreceptor circuits regulating respiratory rhythms.
21. A functional system that ensures the constancy of blood gas constants. Analysis of its elements.
22. Breathing under conditions of low and high atmospheric pressure. Analysis of the causes of its changes.
23. Blood, its properties and functions. Electrolyte composition of blood plasma. Osmotic pressure. The functional system that ensures the constancy of blood osmotic pressure.
24. Blood plasma proteins, their quantitative and qualitative characteristics, and functional significance. Oncotic pressure and its role.
25. Acid-base balance and the functional system that maintains its constancy.

26. Red blood cells and their functions. The functional system regulating red blood cell count. The morphofunctional system of the erythron . Hematopoiesis and hematopoiesis processes.
27. Types of hemoglobin, its compounds, and their physiological significance. Hemolysis, its types and mechanisms.
28. Leukocytes: their quantitative and qualitative characteristics. Functions of different types of leukocytes. Physiological foundations of immunity, T and B lymphocytes .
29. Bleeding control (hemostasis) and its stages. Platelets, quantitative characteristics and functions.
30. General characteristics of the blood coagulation and anticoagulation systems that ensure its optimal aggregate state.
31. Physiological immune systems of the blood. Blood types and Rh factor. Blood transfusion guidelines.
32. Digestion in the oral cavity. Salivation and its regulation.
33. Digestion in the stomach. Quantitative and qualitative characteristics of gastric juice. Neurohumoral regulation of gastric secretion. Appetitive gastric juice and its significance.
34. Gastric motor function and its types of motor activity. Neurohumoral regulation of gastric motility.
35. Exocrine function of the pancreas. Pancreatic juice, its daily quantity and qualitative composition. Neurohumoral regulation of pancreatic secretion.
36. Digestion in the small intestine. Composition and properties of intestinal juice. Cavity and membrane hydrolysis of nutrients in the small intestine.
37. The liver as a multifunctional organ. The liver's role in digestion. Bile formation and excretion, and their neurohumoral regulation.
38. Small and large intestinal motility, its types, and regulatory mechanisms. The importance of motility for intestinal absorption and secretory function.
39. The large intestine and its functions. Digestion in the large intestine. The act of defecation and its mechanism.
40. Absorption of substances in various parts of the digestive tract. Types and mechanisms of absorption.
41. A functional nutritional system that ensures optimal levels of nutrients in the blood, its external and internal regulatory circuits. Food motivation. Physiological mechanisms of hunger and satiety.
42. Endocrine function of the gastrointestinal tract and its participation in the regulation of its motility, secretion and the body as a whole.
43. The functional excretory system and its executive elements ensure the constancy of the internal environment of the body.
44. The kidney and its functions. The nephron is the structural and functional unit of the kidney. Mechanisms of urine formation.
45. The process of glomerular filtration, quantitative and qualitative characteristics of primary urine. General principles of filtration regulation. The artificial kidney and its clinical use.
46. Tubular reabsorption and its types and mechanisms. Humoral mechanisms regulating reabsorption in the distal nephron.
47. Physiology of the act of urination and its regulatory mechanisms.
48. The concept of metabolism in the body. The plastic and energetic roles of nutrients. Nitrogen balance and its types.
49. Energy balance of the body. Work metabolism. Energy expenditure of the body during various types of work.
50. Basal metabolism, its normal values, clinical significance.
51. The constancy of body temperature and its importance for metabolism. The body's temperature scheme. The functional thermoregulatory system.

### **Section 3. Integrative activity of the organism.**

1. An analytical and systems approach to the study of body functions.

2. I. P. Pavlov's theory of analyzers. Their significance. General plan and basic diagram of the analyzer's structure.
3. The receptor section of the analyzers. General classification of receptors, physiological properties, and patterns of information encoding.
4. Functional properties of analyzers and the patterns of operation in which they manifest themselves.
5. Conductive and central regions of the brain. Features of afferent impulse transmission. Involvement of subcortical structures in the transmission and stage-by-stage processing of afferent impulses.
6. The auditory analyzer. The receptor section of the auditory analyzer. The mechanism of receptor potential generation in the hair cells of the spiral organ. Current understanding of the mechanisms of pitch and sound intensity perception.
7. Physiology of the vestibular system. Receptor, conduction, and cortical sections. The complex of reactions that occur when the vestibular apparatus is stimulated.
8. The visual analyzer and its characteristics. The receptor apparatus. Color perception. The main forms of color vision deficiency.
9. The optical system of the eye and its importance. Physiological mechanisms of ocular accommodation. Adaptation of the visual analyzer. The role of the cortex in the formation of a visual image.
10. Tactile analyzer. The receptor, conduction, and cortical sections of this analyzer.
11. The temperature analyzer. Its role in perceiving the temperature of the external and internal environments of the body. The receptor, conduction, and cortical sections of the temperature analyzer.
12. The nociceptive analyzer. Modern concepts of pain receptors and types of pain sensitivity. Pain pathways and central mechanisms of pain perception.
13. Antinociceptive system. Neurochemical mechanisms of antinociception . Systemic concepts and the biological significance of pain.
14. Physiological basis of pain relief and anesthesia. Opiate receptors and their ligands .
15. The role of the cortex, subcortical formations and humoral factors in the formation of pain reactions.
16. The motor analyzer and its role in the perception and assessment of the body's position in space and in the formation of movements.
17. Physiological characteristics of the olfactory analyzer, mechanism of odor perception.
18. Physiological characteristics of the taste analyzer. Receptor, conduction, and cortical sections. Classification of taste sensations.
19. The role of the interoceptive analyzer in maintaining the constancy of the body's internal environment and its structure. Classification of interoreceptors and their functional characteristics.
20. Innate behavior patterns. Their neurophysiological basis and significance for adaptive functioning.
21. Conditioned reflexes as a form of adaptation in animals and humans to changing conditions. Patterns of formation and manifestation of conditioned reflexes, their classification.
22. Physiological foundations of conditioned reflex formation. Concepts of the mechanisms of temporary association formation.
23. The structure (architectonics) of goal-oriented behavior from the standpoint of the theory of functional systems of P.K. Anokhin and its main key elements.
24. The stage of afferent synthesis of the functional system of behavior and its neurophysiological mechanisms.
25. Needs and motivations. Principles of classification of needs and motivations and neurophysiological mechanisms of their origin. Goal-directed activity as a motivationally determined form of behavior.


26. Inhibition of conditioned reflexes and its types. Modern concepts of the mechanisms of unconditional and conditioned inhibition.
27. Analytical and synthetic activity of the cerebral cortex. Dynamic stereotype. Its physiological essence.
28. Memory and its types. The importance of memory in the formation of holistic adaptive responses.
29. Education and its main forms. The importance of education in the development of the psyche and personality.
30. I. P. Pavlov's theory of the first and second signaling systems. Figurative and verbal thinking. Functional asymmetry of higher mental functions of the brain.
31. Types of higher nervous activity in various concepts, their characteristics and principles of classification.
32. Emotions and their role and significance in the organization of behavior. Need -information theory of emotions. Autonomic and somatic components of emotional states. Types and role of emotions in the development of psychosomatic illnesses.
33. The role of emotions in goal-directed human activity. Emotional tension (emotional stress) and its role in the development of psychosomatic pathology.
34. Sleep and its physiological mechanisms. Sleep theories. The modern phase-information theory of sleep by Kleitman and Azerinsky . The physiological significance of sleep phases.
35. Speech. Functional asymmetry of the cerebral cortex and its relationship to human speech. Suggestion, self-hypnosis, psychotherapy.
36. The symbolic function of the brain: gnosis and praxis .
37. Physiological foundations of work activity. Characteristics of human work activity in modern production conditions. Physiological characteristics of work involving nervous, emotional, and mental stress.
38. Changes in autonomic and somatic functions associated with physical labor and sports. Physical training and its impact on human performance.
39. Characteristics of mental work. Nervous, autonomic, and endocrine changes during mental work. The role of emotions in mental activity.
40. Physical and mental performance and fatigue during goal-directed human activity. Characteristics of physical, motor, and mental fatigue.
41. Methodological principles for studying the physiological basis for the formation of various forms of behavior . The reactivity and activity paradigm.
42. The structure of the human psyche and its main components. Localization of mental functions in brain structures from A.R. Luria's systemic perspective .
43. The functional state of wakefulness of the brain and the main mechanisms of its maintenance.
44. The role of the cerebral cortex in regulating the function of internal organs. Cortico -visceral theory and its clinical application. Suggestion and self-suggestion.
45. Physiological mechanisms of stress responses. Adaptation to stress factors. Structural trace of adaptation.

#### **Section 4. Methods for studying physiological functions.**

1. Methods for recording muscle electrical activity. Muscle contraction force and its determination.
2. Method for determining chronaxie. Chronaximetry.
3. Method for counting leukocytes in the blood.
4. Methods for counting the number of red blood cells in the blood.
5. Method for determining the osmotic stability of erythrocytes.
6. Method for determining the amount of hemoglobin in the blood.
7. Color index, its information value, calculation method.
8. Method for determining blood group.
9. Rhesus factor and method for determining Rhesus status.
10. The concept of hematocrit and the method of its determination.

11. ESR, a method for determining the erythrocyte sedimentation rate.
12. Methods for determining blood clotting time and bleeding duration.
13. Gradient of automaticity . Stannius's experiment .
14. Principles of determining systolic and minute blood volumes.
15. Heart sounds and their origin. Research methods (auscultation, phonocardiography).
16. Electrocardiography. Principles of electrocardiogram analysis.
17. Bloodless methods for determining blood pressure.
18. Blood pressure recording method. Analysis of the blood pressure curve recorded in an acute experiment.
19. Methods for recording arterial and venous pulses. Analysis of sphygmograms and phlebograms .
20. vascular reactions. Plethism and rheography.
21. Methods for determining the time of complete blood circulation.
22. Respiratory muscles, bronchial muscle tone. Pneumotachometry .
23. Pneumothorax. Methods for determining pleural pressure.
24. Frederick's experiment with cross-circulation.
25. Tidal volumes. Spirometry. Spirography as a method of recording external respiration.
26. Physiological surgery. Chronic methods for studying the secretory function of the gastric glands (I. P. Pavlov, R. Heidenhain ) and salivation.
27. Methods for studying the motor function of the stomach and intestines in humans. Methods for studying absorption processes in the gastrointestinal tract.
28. Methods for studying salivation and gastric secretory function in humans.
29. Methods for studying bile secretion in animals and humans.
30. Thermometry of the body surface and internal organs.
31. Methods for studying energy expenditure. Direct and indirect calorimetry. Principles of the methods.
32. Principles of dietary planning. Physiological foundations of balanced nutrition and diet therapy.
33. Respiratory quotient, its definition and significance for energy calculations.
34. Methodology for determining renal plasma flow and blood flow.
35. Clearance coefficient. Method for assessing the amount of filtration.
36. Principles of methods for studying the functions of endocrine glands .
37. Methods for determining renal reabsorption and secretion.
38. Microelectrode method for recording the activity of single neurons in the brain. Stereotactic technique. Method for recording evoked potentials in the cerebral cortex.
39. Objective methods for studying functional states of the brain and their characteristics
40. Electroencephalography and EEG analysis.
41. Methods for studying the functions of the visual analyzer ( visual acuity, visual fields, color perception).
42. Methods of studying the tactile analyzer. Esthesiometry .
43. Methods for studying the functions of the taste analyzer. Determining taste stimuli thresholds.
44. Methods for studying the auditory analyzer. Speech and pure tone audiometry.
45. Rinne auditory tests . Investigation of binaural hearing.
46. Methodology for developing conditioned reflexes.

APPROVED  
at a meeting of the Department of Physiology and  
Pathophysiology  
protocol No. \_14\_ dated July 14, 2022

Head of Department \_\_\_\_\_  
  
/Batalova T.A./  
(signature, full name)

**ADDITIONS AND CHANGES TO THE WORK PROGRAM  
IN THE DISCIPLINE "NORMAL PHYSIOLOGY"  
SPECIALTY 31.05.02 PEDIATRICS  
FOR THE 2022–2023 ACADEMIC YEAR**

**1. Make an addition or change:**

In the section 3.6 “Licensed and freely distributed software used in the educational process”  
replace the table.

**List of software (commercial software products)**

No. p/ p	List of software (commercial software products)	Details of supporting documents
1	MS operating system Windows 7 Pro	License number 48381779
2	MS operating system Windows 10 Pro	CONTRACT No. UT-368 from September 21, 2021
3	MS Office	License numbers: 43234783, 67810502, 67580703, 64399692, 62795141, 61350919
4	Kaspersky Endpoint Security for business . Advanced	Agreement 326po/21-IB dated November 26, 2021
5	1C Accounting and 1C Salary	LICENSE AGREEMENT 612/L dated 02.02.2022
6	1C: PROF University	LICENSE AGREEMENT No. ЦБ- 1151 dated 01.14.2022
7	1C: PROF Library	LICENSE AGREEMENT No. 2281 dated November 11, 2020
8	Consultant Plus	Agreement No. 37 /C dated 02/25/2022
9	Aktion 360	Agreement No. 574 dated November 16, 2021
10	3KL e-learning environment (Russian Moodle )	Agreement No. 1362.2 dated November 15, 2021
11	Astra Linux Common Edition	Agreement No. 142 A dated September 21, 2021

12	Information system "Plans"	Agreement No. 8245 dated 06/07/2021
13	1C: Document Management	Agreement No. 2191 dated 10/15/2020
14	R7-Office	Agreement No. 2 KS dated 12/18/2020

**List of freely distributed software**


No . p/ p	List of freely distributed software	Links to the license agreement
1	Yandex Browser	Freely distributed License Agreement for the Use of Yandex Browser Software : <a href="https://yandex.ru/legal/browser_agreement/">https://yandex.ru/legal/browser_agreement/</a>
2	Yandex.Telemost	Freely distributed License Agreement for the Use of Software <a href="https://yandex.ru/legal/telemost_mobile_agreement/">https://yandex.ru/legal/telemost_mobile_agreement/</a>
3	Dr.Web CureIt !	Freely distributed License Agreement: <a href="https://st.drweb.com/static/new-www/files/license_CureIt_ru.pdf">https://st.drweb.com/static/new-www/files/license_CureIt_ru.pdf</a>
4	OpenOffice	Freely distributed License: <a href="http://www.gnu.org/copyleft/lesser.html">http://www.gnu.org/copyleft/lesser.html</a>
5	LibreOffice	Freely distributed License: <a href="https://ru.libreoffice.org/about-us/license/">https://ru.libreoffice.org/about-us/license/</a>

Author: Head of the Department Batalova T.A.



signature \_\_\_\_\_

APPROVED  
at a meeting of the Department of Physiology and  
Pathophysiology  
protocol No. 12 dated 06/15/2023

Head of Department  \_\_\_\_\_  
/Batalova T.A./  
(signature, full name)

**ADDITIONS AND CHANGES TO THE WORK PROGRAM  
IN THE DISCIPLINE "NORMAL PHYSIOLOGY"  
SPECIALTY 31.05.02 PEDIATRICS  
FOR THE 2023-2024 ACADEMIC YEAR**

Update the table in the section “Licensed and freely distributed software used in the educational process.”

**List of software (commercial software products)**


No. p/ p	List of software (commercial software products)	Details of supporting documents
1	MS operating system Windows 7 Pro	License number 48381779
2	MS operating system Windows 10 Pro	CONTRACT No. UT-368 from September 21, 2021
3	MS Office	License numbers: 43234783, 67810502, 67580703, 64399692, 62795141, 61350919
4	Kaspersky Endpoint Security for business – Standard Russian Edition. 50-99 Node 2 year Educational Renewal License	Agreement 165A dated November 25, 2022
5	1C Accounting and 1C Salary	LICENSE AGREEMENT 612/L dated 02.02.2022
6	1C: PROF University	LICENSE AGREEMENT No. ЦБ-1151 dated 01.14.2022


7	1C: PROF Library	LICENSE AGREEMENT No. 2281 dated November 11, 2020
8	Consultant Plus	Agreement No. 37 /C dated 02/25/2022
9	Contour .Tolk	Agreement No. K007556/22 dated 09/19/2022
10	3KL e-learning environment (Russian Moodle )	Agreement No. 1362.3 dated November 21, 2022
11	Astra Linux Common Edition	Agreement No. 142 A dated September 21, 2021
12	Information system "Plans"	Agreement No. 9463 dated May 25, 2022
13	1C: Document Management	Agreement No. 2191 dated 10/15/2020
14	R7-Office	Agreement No. 2 KS dated 12/18/2020

### List of freely distributed software

No. p / p	List of freely distributed software	Links to the license agreement
1	Yandex Browser	Freely distributed License Agreement for the Use of Yandex Browser Software : <a href="https://yandex.ru/legal/browser_agreement/">https://yandex.ru/legal/browser_agreement/</a>
2	Yandex.Telemost	Freely distributed License Agreement for the Use of Software <a href="https://yandex.ru/legal/telemost_mobile_agreement/">https://yandex.ru/legal/telemost_mobile_agreement/</a>
3	Dr.Web CureIt !	Freely distributed License Agreement: <a href="https://st.drweb.com/static/new-www/files/license_CureIt_ru.pdf">https://st.drweb.com/static/new-www/files/license_CureIt_ru.pdf</a>
4	OpenOffice	Freely distributed License: <a href="http://www.gnu.org/copyleft/lesser.html">http://www.gnu.org/copyleft/lesser.html</a>
5	LibreOffice	Freely distributed License: <a href="https://ru.libreoffice.org/about-us/license/">https://ru.libreoffice.org/about-us/license/</a>
6	VK Calls	Freely distributed <a href="https://vk.com/licence">https://vk.com/licence</a>

Author: Head of the Department Batalova T.A.

  
signature

APPROVED  
at a department meeting  
physiology and pathophysiology  
Protocol No. 10 dated April 29, 2024  
Head of Department  Batalova T.A.

**ADDITIONS AND CHANGES TO THE WORK PROGRAM  
IN THE DISCIPLINE "NORMAL PHYSIOLOGY"  
SPECIALTY 31.05.02 PEDIATRICS  
FOR THE 2024-2025 ACADEMIC YEAR**

1. Make a change and update the table in the section “Professional databases, information and reference systems, electronic educational resources”.

Resource name	Resource Description	Access	Resource address
Electronic library systems			
Student Consultant. Medical University Electronic Library	For students and faculty of medical and pharmaceutical universities. Provides access to electronic versions of textbooks, teaching aids, and periodicals.	Remote access after registration under the university profile	<a href="http://www.studmedlib.ru/">http://www.studmedlib.ru/</a>
"Doctor's Consultant" Electronic Medical Library.	The materials in the library were developed by leading Russian specialists based on modern scientific knowledge (evidence-based medicine). The information was prepared taking into account the position of the scientific and practical medical community (global, European, and Russian) in the relevant specialty. All materials have undergone mandatory independent peer review.	Remote access after registration under the university profile	<a href="http://www.rosmedlib.ru/cgi-bin/mb4x">http://www.rosmedlib.ru/cgi-bin/mb4x</a>
Electronic Library System "Bookup "	A large medical library is an information and educational platform for the shared use of electronic educational and methodological publications from medical universities in Russia and the CIS countries.	Remote access after registration under the university profile	<a href="https://www.books-up.ru/">https://www.books-up.ru/</a>

Electronic Block System "Lan"	Network electronic library of medical universities - an electronic database of educational and scientific works on medical topics, created for the purpose of implementing network forms of professional educational programs, open access to educational materials for partner universities	Remote access after registration under the university profile	<a href="https://e.lanbook.com/">https://e.lanbook.com/</a>
Scientific electronic library "CyberLeninka"	CyberLeninka is a scientific electronic library built on the paradigm of open science ( Open Science ), whose main goals are the popularization of science and scientific activity, public oversight of the quality of scientific publications, the development of interdisciplinary research, a modern institution of scientific review, increasing the citation rate of Russian science, and building a knowledge infrastructure. It contains over 2.3 million scientific articles.	free access	<a href="https://cyberleninka.ru/">https://cyberleninka.ru/</a>
Oxford Medicine Online	A collection of Oxford Medical Press 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.	free access	<a href="http://www.oxfordmedicine.com">http://www.oxfordmedicine.com</a>
Human Biology Knowledge Base	Reference information on <a href="#">physiology</a> , <a href="#">cell biology</a> , <a href="#">genetics</a> , <a href="#">biochemistry</a> , <a href="#">immunology</a> , and <a href="#">pathology</a> . (Source: <a href="#">Institute of Molecular Genetics, Russian Academy of Sciences</a> .)	free access	<a href="http://humbio.ru/">http://humbio.ru/</a>
Medical online library	Free reference books, encyclopedias, books, monographs, essays, English-language literature, tests.	free access	<a href="https://www.medlib.ru/library/library/books">https://www.medlib.ru/library/library/books</a>
Information systems			
Clinical Guidelines Index	A resource of the Russian Ministry of Health that contains clinical guidelines developed and approved by medical professional non-profit organizations of the Russian Federation, as well as methodological manuals, nomenclatures, and other reference materials.	Link to download the application	<a href="https://cr.minzdrav.gov.ru/#/">https://cr.minzdrav.gov.ru/#/</a>
Federal Electronic Medical Library (FEMB)	The Federal Electronic Medical Library is part of the unified state information system in the field of healthcare as a reference system . The FEMB was created based on the collections of the I.M. Sechenov Central Scientific Medical Library.	free access	<a href="https://femb.ru/">https://femb.ru/</a>
Russian Medical Association	A professional online resource . Purpose: to promote effective professional activity among medical personnel. Contains the charter, personnel, structure, membership rules, and information about the Russian Medical Union.	free access	<a href="http://www.rmass.ru/">http://www.rmass.ru/</a>
Web medicine	The website provides a directory of professional medical resources, including links to the most authoritative specialized websites, journals, societies, as well as useful documents and programs. It is intended for physicians, students, and staff of medical universities and research institutions.	free access	<a href="http://webmed.irkutsk.ru/">http://webmed.irkutsk.ru/</a>
Databases			
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.	free access	<a href="http://www.who.int/ru/">http://www.who.int/ru/</a>
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 much more.	free access	<a href="http://www.minobrnauki.gov.ru">http://www.minobrnauki.gov.ru</a>
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.	free access	<a href="https://edu.gov.ru/">https://edu.gov.ru/</a>
Federal Portal "Russian Education"	A single point of access to educational resources. This portal provides access to textbooks on all areas of medicine and healthcare.	free access	<a href="http://www.edu.ru/">http://www.edu.ru/</a>
<a href="http://Polpred.com">Polpred.com</a>	Electronic Library System Business Media. Media Review	free access	<a href="https://polpred.com/news">https://polpred.com/news</a>
Bibliographic databases			

Database "Russian Medicine"	Created at the Central Scientific and Methodological Library, it covers the entire collection since 1988. The database contains bibliographic descriptions of articles from Russian journals and collections, dissertations and their abstracts, as well as Russian and foreign books, institute proceedings, conference materials, etc. Thematically, the database covers all areas of medicine and related fields of biology, biophysics, biochemistry, psychology, etc.	free access	<a href="https://rucml.ru/">https://rucml.ru/</a>
PubMed	A text <a href="#">database</a> of medical and biological publications in English. PubMed is an electronic search engine with free access to 30 million publications from 4,800 indexed medical journals. The database contains articles published from 1960 to the present, including information from MEDLINE, PreMEDLINE, and NLM. Each year, the portal is updated with more than 500,000 new papers.	free access	<a href="http://www.ncbi.nlm.nih.gov/pubmed/">http://www.ncbi.nlm.nih.gov/pubmed/</a>
eLIBRARY.RU	A Russian information portal in science, technology, medicine, and education, containing abstracts and full texts of over 13 million scientific articles and publications. The eLIBRARY.RU platform offers electronic versions of over 2,000 Russian scientific and technical journals, including over 1,000 open-access journals.	Full functionality of the site is available after registration.	<a href="http://elibrary.ru/default_x.asp">http://elibrary.ru/default_x.asp</a>
Electronic Library of Dissertations (RSL)	Currently, the Electronic Library of Dissertations of the Russian State Library contains more than 919,000 full texts of dissertations and abstracts.	free access	<a href="http://diss.rsl.ru/?menu=disscatalog/">http://diss.rsl.ru/?menu=disscatalog/</a>
Medline .r u	Medical and biological portal for specialists. Biomedical journal.	free access	<a href="https://journal.scbmt.ru/jour/index">https://journal.scbmt.ru/jour/index</a>
Official Internet portal of legal information	The single official state information and legal resource in Russia	free access	<a href="http://pravo.gov.ru/">http://pravo.gov.ru/</a>

2. Make a change and update the table in the section “Licensed and freely distributed software used in the educational process.”

### List of software (commercial software products)

No. p / p	List of software (commercial software products)	Details of supporting documents
1.	MS operating system Windows 7 Pro	License number 48381779
2.	MS operating system Windows 10 Pro	CONTRACT No. UT-368 from September 21, 2021
3.	MS Office	License numbers: 43234783, 67810502, 67580703, 64399692, 62795141, 61350919
4.	Kaspersky Endpoint Security for business – Standard Russian Edition. 50-99 Node 2 year Educational Renewal License	Agreement 165A dated November 25, 2022
5.	1C Accounting and 1C Salary	LICENSE AGREEMENT 612/L dated 02.02.2022 (additional licenses)
6.	1C: PROF University	LICENSE AGREEMENT No. KrTsB-004537 dated December 19, 2023
7.	1C: PROF Library	LICENSE AGREEMENT No. 2281 dated November 11, 2020
8.	Consultant Plus	Agreement No. 37-2C dated March 27, 2023
9.	Contour .Tolk	Agreement No. K1029608/23 dated 09/04/2023
10.	3KL e-learning environment (Russian Moodle )	Agreement No. 1362.4 dated 12/11/2023
11.	Astra Linux Common Edition	Agreement No. 142 A dated September 21, 2021
12.	Information system "Plans"	Agreement No. 1338-23 dated May 25, 2023
13.	1C: Document Management	Agreement No. 2191 dated 10/15/2020
14.	R7-Office	Agreement No. 2 KS dated 12/18/2020

### List of freely distributed software

No. p / p	List of freely distributed software	Links to the license agreement
1.	Yandex Browser	Freely distributed License Agreement for the Use of Yandex Browser Software : <a href="https://yandex.ru/legal/browser_agreement/">https://yandex.ru/legal/browser_agreement/</a>
2.	Yandex.Telemost	Freely distributed License Agreement for the Use of Software <a href="https://yandex.ru/legal/telemost_mobile_agreement/">https://yandex.ru/legal/telemost_mobile_agreement/</a>
3.	Dr.Web CureIt !	Freely distributed License Agreement: <a href="https://st.drweb.com/static/new-www/files/license_CureIt_ru.pdf">https://st.drweb.com/static/new-www/files/license_CureIt_ru.pdf</a>
4.	OpenOffice	Freely distributed License: <a href="http://www.gnu.org/copyleft/lesser.html">http://www.gnu.org/copyleft/lesser.html</a>
5.	LibreOffice	Freely distributed License: <a href="https://ru.libreoffice.org/about-us/license/">https://ru.libreoffice.org/about-us/license/</a>
6.	VK Calls	Freely distributed <a href="https://vk.com/licence">https://vk.com/licence</a>
7.	Kaspersky Free Antivirus	Freely distributed <a href="https://products.s.kaspersky-labs.com/homeuser/Kaspersky4Win2021/21.16.6.467/english-0.207.0/3830343439337c44454c7c4e554c4c/kis_eula_en-in.txt">https://products.s.kaspersky-labs.com/homeuser/Kaspersky4Win2021/21.16.6.467/english-0.207.0/3830343439337c44454c7c4e554c4c/kis_eula_en-in.txt</a>

APPROVED

at a meeting of the Department of Physiology and  
Pathophysiology  
Protocol No. 8 of March 27, 2025  
Head of Department  
Batalova T.A.

**ADDITIONS AND CHANGES TO THE WORK PROGRAM  
IN THE DISCIPLINE "NORMAL PHYSIOLOGY"  
SPECIALTY 31.05.02 PEDIATRICS  
FOR THE 2025-2026 ACADEMIC YEAR**

**1. Make additions and changes to section 2.2. Thematic plan of lectures and their summary**

- *Physiology of endocrine glands.*

Structural and functional organization of the endocrine system. Characterization and classification of physiologically active substances (hormones, peptides, metabolites), concepts of autocrine, paracrine, and telecrine forms of regulation. Basic mechanisms of hormonal action. Self-regulation of the endocrine system. Reception of physiologically important substances. Interrelationships between neural and humoral mechanisms of function regulation.

- *Systemic principle of regulation of physiological functions*

The concept of homeostasis and homeokinesis. Self-regulatory principles for maintaining the constancy of the body's internal environment and its physiological constants. P.K. Anokhin's theory of functional systems and self-regulation of functions. A cybernetic approach to regulatory processes. Classification of functional systems. Schematic diagram of the structural organization of a functional homeostatic system, a system-forming factor. Regulation of functions by discrepancies and disturbances. Principles of multi-connected regulation. Feedback as one of the leading mechanisms in regulating functions. Principles of coding physiological information. The significance of the theory of functional systems for physiology, biology, medicine, and other disciplines.

Age-related features of the formation and regulation of physiological functions. Systemogenesis.

**2. Make an addition and change to section 3.1 "Key Literature":**

1. Nozdrachev, A. D. Normal physiology : textbook / A. D. Nozdrachev, P. M. Maslyukov. - Moscow : GEOTAR-Media, 2023. - 1088 p. - ISBN 978-5-9704-7492-1. - Text : electronic // Electronic Library System "Student Consultant": [site]. - URL : <https://www.studentlibrary.ru/book/ISBN9785970474921.html> (accessed: 07.11.2024). - Access mode : by subscription.

2. Normal Physiology : in 2 volumes. Volume 1: textbook / edited by M. M. Lapkin, A. V. Kotov, V. I. Torshin. - Moscow : GEOTAR-Media, 2023. - 560 p. - ISBN 978-5-9704-7875-2, DOI: 10.33029/9704-7875-2-NF1-2023-1-560. - Electronic version is available on the website of the Electronic Library System "Student Consultant" : [site]. URL: <https://www.studentlibrary.ru/book/ISBN9785970478752.html> (date accessed: 07.11.2024). - Access mode: by subscription. - Text: electronic

3. Normal Physiology: in 2 volumes. Volume 2 : textbook / edited by M. M. Lapkin, A. V. Kotov, V. I. Torshin. - Moscow : GEOTAR-Media, 2023. - 544 p. - ISBN 978-5-9704-7876-9,

DOI: 10.33029/9704-7876-9-NF2-2023-1-544. - Electronic version is available on the website of the Electronic Library System "Student Consultant" : [site]. URL: <https://www.studentlibrary.ru/book/ISBN9785970478769.html> (date accessed: 07.11.2024). - Access mode: by subscription. - Text: electronic

### **3. Make an addition and change to section 3.2 “Additional Literature”:**

1. Normal Physiology. Guide to Practical Classes / S. S. Pertsov, N. D. Sorokina, V. P. Degtyarev [et al.]. - Moscow : GEOTAR-Media, 2024. - 400 p. - ISBN 978-5-9704-8247-6, DOI: 10.33029/9704-8247-6-NPH-2024-1-400. - Electronic version is available on the website of the Electronic Library System "Student Consultant" : [site]. URL: <https://www.studentlibrary.ru/book/ISBN9785970482476.html> (date accessed: 10/29/2024). - Access mode: by subscription. - Text: electronic
2. Human anatomy and physiology. Illustrated textbook / edited by I. V. Gaivoronsky . - Moscow: GEOTAR-Media, 2025. - 672 p. - ISBN 978-5-9704-8833-1. -Text: electronic // Electronic Library System "Student Consultant": [website]. - URL: <https://www.studentlibrary.ru/book/ISBN9785970488331.html> (accessed: 09/06/2024). - Access mode: by subscription.
3. Sudakov, K. V. Human Physiology. Atlas of Dynamic Schemes: a tutorial / K. V. Sudakov [et al.]; edited by K. V. Sudakov. - 2nd ed. rev. and additional - Moscow: GEOTAR-Media, 2020. - 416 p. : ill. - 416 s. - ISBN 978-5-9704-5880-8. - Text : electronic // EBS “Student Consultant”: [website]. - URL : <https://www.studentlibrary.ru/book/ISBN9785970458808.html> (accessed: 08.11.2024). - Access mode : by subscription.
4. Physiology of the sphincter -valve apparatus of the digestive system: a teaching aid / compiled by S. N. Tsybusov [et al.]. - Nizhny Novgorod : Lobachevsky State University of Nizhny Novgorod, 2022. - 38 p. - Text : electronic // Lan: electronic library system. - URL: <https://e.lanbook.com/book/283175> (accessed: 12.12.2022). - Access mode: for authorized users.
5. Physiology of the cardiovascular system and respiration: a teaching aid / compiled by A. V. Deryugina , M. A. Shabalin. - Nizhny Novgorod : Lobachevsky State University of Nizhny Novgorod, 2021. - 47 p. - Text: electronic // Lan : electronic library system. - URL: <https://e.lanbook.com/book/191670> (accessed: 12.12.2022). - Access mode: for authorized users.
6. Deryugina , A. V. Electrophysiology. Physiology of excitable tissues: a teaching aid / A. V. Deryugina , M. A. Shabalin. - Nizhny Novgorod : Lobachevsky State University of Nizhny Novgorod, 2020. - 80 p. - Text : electronic // Lan: electronic library system. - URL: <https://e.lanbook.com/book/191666> (accessed: 12.12.2022). - Access mode: for authorized users.
7. Degtyarev, V. P. Normal Physiology. Typical Test Tasks : A Tutorial / edited by V. P. Degtyarev. - Moscow: GEOTAR-Media, 2020. - 528 p. - ISBN 978-5-9704-5280-6. - Text : electronic // Electronic Library System "Student Consultant": [website]. - URL : <https://www.studentlibrary.ru/book/ISBN9785970452806.html> (accessed: 08.11.2024). - Access mode : by subscription.
8. Physiology of nerves and muscles. Physiology of the central nervous system : a teaching aid / compiled by A. V. Deryugina , M. A. Shabalin. — Nizhny Novgorod : Lobachevsky State University of Nizhny Novgorod, 2019. — 41 p. — Text : electronic // Lan: electronic library system. — URL: <https://e.lanbook.com/book/144823> (accessed: 12.12.2022). — Access mode: for authorized users.

### **4. Make additions and changes to section 3.5 “ Professional databases, information and reference systems, electronic educational resources .”**

**Professional databases, information reference systems,  
electronic educational resources**

Name resource	Resource Description	Access	Resource address
<b>ELECTRONIC LIBRARY SYSTEMS</b>			
Student Consultant. Medical University Electronic Library	For students and faculty of medical and pharmaceutical universities. Provides access to electronic versions of textbooks, teaching aids, and periodicals.	Remote access after registration under the university profile	<a href="https://www.studentlibrary.ru/">https://www.studentlibrary.ru/</a>
Reference and information system " MedBaseGeotar " .	The MedBaseGeotar reference and information system is designed for practicing medical specialists, researchers, teachers, postgraduate students, residents, senior students, and healthcare managers to quickly search, select, and read the medical literature they need for their work in a single data source.	Remote access after registration under the university profile	<a href="https://mbasegeotar.ru/pages/index.html">https://mbasegeotar.ru/pages/index.html</a>
Electronic Library System " Bookup "	A large medical library is an information and educational platform for the shared use of electronic educational and methodological publications from medical universities in Russia and the CIS countries.	Remote access after registration under the university profile	<a href="https://www.books-up.ru/">https://www.books-up.ru/</a>
Electronic Block System "Lan"	Network electronic library of medical universities - an electronic database of educational and scientific works on medical topics, created for the purpose of implementing network forms of professional educational programs, open access to educational materials for partner universities	Remote access after registration under the university profile	<a href="https://e.lanbook.com/">https://e.lanbook.com/</a>
Scientific electronic library " CyberLeninka "	CyberLeninka is a scientific electronic library built on the paradigm of open science ( Open Science ), whose main goals are the popularization of science and scientific activity, public oversight of the quality of scientific publications, the development of interdisciplinary research, a modern institution of scientific review, increasing the citation rate of Russian science, and building a knowledge infrastructure. It contains over 2.3 million scientific articles.	free access	<a href="https://cyberleninka.ru/">https://cyberleninka.ru/</a>
Oxford Medicine Online	Oxford Medical Press's collection of 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	free access	<a href="http://www.oxfordmedicine.com">http://www.oxfordmedicine.com</a>

	versions of which are constantly updated.		
Human Biology Knowledge Base	Reference information on physiology , cell biology , genetics , biochemistry , immunology , and pathology . (Source: Institute of Molecular Genetics, Russian Academy of Sciences .)	free access	<a href="http://humbio.ru/">http://humbio.ru/</a>
Online Medical Library	Free reference books, encyclopedias, books, monographs, essays, English-language literature, tests.	free access	<a href="https://www.medlib.ru/library/library/books">https://www.medlib.ru/library/library/books</a>
<b>INFORMATION SYSTEMS</b>			
Clinical Guidelines Index	A resource of the Russian Ministry of Health that contains clinical guidelines developed and approved by medical professional non-profit organizations of the Russian Federation, as well as methodological manuals, nomenclatures, and other reference materials.	Link to download the application	<a href="https://cr.minzdrav.gov.ru/#/">https://cr.minzdrav.gov.ru/#/</a>
Federal Electronic Medical Library (FEMB)	The Federal Electronic Medical Library is part of the unified state information system in the field of healthcare as a reference system . The FEMB was created on the basis of the funds of the Central Scientific Medical Library named after I.M. Sechenov.	free access	<a href="https://femb.ru/">https://femb.ru/</a>
Russian Medical Association	A professional online resource . Purpose: to promote effective professional activity among medical personnel. Contains the charter, personnel, structure, membership rules, and information about the Russian Medical Union.	free access	<a href="http://www.rmass.ru/">http://www.rmass.ru/</a>
Web medicine	The website provides a directory of professional medical resources, including links to the most authoritative specialized websites, journals, societies, as well as useful documents and programs. It is intended for physicians, students, and staff of medical universities and research institutions.	free access	<a href="http://webmed.irkutsk.ru/">http://webmed.irkutsk.ru/</a>
<b>DATABASES</b>			
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.	free access	<a href="http://www.who.int/ru/">http://www.who.int/ru/</a>
Ministry of Science and Higher	The website of the Ministry of Science and Higher Education of the Russian	free access	<a href="http://www.minobrnauki.gov.ru">http://www.minobrnauki.gov.ru</a>

Education of the Russian Federation	Federation contains news, newsletters, reports, publications, and much more.		
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.	free access	<a href="https://edu.gov.ru/">https://edu.gov.ru/</a>
Federal Portal "Russian Education"	A single point of access to educational resources. This portal provides access to textbooks on all areas of medicine and healthcare.	free access	<a href="http://www.edu.ru/">http://www.edu.ru/</a>
<a href="https://polpred.com">Polpred.com</a>	Electronic Library System Business Media. Media Review	free access	<a href="https://polpred.com/news">https://polpred.com/news</a>
<b>BIBLIOGRAPHICAL DATABASES</b>			
Database "Russian Medicine"	Created at the Central Scientific and Methodological Library, it covers the entire collection since 1988. The database contains bibliographic descriptions of articles from Russian journals and collections, dissertations and their abstracts, as well as Russian and foreign books, institute proceedings, conference materials, etc. Thematically, the database covers all areas of medicine and related fields of biology, biophysics, biochemistry, psychology, etc.	free access	<a href="https://rucml.ru/">https://rucml.ru/</a>
PubMed	A text database of medical and biological publications in English. PubMed is an electronic search engine with free access to 30 million publications from 4,800 indexed medical journals. The database contains articles published from 1960 to the present, including information from MEDLINE, PreMEDLINE, and NLM. Each year, the portal is updated with more than 500,000 new papers.	free access	<a href="https://pubmed.ncbi.nlm.nih.gov/">https://pubmed.ncbi.nlm.nih.gov/</a>
eLIBRARY.RU	A Russian information portal in science, technology, medicine, and education, containing abstracts and full texts of over 13 million scientific articles and publications. The eLIBRARY.RU platform offers electronic versions of over 2,000 Russian scientific and technical journals, including over 1,000 open-access journals.	Full functionality of the site is available after registration.	<a href="http://elibrary.ru/defaultx.asp">http://elibrary.ru/defaultx.asp</a>
Electronic library of dissertations (RSL)	Currently, the Electronic Library of Dissertations of the Russian State Library contains more than 919,000 full texts of dissertations and abstracts.	free access	<a href="http://diss.rsl.ru/?menu=disscatalog/">http://diss.rsl.ru/?menu=disscatalog/</a>

Medline .r u	Medical and biological portal for specialists. Biomedical journal.	free access	<a href="https://journal.scbmt.ru/jour/index">https://journal.scbmt.ru/jour/index</a>
Official Internet portal of legal information	The single official state information and legal resource in Russia	free access	<a href="http://pravo.gov.ru/">http://pravo.gov.ru/</a>

**5. Make an addition and change to section 3.6 “ Licensed and freely distributed software used in the educational process .”**

**List of software (commercial software products).**

<b>No. p / p</b>	<b>List of software (commercial software products)</b>	<b>Details of confirming documents documents</b>
1.	MS operating system Windows 7 Pro	License number 48381779
2.	MS operating system Windows 10 Pro	CONTRACT No. UT-368 from September 21, 2021
3 .	MS Office	License numbers: 43234783, 67810502, 67580703, 64399692, 62795141, 61350919
4.	Kaspersky Endpoint Security for Business - Standard Russian Edition . 50-99 Node 1 year Educational Renewal License	Agreement No. 7 AA dated 02/07/2025
5.	1C Accounting and 1C Salary	LICENSE AGREEMENT 612/L dated 02.02.2022 (additional licenses)
6.	1C: PROF University	LICENSE AGREEMENT No. KrTsB-004537 dated December 19, 2023
7.	1C: PROF Library	LICENSE AGREEMENT No. 2281 dated November 11, 2020
8.	Consultant Plus	Contract No. 41AA dated December 27, 2024
9.	Contour .Tolk	Agreement No. K213753/24 dated August 13, 2024
10.	3KL e-learning environment (Russian Moodle )	Agreement No. 1362.5 dated November 20, 2024
11.	Astra Linux Common Edition	Agreement No. 142 A dated September 21, 2021
12.	Information system "Plans"	Agreement No. 2873-24 dated June 28, 2024
13.	1C: Document Management	Agreement No. 2191 dated 10/15/2020
14.	R7-Office	Agreement No. 2 KS dated 12/18/2020
15.	License for "ROSA CHROME OS Workstation"	Agreement No. 88A dated 08/22/2024
16.	Alt Virtualization Server 10 (for secondary and higher vocational education)	Agreement No. 14AK dated September 27, 2024

17.	Dr.Web Desktop Security Suite Comprehensive Protection + Control Center for 12 months.	Agreement No. 8 dated October 21, 2024
18.	Software "Schedule for educational institutions"	Agreement No. 82A dated July 30, 2024

### List of freely distributed software

No . p / p	The list is free distributed software	Links to license agreement
1.	Yandex Browser	Freely distributed License Agreement for the Use of Yandex Browser Software <a href="https://yandex.ru/legal/browser_agreement/">https://yandex.ru/legal/browser_agreement/</a>
2.	Yandex.Telemost	Freely distributed License agreement for the use of programs <a href="https://yandex.ru/legal/telemost_mobile_agreement/">https://yandex.ru/legal/telemost_mobile_agreement/</a>
3.	Dr.Web CureIt !	Freely distributed License Agreement: <a href="https://st.drweb.com/static/new-www/files/license_CureIt_ru.pdf">https://st.drweb.com/static/new-www/files/license_CureIt_ru.pdf</a>
4.	OpenOffice	Freely distributed License: <a href="http://www.gnu.org/copyleft/lesser.html">http://www.gnu.org/copyleft/lesser.html</a>
5.	LibreOffice	Freely distributed License: <a href="https://ru.libreoffice.org/about-us/license/">https://ru.libreoffice.org/about-us/license/</a>
6.	VK Calls	Freely distributed <a href="https://vk.com/licence">https://vk.com/licence</a>
7.	Kaspersky Free Antivirus	Freely distributed <a href="https://products.s.kaspersky-labs.com/homeuser/Kaspersky4Win2021/21.16.6.467/english-0.207.0/3830343439337c44454c7c4e554c4c/kis_eula_en-in.txt">https://products.s.kaspersky-labs.com/homeuser/Kaspersky4Win2021/21.16.6.467/english-0.207.0/3830343439337c44454c7c4e554c4c/kis_eula_en-in.txt</a>

### 6. Make an addition and change to section 3.7 “ Resources of the information and telecommunications network “Internet” .

- Amur State Medical Academy Library. Access mode:  
<https://amurgma.ru/obuchenie/biblioteki/biblioteka-amurskoy-gma/>
- Electronic Library System "Student Consultant." Access Mode:  
<https://www.studentlibrary.ru>

APPROVED

At a department meeting  
physiology and pathophysiology  
Protocol No. 9 date 18.05.2026

Head of Department  Matytsin A.P.

**ADDITIONS AND CHANGES TO THE WORK PROGRAM FOR THE DISCIPLINE  
"NORMAL PHYSIOLOGY"  
SPECIALTY 31.05.01 MEDICAL CARE  
FOR THE 2026-2027 ACADEMIC YEAR**

1. The amount of contact work in the discipline has been reduced from 144 to 128 hours.
2. The amount of independent work in this discipline has been increased from 72 to 88 hours.
3. Clause 2.1. "Scope of the discipline and types of academic work" shall be stated as follows:

No. p / p	Type of academic work	Total hours	semesters	
			3rd semester	4th semester
1	Lectures	32	16	16
2	Practical classes	96	48	48
3	Independent work	88	44	44
4	Exam			36
Total labor intensity in hours		252	108	144
Total workload in credit units		7	3	4

4. Clause 2.2. "Thematic plan of lectures and their summary" of section 2 shall be set out as follows:

No. p / p	Topics and content of lectures	Codes of the formed competencies	Labor intensity in hours
<b>3rd semester</b>			
1.	<b><i>Fundamental concepts of physiology. General physiology of excitable tissues.</i></b> Understanding integrative and disintegrative processes in the body as the basis for clinical thinking. Health diagnostics and prognosis of functional state and human performance. Basic physiological properties and processes in cells and tissues. Excitability, conductivity, contractility, secretion, and automaticity. Laws of stimulus action in homogeneous and heterogeneous systems and excitation conduction.	UK-1.7, OPK-2.5	2
2.	<b><i>Neuromuscular physiology. Regulation of physiological functions of the body.</i></b> Physical and chemical mechanisms of excitation conduction in systems. Contractile function and neuromotor units. Physiological and physical properties of muscles. The concept of regulation. Types of nervous, humoral and neurohumoral regulation. Self-regulation. The principle of the nervous system's activity, its development in the works of I. M. Sechenov, I. P. Pavlov. The reflex pathway. Disadvantages of reflex regulation. The concept of	UK-1.7, OPK-2.5	2
	of management effectiveness and efficiency. Feedback. Afferentation and its significance. The concept of adaptive outcome. Principles of reflex theory.		

3.	<p><b><i>The systemic principle of regulation of physiological functions. Excitation and inhibition in the central nervous system. The theory of nerve centers.</i></b></p> <p>P.K. Anokhin's theory of functional systems and self-regulation of functions. A cybernetic approach to regulatory processes. Classification of functional systems. Schematic diagram of the structural organization of a functional homeostatic system, a system-forming factor. Regulation of functions by discrepancies and disturbances. Principles of multi-coupled regulation. Feedback as one of the leading mechanisms in regulating functions. Principles of coding physiological information.</p> <p>The concept of homeostasis and homeokinesis . Self-regulating principles for maintaining the constancy of the body's internal environment and its physiological constants. The significance of the theory of functional systems for physiology, biology, medicine, and other disciplines.</p> <p>Age-related features of the formation and regulation of physiological functions. Systemogenesis .</p> <p>The neuron as a structural and functional unit of the central nervous system. General outline of the nervous system's structure. Brain and spinal cord. Nerve centers in the narrow and broad sense. Basic properties of nerve centers. Inhibition in the central nervous system: characteristics, classification at various levels of this process, and its mechanisms. Types of inhibition at the membrane, synapse, small neural circuit, and organismal levels. General principles of central nervous system coordination. Interaction between excitation and inhibition. Principles of reciprocity , feedback, a common "final pathway," and dominance. Interaction between various levels of the central nervous system during function regulation.</p>	UK-1.7, OPK-2.5	2
4.	<p><b><i>Physiology of motor activity. Mechanisms regulating muscle tone and movement.</i></b></p> <p>Types of motor activity. Lower and higher motor regulation centers. The pyramidal and extrapyramidal systems and their influence on the lower motor centers. Mechanisms of muscle tone regulation at the spinal level. Brongest's experiment .</p> <p>Supraspinal mechanisms of muscle tone regulation. Decerebrate rigidity and the mechanism of its development. Descending influences of the reticular formation (inhibitory and facilitatory) on spinal cord reflex activity. The role of the reticular formation in maintaining and redistributing muscle tone.</p> <p>Tonic reflexes of the brainstem (R. Magnus ). The role of the spinal cord, medulla oblongata, and midbrain in the implementation of phasic-tonic muscle activity. Age-related characteristics regulation of muscle tone and movement</p>	UK-1.7, OPK-2.5	2
5.	<p><b><i>Physiology of the autonomic nervous system.</i></b></p> <p>Structural and functional features of the somatic and autonomic nervous systems. Sympathetic and parasympathetic divisions of the autonomic nervous system. Organizational principles of the efferent link of autonomic reflexes. Autonomic ganglia and their functions. Preganglionic and postganglionic nerve fibers and their functional differences. The mechanism of excitation transmission in the autonomic ganglia. Autonomic nervous system mediators. Main types of receptive substances. Influence of the sympathetic and parasympathetic divisions of the autonomic nervous system on the innervated organs. Synergism and relative antagonism of influences. Higher and lower autonomic centers. Participation of the autonomic nervous system in the integration of functions during the formation of holistic behavioral acts. Autonomic components of behavior.</p>	UK-1.7, OPK-2.5	2
6.	<p><b><i>Blood as part of the body's internal environment. Its basic physical and chemical properties . Immunological properties of blood. The RASK system.</i></b></p> <p>Homeostasis of formed elements of the blood. Basic functions of the blood. Basic physiological constants of the blood. Osmotic and oncotic pressure. Hemoglobin: structure, properties, and amount in the blood. Hemoglobin compounds. Color index of the blood. The concept of the erythron . Physiological erythrocytosis, conditions, and mechanisms of its development. The concept of leukocytosis and leukopenia. Functions of</p>	UK-1.7, OPK-2.5	2

	<p>leukocytes. Functional system regulating the number of formed elements in the blood. Nervous and humoral mechanisms regulating the number of erythrocytes.</p> <p>Characteristics of the physiological immune systems of the blood. Innate and acquired immunity. Cellular and humoral, specific and nonspecific. The concept of immunization. Blood groups. The importance of knowledge of blood group affiliation. Classification and characteristics of blood groups according to the ABO system and according to Rhesus factors - accessories. Blood transfusion rules. Physiology of hemostasis. The process of stopping bleeding, its stages and significance. The coagulation and anticoagulation systems of the blood. The functional system regulating the state of aggregation. Regulation of hemostasis</p>		
7 .	<p><b><i>Physiology of respiration.</i></b></p> <p>The Importance of Breathing for the Body. The Main Stages of the Respiration Process. The Mechanism of External Respiration. Biomechanics of Inhalation and Exhalation. The Pleural Cavity and Its Role in the Mechanism of External Respiration. Elastic Properties of the Lungs and Chest Walls. Surfactants. Gas Exchange in the Lungs. Relative Constancy of the Alveolar Air Composition. Tensions of Gases Dissolved in the Blood and Methods of Measurement. Partial Pressure of Oxygen and Carbon Dioxide in the Alveolar Air. Properties of the Pulmonary Membrane. Diffusion Capacity of the Lungs. Gas Transport (O<sub>2</sub>, CO<sub>2</sub>) by the Blood. Hemoglobin and Its Forms. Dissociation of Oxyhemoglobin. O<sub>2</sub> and CO<sub>2</sub> Content in Arterial and Venous Blood. Formation and Dissociation of Bicarbonates and Carboxyhemoglobin. The Importance of Carbonic Anhydrase. Gas Exchange between Blood and Tissues.</p> <p>CNS structures that regulate respiratory cycles. Neuronal organization of the bulbar respiratory center. Mechanisms of respiratory rhythm formation . Mechanoreceptors of the lungs and their role in the self-regulation of respiratory rate and depth. Hering and Breuer reflexes . Conditioned and voluntary regulation of breathing.</p> <p>The influence of arterial blood gas composition and pH on respiratory rate and depth. Central and peripheral chemoreceptors and their role in maintaining gas homeostasis. The functional system regulating external respiration. Changes in pulmonary ventilation during hypercapnia and hypoxia. The functional system maintaining blood gas composition.</p>	UK-1.7, OPK-2.5	2
8.	<p><b><i>Physiological properties of the myocardium and their characteristics. The cardiac cycle.</i></b></p> <p>The importance of blood circulation for the body. General structure of the circulatory system. Blood circulation as a component of various functional systems that determine homeostasis. The heart, the importance of its chambers and valve apparatus. The cardiac cycle and its structure. Cardiac automaticity . Modern concepts of the substrate, nature, and gradient of automaticity . Ionic mechanisms of the action potential of cardiomyocytes . The relationship between excitation, excitability, and contraction in different phases of the cardiac cycle . Extrasystoles. Phase analysis. Changes in pressure and blood volume in the cavities of the heart in different phases of the cardiac cycle . Systolic and minute blood volume as a quantitative result of cardiac activity. External manifestations of cardiac activity, their origin, and research methods.</p>	UK-1.7, OPK-2.5	2
<b>4th semester</b>			
9	<p><b><i>Physiological principles of hemodynamics. Regulation of cardiac function and vascular tone. Functional systems for maintaining optimal blood pressure.</i></b></p> <p>Systemic hemodynamics. Functional classification of blood and lymphatic vessels. Fundamental laws of hemodynamics. Total peripheral vascular resistance. Mechanism of vascular tone formation. Factors ensuring blood movement through high- and low-pressure vessels. Blood flow velocity in various parts of the circulatory system. Blood circulation time. Blood pressure and its types. Factors determining blood pressure. Blood storage organs. Blood pressure, linear and volumetric blood flow velocities in various parts of the circulatory system. Regional circulation.</p>	UK-1.7, OPK-2.5	2

	<p>Morphofunctional characteristics of the main components of the microcirculatory bed.</p> <p>Functional system of cardiac regulation. Myogenic regulatory mechanisms: Frank- Starling law, Bowditch ladder , Anrep phenomenon , chrono -inotropic dependence. Neurogenic regulatory mechanism, peripheral cardiac reflexes: receptors, reflex arcs, significance. Influence of extracardiac nerves on the heart. Reflex regulation of cardiac activity: classification, reflexogenic zones, significance. Influence of humoral factors on cardiac function. Mechanisms of vascular tone regulation: local and central. The role of the endothelium in vascular tone regulation. Influence of efferent nerves and humoral factors on vessels. Vascular regulatory phenomena: autoregulation , functional and reactive hyperemia.</p>		
10.	<p><b><i>Digestion is a systemic process of metabolic saturation Mechanisms and basic patterns of regulation of digestive functions.</i></b></p> <p>Physiological foundations of hunger and satiety. I. P. Pavlov's concept of the food center. Functional nutrition. Digestion, basic principles and regulatory mechanisms. The essence of digestion. Types of digestion. Basic principles and mechanisms of digestion regulation. Phases of secretion of the main digestive glands. Methods for studying the functions of the digestive tract.</p>	UK-1.7, OPK-2.5	2
11.	<p><b><i>Metabolic basis of physiological functions.</i></b></p> <p>Biological thermodynamics or bioenergetics. The laws of thermodynamics and their applicability to living organisms. The body's energy balance and its regulation. The body as an open thermodynamic system. The exchange of substances and energy between the organism and the external environment as the fundamental conditions of life and the maintenance of homeostasis. The body's energy balance. Accounting for energy intake and expenditure: physical calorimetry, the caloric value of various substances (physical and physiological). Direct and indirect calorimetry (complete and incomplete gas analysis). The caloric coefficient of oxygen. Respiratory quotient. Basal metabolic rate, its magnitude, and the factors determining it. The specific dynamic effect of food. Work metabolism. Energy expenditure of the body during different types of work and at different ages.</p>	UK-1.7, OPK-2.5	2
12.	<p><b><i>Physiology of thermoregulation. The system that maintains a constant body temperature.</i></b></p> <p>Homeothermy and poikilothermy . Body temperature scheme. Constancy of internal body temperature as a prerequisite for normal metabolic processes. Metabolism as a source of heat generation. Centers of physical and chemical thermoregulation. Heat production and heat loss. The functional system that maintains a constant internal temperature despite changes in external temperature. Age-related characteristics of thermoregulation.</p>	UK-1.7, OPK-2.5	2
13.	<p><b><i>Functional system of allocation and characteristics of its main elements.</i></b></p> <p>The executive elements of the excretory system (kidneys, lungs, skin, gastrointestinal tract) and their role in maintaining the body's homeostasis. Skin as an excretory organ. Functions of the sebaceous and sweat glands and regulation of their activity.</p> <p>The main processes of urine formation (glomerular filtration, tubular Reabsorption and secretion). Mechanisms of glomerular filtration, composition of primary urine. Countercurrent system. Reabsorption in the tubules and mechanisms of its regulation. Secretory processes in the tubules. Final urine and its composition. Neurohumoral mechanisms of regulation of urine formation, the role of the nervous system and hormones (ADH, aldosterone, catecholamines, etc.). Methods for quantitative assessment of the processes of filtration, reabsorption , secretion, plasma flow and blood flow in the kidneys. The role of the kidneys in the regulation of nitrogen balance. Adaptive changes in kidney function under various environmental conditions</p> <p>Nervous and humoral regulation of renal blood supply. Regulation of glomerular filtration in the kidneys. The importance of arterial pressure in the systemic circulation, effective and ineffective filtration pressure. The</p>	UK-1.7, OPK-2.5	2

	regulatory significance of the tone of the afferent and efferent vessels. Obligatory and facultative reabsorption in the proximal and distal segments of the nephron. Regulation of the renal concentrating mechanism. Humoral regulation of reabsorption . Na and water in the kidneys. Age-related features of urine formation		
14.	<p><b>General physiology of sensory systems.</b></p> <p>The concept of sensory organs, analyzers, and sensory systems. I. P. Pavlov's theory of analyzers. The importance of analyzers in understanding the world.</p> <p>Functional organization of analyzers. Peripheral (receptor) section of analyzers. Classification, main properties, and characteristics of receptors. Mechanism of excitation in receptors. Functions of the peripheral section of analyzers. Functional mobility. Conduction section of analyzers. Characteristics of afferent impulse conduction. Specific and nonspecific pathways. Participation of subcortical structures in the conduction and processing of afferent impulses.</p> <p>The cortical part of the analyzer. Localization of afferent functions. Processes of higher cortical analysis and synthesis of afferent excitations. Interaction of analyzers. Coding of information in different parts of the analyzers. Adaptation of analyzers. Age-related characteristics physiology of sensory systems</p>	UK-1.7, OPK-2.5	2
15.	<p><b>Physiology of pain.</b></p> <p>Systemic mechanisms of pain. The concept of pain. Classification of pain types. Theories of pain. Nociceptors . Conduction section of the nociceptive analyzer. Central mechanisms of pain. Antinociceptive systems of the body. Gate theory of pain conduction. Afferentation . Neurochemical mechanisms of antinociception . Opiate receptors and their ligands . Systemic concepts and biological significance of pain. Physiological basis of pain relief and anesthesia. Biologically active points and the principle of reflexology.</p>	UK-1.7, OPK-2.5	2
16.	<p><b>Concept of higher brain functions. Functional system of goal-directed behavioral act. Physiological foundations of human mental activity.</b></p> <p>Unconditioned reflexes and instincts, their classification, characteristics, and significance for the adaptive activity of the organism.</p> <p>Conditioned reflexes as a form of adaptation in animals and humans to changing conditions. Patterns of formation and manifestation of conditioned reflexes. Physiological mechanisms of conditioned reflex formation. Their structural and functional basis. Analytical and synthetic activity of the cerebral cortex. Dynamic stereotypes, their physiological essence, and their significance for learning and the acquisition of work skills.</p> <p>Needs and motivations, their classification and neurophysiological mechanism of origin. Architecture of the integral behavioral act (P.K. Anokhin). The main stages of the functional system of behavior and their neurophysiological mechanisms. Physiology of memory and learning. Memory, its types from the standpoint of psychology and neurophysiology. Physiological classification of memory types and their mechanisms. Brain structures responsible for memory formation. Clinical neurophysiology (J. Penfield , B. Milner ). Implicit and explicit memory (procedural and declarative). Types of learning (training): obligatory, facultative and cognitive. Forms of behavior corresponding to these types.</p> <p>The structure of the human psyche: mental processes, mental states and mental properties. Objective methods of psychophysiological research. Electrophysiological research techniques. Electroencephalogram and its rhythms. Evoked potentials. Basic functional states of the brain. Physiological basis of hypnotic states. Wakefulness. Neurophysiological mechanisms of activation of the cerebral cortex and maintenance of wakefulness. Emotions and their biological role. Classification. Theory of emotions. The role of brain structures in the formation of emotional states. Vegetative and motor components of emotional stress. The role of emotions in purposeful human activity. Emotional tension (emotional stress). The role of emotional stress in the emergence of neuroses, the development of various psychosomatic diseases in humans. Types of higher nervous activity.</p>	UK-1.7, OPK-2.5	2

	Pavlov's doctrine of the first and second signal systems. Figurative and verbal thinking. Functional asymmetry of human mental functions. Suggestion, self-hypnosis, psychotherapy.		
	<b>Total hours</b>		<b>32</b>

**5. Clause 2.3. “Thematic plan for clinical/practical classes” shall be set out as follows:**

No. p / p	Name of the topics of practical classes	Contents of practical classes	Codes generated Competencies and indicators of their achievement	Types of control	Labor intensity (hours)
1	Introduction to normal physiology. Physiological properties and processes of excitable tissues.	<b>Theoretical part:</b> Introduction to the department. Introduction to the organization of practical classes at the department. Study of safety measures. Physiological properties of excitable tissues and the corresponding processes. Laws of stimulation of excitable systems. Mechanism and laws of conduction. <b>Practical part</b> Entrance test control Determining threshold strength and threshold time using chronoximetry. Experiment in the Physiology Simulator program.	UK-1. ID: 1.1, 1.2, OPK-5 ID: 5.3	Interactive survey, discussion of the results of the experiment, conclusions	3.2
2.	Physiology of the neuromuscular junction, skeletal and smooth muscles	<b>Theoretical part:</b> Physical and physiological properties of muscles. The mechanism of excitation conduction at the neuromuscular junction. Muscle work and strength. Types of muscle contractions. Functional characteristics of smooth muscles. <b>Practical part</b> Electromyography. Dynamometry. Experiment in the Physiology Simulator program	UK-1 ID: 1.1, 1.2, OPK-5 ID: -5.3	Interactive survey, monitoring of the practical task, discussion of the experimental results and conclusions	3.2
3.	The main types, principles, mechanisms and levels of regulation of physiological functions	<b>Theoretical part:</b> Reflex and systemic principles of regulation. Classification of reflexes. Reflex arc. Cybernetic principles of regulation based on discrepancies and deviations. Schematic diagram of a homeostatic functional system. <b>Practical part</b> Conjunctival conditioned and unconditioned reflexes (illustration of the principles of regulation by discordance and disturbance). A study of the activity of the functional system regulating gas	UK-1 ID: 1.1, 1.2, OPK-5 ID: 5.1, 5.3	Interactive survey, discussion of the results of the experiment, conclusions	3.2

		homeostasis in the body during various functional tests that deviate blood gas constants.			
4.	Physiology of the nerve center.	<p><b>Theoretical part:</b> Neuron physiology. The concept of a nerve center in a broad and narrow sense. Physiological properties of nerve centers. Inhibition: types, mechanisms, and significance. Principles of coordination of nerve centers.</p> <p><b>Practical part</b> Temporal summation in sensory nerve centers. Working with the Physiology Simulator program. Coupled inhibition in sensory cortical centers of various projection locations. Removal of the inhibitory effect on spinal tendon extensor reflexes.</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.3	Interactive survey, monitoring of the execution of tendon reflexes, discussion of the experimental results, conclusions	3.2
5 .	Physiology of motor activity	<p><b>Theoretical part:</b> Types and significance of motor activity. Spinal and supraspinal mechanisms of maintaining muscle tone. Functional features of the pyramidal and extrapyramidal systems. Decerebrate rigidity.</p> <p><b>Practical part</b> Observation of some motor reflexes in humans. Inducing various postural (tonic) reflexes in a rabbit.</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.3	Interactive survey, monitoring of the execution of tendon reflexes, discussion of the experimental results, conclusions	3.2
6.	Physiology of the autonomic nervous system	<p><b>Theoretical part:</b> Comparative characteristics of the somatic and autonomic nervous systems. The sympathetic and parasympathetic divisions of the autonomic nervous system and their adaptive and trophic roles. Higher and lower centers of the autonomic nervous system.</p> <p><b>Practical part</b> Adaptive pupillary response to light (direct and consensual ). Pupil response to pain. Working with the Physiology Simulator program</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.3	Interactive survey, discussion of the results of the experiment, conclusions	3.2
7	Final lesson: "General Physiology of Excitable Tissues, Physiology of the Central Nervous System"	<p><b>Theoretical part:</b> Testing the acquisition of competencies based on the topics "General Physiology of Excitable Tissues" and "Physiology of the Central Nervous System"</p> <p><b>Practical part</b> testing solving situational problems</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Testing, frontal survey interactive survey, situational task interview	3.2

8.	Physiology of endocrine glands	<p><b>Theoretical part:</b> General characteristics of humoral regulation. Classification of hormones. Physiological effects of hormones. Mechanisms regulating hormone levels in the human body.</p> <p><b>Practical part</b> Testing Working with the Physiology Simulator program</p>	<p>UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.3</p>	<p>Testing, interactive survey, discussion of the experiment results, conclusions</p>	3.2
9 .	Erythrocyte and leukocyte systems of the blood	<p><b>Theoretical part:</b> Blood functions. Blood system. Blood groups: AB0 system , Rh system. Functions of leukocytes. Physiological leukocytosis.</p> <p><b>Practical part</b> Determining the number of red blood cells in 1 liter of blood. Determining the number of white blood cells in 1 liter of blood. Determination of blood group according to the ABO system. Determination of blood Rh factor .</p>	<p>UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3</p>	<p>Interactive survey, monitoring the completion of a practical task, discussion of the results of the experiment, conclusions</p>	3.2
10.	Physicochemical properties of blood	<p><b>Theoretical part:</b> Hemoglobin, its types and functions. Color index. ESR as an integral indicator of homeostasis. Vascular- platelet and coagulation hemostasis. Anticoagulant system.</p> <p><b>Practical part</b> Determining the amount of hemoglobin in the blood using the Sali method . Calculating the color index of blood. Determining bleeding time using the Duke method . Determining clotting time using the Sukhov method. Determining the erythrocyte sedimentation rate.</p>	<p>UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3</p>	<p>Interactive survey, monitoring of the practical task, discussion of the experimental results and conclusions</p>	3.2
11.	External respiration	<p><b>Theoretical part:</b> The respiratory system. External respiration. Tidal volumes and capacities. The mechanism of inhalation and exhalation. Alveolar ventilation.</p> <p><b>Practical part:</b> Spirometry. Spirography. Pneumotachometry . Peak flowmetry . Working with the Physiology Simulator program</p>	<p>UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3</p>	<p>Interactive survey, monitoring of the practical task, discussion of the experimental results and conclusions</p>	3.2
12.	Regulation of breathing	<p><b>Theoretical part:</b> Structural organization of the respiratory center. Mechanisms of rhythm formation : interneuronal , intercentral ,</p>	<p>UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2</p>	<p>Interactive survey, monitoring of the practical task, discussion of the</p>	3.2

		reflex. Humoral mechanisms of respiratory regulation. <b>Practical part</b> A study of the mechanisms underlying changes in pulmonary ventilation during physical exercise. A study of the mechanisms by which changes in blood gas composition influence respiratory parameters. Respiratory function tests to assess human reserve capacity.	ID: 2.2, OPK-5 ID: 5.1, 5.3	experimental results and conclusions	
1 3.	Final lesson "Physiology of the blood system" and "Physiology of respiration".	<b>Theoretical part:</b> Assessment of the acquisition of competencies based on the studied topics "Physiology of the Blood System" and "Physiology of Respiration". <b>Practical part</b> Testing Solving situational problems	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Testing, Frontal survey, interactive survey, situational task interview	3.2
14	Physiological properties of the cardiac muscle.	<b>Theoretical part:</b> Physiological properties of the working myocardium and atypical myocardium. Automaticity and its substrate. Action potential of the pacemaker, working cardiomyocyte . Extrasystole. The cardiac cycle and its phases. <b>Practical part:</b> Stannius's experiment . Solving situational problems	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.3	Interactive survey, discussion of the experimental results, conclusions, interview on situational tasks	3.2
15	Regulation of cardiac activity	<b>Theoretical part:</b> Intracardiac and extracardiac mechanisms of cardiac regulation. Reflex and humoral mechanisms of regulation. <b>Practical part:</b> Working with the Physiology Simulator program. The effect of body position on heart rate.	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.3	Interactive survey, discussion of the results of the experiment, conclusions	3.2
16	Methods of studying cardiac activity	<b>Theoretical part:</b> The essence of the ECG method. The origin of ECG elements. The information value of the ECG method. Heart sounds and their origin. Research methods and information value. Principles of methods for determining CO and IOC. <b>Practical part:</b> Registration and analysis of electrocardiogram. Listening to heart sounds. Introduction to phonocardiography	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.3	Interactive survey, monitoring the completion of a practical task, discussion of the results of the experiment, conclusions	3.2

17	Vascular physiology. Blood pressure and mechanisms regulating it.	<p><b>Theoretical part:</b> Factors determining blood flow through the vessels. Types of blood pressure and factors determining its optimal value. Basal vascular tone. Mechanisms regulating vascular tone. The vasomotor center.</p> <p><b>Practical part:</b> Measurement of blood pressure according to Korotkov and Riva-Rocchi . Using the Physiology Simulator program. Studying the effects of physical activity on blood pressure and heart rate.</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Interactive survey, monitoring the completion of a practical task, discussion of the results of the experiment, conclusions	3.2
18	Final lesson "Physiology of blood circulation"	<p><b>Theoretical part:</b> Assessment of mastery of competencies based on the studied topics "Physiology of Circulation"</p> <p><b>Practical part:</b> Testing Solving situational problems</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Testing, frontal survey, interactive survey, interview on situational tasks	3.2
19	Digestion in the oral cavity, stomach, and intestines. Motility and absorptive functions of the digestive tract	<p><b>Theoretical part:</b> The nature and importance of digestion. Methods for studying the secretory function of the salivary glands and stomach. Digestion in the oral cavity and stomach. Functional nutrition. Chewing, swallowing. Types of motility of the stomach, small intestine, and large intestine. Vomiting. Defecation. Mechanisms regulating gastrointestinal motility. Intestinal absorption. The role of the liver and pancreas in digestion.</p> <p><b>Practical part:</b> Study of the secretory activity of the salivary glands at rest and under the influence of various stimuli. Study of the absorptive function of the stomach and the excretory function of the salivary glands The effect of bile on fats. Solving situational problems. Demonstration of the video film "Motor function of the digestive tract.</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Interactive survey, discussion of the results of the experiment, conclusions of the educational film, solutions to situational problems.	3.2
20	Metabolic basis of physiological functions.	<p><b>Theoretical part:</b> The plastic and energetic role of nutrients. Basal metabolism. Total energy metabolism . Energy expenditure during different types of labor. Methods</p>	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2	Interactive survey, discussion of the results of calculation	3.2

		for determining energy expenditure. Physiological norms of nutrition. Regulation of metabolism and energy. <b>Practical part:</b> Calculation of energy expenditure based on indirect respiratory calorimetry data. Calculation of daily energy balance	ID: 2.2, OPK-5 ID: 5.1, 5.3	tasks, conclusions	
21	Excretory function of the kidneys and methods of its study	<b>Theoretical part:</b> Pathways for the elimination of metabolic products from the body. Modern theory of urine formation . Regulation of kidney function. Method for quantitative assessment of filtration, reabsorption , secretion, plasma and blood flow. Functional urinary system. <b>Practical part:</b> Working with the Physiology Simulator program Solving situational and computational problems.	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Interactive survey, discussion of experimental results, calculation tasks, conclusions	3.2
22	Final lesson (seminar) "Physiology of digestion, metabolism and energy, excretion and thermoregulation"	<b>Theoretical part:</b> Assessment of mastery of competencies based on the studied topics "Physiology of digestion, metabolism and energy, excretion and thermoregulation" <b>Practical part:</b> Testing Solving situational problems	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Testing, interactive survey, interview on situational tasks	3.2
23	General properties and patterns of functioning of sensory systems (analyzers). Physiology of the visual analyzer.	<b>Theoretical part:</b> I.P. Pavlov's theory of analyzers. Functional properties of analyzers. Functions of the optical system of the eye. Theories of light perception. Conductive and cortical sections of the visual analyzer. Adaptation of the visual analyzer. <b>Practical part:</b> Determination of visual acuity. Determination of visual fields (perimetry). Color vision test.	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Interactive survey, monitoring the completion of a practical task, discussion of the results of the experiment, conclusions	3.2
2 4	Physiology of the auditory, vestibular and cutaneous analyzers	<b>Theoretical part:</b> The structure and functions of the auditory, vestibular, and cutaneous analyzers. The physiology of pain. Antinociceptive systems of the brain. <b>Practical part:</b> Air and bone conduction studies. Study of binocular hearing characteristics. Study of the	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Interactive survey, monitoring the completion of a practical task, discussion of the results of the experiment, conclusions	3.2

		body's autonomic responses to pain.			
25	Final lesson (seminar) "Physiology of sensory systems (analyzers)".	<b>Theoretical part:</b> Testing the acquisition of competencies based on the studied topics "Physiology of sensory systems (analyzers)". <b>Practical part:</b> Testing. Solving situational problems	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Testing, interactive survey, interview on situational tasks	3.2
26	Innate and acquired forms of behavior.	<b>Theoretical part:</b> The structure of a holistic behavioral act from the perspective of TFS. Innate forms of behavior. Learning and its types. Conditioned reflexes, inhibition of conditioned reflexes. The concept of a dynamic stereotype. <b>Practical part:</b> Demonstration of experimental methods for studying higher nervous activity in small laboratory animals and recording of experiments on studying search activity in a problem chamber. The influence of the goal on the result of the activity.	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Interactive survey, discussion of the experimental results, conclusions, and educational film	3.2
27	Physiological foundations of higher mental functions of a person.	<b>Theoretical part:</b> The theory of the first and second signaling systems. Typological features of the higher nervous activity. Needs, motivations, emotions. Speech and speech functions. Sleep and its physiological mechanisms. Memory, its types, and physiological mechanisms. Thinking. <b>Practical part:</b> Tapping test. Study of personality psychotype using testing method. Study of short-term memory capacity	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	interactive survey, discussion of the experiment results, conclusions.	3.2
28	Final lesson "Physiology of higher nervous activity".	<b>Theoretical part:</b> Testing the acquisition of competencies based on the studied topics "Physiology of Higher Nervous Activity" <b>Practical part</b> Testing Solving situational problems	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Testing, interactive survey, interview on situational tasks	3.2

29	Final lesson on practical skills.	<b>Practical part</b> Checking the acquisition of competencies (monitoring the acquisition of practical skills in written form).	OPK-5 ID: 5.1, 5.3	Frontal survey, interview based on results	3.2
30	Pre-exam testing	<b>Practical part</b> Checking the acquisition of competencies (testing).	UK-1 ID: 1.1, 1.2, UK-7 ID: 7.1, OPK-2 ID: 2.2, OPK-5 ID: 5.1, 5.3	Testing	3.2
<b>Total hours</b>					<b>96</b>

6. In paragraph 2.4. "Interactive forms of training," the table shall be presented as follows:

Item No.	Topic of the practical lesson	Trudoem - bone in hours	Interactive learning	Labor intensity per minute, in % of the session
1	2	3	4	5
1	Introduction to normal physiology. Physiological properties and processes of excitable tissues.	3.25	Interactive survey. Computer simulations.	90 minutes (2 hours) / 62%
2	Physiology of the neuromuscular junction, skeletal and smooth muscles	3.25	Interactive survey. Computer simulations.	90 minutes (2 hours) / 62%
3	The main types, principles, mechanisms and levels of regulation of physiological functions	3.25	Interactive survey. Small group method.	90 minutes (2 hours) / 62%
4	Physiology of the nerve center.	3.25	Interactive survey. Computer simulations.	90 minutes (2 hours) / 62%
5	Physiology of motor activity	3.25	Interactive survey. Small group method.	65 minutes (1.4 hours) / 44%
6	Physiology of the autonomic nervous system	3.25	Interactive survey. Small group method.	90 minutes (2 hours) / 62%
7	Final lesson: "General physiology of excitable tissues. Physiology of the central nervous system."	3.25	Computer testing, interactive survey	60 min (1.33 hours) / 41%
8	Physiology of endocrine glands	3.25	Interactive survey. Computer simulations. Computer testing.	120 min (2.67 hours) / 82%
9	Erythrocyte and leukocyte systems of the blood	3.25	Interactive survey. Small group method	90 minutes (2 hours) / 62%
10	Physicochemical properties of blood	3.25	Interactive survey. Small group method	90 minutes (2 hours) / 62%
11	External respiration	3.25	Computer simulations Interactive survey. Small group method	120 min (2.67 hours) / 82%
12	Regulation of breathing	3.25	Interactive survey Computer simulations Small group method	120 min (2.67 hours) / 82%
13	Final lesson "Physiology of the blood system" and "Physiology of respiration".	3.25	Computer testing Interactive survey	120 min (2.67 hours) / 82%

14	Physiological properties of the cardiac muscle. Methods for studying cardiac activity.	3.25	Interactive survey Small group method	90 minutes (2 hours) / 62%
15	Regulation of cardiac activity	3.25	Small group method. Interactive survey	90 minutes (2 hours) / 62%
16	Methods of studying cardiac activity	3.25	Interactive survey. Small group method	90 minutes (2 hours) / 62%
17	Vascular physiology. Blood pressure and mechanisms regulating it.	3.25	Small group method. Interactive survey	90 minutes (2 hours) / 62%
18	Final lesson "Physiology of blood circulation"	3.25	Interactive survey. Computer testing	120 min (2.67 hours)/82%
19	Digestion in the oral cavity and stomach. Digestion in the intestines. Motility and absorptive functions of the digestive tract.	3.25	Interactive survey Small group method. Working with an educational film	100 min (2.2 hours)/ 68%
20	Metabolic basis of physiological functions.	3.25	Interactive survey. Small group method	120 min (2.67 hours)/82%
21	Excretory function of the kidneys and methods of its study	3.25	Interactive survey. Computer simulations. Small group method.	120 min (2.67 hours)/82%
22	Final lesson (seminar) "Physiology of digestion, metabolism and energy, excretion and thermoregulation"	3.25	Interactive survey. Computer testing	120 min (2.67 hours)/82%
23	General properties and patterns of functioning of sensory systems (analyzers). Physiology of the visual analyzer.	3.25	Interactive survey. Small group method	90 minutes (2 hours) / 62%
24	Physiology of the auditory, vestibular and cutaneous analyzers	3.25	Interactive survey. Small group method	120 min (2.67 hours)/82%
25	Final lesson "Physiology of sensory systems (analyzers)".	3.25	Computer testing. Interactive survey	120 min (2.67 hours)/82%
26	Innate and acquired forms of behavior.	3.25	Interactive survey. Work in psychophysiological laboratories. Working with an educational film	60 min (1.33 hours)/ 41%
27	Physiological foundations of higher mental functions of a person.	3.25	Interactive survey	60 min (1.33 hours)/ 41%
28	Final lesson "Physiology of higher nervous activity".	3.25	Computer testing, interactive survey	120 min (2.67 hours)/82%
29	Final lesson on practical skills.	3.25	Interactive conversation	120 min (2.67 hours)/82%
30	Pre-exam testing	3.25	Computer testing	120 min (2.67 hours)/82%

**7. In paragraph 2.6. "Independent work of students: in-class, out-of-class," the table shall be presented as follows:**

No. p / p	Topic of the discipline section	Time to prepare student to class	Forms of independent extracurricular work	
			Mandatory and the same for all students	At the student's choice
1.	Introduction to Normal Physiology. Physiological Properties and Processes of Excitable Tissues	3	Reading a text (textbook, lecture, additional literature), solving tests, completing written homework	Making notes on the topic
2.	Physiology of the neuromuscular junction, skeletal and smooth muscles	2	Reading a text (textbook, lecture, additional literature); solving tests, completing written homework	Making notes on the topic
3.	The main types, principles, mechanisms and levels of	2	Reading a text (textbook, lecture, additional literature);	Making notes on the topic

	regulation of physiological functions		solving tests, completing written homework;	
4.	Physiology of the nerve center . braking	3	Reading a text (textbook, lecture, additional literature); solving tests, completing written homework	Making notes on the topic
5.	Physiology of motor activity	2	Reading a text (textbook, lecture, additional literature); completing written homework; solving tests	Making notes on the topic
6.	Physiology of the autonomic nervous system	2	Reading a text (textbook, lecture, additional literature); completing written homework; solving tests	Making notes on the topic
7.	Final lesson (seminar) on the sections "General physiology of excitable tissues. Physiology of the central nervous system."	4	Reading a text (textbook, lecture, additional literature); solving tests, watching a film on the department's Moodle page	Preparing presentations for class: (1. Cybernetics and the central nervous system, 2. The influence of the bark on vegetative functions. 3. Fatigue issues 4. The theory of parabiosis), drawing up notes on the topic
8.	Physiology of endocrine glands.	3	Reading a text (textbook, lecture, additional literature); solving tests, completing written homework.	Preparing presentations for class (1. Regulation of blood calcium levels. 2. Regulation of blood glucose levels), video presentations , studying tables on the department's Moodle page ; compiling notes on the topic
9.	Erythrocyte and leukocyte systems of the blood	3	Reading a text (textbook, lecture, additional literature); solving tests, completing written homework	Making notes on the topic, viewing the material on the department's Moodle page
10.	Physicochemical properties of blood	3	Reading a text (textbook, lecture, additional literature); solving tests, watching a film on the department's Moodle page completing written homework	Making notes on the topic
11.	External respiration	3	Reading a text (textbook, lecture, additional literature); solving tests, watching a film on the department's Moodle page completing written homework	Completing written homework
12.	Regulation of breathing	3	Reading a text (textbook, lecture, additional literature, solving tests) completing written homework	Making notes on the topic
13.	Final lesson (seminar) on the sections "Physiology of the blood system" and physiology of respiration."	3	Reading a text (textbook, lecture, additional literature); solving tests	Drawing up notes on the topic, preparing a presentation for a seminar (1. Donation is an honorable duty of a citizen. 2. Artificial blood)

14.	Physiological properties of the cardiac muscle. A single cardiac cycle.	3	Reading a text (textbook, lecture, additional literature); solving tests completing written homework	Making notes on the topic
15.	Regulation of cardiac activity	3	Reading a text (textbook, lecture, additional literature); solving tests; completing written homework	Making notes on the topic
16	Methods of studying cardiac activity	3	Reading a text (textbook, lecture, additional literature); solving tests, completing written homework	Drawing up notes on topics, preparing a presentation (1. Echocardiography as a modern research method. 2. Heart transplantation and its alternatives)
17.	Vascular physiology. Blood pressure and mechanisms regulating it.	3	Reading a text (textbook, lecture, additional literature); solving tests completing written homework	Making notes on the topic
18	Final lesson (seminar) on the section "Physiology of Blood Circulation"	3	Reading a text (textbook, lecture, additional literature); solving tests	Making notes on the topic
19	Digestion in the oral cavity and stomach. Digestion in the intestines. Motility and absorptive functions of the digestive tract.	3	Reading a text (textbook, lecture, additional literature); solving tests; completing written homework	Making notes on the topic
20.	Metabolic basis of physiological functions.	3	Reading a text (textbook, lecture, additional literature); solving tests, completing written homework	Making notes on the topic
21.	Excretory function of the kidneys and methods of its study	3	Reading a text (textbook, lecture, additional literature); solving tests completing written homework	Taking notes on the topic and watching films on the department's Moodle page
22.	Final lesson (seminar) on the sections "Physiology of digestion, metabolism and energy, excretion and thermoregulation"	3	Reading a text (textbook, lecture, additional literature); solving tests	Drawing up notes on the topic, preparing a presentation for a seminar (1. Artificial kidney. 2. Proper nutrition as the basis of health)
23.	General properties and patterns of functioning of sensory systems (analyzers). Physiology of the visual analyzer.	3	Reading a text (textbook, lecture, additional literature); solving tests, completing written homework	Making notes on the topic
24.	Physiology of the auditory, vestibular and cutaneous analyzers	3	Reading a text (textbook, lecture, additional literature); completing written homework; solving tests	Making notes on the topic
25.	Final lesson (seminar) on the section "Physiology of sensory systems" (analyzers)".	3	Reading a text (textbook, lecture, additional literature); solving tests	Drawing up notes on the topic, preparing a presentation for a seminar (1. Features of the visceral analyzer. 2. Physiology of the vomeronasal organ)
26.	Innate and acquired forms of behavior.	3	Reading a text (textbook, lecture, additional literature); solving tests completing written homework	Making notes on the topic

27.	Physiological foundations of higher mental functions of a person.	2	Reading a text (textbook, lecture, additional literature), solving tests	Drawing up notes on the topic , studying materials on the department's Moodle page
28.	Final lesson (seminar) on the section "Physiology of higher nervous activity".	3	Reading a text (textbook, lecture, additional literature); solving tests	Completing written homework, Preparing a presentation for a seminar (1. R. Sperry's contribution to the study of the brain. 2. Somnology as a modern science)
29.	Test session on practical skills	4	Reading a text (textbook, lecture, methodological instructions, additional literature)	
30.	Pre-exam testing	4	Reading a text (textbook, lecture, methodological instructions, additional literature)	
	<b>Total labor intensity (in hours)</b>	<b>88</b>		

**8. Tables in section 3.5. "Licensed and freely distributed software used in the educational process" . and state it in the following wording:**

**List of software (commercial software products)**

No. p / p	List of software (commercial software products)	Details of supporting documents
1.	MS operating system Windows 7 Pro	License number 48381779
2.	MS operating system Windows 10 Pro	CONTRACT No. UT-368 from September 21, 2021
3 .	MS Office	License numbers: 43234783, 67810502, 67580703, 64399692, 62795141, 61350919
4.	Kaspersky Endpoint Security for Business - Standard Russian Edition . 50-99 Node 1 year Educational Renewal License	Agreement No. 7 AA dated 02/07/2025
5.	1C Accounting and 1C Salary	LICENSE AGREEMENT 612/L dated 02.02.2022 (additional licenses)
6.	1C: PROF University	LICENSE AGREEMENT No. KrTsB-004537 dated December 19, 2023
7.	1C: PROF Library	LICENSE AGREEMENT No. 2281 dated November 11, 2020
8.	Consultant Plus	Contract No. 41AA dated December 27, 2024
9.	Contour .Tolk	Agreement No. K213753/24 dated August 13, 2024
10.	3KL e-learning environment (Russian Moodle )	Agreement No. 1362.5 dated November 20, 2024
11.	Astra Linux Common Edition	Agreement No. 142 A dated September 21, 2021
12.	Information system "Plans"	Agreement No. 2873-24 dated June 28, 2024
13.	1C: Document Management	Agreement No. 2191 dated 10/15/2020
14.	R7-Office	Agreement No. 2 KS dated 12/18/2020
15.	License for the "ROSA CHROME OS Workstation"	Agreement No. 88A dated 08/22/2024
16.	Alt Virtualization Server 10 (for secondary and higher vocational education)	Agreement No. 14AK dated September 27, 2024
17.	Dr.Web Desktop Security Suite Comprehensive Protection + Control Center for 12 months.	Agreement No. 8 dated October 21, 2024

18.	Software "Schedule for educational institutions"	Agreement No. 82A dated July 30, 2024
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**List of freely distributed software**

No. p / p	List of freely distributed software	Links to the license agreement
1.	Yandex Browser	Freely distributed License Agreement for the Use of Yandex Browser Software : <a href="https://yandex.ru/legal/browser_agreement/">https://yandex.ru/legal/browser_agreement/</a>
2.	Yandex.Telemost	Freely distributed License Agreement for the Use of Software <a href="https://yandex.ru/legal/telemost_mobile_agreement/">https://yandex.ru/legal/telemost_mobile_agreement/</a>
3.	Dr.Web CureIt !	Freely distributed License Agreement: <a href="https://st.drweb.com/static/new-www/files/license_CureIt_ru.pdf">https://st.drweb.com/static/new-www/files/license_CureIt_ru.pdf</a>
4.	OpenOffice	Freely distributed License: <a href="http://www.gnu.org/copyleft/lesser.html">http://www.gnu.org/copyleft/lesser.html</a>
5.	LibreOffice	Freely distributed License: <a href="https://ru.libreoffice.org/about-us/license/">https://ru.libreoffice.org/about-us/license/</a>
6.	VK Calls	Freely distributed <a href="https://vk.com/licence">https://vk.com/licence</a>
7.	Kaspersky Free Antivirus	Freely distributed <a href="https://products.s.kaspersky-labs.com/homeuser/Kaspersky4Win2021/21.16.6.467/english-0.207.0/3830343439337c44454c7c4e554c4c/kis_eula_en-in.txt">https://products.s.kaspersky-labs.com/homeuser/Kaspersky4Win2021/21.16.6.467/english-0.207.0/3830343439337c44454c7c4e554c4c/kis_eula_en-in.txt</a>

**9. The tables in Section 3.5. "Licensed and Freely Distributed Software Used in the Educational Process" and "Professional Databases, Information and Reference Systems, Electronic Educational Resources" shall be set out as follows:**

Resource name	Resource Description	access	Resource address
<b>Electronic library systems</b>			
Student Consultant. Medical University Electronic Library	For students and faculty of medical and pharmaceutical universities. Provides access to electronic versions of textbooks, teaching aids, and periodicals.	Remote access after registration under the university profile	<a href="https://www.studentlibrary.ru/">https://www.studentlibrary.ru/</a>
Reference and information system " MedBaseGeotar "	The MedBaseGeotar reference and information system is designed for practicing medical specialists, researchers, teachers, postgraduate students, residents, senior students, and healthcare managers to quickly search, select, and read the medical literature they need for their work in a single data source.	Remote access after registration under the university profile	<a href="https://mbasegeotar.ru/pages/index.html">https://mbasegeotar.ru/pages/index.html</a>
Electronic Library System " Bookup "	A large medical library is an information and educational platform for the shared use of electronic educational and methodological publications from medical universities in Russia and the CIS countries.	Remote access after registration under the university profile	<a href="https://www.books-up.ru/">https://www.books-up.ru/</a>
Electronic Block System "Lan"	The Network Electronic Library of Medical Universities is an electronic database of educational and scientific works on medical topics, created for the purpose of implementing network forms of professional educational programs, open access to educational materials for partner universities.	Remote access after registration under the university profile	<a href="https://e.lanbook.com/">https://e.lanbook.com/</a>
Scientific electronic library " CyberLeninka "	CyberLeninka is a scientific electronic library built on the paradigm of open science ( Open Science ), whose main goals are the popularization of science and scientific activity, public oversight of the quality of scientific publications, the development of interdisciplinary research, a modern institution of scientific review, increasing the citation rate of Russian science, and building a knowledge infrastructure. It contains over 2.3 million scientific articles.	with free access	<a href="https://cyberleninka.ru/">https://cyberleninka.ru/</a>
Oxford Medicine Online	A collection of Oxford Medical Press 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.	with free access	<a href="http://www.oxfordmedicine.com">http://www.oxfordmedicine.com</a>
Human Biology Knowledge Base	Reference information on <a href="#">physiology</a> , <a href="#">cell biology</a> , <a href="#">genetics</a> , <a href="#">biochemistry</a> , <a href="#">immunology</a> , and <a href="#">pathology</a> . (Source: <a href="#">Institute of Molecular Genetics, Russian Academy of Sciences</a> .)	free access	<a href="http://humbio.ru/">http://humbio.ru/</a>
Medical online library	Free reference books, encyclopedias, books, monographs, essays, English-language literature, tests.	free access	<a href="https://www.medlib.ru/library/library/books">https://www.medlib.ru/library/library/books</a>

<b>Information systems</b>			
Clinical Guidelines Index	A resource of the Russian Ministry of Health that contains clinical guidelines developed and approved by medical professional non-profit organizations of the Russian Federation, as well as methodological manuals, nomenclatures, and other reference materials.	link to download the application	<a href="https://cr.minzdrav.gov.ru/#/">https://cr.minzdrav.gov.ru/#/</a>
Federal Electronic Medical Library (FEMB)	The Federal Electronic Medical Library is part of the unified state information system in the field of healthcare as a reference system. The FEMB was created on the basis of the funds of the Central Scientific Medical Library named after I.M. Sechenov.	with free access	<a href="https://femb.ru/">https://femb.ru/</a>
Russian State Library (RSL)	Collection size: approximately 3 million titles. Coverage ranges from the 10th century to the present.	Registration on the website	<a href="https://www.rsl.ru/">https://www.rsl.ru/</a>
Russian Medical Association	A professional online resource. Purpose: to promote effective professional activity among medical personnel. Contains the charter, personnel, structure, membership rules, and information about the Russian Medical Union.	with free access	<a href="http://www.rmass.ru/">http://www.rmass.ru/</a>
Web medicine	The website provides a directory of professional medical resources, including links to the most authoritative specialized websites, journals, societies, as well as useful documents and programs. It is intended for physicians, students, and staff of medical universities and research institutions.	with free access	<a href="http://webmed.irkutsk.ru/">http://webmed.irkutsk.ru/</a>
<b>Databases</b>			
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.	free access	<a href="http://www.who.int/ru/">http://www.who.int/ru/</a>
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 much more.	free access	<a href="http://www.minobrnauki.gov.ru">http://www.minobrnauki.gov.ru</a>
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.	free access	<a href="https://edu.gov.ru/">https://edu.gov.ru/</a>
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.	free access	<a href="https://edu.gov.ru/">https://edu.gov.ru/</a>
<a href="http://polpred.com">Polpred.com</a>	Electronic library system Business media. Media review	free access	<a href="https://polpred.com/news">https://polpred.com/news</a>
<b>Biographical databases</b>			
Database "Russian Medicine"	Created at the Central Scientific and Methodological Library, it covers the entire collection since 1988. The database contains bibliographic descriptions of articles from Russian journals and collections, dissertations and their abstracts, as well as Russian and foreign books, institute proceedings, conference materials, etc.	free access	<a href="https://rucml.ru/">https://rucml.ru/</a>

	Thematically, the database covers all areas of medicine and related fields of biology, biophysics, biochemistry, psychology, etc.		
PubMed	A text <a href="#">database</a> of medical and biological publications in English. PubMed is an electronic search engine with free access to 30 million publications from 4,800 indexed medical journals. The database contains articles published from 1960 to the present, including information from MEDLINE, PreMEDLINE, and NLM. Each year, the portal is updated with more than 500,000 new papers.	free access	<a href="https://pubmed.ncbi.nlm.nih.gov/">https://pubmed.ncbi.nlm.nih.gov/</a>
eLIBRARY.RU	A Russian information portal in science, technology, medicine, and education, containing abstracts and full texts of over 13 million scientific articles and publications. The eLIBRARY.RU platform offers electronic versions of over 2,000 Russian scientific and technical journals, including over 1,000 open-access journals.	Full functionality of the site is available after registration.	<a href="http://elibrary.ru/defaultx.asp">http://elibrary.ru/defaultx.asp</a>
Electronic library of dissertations (RSL)	Currently, the Electronic Library of Dissertations of the Russian State Library contains more than 919,000 full texts of dissertations and abstracts.	free access	<a href="http://diss.rsl.ru/?menu=disscatalog/">http://diss.rsl.ru/?menu=disscatalog/</a>
Medline .r u	Medical and biological portal for specialists. Biomedical journal.	with free access	<a href="https://journal.scbmt.ru/jour/index">https://journal.scbmt.ru/jour/index</a>
Official Internet portal of legal information	The single official state information and legal resource in Russia	free access	<a href="http://pravo.gov.ru/">http://pravo.gov.ru/</a>