BOGOMOLETS NATIONAL MEDICAL UNIVERSITY

Educational and scientific Institute of medicine

Department of Physiology

APPROVED
Vice-Rector of the Higher Education Institution Bogomolets National Medical University for Scientific, Pedagogical, and Academic Affairs,
Doctor of Medical Sciences, Professor
Oleh VLASENKO

WORKING PROGRAM OF THE EDUCATIONAL DISCIPLINE PHYSIOLOGY

Educational level	second (master's)
Discipline	And "Healthcare and Social Security"
Specialty	12 "Medicine"
Educational program	Educational and professional program "Medicine" of the second (master's) level of higher education in specialty 12 "Medicine"

2026 – 2027 academic year

UB
НМУ імені О.О.Богомольця
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The work program OC 12 **"Physiology"** for higher education applicants, second educational level (master's), specialty I2 "Medicine", 2nd year.

Program developers : Acting Head of the Department of Physiology, Candidate of Biological Sciences, Associate Professor Vynohradova-Anyk O.O., Candidate of Medical Sciences , Senior Lecturer Karvatsky I.M.

The work program was discussed and approved at a meeting of the Department of Physiology
Protocol No. 147/26 of "26" August 2026

The work program was approved at a meeting of the Cyclic Methodological Commission for Natural Sciences
Protocol No. 1 of "26" August 2026

Acting Head of the Department of Physiology,
Candidate of Biological Sciences ,
Associate Professor O.O. Vynohradova-Anyk

Head of the Cyclic Methodological Commission
in Natural Sciences, Candidate of Biological Sciences ,
Associate Professor L.V. Yanitska

Guarantor of the educational (educational and professional) program
Doctor of Medicine , Professor, V.S. Melnyk

Head of the Department of Educational and Methodological Work,
licensing and accreditation, PhD , Associate Professor I.I. Kucherenko

1. Description of the academic discipline OC 12 "Physiology"

<table>
<tr><td rowspan="2">Name indicators</td><td rowspan="2">Branch knowledge, specialty, educational level</td><td>Characteristic academic discipline</td></tr>
<tr><td>daytime form of study</td></tr>
<tr><td>Number credits – 9.0</td><td>And "Healthcare and Social Security"</td><td>Required</td></tr>
<tr><td>Modules – 2</td><td rowspan="5">Specialty 12 "Medicine" (code and name)</td><td>Year preparation</td></tr>
<tr><td>Content-based modules – 16</td><td>2nd</td></tr>
<tr><td>Individual research task

_____
(name)</td><td>Semester</td></tr>
<tr><td rowspan="2">General number credits/hours – 9.0/270</td><td>III-IV- th</td></tr>
<tr><td>Lectures</td></tr>
<tr><td rowspan="11">Weekly hours for Full-time study: classroom hours/credits – 5.0 hours/ 0.17 credits independent works student – 3.4 /0.11 credit</td><td rowspan="11">Educational Master's level</td><td>40 hours.</td></tr>
<tr><td>Practical, seminar</td></tr>
<tr><td>120 hours</td></tr>
<tr><td>Laboratory</td></tr>
<tr><td>- hour. | - hour.</td></tr>
<tr><td>Independent work</td></tr>
<tr><td>110 hours</td></tr>
<tr><td>Individual task:</td></tr>
<tr><td>Final control:</td></tr>
<tr><td>exam</td></tr>
</table>

Note.

The ratio of the number of hours of classroom lessons to independent and individual students work for full-time study is (%): classroom load – 59%, ISW – 41%

2. Purpose, expected learning outcomes and criteria for assessing learning outcomes

The purpose of teaching the academic discipline "Physiology" is to study the functions of various cells, tissues, organs and systems as a whole in order to use the knowledge gained in the study of subsequent medical disciplines and in future professional activities. It lays the foundation for understanding the concept of health, a healthy lifestyle and prevention of dysfunction in the process of life.

The final goals are set on the basis of the EPP for the training of a pediatrician by specialty in accordance with the block of its content module (natural science training) and are the

basis for building the content of the academic discipline. The description of the goals is formulated through skills in the form of target tasks (actions). Based on the final goals, specific goals are formulated for each module or content module in the form of certain skills (actions), target tasks that ensure the achievement of the final goal of studying the discipline.

Main goals of discipline

- To draw conclusions about the state of the physiological functions of the body, its systems and organs
- Analyze age-related features of body functions and their regulation
- Analyze regulated parameters and draw conclusions about the mechanisms of nervous and humoral regulation of physiological functions of the body and its systems
- Analyze human health under different conditions based on physiological criteria
- Interpret the mechanisms and patterns of functioning of the body's excitable structures
- Analyze the state of sensory processes in ensuring human life
- Explain the physiological foundations of methods for studying body functions
- Explain the mechanisms of integrative activity of the organism.

The main objectives of studying the discipline “Physiology” as a science are a systematic approach to studying the essence of physiological processes, functions of individual organs, systems and the whole organism. Studying the nervous and endocrine regulation of the activity of the organism, its organs and systems. Revealing the physiological mechanisms of interaction of organs and their systems. Studying the mechanisms of pharmacological correction of physiological processes of the organism. Forming in students practical skills of determining and assessing the functional features of the organism and the features of childhood and old age. Expanding the understanding of the role of studying human physiology for other medical disciplines.

Competencies and learning outcomes, the formation of which is facilitated by the discipline (relationship with the normative content of training for higher education applicants, formulated in terms of learning outcomes in the Standard).

According to the requirements of the standard, the discipline ensures that students acquire the following competencies :

integral: the ability to solve complex specialized tasks and practical problems in professional activity or in the learning process, which involves the application of certain theories and methods of the relevant science and is characterized by the complexity and uncertainty of conditions;

general:

Ability to apply knowledge in practical situations. Ability to think abstractly, analyze and synthesize; ability to learn and be up-to-date. Knowledge and understanding of the subject area and understanding of the profession. Ability to communicate in the native language both orally and in writing, ability to communicate in a second language. Skills in using information and communication technologies. Ability to evaluate and ensure the quality of work performed. Ability to conduct research at the appropriate level.

special (professional, subject-specific):

To establish the causes and consequences of various disorders in order to successfully treat the patient, the characteristics of childhood. Prevention of diseases and their spread.

2.2. Competencies and program learning outcomes

The program competencies according to the educational and professional program of the specialty I2 "Medicine", the formation of which is ensured when teaching the discipline "Physiology", include (OK 12: GC 1-15; PC 21,23-25; PRN 1-6,8,9,13):

Integral:

Ability to solve complex problems, including those of a research and innovation nature in the field of medicine. Ability to continue learning with a high degree of autonomy.

General competencies (GC):

GC 1. GC1. Ability for abstract thinking, analysis and synthesis.

GC 2. Ability to learn and master modern knowledge.

GC 3. Ability to apply knowledge in practical situations.

GC 4. Knowledge and understanding of the subject area and understanding of professional activity.

GC 5. Ability to adapt and act in a new situation.

GC 6. Ability to make informed decisions.

GC 7. Ability to work in a team.

GC 8. Ability for interpersonal interaction.

GC 9. Ability to communicate in a foreign language.

GC 10. Ability to use information and communication technologies.

GC 11. Ability to search, process and analyze information from various sources.

GC 12. Determination and persistence in achieving goals

GC 13. Awareness of equal opportunities and gender issues.

GC 14. The ability to exercise one's rights and obligations as a member of society, to realize the values of a civil (free democratic) society and the need for its sustainable development, the rule of law, and the rights and freedoms of man and citizen in Ukraine.

GC 15. The ability to preserve and multiply moral, cultural, scientific values and achievements of society based on understanding the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, technology and engineering, to use various types and forms of physical activity for active recreation and leading a healthy lifestyle.

Special (professional, subject) competencies (PC):

PC 21. Clearly and unambiguously communicate one's own knowledge, conclusions, and arguments on health care problems and related issues to specialists and non-specialists, including students .

PC 23. Ability to develop and implement scientific and applied projects in the field of healthcare.

PC 24. Compliance with ethical principles when working with patients and laboratory animals.

PC 25. Adherence to professional and academic integrity, responsibility for the reliability of the obtained scientific results.

Program Learning Outcomes (PLO):

PLO 1. Have a thorough knowledge of the structure of professional activity. Be able to to carry out professional activities that require updating and integration knowledge. Be responsible for professional development, ability to further professional training with a high level of autonomy.

PLO 2. Understanding and knowledge of basic and clinical biomedical sciences, including level sufficient to solve professional tasks in the field of security health.

PLO 3. Specialized conceptual knowledge that includes scientific achievements in the field of health care and is the basis for conducting research, critical understanding of problems in the field of medicine and related interdisciplinary problems, including the system of early intervention.

PLO 4. Highlight and identify the leading clinical symptoms and syndromes (list 1); According to standard methods, using preliminary data from the patient's history, patient examination data, knowledge about the person, his organs and systems, establish a preliminary clinical diagnosis of the disease (according to list 2).

PLO 5. Collect complaints, life and disease history, assess the patient's psychomotor and physical development, the condition of organs and body systems, and based on the results of laboratory and instrumental studies, evaluate information regarding the diagnosis (according to list 4), taking into account the patient's age.

PLO 6. Establish a final clinical diagnosis by making a reasoned decision and analyzing the obtained subjective and objective data of clinical, additional examination, conducting differential diagnostics, adhering to relevant ethical and legal norms, under the supervision of the head physician in a healthcare facility (according to list 2).

PLO 8. Determine the main clinical syndrome or what determines the severity of the victim's condition (according to list 3) by making a reasoned decision and assessing the person's condition under any circumstances (in a healthcare facility, outside it), including in emergency situations and combat operations, in field conditions, in conditions of lack of information and limited time.

PLO 9. Determine the nature and principles of treatment of patients (conservative, surgical) with diseases (according to list 2), taking into account the patient's age, in the conditions of a healthcare institution, outside it and at the stages of medical evacuation, including in field conditions, based on a preliminary clinical diagnosis, adhering to relevant ethical and legal norms, by making a reasoned decision according to existing algorithms and standard schemes, if necessary, expand the standard scheme, be able to substantiate personalized recommendations under the supervision of the head physician in the conditions of a medical institution.

PLO 13 Assess and monitor child development, provide recommendations

on feeding and nutritional characteristics depending on age, organize preventive vaccinations according to the calendar.

2.3. Competency matrix :

	GC	PC		PLO	PLO	PLO
OK11	1-15	21	23-25	1-6	8.9	13

Expected learning outcomes

- Do conclusion about state physiological functions organism, its systems and organs
- Analyze age-related features functions organism and their regulation
- Analyze regulated parameters and draw conclusions about the mechanisms of nervous and humoral regulation of physiological functions of the body and its systems
- Analyze state health human by different conditions on basis physiological criteria
- Interpret mechanisms and patterns functioning excitable structures organism
- Analyze state sensory processes in provision vital activity human
- Explain physiological foundations methods research functions organism
- Explain mechanisms integrative activities organism.

2.4. Criteria evaluation results teaching.

Criteria for evaluating learning outcomes:

Assessment of students' academic performance is regulated by the Regulations on the "Procedure for assessing students' knowledge during current and final discipline control at the O.O. Bogomolets National Medical University" (minutes of the meeting of the Academic Council of the O.O. Bogomolets National Medical University No. 4 dated 11/28/2023).

Current control involves 100% surveying of students in the group with mandatory assessment of all components of the lesson: student's independent work, test control, oral survey, written assignment and solving a situational problem. At each practical lesson, the teacher assesses the student's knowledge in points in accordance with the "Regulations for conducting practical lessons and assessing current control" and converts the points into a grade on a four-point national scale ("5", "4", "3", "2").

Practical classes in physiology are structured and involve a comprehensive assessment of all types of learning activities (learning tasks) that students perform during the practical class:

1) At the initial stage of practical training, test control is carried out: the tests contain at least 10 multiple-choice test tasks with one correct answer. Its results are evaluated positively, if getter gave not Less 60% correct answers; the applicant is not receives points if number correct answers Less 60%. IN general assessment current educational activities this

stage is 20%.

2) On basically stage practical occupation are evaluated **:**

- performing practical work (research), writing a research protocol in accordance with the requirements, skills analyze and interpret results research and do it right justified conclusions;
- solution situational tasks, painting graphs, schemes, contours regulation.

IN general assessment current educational activities this stage constitutes 50%. **,** if getter correctly performed practical work (research), wrote a research protocol in accordance with the requirements, was able to analyze and interpret the research results, draw well-founded conclusions, and also correctly solved all the proposed situational tasks and other tasks.

The applicant scores 40% of the points if he/she correctly completed the practical work (research), wrote a research protocol in accordance with the requirements, was able to analyze and interpret the research results, draw reasonable conclusions, and solved at least half of the proposed problems.

The applicant scores 30% of the points if he/she correctly completed the practical work (research), wrote the research protocol in accordance with the requirements, was able to analyze and interpret the research results, draw reasonable conclusions, and did not solve any of the proposed tasks.

The applicant does not earn points at the main stage of educational activity if he/she fails to correctly complete practical work (research), write a research protocol in accordance with the requirements, analyze and interpret the research results, and draw substantiated conclusions.

3) At the final stage of the practical session, the control of theoretical and practical training is carried out using test tasks (at least 10) or solving complex situational tasks, creating regulation contours and other tasks that allow assessing the degree of achievement of the educational goal. It is assessed positively provided that the applicant has correctly solved at least 60% of the test tasks or solved all situational tasks and other tasks. Provided that the applicant has correctly solved less than 60% of the test tasks or has not solved the proposed situational tasks, the applicant does not receive any points. In the overall assessment of the current educational activity, this stage is 30%.

At the final stage of the lesson, the teacher gives a traditional grade on a 4-point (traditional) scale ("5", "4", "3", "2") according to the criteria for evaluating the applicant's current activity in the progress log. and notebooks student for practical classes, where must to be fulfilled all task and records research protocols, signs and dates.

For current studies, the applicant can receive a maximum of 80 points. The student is admitted to the exam with the number of points that he received during the study of the discipline under current control and attended at least 75% of the classroom hours in the discipline.

3. Academic discipline program

List of content modules and topics

	Number hours, with them	Year	Type of

	Total	Auditorium				teaching	control
Structure academic discipline		Lectures	Seminary classes	Practical classes	Wednesday S		
	270	40		120	110	2nd	
Credits ECTS	9.0						
Module 1: *Content-based modules 8*	137 hour / 4.6 loans ECTS	22		60	55		Results and control (exam)
Module 2: *Content-based modules 8*	133 hour / 4.4 ɔans ECTS	18		60	55		
Weekly load	*7.9 hour / 0.26 loans ECTS*						

Note : 1 credit ECTS – 30 hours

The ratio of the number of hours of classroom lessons to independent and individual work for daytime The form of study is: classroom load – 59%, CRT – 41%

4. Structure of the academic discipline

Names meaningful modules and topics	Number hours day uniform					
	Total about	in ago number				
		l	n	seven	ind	s.r.
1	2	3	4	5	6	7
Module 1.“General physiology and higher integrative functions”						
Content-based module 1.Introduction in physiology						
Topic 1. Subject and tasks physiology. Methods physiological research	3		1		-	2
Topic 2. The main stages of the development of physiology. History of the development of physiology in XIX century. Contribution works I.M. Sechenov , I.P. Pavlov , P.K. Anokhin , P.G. Kostyuk in the development of world physiology. Ukrainian physiological school	2		-		-	2
Content module 2. Physiology of excitable structures						
Topic 3. Functions cellular membranes. Mechanisms transportation of substances through membrane	5	1	2		-	2
Topic 4. Membrane potentials. Potential peace and potential actions	7	1	3		-	3

Topic 5. Carrying out excitation nervous fibers and through neuromuscular synapse	7	1	3		-	3
Topic 6. Properties skeletal muscles and mechanisms their abbreviation	7	1	3		-	3
Topic 7. Properties smooth muscles, mechanisms their abbreviation and relaxation – **individual independent work students**	2		-			2
Content module 3. Biological regulation of body functions						
Topic 8. General characteristics of biological regulation. Study of the reflex arc	7	2	3		-	2
Topic 9. Process research excitation and braking in central nervous system. Integrative functions of the CNS. Principles of coordination of reflex activity	7	2	3		-	2
Content module 4. Neural regulation of motor functions						
Topic 10. Research into the role of the spinal cord in the regulation of the body's motor functions	7	1	3		-	3
Topic 11. Research into the role of the brainstem in the regulation of motor functions of the body	7	1	3			3
Topic 12. Research into the role of the cerebellum and forebrain in the regulation of the body's motor functions.	8	2	3		-	3
Topic 13. Practical skills in the physiology of excitable structures and nervous regulation of motor functions.	5		2		-	3
Content module 5. Nervous regulation of visceral functions						
Topic 14. Research into the mechanisms of nervous regulation of visceral functions of the body	7	1	3		-	3
Content module 6. Humoral regulation of visceral functions						
Topic 15. Research into the mechanisms of humoral regulation of visceral functions of the body	5	1	3		-	1
Topic 16. Research into the role of hormones in the regulation of physical, mental, and sexual development	7	1	3			3
Topic 17. Research into the role of hormones in the regulation of homeostasis and the body's adaptation to the effects of stress factors	7	1	3		-	3
Topic 18. Practical skills in the physiology of nervous and humoral regulation of visceral functions	5		2			3
Content module 7. Physiology of sensory systems						

Topic 19. Research on the somatosensory system. Physiology of the nociceptive and antinociceptive systems	7	2	3		-	2
Topic 20. Research on the visual sensory system	5	1	3		-	1
Topic 21. Research on the auditory sensory system	5	1	3		-	1
Content module 8. Higher integrative functions						
Topic 22. The role of the forebrain, diencephalon and its non-specific structures in the functional support of mental processes and states. *EEG*	5	1	3		-	1
Topic 23. Neurophysiological foundations and types of innate and acquired behavior. Research into the role of biological needs and motivation in behavioral reactions.	5	1	3		-	1
Topic 24. Practical skills in the physiology of sensory systems and higher integrative	5		2			3
Total hours	**137**	**22**	**60**			**55**
Module 2. "Physiology of visceral systems"						
Content module 9. Blood system						
Topic 1. General characteristic system blood. Functions blood, physicochemical properties blood	5.5	0.5	3			2
Topic 2. Physiology erythrocytes Topic 3. Types and physiological mechanisms of hemostasis. Physiology platelets	6.5	0.5	3		-	3
Topic 4. Protective functions blood. Physiology leukocytes. Immunity. Groups blood	6	1	3		-	2
Topic 5. Practical skills in the physiology of blood systems	5		2		-	3
Content module 10. Circulatory system						
Topic 6. General characteristic systems blood circulation. Physiological properties cardiac muscle	6	1	3		-	2
Topic 7. Dynamics excitation hearts. Physiological foundations electrocardiography	6	1	3		-	2
Topic 8. Pumping function hearts, its role in hemodynamics, physiological foundations of research methods	4.5	1	1.5		-	2
Topic 9. Regulation activities hearts	4.5	1	1.5		-	2
Topic 10. Systemic blood circulation. Laws hemodynamics, role vessels in blood circulation	6	1	3		-	2
Topic 11. Regulation blood circulation	6	1	3		-	2

Topic 12. Features regional blood circulation and its regulation	2		-		-	2
Topic 13. Dynamics lymphatic circulation	2		-		-	2
Topic 14. Practical skills in the physiology of circulatory systems	5		2		-	3
Content module 11. Respiratory system						
Topic 15. General characteristic systems breath. External breath	5.5	0.5	3	-	-	2
Topic 16. Gas exchange in lungs Topic 17. Transportation gases with blood	7	1	3	-	-	3
Topic 18. Regulation breath	6.5	0.5	3	-	-	3
Content module 12. Digestive system						
Topic 20. General characteristics and functions of the digestive system. Digestion in oral cavity. Role taste and olfactory sensory systems	6.5	0.5	3	-	-	3
Topic 21. Digestion in stomach	5.5	0.5	3	-	-	2
Topic 22. Digestion in 12-finger intestine. Role pancreatic juice and bile in processes digestion	4.5	0.5	2	-	-	2
Topic 23. Digestion in intestines. Physiological foundations hunger and saturation	3.5	0.5	1	-	-	2
Content module 13. Energy exchange. ***Content module 14. Thermoregulation***						
Topic 24. Energetic exchange and methods its research Topic 25. Temperature bodies and regulation its sustainability	7	2	3	-	-	2
Content module 15. Allocation system						
Topic 27. System allocation. Role kidneys in processes allocation, mechanisms urine formation	6	1	3	-	-	1
Topic 28. Role kidneys in supported homeostasis	6	1	3	-	-	1
Develop a diagram of the circuit of biological regulation of homeostasis parameters by participation kidneys – **individual independent work students**			-	-		2
Topic 29. Practical skills in the physiology of respiration, digestion, energy metabolism, thermoregulation and excretion	4		2		-	2
Content module 16. Physiology of work and sports.						
Topic 30. Physiology of work and sports. Physical and mental efficiency, their indicators and periods. Theories development fatigue. Interconnection physical and mental labor.	6	2	3	-	-	1

Training						
Total hours	**133**	**18**	**60**			**55**
TOGETHER	**270**	**40**	**120**	**-**		**110**

5.1.Lecture topics

No.	**Name topics**	**Number of hours**
3rd semester		
1.	Methods of physiological research. Functions of the cell membrane. Biopotentials .	2
2.	Conduction of excitation by nerve and muscle fibers and through the neuromuscular synapse. Muscle physiology	2
3.	General principles of biological regulation. Nervous regulation of functions. Reflex principle of CNS activity	2
4.	Excitation and inhibition in the central nervous system. Integrative functions of the CNS. Principles of coordination of reflex activity	2
5.	The role of different levels of the CNS in the regulation of motor functions: the role of the spinal cord and brainstem	2
6.	The role of the cerebellum and forebrain in the regulation of motor functions.	2
7.	Nervous and humoral regulation of visceral functions	2
8.	The role of hormones in the regulation of physical, mental, and sexual development and homeostasis. Nonspecific adaptation of the body to the effects of stress factors.	2
9.	Sensory systems (analyzers). Somatosensory system. Physiology of nociceptive and antinociceptive systems	2
10.	Visual sensory system. Auditory sensory system	2
11.	Physiological foundations of innate and acquired forms of behavior. Features of human GNI. Sleep	2
Total		**22**
	4th semester	
1.	Physiology of the blood system	2
2.	Circulatory system. Physiological properties of the heart muscle. Dynamics of cardiac excitation. Physiological foundations of electrocardiography	2
3.	Pumping function of the heart. Regulation of heart activity	2
4.	Physiological foundations of hemodynamics. The role of vessels in blood circulation. Regulation of blood circulation.	2
5.	Physiology of the respiratory system	2
6.	Physiology of the digestive system. Physiological foundations of hunger and	2

	satiety.	
7.	Physiology of metabolism and energy. Thermoregulation.	2
8.	Physiology of the excretory system. The role of the kidneys in maintaining homeostasis	2
9.	Mechanisms of adaptive changes in visceral systems caused by physical and mental stress. Mechanisms of fatigue development and recovery	2
Total		**18**
Total per discipline		**40**

5.2. Topics of seminar classes.

None.

5.3. Topics of practical classes.

No.	Topic name	Hours
GENERAL PHYSIOLOGY AND HIGHER INTEGRATIVE FUNCTIONS		
1	Subject and tasks of physiology. Methods of physiological research. Functions of the cell membrane. Mechanisms of transport of substances through the membrane	3
2	Recording of resting potential and action potential of nerve and muscle fibers	3
3	Study of conduction of excitation through nerve fibers and through the neuromuscular synapse. Study of the action potential of intact nerves and muscles	3
4	Research into the mechanisms of skeletal muscle contraction	3
5	General characteristics of biological regulation. Study of the reflex arc	3
6	Research into the processes of excitation and inhibition in the central nervous system	3
7	Research into the role of the spinal cord in the regulation of the body's motor functions	3
8	Research into the role of the brainstem in the regulation of motor functions of the body	3
9	Research into the role of the cerebellum and forebrain in the regulation of motor functions of the body	3
10	Practical skills in the physiology of excitable structures and nervous regulation of motor functions	2
11	Research into the mechanisms of nervous regulation of visceral functions of the body	3
12	Research into the mechanisms of humoral regulation of visceral functions of the body	3
13	Research into the role of hormones in the regulation of physical, mental, and sexual development	3
14	Research into the role of hormones in the regulation of homeostasis and the body's adaptation to the effects of stress factors	3

15	Practical skills in the physiology of nervous and humoral regulation of visceral functions	2
16	Research on the somatosensory system	3
17	Research on the visual sensory system	3
18	Research on the auditory sensory system	3
19	The role of the forebrain, diencephalon and its non-specific structures in the functional support of mental processes and states. *EEG*	3
20	Neurophysiological foundations and types of innate and acquired behavior. Research into the role of biological needs and motivation in behavioral reactions.	3
21	Practical skills in the physiology of sensory systems and higher integrative functions	2
	Total	**60**
	4th semester PHYSIOLOGY OF VISCERAL SYSTEMS	
1	Blood system. Study of the physicochemical properties of blood	3
2	Study of the number of erythrocytes and hemoglobin in the blood. Study of blood clotting.	3
3	Protective functions of blood. Blood group testing	3
4	Practical skills in the physiology of blood systems	2
5	Circulatory system. Study of the physiological properties of the heart muscle	3
6	Study of the dynamics of cardiac excitation. Registration and analysis of the electrocardiogram	3
7	Research into the pumping function of the heart and the regulation of cardiac activity	3
8	The role of blood vessels in blood circulation. Research on blood pressure in humans	3
9	Research on blood circulation regulation	3
10	Practical skills in the physiology of circulatory systems	2
11	Respiratory system. Study of external respiration	3
12	Study of diffusion, transport of gases through blood	3
13	Research on respiratory regulation	3
1 4	Digestive system. Study of digestion in the oral cavity. Role of the gustatory and olfactory sensory systems	3
15	Study of digestion in the stomach	3
16	Study of digestion in the intestines	3
17	Research on energy metabolism and thermoregulation	3
18	Research into the mechanisms of urine formation	3
19	Research into the role of the kidneys in maintaining homeostasis	3

20	Practical skills in the physiology of respiration, digestion, energy metabolism, thermoregulation and excretion	2
21	Research into fatigue and recovery during muscular work and the body's adaptation to physical exertion	3
	Total	**60**
	Total from the discipline	**120**

5.4. Independent work

Preparation for practical classes	**Number of hours**	**Type of control**
1. Independent study of theoretical questions before practical classes. 2. Complete tasks in a workbook for independent study of the topic. 3. Preparation for test control. 4. Properties smooth muscles, mechanisms their abbreviation and relaxation – **individual independent work students** 5. Develop a diagram of the circuit of biological regulation of homeostasis parameters by participation kidneys – **individual independent work** students.	110	According to the practical training evaluation criteria

6. Individual independent work -

Individual independent work is performed by students at their request to receive additional points and is evaluated in process current control on relevant (to topics work) practical classes and under final exam time control (exam). Maximum number points, What is assigned students as "counted" by individual work - 10 points.

It was agreed to set the following indicative values:

Participation in the Physiology Olympiad - 3 points.

Participation in the conference - 5 points. Prize-winning place at the conference/competition - 10 points. Participation in the work of a student scientific circle - 0.5 points for 1 meeting.

Report in the circle - 3 points.

Participation in the scientific work of the department - 5–10 points depending on the contribution. Article of category A, B co-authored with a teacher of the department. First place in the Physiology Olympiad - 120 points for the exam, 2nd and 3rd place 60 points for the written part of the exam.

These types activities are additional tasks that allow student to deepen your knowledge of the discipline and obtain additional points - in particular for participation in conferences , publication of abstracts in accordance with the department's research topic ,

prizes places in discipline olympiads among students your higher education institution and others institutions higher education Ukraine .

7. Methods teaching

. Methods organizations and implementation educational and cognitive activities in studied disciplines:

- verbal : lectures from application presentations . At lectures reveal problematic question relevant sections physiology with features children's age , clinical cases . Explanation contours regulations physiological functions .

- visual : observation , illustrations , demonstrations .

- practical occupation provide for :

1) research students physiological functions in experiment on animals, isolated organs, cells , models or based on virtual research presented in computer programs and others educational technologies ;

2) research functions practically healthy human ;

3) solution situational tasks (assessment indicators functions , homeostasis parameters , mechanisms regulations , etc.) , which have practical significance in the future professional activities future doctor .

II. Methods differ in the logic of transmitting and perceiving educational information: inductive, deductive, analytical, synthetic.

III. Methods different equal independence thinking: reproductive, search, Research. Independent work of students: with a book; implementation of individual educational projects .

8. **Methods and forms of control, distribution of points received by applicants**

Current control:

- independent work of the student in a workbook, which is carried out outside of class time; Independent work is a mandatory task that the student must complete for each practical session (synopsis according to theoretical questions, completion of tasks in a workbook, preparation of a protocol for practical work, study of additional literature in Ukrainian and English according to the methodological recommendations of the department).
- test control (performance of standardized test tasks of format "A" from collections of tasks for passing the test exam "Step 1");
- oral examination of theoretical material, based on the student's processing of theoretical questions from the methodological recommendations of the department;
- performing practical work with the mandatory formulation of conclusions regarding the obtained research results;
- solving a situational problem close to clinical cases in medicine. Distribution of points received by students during the current control:

Part 1.	[illegible]	Conversion in points traditional	[illegible]	[illegible]

“ *General physiology and higher integrative functions* ”. *Number educational hours /* ECTS credits: 137/4.6. Number meaningful modules: No. 1- 8 **Part 2. “ *Physiology visceral systems* ”.** *Number educational hours /* ECTS credits: 133/4.4. Number meaningful modules: No. 9- 16		grades						
		Traditional assessments				Points for the performance of individual tasks as type of VRS		
		“5”	**“4”**	**“3”**	**“2”**			
By current educational activities	42	1.63	1.33	1.0	0	10		80
By results drafting exam								120
By assimilation disciplines								200

8.1. Final control:

The exam is a form of final control to identify the theoretical knowledge and practical skills developed by higher education students over the entire period of studying the discipline " **Physiology** ". A higher education student is admitted to the exam with the number of points he received over the entire period of studying the academic discipline and who attended at least 75% of the classroom hours.

8.2. Exam components

1. Conducting computer-based test control (completion of 60 test tasks of a selective type (clinically oriented) of format A with one correct answer).
2. The applicant receives a ticket that contains questions in the form of situational tasks and other integrated tasks.

On received form student should write yours name, initials, number groups, faculty, number ticket, then to record solution situational tasks, painting graphs, schemes, contours regulation, other integrated tasks.

The teacher checks the completion of educational tasks and practical skills during the control session as the student completes them.

Task have be standardized and directed on CONTROL achievement student the ultimate goals of the discipline.

8.3. Evaluation criteria for final control

The comprehensive number of points that a student receives based on the results of the final control (exam) has the following components:

1. By results computer test control student receives:

60 points - if he gave at least 90% correct answers,
50 points – if he gave at least 85% correct answers,
40 points – if he gave at least 80% correct answers,
30 points – if he gave correct respond not Less, than on 75%,
20 points – if he gave correct respond not Less, than on 70%,
10 points – if he gave correct respond not Less, than on 64%,
0 points - if he gave less than 64% of the correct answer.

2. *From* a implementation planned practical works (research) in accordance to requirements, solving situational problems tasks, painting graphs, schemes, contours regulations, others integrated tasks, ability to analyze and interpret results research, proposed situations and right To make reasonable conclusions, the student receives:
60 points – if he correctly completed all the planned practical work and was able to analyze and interpret results research and make reasoned conclusions, and also gave correct answers to at least 90% of situational tasks and other integrated tasks;
50 points – if student right performed all planned practical work, managed analyze and interpret research results and draw reasoned conclusions, as well as give correct answers not Less, than on 80% situational tasks and others integrated tasks;
40 points – if student right performed all planned practical work, managed analyze and interpret research results and draw reasoned conclusions, as well as give correct answers not Less, than on 70% situational tasks and others integrated tasks;
30 points – if student right performed all planned practical work, managed analyze and interpret research results and draw reasoned conclusions, as well as give correct answers not Less, than on 60% situational tasks and others integrated tasks;
20 points – if student right performed all planned practical work, managed analyze and interpret research results and draw reasoned conclusions, as well as give correct answers not Less, than on 50% situational tasks and others integrated tasks;
0 points – if student not performed all planned practical work, and not managed analyze and interpret research results and draw reasoned conclusions.
Teacher, which by by order manager departments carries out carrying out final control (exam), has to evaluate and to determine:

- How many points typed student at solution situational tasks and others integrated tasks;
- how many points the student scored based on the results of the computer-based test control (computer data);
- total number points by results final control (exam).

The teacher must inform the students about this at the end of the test (exam), record the number of points in the examination report and in the progress log. Put his signature and the date of the final test (exam).

8.4. Discipline Assessment

When assigning a grade for a discipline, the number of points accumulated by the higher education applicant for current studies (maximum 80) and the result of the exam (maximum 120) are taken into account.

Rating in balls	Rating by national scale	Rating by scale ECTS	
		Rating	Explanation
170 – 200	perfectly	A	Perfectly (excellent implementation only with a small number of errors)
155 – 169	good	B	Very good (above average equal with several errors)
140 – 154		C	Good (in whole correct execution with certain quantity essential errors)
125 – 139	satisfactorily	D	Satisfactorily (not bad, but with a significant amount disadvantages)
111 – 124		E	Enough (implementation satisfies the minimum criteria)
60 – 110	unsatisfactorily	FX	Unsatisfactorily (with the possibility of re-drafting)
0 – 59		F	Unsatisfactorily (with mandatory repeat studying disciplines)

At receiving unsatisfactory assessments from disciplines in within 0-110 points (F, FX) student has the right to retake it 2 times: once to the departmental commission with the participation of the head of the department, and the last time - to the commission with the participation of the head of the department and the dean.

The objectivity of the assessment of students' academic performance is verified by statistical methods (correlation coefficient between ECTS and assessment on the national scale).

Course Policy:

9. Course Academic Integrity Policy

1. General principles

The course "Fundamentals of Human Physiology" is based on the principles of academic integrity, which is an integral condition of quality medical education. All participants in the educational process are obliged to adhere to honesty, responsibility, respect for intellectual work and ethical norms defined by the legislation of Ukraine and internal documents of the university.

2. Expected academic behavior of students

The course student must:

- to carry out all types of educational activities independently, without using prohibited sources or third-party assistance;
- correctly cite the sources of information used;
- demonstrate honesty during testing, module control, practical and laboratory work;
- adhere to ethical norms in interaction with teachers and classmates;
- report cases of integrity violations to the teacher if they become apparent.

3. The following are considered violations of academic integrity:

- Plagiarism is the appropriation of someone else's ideas, texts, diagrams, and images without proper citation.
- Cheating during tests, modules, practical work, including using gadgets without permission.
- Falsification or fabrication of laboratory or physiological experiment results.
- Self-plagiarism is the reuse of one's own work without the teacher's consent.
- Impersonation or performing tasks for another person.
- Unlawful collaboration — receiving or providing unauthorized assistance during the activities being evaluated.
- Manipulating assessments or attempting to influence test results through non-academic means.

4. Features of integrity in physiological disciplines

Within the course, the following are particularly important:

- reliability and accuracy of maintaining physiological protocols;
- correct design of graphs, tables, diagrams displaying the results;
- the inadmissibility of data falsification, as this contradicts the principles of evidence-based medicine;
- ethical attitude towards biological models and compliance with safety rules.

5. Consequences of Violating Academic Integrity

If a violation is established, the following measures shall be applied:

- cancellation of work or assessment with 0 points;
- mandatory re-performance of the task (by decision of the department);
- recording the violation in the internal documentation of the department;
- in case of systematic violations, the issue will be referred to the university's academic integrity committee.

6. Maintaining academic integrity

The Department of Physiology provides:

- transparent evaluation criteria;
- the opportunity to receive advice on correct citation and formatting of works;
- creating a learning environment that encourages honesty, responsibility, and respect for scholarly work.

Methodical software

Methodical, didactic literature to ensure the academic discipline is indicated in the curricula of physiology and neurophysiology depending on the provision of literature to the departments (educational content (synopsis or extended lecture plan), plans for practical classes, tasks for independent work, questions, tasks or cases for current and

final control of students' knowledge and skills, comprehensive control work, post-certification monitoring of acquired knowledge and skills in the academic discipline).

- Basic and supplementary literature.
- Test tasks of format A (educational and methodological manual).
- List of questions for preparation and completion of the PMK (basic, intermediate, and final levels).
- Block of questions for written answers within the PMK.
- Multimedia support for lecture and practical class materials.
- Blocks of situational tasks.
- Physiology, edited by Igor Karvatsky. Educational manual for practical classes and independent student work. In 2 volumes. Kyiv: *Kniga-plus*, 2025. Vol. 1 – 332 p., Vol. 2 – 516 p.
- Workshop on Physiology and Neurophysiology, edited by Igor Karvatsky. Educational guide for practical classes and independent work of students of the Medical and Psychological Faculty, specialty 225 *Medical Psychology*. In 2 volumes. Kyiv: *Kniga-plus*, 2021. Vol. 1 – 144 p., Vol. 2 – 242 p.
- Child Developmental Physiology. Educational manual, edited by Igor Karvatsky. Kyiv: *Phoenix*, 2017. 160 p.
- Methodical recommendations for lectures in the discipline “Physiology and Neurophysiology” for students of the Medical and Psychological Faculty, Department of Physiology, Bogomolets NMU, 2025.
- Methodical recommendations for practical classes in the discipline “Physiology and Neurophysiology” for students of the Medical and Psychological Faculty, Department of Physiology, Bogomolets NMU, 2025.
- Set of scientific, educational, and instructional video materials.
- Set of computer-based educational programs.
- TestShell 6 Office (Version 6.01) by I.M. Karvatsky and E.V. Gorshkov — a universal software package designed for creating various tests, conducting testing, and processing results.
- TestShell Personal Edition 6.01 by I.M. Karvatsky and E.V. Gorshkov — a universal testing system designed for individual preparation of students and interns for PMK, examinations, and the LII “Krok”.

List questions for preparation students to exam

Module 1. General physiology and higher integrative functions

List theoretical questions

Content module 1. Introduction in physiology and neurophysiology

1. Physiology and neurophysiology as science. Concept about functions . Methods physiological research .
2. Becoming and development physiology in XIX century .

3. Contribution works I.M. Sechenov' , I.P.Pavlov', P.K. Anokhin' , P.G. Kostyuk' in development world physiology .
4. Ukrainian physiological school.

Content-based module 2. Physiology excitable structures

1. Potential peace, mechanisms origin , its parameters , physiological role.
2. Potential actions , mechanisms origin , its parameters , physiological role.
3. Excitability . Critical level depolarization , threshold depolarization cellular membranes
4. Changes excitability cells at development single potential actions .
5. Value parameters electric incentives for emergence excitement .
6. Mechanisms carrying out excitation nervous fibers.
7. Patterns carrying out excitation nervous fibers.
8. Mechanisms transmission excitation through neuromuscular synapse.
9. Conjugation excitation and reduction . Mechanisms abbreviation and relaxation skeletal muscles .
10. Types muscular abbreviations : single and tetanic ; isotonic and isometric .
11. Properties smooth muscles , mechanisms their abbreviation and relaxation .
12. Age-related features physiology excitable fabrics.

Content-based module 3. Biological regulations functions organism

1. Biological regulation , its types and value for organism . Contours biological regulation . Role reverse communication in regulation .
2. Concept about reflex. Structure reflex arcs and functions its links.
3. Receptors , their classification , mechanisms excitement .
4. Proprioceptors , their types , functions . Structure and functions muscular spindle
5. Mechanisms and patterns transmission excitation in central synapses.
6. Types central braking . Mechanisms development presynaptic and postsynaptic braking
7. Summation excitation and braking neurons CNS.
8. Age-related features physiology CNS.

Content-based module 4. Physiology and neurophysiology sensor systems

1. Sensory systems , their structure and functions .
2. Flavorful sensory system, its structure , functions , methods research .
3. Smell sensory system, its structure and functions .
4. Somatosensory system, its structure and functions .
5. Physiological mechanisms pain.
6. Opiate and non-opiate antinociceptive systems organism , their value .
7. Physiological mechanisms anesthesia .
8. Auditory sensory system, its structure and functions .
9. Functions external and average ears . Internal ear , frequency analysis sound signals .
10. Visual sensory system, its structure and functions .
11. Basic visual functions and methods their research .
12. Age-related changes sensory systems.

Content-based module 5. Nervous regulation motor functions

1. Motor reflexes dorsal brain , their reflex arcs, physiological value .
2. Providnikova function dorsal brain . Dependence spinal reflexes from activities centers brain . Spinal shock .
3. Motor reflexes rear brain , decerebrate rigidity .
4. Motor reflexes average brain , their physiological value .
5. Cerebellum , its functions , symptoms damage .
6. Thalamus, its functions .
7. Limbic system, hypothalamus , their functions .
8. Basal kernels, their functions , symptoms damage .
9. Sensory , associative and motorized zones bark main brain , their functions .
10. Interactions different levels CNS in regulations motor functions . Locomotives , their regulation . Functional structure of arbitrary movements . Age changes motor functions .

Content-based module 6. Nervous regulation visceral functions

1. General plan structures autonomous nervous systems . Autonomous reflexes , their reflex arcs.
2. Synapses autonomous nervous systems , their mediators , cytoreceptors and blockers transmission excitation in synapses.
3. Influence nice nervous systems on visceral functions .
4. Influence parasympathetic nervous systems on visceral functions .
5. Role metasympathetic systems in regulations visceral functions .
6. Unity nice and parasympathetic systems in regulations functions .

Content-based module 7. Humorous regulation visceral functions

1. Humorous regulation , its differences from nervous . Characteristic factors humorous regulation .
2. Properties hormones , their main influences . Mechanism actions hormones on target cells .
3. Contour humorous regulation . Regulation secretions hormones endocrine glands .
4. Role hypothalamic-pituitary systems in regulations functions endocrine glands .
5. Role somatotropin , thyroxine and triiodothyronine , insulin in regulations linear growth bodies , processes physical , mental development organism .
6. Role calcitonin , parathyroid hormone, calcitriol in regulations sustainability concentrations ions calcium and phosphates in the blood .
7. Role hormones pancreatic glands in regulations functions organism .
8. Role hormones thyroid glands (T 3, T 4) in regulations functions organism .
9. Physiology female sexual systems , its functions , role sexual hormones .
10. Physiology male sexual systems , role sexual hormones .
11. Age-related features functions endocrine glands . Physiological aspects sexual development .

12. General idea about nonspecific adaptation organism to stressful situations . Role hormones in nonspecific adaptation .
13. Role sympatho- adrenal systems in regulations nonspecific adaptations organism to stressful situations .
14. Role pituitary-adrenal systems in regulations nonspecific adaptations organism to stressful situations . Main influences glucocorticoids and mineralocorticoids on the body .

List practical tasks

1. Carry out calculations parameters functions and graphically to display processes , What are happening in excitable structures.
2. Draw schemes and explain structure and mechanisms :
   - contours biological regulations , reflex arcs motor reflexes ;
   - development processes excitation and braking in CNS, processes their summations and coordination reflexes ;
   - reflex arcs motor reflexes for everyone levels CNS and leading ways , What provide interaction different CNS levels ;
   - reflex arcs autonomous reflexes , What provide regulation visceral functions ;
   - actions different hormones on target cells and regulations their secretions , contours regulations visceral functions with the participation of hormones .
3. Evaluate state sensory systems by indicators research their functions .
4. Draw schemes structures specific channels transmission information in sensory systems and explain mechanisms formation relevant feelings and images external reality .

Content-based module 18. Higher integrative functions

- Physiological and neurophysiological foundations behavior

1. Biological forms behavior . Need and motivation , their role in forming behavior .
2. Congenital forms behavior . Instincts , their physiological role.
3. Acquired forms behavior . Mechanisms formation conditional reflexes , their differences from unconditional .
4. Memory : types and mechanisms formation .
5. Emotions , mechanisms formation . Biological and informational theories emotions . Their role in forming behavior
6. Age-related features behavior children and persons elderly age .

- Neurophysiological foundations higher nervous activities human

1. Functions new bark main brain and higher nervous activity human .
2. Functional asymmetry bark large hemispheres main brain , its integrative function .
3. Language, its functions , physiological foundations formation .
4. Thinking . Development abstract thinking in human . Role cerebral structures in process thinking .
5. Types higher nervous activities human . Temperaments and nature.
6. Sleep, its types , phases , electric activity bark, physiological mechanisms .

7. Age-related aspects higher nervous activities in human .

Module 2. Physiology visceral systems

List theoretical questions

Content-based module 9. System blood

1. General characteristic systems blood . Composition and functions blood . Concept about homeostasis.
2. Electrolytes plasma blood . Osmotic pressure blood and its regulation .
3. Proteins plasma blood , their functional value . Speed sinking erythrocytes (SOE).
4. Oncotic pressure plasma blood and his role.
5. Acid- base state blood , role buffer systems blood in supported its sustainability .
6. Erythrocytes , their functions . Regulation erythropoiesis .
7. Types hemoglobin and its compounds , their physiological role.
8. Leukocytes , their functions . Regulation leukopoiesis . Physiological leukocytosis .
9. Platelets , their physiological role.
10. Vascular-platelet hemostasis, its mechanisms and physiological value .
11. Coagulation hemostasis, its mechanisms and physiological value .
12. Coagulants , anticoagulants , factors fibrinolysis , their physiological value .
13. Physiological characteristic systems AB0 blood . Conditions compatibility blood donor and recipient . Samples before transfusion blood .
14. Physiological characteristic Rhesus system blood (CDE). Value Rh- affiliation at transfusion blood and pregnancy .
15. Age-related features systems blood .

Content-based module10. System blood circulation

1. General characteristic systems blood circulation . Factors , which provide movement blood on vessels , its direction and continuity .
2. Automatism hearts . Gradient automatism. Experiment Stanius .
3. Potential actions atypical cardiomyocytes sinoatrial nodes , mechanisms origin , physiological role.
4. Leading system hearts . Sequence and speed carrying out excitation in heart .
5. Potential actions typical cardiomyocytes ventricles , mechanisms origin , physiological role. Time relationship between PD and single contraction myocardium .
6. Periods refractoriness under time development PD typical cardiomyocytes , their value .
7. Conjugation excitation and abbreviation in myocardium . Mechanisms abbreviation and relaxation myocardium .
8. Vector theory formation ECG. Electrocardiographic lead . Origin teeth , segments , ECG intervals .
9. Cardiac cycle, its phases , their physiological role.
10. Role valves hearts . Tones hearts , mechanisms their origin . FKG, its analysis .

11. Arterial pulse, its origin . SFG, its analysis .
12. Myogenic mechanisms regulations activities hearts .
13. Nature and mechanisms influences nice nerves on activity hearts . Role nice reflexes in regulation cardiac activities .
14. Nature and mechanisms influences parasympathetic nerves on activity hearts . Role parasympathetic reflexes in regulation cardiac activities .
15. Humorous regulation activities hearts . Dependence activities hearts from changes ionic warehouse blood .
16. Features structures and functions different departments blood vessels vessels . Basic law hemodynamics .
17. Value viscosity blood for blood circulation .
18. Linear and volumetric speed movement blood in different areas vascular channels. Factors , What affect on their size.
19. Bloody pressure and its changes in different departments vascular channels.
20. Arterial pressure , factors , What determine its size. Methods registration arterial pressure .
21. Blood circulation in capillaries . Mechanisms exchange liquids between with blood and fabrics.
22. Blood circulation in veins, influence on him gravity . Factors , What determine size venous pressure .
23. Tone arteriole and venul, its value . Influence vascular and musculoskeletal nerves on tone vessels .
24. Myogenic and humorous regulation tone vessels . Role substances , which highlights endothelium vessels , in regulations vascular tone.
25. Hemodynamic center. Reflex regulation tone vessels . Pressors and depressant reflexes .
26. Reflex regulation blood circulation at change position bodies in spacious (orthostatic sample).
27. Regulation blood circulation at muscular work .
28. Features blood circulation in vessels main brain and its regulation .
29. Features blood circulation in vessels hearts and its regulation .
30. Features pulmonary blood circulation and its regulation .
31. Mechanisms formation lymph . Movement lymph in vessels .
32. Age-related features cardiovascular systems .

Content-based module 11. System breath

1. General characteristic systems breathing . Basic stages breathing . Biomechanics inhale and exhalation .
2. Elastic traction lungs , negative pressure in pleural slits .
3. External breathing . Indicators external breath and their assessment .
4. Anatomical and physiological “ dead space ”, its physiological role.
5. Diffusion gases in lungs . Diffusion ability lung and factors , from whose it depends .

6. Transport oxygen with blood . Oxygen capacity blood .
7. Curve dissociation oxyhemoglobin , factors , What affect on its move .
8. Transport carbon dioxide gas with blood . Role erythrocytes in transport carbon dioxide gas.
9. Physiological role respiratory ways , regulation their enlightenment .
10. Respiratory center, its structure , regulation rhythmicity breathing .
11. Mechanism the first inhale newborn child .
12. Role receptors stretching lung and afferent fibers wandering nerves in regulations breathing .
13. Role central and peripheral chemoreceptors in regulations breathing . Components blood , What stimulate external breathing .
14. Regulation external breath at physical load .
15. Age-related features breathing .

Content-based module 12. System digestion

1. General characteristic systems digestion . Digestion in oral cavity . Chewing , swallowing .
2. Composition saliva , its role in etching .
3. Mechanisms formation saliva , primary and secondary saliva .
4. Regulation salivation . Influence properties irritant on number and quality saliva .
5. Methods research secretory functions stomach in human . Composition and properties gastric juice. Mechanisms secretions hydrochloric acids .
6. Complex-reflex (“ cephalic ”) phase regulations gastric secretions .
7. Neurohumoral (" stomach and intestinal) phase regulations gastric secretions . Enteral stimulants and inhibitors gastric secretions .
8. Nervous and humorous mechanisms braking gastric secretions .
9. Rukhova function stomach and its regulation . Mechanisms transition gastric content in twelve-digit intestine.
10. Methods research secretions pancreatic juice in human . Composition and properties pancreatic juice.
11. Phases regulations secretory functions pancreatic glands .
12. Methods research bile secretion in human . Composition and properties bile .
13. Regulation formation and allocation bile . Mechanisms receipt bile in twelve-digit intestine.
14. Composition and properties intestinal juice. Regulation its secretions . Porozhinnoye and membrane digestion .
15. Absorption in digestive channel . Mechanisms absorption ions sodium , water, carbohydrates , proteins , fats .
16. Rukhova function intestines, types abbreviations , their regulation .
17. Physiological mechanisms hunger and saturation .
18. Physiological features systems digestion in children and persons elderly age .

Content-based module 13. Energetic exchange

1. Sources and ways using energy in organism human .
2. Methods definition energy consumption human . Respiratory coefficient .
3. Basic exchange and conditions its definition , factors , What affect on its size.
4. Working exchange , value its definition .
5. Age-related features exchange energy .

Content-based module 14. Thermoregulation

1. Temperature bodies human , its daily oscillations .
2. Physiological value homoiothermia . Center thermoregulation , thermoreceptors .
3. Heat generation in organism , its regulation .
4. Heat transfer in organism , its regulation .
5. Regulation sustainability temperatures bodies at different temperature surrounding environment .
6. Physiological foundations hardening .
7. Age-related and sexual features thermoregulation .

Content-based module 14. System allocation

2. General characteristic systems allocation . Role kidneys in processes allocation . Features blood supply kidneys .
3. Mechanisms urine formation . Filtration in glomeruli and factors , from whose she depends .
4. Reabsorption and secretion in nephrons , their physiological mechanisms .
5. Reciprocating- countercurrent - multiple system nephrons , its physiological mechanisms and role.
6. Regulation reabsorption ions sodium and water in tubules nephrons .
7. Role kidneys in provision isoosmia . Mechanisms thirst .
8. Role kidneys in provision isovolumic .
9. Role kidneys in provision sustainability acid-base state blood .
10. Urination and its regulation .
11. Age-related changes urine formation and urination .

Content-based module 16. Physiological foundations labor activities and sports

1. Physiological foundations labor activities human .
2. Features physical and mental labor . Optimal modes labor .
3. Physiological mechanisms fatigue . Active rest and its mechanisms .
4. Age-related changes working capacity human .
5. Physiological foundations sports. Principles construction optimal modes training .

List practical tasks

1. Define contents hemoglobin in blood by method Sally , to evaluate results .
2. Define group investigated blood in system AB0, make conclusions .
3. Calculate color indicator blood , make conclusions .

4. Define hematocrit indicator , make conclusions .
5. Define in researched level arterial pressure , make conclusion .
6. Define duration period tension ventricles hearts on basis analysis polycardiograms , make conclusion .
7. Define duration period exile blood with ventricles hearts on the basis of analysis polycardiograms , do conclusion .
8. Define duration general systole ventricles hearts on basis analysis polycardiograms , make conclusion .
9. Define duration phases isometric abbreviation ventricles hearts on basis analysis polycardiograms , do conclusion .
10. Define direction and amplitude teeth electrocardiograms in standard leads . Make conclusions .
11. Define duration cardiac cycle on basis analysis ECG. Make conclusion .
12. Calculate on basis analysis ECG duration interval PQ. Make conclusion .
13. Calculate on basis analysis ECG duration interval Q-T. Make conclusion .
14. Calculate on basis analysis ECG duration complex QRS. Make conclusion .
15. Define on basis analysis ECG, What there are driver rhythm hearts . Argue conclusion .
16. Calculate by spirogram respiratory volume , life capacity lungs . Make conclusion .
17. Calculate by spirogram reserve volume inhale and exhalation . Make conclusion .
18. Calculate by spirogram minute volume breathing . Make conclusion .
19. Calculate by spirogram maximum ventilation lungs , make conclusions .
20. Calculate by spirogram reserve breathing . Make conclusion .
21. Define by spirogram consumption oxygen studied in condition peace and for first minutes after physical load , do conclusions .
22. Define by spirogram consumption oxygen studied in condition peace and for three minutes after load , do conclusions .
23. Calculate basic exchange the subject , having determined consumption oxygen by spirogram , registered in standard conditions , do conclusion .
24. Perform samples with delay breathing . To spend analysis results .
25. As and Why will change salivation after introduction to a person atropine ?
26. Rate secretory function stomach in human .
27. Why at increase acidity gastric juice recommend dairy diet ?
28. As and Why will change secretion pancreatic juice at reduction acidity gastric juice?
29. As will affect on process digestion reduction content biliary acids in bile ? Why ?
30. Suggest means magnification motor functions intestines. Give their physiological argumentation .
31. As and Why will change number and composition gastric and pancreatic juices at receipt to the duodenum of fats ?
32. As and Why will change number and composition gastric and pancreatic juices at incoming to stomach cabbage juice?
33. Define speed filtration in glomeruli, make conclusion .

34. Define size reabsorption water in nephrons . Make conclusion .
35. Rate results research functions kidneys by method Zimnytsky .
36. Draw schemes , What explain formation biological forms behavior and interpret mechanisms each from her stages , roles emotions in behavior .
37. Evaluate and interpret results research , What characterize types GNI human .
38. Evaluate state organism at physical loading by indicators functions .

Recommended literature

Basic

1. Hall J.E., Hall M.E. Guyton and Hall Textbook of Medical Physiology. 14th ed. Philadelphia: Elsevier, 2021. 1085 p.
2. Silverthorn D.U. Human Physiology: An Integrated Approach. 9th ed. New York: Pearson, 2021. 928 p.
3. Fox S.I. Human Physiology. 15th ed. New York: McGraw-Hill Education, 2021. 832 p.
4. Widmaier E.P., Raff H., Strang K.T. Vander's Human Physiology: The Mechanisms of Body Function. 15th ed. New York: McGraw-Hill Education, 2022. 816 p.
5. Sherwood L. Human Physiology: From Cells to Systems. 9th ed. Boston: Cengage Learning, 2020. 928 p.
6. Methodological Guidelines for Lectures in the Discipline "Physiology" for Students of the Educational and Scientific Institute of Medicine. Department of Physiology, Bogomolets National Medical University. Kyiv, 2025.
7. Methodological Guidelines for Practical Classes in the Discipline "Physiology" for Students of the Educational and Scientific Institute of Medicine. Department of Physiology, Bogomolets National Medical University. Kyiv, 2025.
8. Methodological Recommendations for Independent Work of Students in the Discipline "Physiology" (Specialty 222 "Medicine"). Department of Physiology, Bogomolets National Medical University. Kyiv, 2025.

Auxiliary

1. Klabunde R.E. Cardiovascular Physiology Concepts. 3rd ed. Philadelphia: Wolters Kluwer, 2021. 304 p.
2. Haines D.E., Mihailoff G.A. Fundamental Neuroscience for Basic and Clinical Applications. 6th ed. Philadelphia: Elsevier, 2022. 528 p.
3. Johnson L.R., Barrett K.E. Gastrointestinal Physiology. 10th ed. Philadelphia: Elsevier, 2022. 288 p.
4. Koeppen B.M., Stanton B.A. Renal Physiology. 6th ed. Philadelphia: Elsevier, 2021. 256 p.
5. Levitzky M.G. Pulmonary Physiology. 10th ed. New York: McGraw-Hill Education, 2020. 304 p.
6. Barrett K.E., Barman S.M. Endocrine Physiology. 5th ed. Philadelphia: Elsevier, 2020. 320 p.
7. Barrett K.E., Barman S.M., Brooks H.L. Physiology Cases and Problems. 6th ed. New

York: McGraw-Hill Education, 2022. 448 p.
8. Hall J.E. Guyton and Hall Physiology Review. 4th ed. Philadelphia: Elsevier, 2020. 320 p.
9. Preston R.R., Wilson T.E. Foundations of Cellular Neurophysiology. Updated ed. New York: Springer, 2021. 520 p.
10. Klabunde R.E. Essentials of Cardiovascular Physiology. Philadelphia: Wolters Kluwer, 2023. 280 p.
11. Barrett K.E. Gastrointestinal Physiology Review. Philadelphia: Elsevier, 2023. 210 p.
12. Boulpaep E.L. Cellular Physiology Primer. 4th ed. Philadelphia: Elsevier, 2020. 350 p.
13. Hall M.E. Clinical Physiology Made Easy. London: CRC Press, 2022. 290 p.
14. Cramer M.N. Environmental Physiology. Oxford: Oxford University Press, 2021. 400 p.

Informational resources

- ***https://www.the-aps.org/***
- ***https://www.iups.org/***
- ***http://www.physionet.org/***
- ***https://ispyphysiology.com/***
- ***https://www.hapsweb.org/***
- ***https://www.physiology.org/***
- ***https://rupress.org/jgp***
- ***https://www.getbodysmart.com/***
- ***https://www.kenhub.com/***
- ***https://www.khanacademy.org/science/health-and-medicine***
- ***https://openstax.org/details/books/anatomy-and-physiology***