

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

Petro Mohyla Black Sea National University

Medical Institute

Department of medical biology, microbiology, histology, physiology and pathophysiology



Course Description

«PHYSIOLOGY»

field of knowledge 22 «Health care»

in the specialty 222 «Medicine»

Developer

Hilmutdinova M.Sh.

Head of the Developer's Department

Kozii M.S.

Guarantor of the Educational Program

Klymenko M.O.

Director of the Institute

Hryshenko G.V.

Head of educational and methodical
department

Kalinichenko V.I.

Description of the educational discipline (annotation)

Title of indices	Characterization of educational discipline	
	«Physiology»	
Field of knowledge	22 «Health care»	
Specialty	222 «Medicine»	
Educational program	Master of Medicine	
Higher education level	Master	
Status of discipline	Normative	
Curriculum	2	
Academic year	2019/2020	
Semester number	Full-time	External form of education
	3 - 4	-
Total ECTS credits / hours	10 / 300	
Course structure: – lectures – seminars (practical) – hours of independent work of students	Full-time	External form of education
	50	-
	130	
	120	
Percentage of classroom load	60 %	
Language of instruction	english	
Form of final control	exam	

INTRODUCTION

The program of study of the discipline "Physiology" is made in accordance with the draft Higher Education Standard of Ukraine (hereinafter - the Standard) of the second (master's) level

Knowledge 22 Health
specialty 222 "Medicine"

educational program Master of Medicine_

discussed at the XIII All-Ukrainian Scientific-Practical Conference with International Participation "Topical Issues of Quality of Medical Education" (May 12-13, 2016, Ternopil) and an indicative curriculum for the training of specialists of the second (master's) level of higher education in the field of knowledge 22 "Health care" I "in higher educational establishments of the Ministry of Health of Ukraine, specialty 222" Medicine "qualification of educational" Master of Medicine ", qualification of professional" Doctor ", approved 26.07.2016 in. at. Minister of Health V. Shafransky.

Course description (abstract).

Physiology as a basic discipline, focused on the preparation of highly qualified masters of medicine and is one of the most important subjects in the system of medical education.

This program is made taking into account the latest achievements of medical and biological disciplines.

The subject of study is the functions of the living organism, their relations with each other, regulation and adaptation to the external environment, origin and formation in the process of evolution and individual development of the individual.

Physiology as a discipline provides the preparation of masters who have a considerable amount of theoretical and practical knowledge regarding the structural and functional features of the organism at different levels of its organization;

a) is based on the study of students of medical biology, medical and biological physics, medical chemistry, biological and bioorganic chemistry, morphological disciplines and integrates with these disciplines;

b) lays the foundations of study for the students of pathophysiology and propedeutics of clinical disciplines, which involves the integration of teaching with these disciplines and the formation of skills to apply knowledge of physiology in the process of further learning and professional activity;

c) lays the foundations for a healthy lifestyle and prevention of impaired function in the process of life.

Interdisciplinary links: the discipline is based on the study of students of medical biology, Latin, ethics, philosophy, ecology, medical and biological physics, medical chemistry, biological and bioorganic chemistry, morphological disciplines and integrates with these disciplines; pathomorphology, deontology and propedeutics of clinical disciplines, which involves the integration of teaching with these disciplines and the formation of skills to apply knowledge of physiology in the process of further education and professional activity; it lays the foundations for a healthy lifestyle and prevention of impaired structure and function in the process of life.

The discipline program is structured in 2 modules, which include blocks of content modules:

Module 1. «General Physiology and Higher Integrative Functions»

Content modules:

1. *Introduction to physiology.*
2. *Physiology of excitatory structures.*
3. *Biological regulation of body functions.*
4. *Nervous regulation of motor functions.*
5. *Nervous regulation of visceral functions.*
6. *Humoral regulation of visceral functions.*
7. *Physiology of sensor systems.*
8. *Physiological basis of behavior.*
9. *Physiological bases of higher nervous activity of the person.*

Module 2. «Physiology of visceral systems»

Content modules:

10. *Blood system.*
11. *Circulatory system*
12. *Respiratory system.*
13. *Energy exchange.*
14. *Thermoregulation.*
15. *The digestive system.*
16. *The excretory system.*
17. *Physiology of work and sports.*

The amount of student workload is described in the ECTS credits, which are credited to students upon successful completion of the corresponding module (test credit).

Types of educational activities of students according to the curriculum are: a) lectures, b) practical classes, c) independent student work. Thematic plans of lectures, practical classes, independent student work provide implementation in the educational process of all topics that are parts of the content modules.

The topics of the lecture course reveal the problematic issues of the relevant sections of physiology.

Practical classes include:

- 1) research by students of functions in experiments on animals, isolated organs, cells, models, or on the basis of experiments recorded in videos, movies that are made in computer programs and other educational technologies;
- 2) study of functions in a healthy person;
- 3) solving of situational problems (estimation and analysis of indicators of functions, parameters of homeostasis, mechanisms of regulation, etc.), have experimental or clinical-physiological direction.

Assessment of the student's educational activity is carried out at each stage of the practical lesson, the overall assessment is complex.

Students in practical classes briefly record the protocols of the conducted research, specifying the topic of the lesson, the purpose of the study, the course of work or the name of the method, the results and conclusions of the study, the answers to situational tasks.

Students' current educational activities are monitored in practical classes according to specific goals.

The following means of diagnostics of the level of preparation of students are applied: computer tests, solving of situational tasks, carrying out laboratory researches and interpretation and evaluation of their results, analysis and evaluation of the results of instrumental researches and parameters characterizing the functions of the human body, its systems and organs; control of practical skills, others.

Students perform independent work during the preparation for the classes, as well as work on topics not included in the thematic plan of practical classes. Teachers' consultations play a significant role in the independent work organization. The independent work is supervised by the teacher in the practical classes and in the final module control.

Upon completion of the study of each module is the final module control (exam).

Assessment of student achievement in the discipline is a rating and is ranked on a multi-scale scale as the arithmetic mean of mastering the relevant modules and is determined by the ECTS system and the traditional scale adopted in Ukraine.

1. The purpose and objectives of the discipline

1.1. The purpose of teaching the course "Physiology" is to study the functions of different cells, tissues, organs and systems as a whole in order to use the knowledge gained in the study of the following medical disciplines, and in future professional activity. It provides an understanding of the concept of health, healthy lifestyles and prevention of impaired function in the process of life.

The end goals are set on the basis of the EPP training of the doctor in the specialty in accordance with the block of its content module (natural science training) and are the basis for building the content of the discipline. Description of goals is formulated through the ability in the form of goals (actions). On the basis of the final goals, specific goals are formulated for each module or content module in the form of specific skills (actions), objectives that ensure achievement of the ultimate goal of studying the discipline.

The ultimate goals of the discipline

• To make a conclusion about the state of physiological functions of an organism, its systems and organs

• To analyze age-specific features of body functions and their regulation

• Analyze the regulated parameters and draw conclusions about the mechanisms of nervous and humoral regulation of the physiological functions of the organism and its systems

• Analyze human health under different conditions based on physiological criteria

• To interpret the mechanisms and patterns of functioning of excitatory structures of the body

• Analyze the state of sensory processes in human life support

• Explain the physiological bases of methods for studying the functions of the body

• Explain the mechanisms of integrative activity of the body.

1.2. The main tasks of studying the discipline "Physiology" as a science is a systematic approach to the study of the essence of physiological processes, functions of individual organs, systems and the whole organism. Study of the nervous and endocrine regulation of the organism, its organs and systems. To reveal the physiological mechanisms of interaction of organs and their systems. To study mechanisms of pharmacological correction of physiological processes of an organism. To develop in students practical skills of definition and assessment of functional features of an organism. To expand the understanding of the role of human physiology in other medical disciplines.

1.3. Competencies and learning outcomes, facilitated by discipline (relations with the regulatory content of higher education applicants' training, formulated in terms of the learning outcomes of the Standard).

According to the requirements of the standard, the discipline provides for the acquisition of students competences:

- *integral*: the ability to solve complex specialized problems 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 the conditions;

- *common*: the ability to apply knowledge in practical situations. Ability to think abstractly, analyze and synthesize; the ability to learn and to be modernly trained. Knowledge and understanding of the subject area and understanding of the profession. Ability to communicate in their native language both verbally and in writing, ability to speak a second language. Use of information and communication technologies. Ability to evaluate and ensure the quality of work performed. Ability to conduct research at the appropriate level.

- *special (specialty, subject)*: to establish the causes and consequences of various disorders in order to successfully treat the patient. Prevention of diseases and their spread.

Results of studying:

As a result of studying the discipline of the student

should know: the essence of physiological processes, functions of individual organs, systems and the whole organism; basic provisions of nervous and endocrine regulation of activity of an organism, its organs and systems; to reveal the physiological mechanisms of interaction of organs and their systems; to characterize mechanisms of pharmacological correction of physiological processes of an organism.

should be able to: develop and draw up all necessary documentation regarding the patient's personal file, prescribing medication, diagnosis and more; justify the choice and method of treatment needed for the technology; to carry out a set of organizational and managerial measures on the possible spread of morbidity among the population; be able to evaluate key clinical trial indicators; form and promote a healthy lifestyle culture; develop, implement and apply management approaches in the professional work of healthcare institutions, be able to apply in professional activity

2. Information volume of the discipline

The course takes 300 hours 10.0 ECTS credits.

Description of the curriculum in the discipline "Physiology" for students of medical faculties

Structure of the discipline	Number of hours, of them			IWS	Year of study	Type of control
	Total	Auditorium				
		Lectures	Practical sessions			
Credits ECTS	300	50	130	120	2nd	
10, 0						
Module 1: Content modules 9	150 h / 5,0 credits ECTS	24	64	62		Final module control (exam)
Module 2: Content modules 8	150 h / 5,0 credits ECTS	26	66	58		
<i>Including, final module control of mastering of 2 modules (exam)</i>	<i>20 h / 0,67</i> <i>credits</i> <i>ECTS</i>		<i>4</i>	<i>16</i>		
<i>Weekly load</i>	<i>4 h / 0,23</i> <i>credits</i> <i>ECTS</i>					

Note: 1 ECTS credit - 30 hours

The ratio of hours of class to independent and individual work for full-time study is:
classroom load - 60%, IWS - 40%

3. Program of the discipline Daily form

Теми						
	Total					
		L	P	L-b	Ind	IWS
1	2	3	4	5	6	7
Module 1. «General Physiology and Higher Integrative Functions»						
<i>Content module 1. Introduction to physiology</i>						
Topic 1. The subject and tasks of physiology. Methods of physiological research	2	-	1	-	-	1
Topic 2. The main stages of development of physiology. History of the development of physiology in the nineteenth century. Contribution of the works of Sechenov, Pavlov, Anokhin, Kostyuk to the development of world physiology. Ukrainian School of Physiology	2	-	-	-	-	2
Together for Content module 1	4	-	1	-	-	3
<i>Content module 2. Physiology of excitable structures</i>						
Topic 3. Functions of the cell membrane. Mechanisms of transport of substances across the membrane	5	-	2	-	-	3
Topic 4. Membrane potentials. Resting potential and action potential	5	1	3	-	-	1
Topic 5. Transmission of excitation by nerve fibers and through the neuromuscular synapse	5	1	3	-	-	1
Topic 6. Skeletal muscle properties and mechanisms for their contraction	5	1	3	-	-	1
Topic 7. Smooth muscle properties, mechanisms of their contraction and relaxation - individual work of students	3	-	-	-	3	-
Together for content module 2	23	3	11	-	3	6
<i>Content module 3. Biological regulation of body functions</i>						
Topic 8. Outlines of biological regulation of functions. Reflex principle of CNS activity	6	1	3	-	-	2
Topic 9. CNS synapses. Excitation and inhibition in the central nervous system	7	2	3	-	-	2
Together for content module 3	13	3	6	-	-	4
<i>Content module 4. Nervous regulation of motor functions</i>						
Topic 10. The role of the spinal cord in the regulation of motor functions	6	2	3	-	-	1
Topic 11. The role of brain stem in regulation of motor functions	5	2	2	-	-	1
Topic 12. The role of the forebrain and cerebellum in the regulation of the body's motor functions. Regulation of systemic activity of the organism	5	-	3	-	-	2
Topic 13. Practical skills in the physiology of excitable structures and nervous regulation of body functions	4	-	2	-	-	2
Together for content module 4	20	4	10	-	-	6
<i>Content module 5. Nervous regulation of visceral functions</i>						
Topic 14. Structural and functional organization of the autonomic nervous system, its role in the regulation of visceral functions	6	2	3	-	-	1
Together for content module 5	6	2	3	-	-	1
<i>Content module 6. Humoral regulation of visceral functions</i>						
Topic 15. Humoral regulation, its factors, mechanisms of	5	1	3	-	-	1

action of hormones on target cells, regulation of hormone secretion						
Topic 16. The role of hormones in regulation of processes of mental, physical development, linear growth of the body Topic 17. The role of hormones in the regulation of sexual function	5	1	3	-	-	1
Topic 18. The role of hormones in the regulation of homeostasis Topic 19. The role of hormones in the regulation of the body's adaptation to the action of stressors	7	2	3	-	-	2
Topic 20. Practical skills in physiology of nervous and humoral regulation of visceral functions of an organism	4	-	2	-	-	2
Together by content module 6	21	4	11	-	-	6
<i>Content module 7. Physiology of sensory systems</i>						
Topic 21. General characteristics of sensory systems Topic 22. Somatosensory system. Physiological bases of pain and anesthesia	8	2	3	-	-	3
Topic 23. Visual sensory system	6	1	2	-	-	3
Topic 24. Auditory sensory system	5	1	2	-	-	2
Topic 25. Vestibular sensory system	2	-	-	-	-	2
Topic 26. Taste sensory system Topic 27. Olfactory sensory system	2	-	-	-	-	2
Together for content module 7	23	4	7	-	-	12
<i>Content module 8. Physiological basics of behavior</i>						
Topic 28. Physiological bases of behavior. The role of needs and motivations. The physiology of emotions, their types. Theories of emotions and mechanisms of their development. Emotional tension and its manifestation	8	2	3	-	-	3
Topic 29. Congenital reflexes and instincts. Physiological bases of acquired behavior. Processes and mechanisms of formation and inhibition of conditioned reflexes. Memory and learning	8	2	3	-	-	3
Together for content module 8	16	4	6	-	-	6
<i>Content module 9. Physiological basics of higher nervous activity</i>						
Topic 30. Types of higher nervous activity. The first and second signaling systems. Language and modern mechanisms of its development. Features of asymmetry of cerebral hemispheres	5	-	3	-	-	2
Topic 31. Sleep physiology, its forms and phases. Modern theories of sleep development and its disorders - individual work of students	5	-	2	-	3	-
Topic 32. Practical skills in physiology of higher integrative functions of the nervous system	4	-	2	-	-	2
Together by content module 9	14	-	7	-	3	4
Final module control	10	-	2	-	-	8
Total hours	150	24	64	-	6	56
Module 2. «Physiology of visceral systems»						
<i>Content module 10. System of blood</i>						
Topic 1. General characteristics of the blood system. Blood functions, physico-chemical properties of blood	7	2	3	-		2
Topic 2. Physiology of red blood cells	5	1	3	-	-	1
Topic 3. Protective functions of blood. Physiology of leukocytes. Blood groups	6	1	3	-	-	2

Topic 4. Types and mechanisms of hemostasis. Platelet physiology						
Topic 5. Practical skills in the physiology of the blood system	4	-	2	-	-	2
Together for content module 10	22	4	11	-	-	7
<i>Content module 11. Circulatory system</i>						
Topic 6. General characteristics of the circulatory system. Physiological properties of the cardiac muscle	6	2	3	-	-	1
Topic 7. Dynamics of excitation of the heart. Physiological bases of electrocardiography	5	-	3	-	-	2
Topic 8. Pumping function of the heart, its role in hemodynamics, physiological basics of research methods	6	1	3	-	-	2
Topic 9. Regulation of cardiac activity	6	1	3	-	-	2
Topic 10. Systemic circulation. The laws of hemodynamics, the role of blood vessels in the circulation	6	2	3	-	-	1
Topic 11. Regulation of blood circulation	7	2	3	-	-	2
Topic 12. Features of regional blood circulation and its regulation	1	-	-	-	-	1
Topic 13. Dynamics of lymph circulation	1	-	-	-	-	1
Topic 14. Practical skills in the physiology of the circulatory system	5	-	2	-	-	3
Together by content module 11	43	8	20	-	-	15
<i>Content module 12. Breathing system</i>						
Topic 15. General characteristics of the respiratory system. External breathing	5	1	3	-	-	1
Topic 16. Gas exchange in the lungs Topic 17. Blood gases transportation	6	1	3	-	-	2
Topic 18. Respiratory regulation	7	2	3	-	-	2
Together by content module 12	18	4	9	-	-	5
<i>Content modules: 13. Energy exchange. 14. Thermoregulation</i>						
Topic 19. Energy exchange and methods of its research Topic 20. Body temperature and regulation of its constancy	7	2	3	-	-	2
Topic 21. Practical skills in the physiology of the respiratory system, energy metabolism and thermoregulation	4	-	2	-	-	2
Together by content modules 13, 14	11	2	5	-	-	4
<i>Content module 15. The digestive system</i>						
Topic 22. General characteristics and functions of the digestive system Topic 23. Digestion in the oral cavity. The role of taste and olfactory sensory systems	6	2	3	-	-	1
Topic 24. Digestion in the stomach	7	1	3	-	-	3
Theme 25. Digestion in the duodenum. The role of pancreatic juice and bile in digestive processes	5	2	2	-	-	1
Topic 26. Intestinal digestion. Physiological basics of hunger and saturation	6	1	1	-	-	4
Together by content module 15	24	6	9	-	-	9
<i>Content module 16. Excretory system</i>						
Topic 27. Excretory system. The role of the kidneys in the processes of excretion, mechanisms of urine formation	5	1	3	-	-	1
Topic 28. The role of the kidneys in maintaining homeostasis	5	1	3	-	-	1
To develop a circuit of biological regulation of parameters of homeostasis with the participation of kidneys - individual independent work of students	2	-	-	-	2	-
Topic 29. Practical skills in the physiology of digestive and	4	-	2	-	-	2

excretory systems						
Together by content module 16	16	2	8	-	2	4
Content module 17. Physiological bases of work and sports						
Topic 30. Muscular and mental working capacity, indicators and periods. Theories of fatigue development. Relationship between physical and mental work. Training	6	-	2	-	-	4
Together by content module 17	6	-	2	-	-	4
Final module control	10	-	2	-	-	8
Total hours	150	26	66	-	2	56
TOGETHER	300	50	130	-	8	112

4. Content of the academic discipline

4.1. Thematic plan of the lectures

№	Topic of class / plan	Number of hours
MODULE 1. GENERAL PHYSIOLOGY AND HIGHER INTEGRATIVE FUNCTIONS		
1.	Introduction to the course of physiology. Exciting tissues. Biopotentials.	2
2.	Excitation by nerve fibers and through the neuromuscular synapse. Muscle physiology.	2
3.	General principles of biological regulation. Nervous regulation. Reflexive principle of CNS activity.	2
4.	Excitation and inhibition in the central nervous system. 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 in regulation.	2
6.	Role of brain stem in regulation of motor functions.	2
7.	The role of the autonomic nervous system in the regulation of visceral functions.	2
8.	Humoral regulation of visceral functions. The role of endocrine glands in the regulation of the processes of physical, mental and sexual development.	2
9.	The role of endocrine glands in the regulation of homeostasis, nonspecific adaptation of the body.	2
10.	Sensor systems (analyzers). Somatosensory system. Physiological basis of pain.	2
11.	Sensor systems (analyzers). Visual and auditory sensor systems.	2
12.	Higher integrative functions of the nervous system. Physiological bases of behavior. The role of needs and motivations. The physiology of emotions. Physiological bases of acquired behavior. The processes of formation and inhibition of conditioned reflexes. Memory.	2
Total hours		24
MODULE 2. PHYSIOLOGY OF VISCERAL SYSTEMS		
1.	General characteristics of the blood system. Blood as a means of transport and the internal environment of the body.	2
2.	Physiology of red blood cells. Protective functions of the blood. Blood	2

	groups. Vascular-platelet and coagulation hemostasis. The role of anticoagulants and plasmins.	
3.	Circulatory system. Physiological properties of the heart muscle.	2
4.	Pumping function of the heart, regulation of the activity of the heart.	2
5.	The role of blood vessels in circulation. Basic principles of circulation.	2
6.	Regulation of blood movement in blood vessels. Regulation of systemic circulation.	2
7.	Respiratory system. The main stages of breathing.	2
8.	Respiratory regulation.	2
9.	Energy exchange and thermoregulation.	2
10.	The digestive system. The role of taste and olfactory sensory systems. Digestion in the mouth and stomach.	2
11.	The role of the liver and pancreas in the digestive process.	2
12.	Digestion and absorption in the gut. Physiological basis of hunger and satiation.	2
13.	Selection system. Mechanisms of urine formation. Regulation of urine formation and excretion. The role of the kidneys in maintaining homeostasis.	2
Total hours		26
In all		50

4.2. Thematic plan of the practical classes

№	Topic of class	Number of hours
MODULE 1. GENERAL PHYSIOLOGY AND HIGHER INTEGRATIVE FUNCTIONS		
1.	The subject and tasks of physiology. Methods of physiological research. Function of the cell membrane. Mechanisms of transport of substances across the membrane	2
2.	Recording the resting potential and the action potential of nerve and muscle fibers	2
3.	Research of the excitation of nerve fibers and through the neuromuscular synapse. Research on the potential of action of the whole nerves and muscles	2
4.	Research on the mechanisms of skeletal muscle contraction	2
5.	General characteristics of biological regulation. Research of the reflex arc	2
6.	Research of the processes of excitation and inhibition in the central nervous system	2
7.	Research of the processes of excitation and inhibition in the central nervous system	2
8.	Practical skills in the physiology of excitable structures	2
9.	Research of the role of the spinal cord in the regulation of locomotor functions	2
10.	Research of the role of the spinal cord in the regulation of locomotor	2

	functions	
11.	Research of the role of the brainstem in the regulation of locomotor functions	2
12.	Research of the role of the cerebellum and forebrain in the regulation of locomotor functions	2
13.	Research of the role of the cerebellum and forebrain in the regulation of locomotor functions	2
14.	Practical skills in the physiology of nervous regulation of body functions	2
15.	Research of mechanisms of nervous regulation of visceral functions of an organism	2
16.	Research of mechanisms of nervous regulation of visceral functions of an organism	2
17.	Research of mechanisms of humoral regulation of visceral functions of an organism	2
18.	Research of mechanisms of humoral regulation of visceral functions of an organism	2
19.	Research of the role of hormones in the regulation of physical, mental, sexual development	2
20.	Research of the role of hormones in the regulation of physical, mental, sexual development	2
21.	Research of the role of hormones in the regulation of homeostasis and the adaptation of the body to the action of stressors	2
22.	Practical skills in physiology of nervous and humoral regulation of visceral functions of an organism	2
23.	Research of somatosensory system	2
24.	Research of visual sensory system	2
25.	Research of auditory sensory system	2
26.	Physiological bases of behavior. Research of the role of motivation and emotions in behavioral reactions	2
27.	Physiological bases of acquired behavior: study of formation and inhibition of conditioned reflexes and mechanisms of memory	2
28.	Physiological bases of acquired behavior: study of formation and inhibition of conditioned reflexes and mechanisms of memory	2
29.	Research on types of higher nervous activity	2
30.	Research on types of higher nervous activity	2
31.	Practical skills in physiology of sensory systems and higher integrative functions of the nervous system	2
32.	<i>Final module control (practical and theoretical training)</i>	2
<i>Total hours</i>		<i>64</i>
MODULE 2. PHYSIOLOGY OF VISCERAL SYSTEMS		
1.	The blood system. Research of physical and chemical properties of blood	2
2.	The blood system. Research of physical and chemical properties of	2

	blood	
3.	Research of blood red blood cells and hemoglobin	2
4.	Protective functions of the blood. Study of blood group membership. Blood clotting studies	2
5.	Practical skills in the physiology of the blood system	2
6.	Circulatory system. Research of the physiological properties of the heart muscle	2
7.	Research of the dynamics of heart excitation. Electrocardiogram registration and analysis	2
8.	Research of the dynamics of heart excitation. Electrocardiogram registration and analysis	2
9.	Research of the pumping function of the heart	2
10.	Research of regulation of heart activity	2
11.	Research of regulation of heart activity	2
12.	The role of blood vessels in circulation. Research of blood pressure in humans	2
13.	The role of blood vessels in circulation. Research of blood pressure in humans	2
14.	Research of regulation of blood circulation	2
15.	Practical skills in the physiology of the circulatory system	2
16.	Respiratory system. Research of external respiration	2
17.	Respiratory system. Research of external respiration	2
18.	Research of diffusion, transport of blood gases	2
19.	Research of the regulation of respiration	2
20.	Research of energy exchange and thermoregulation	2
21.	Practical skills in the physiology of respiratory systems, energy metabolism and thermoregulation	2
22.	The digestive system. Research of digestion in the mouth. The role of taste and olfactory sensory systems	2
23.	The digestive system. Research of digestion in the mouth. The role of taste and olfactory sensory systems	2
24.	Research of digestion in the stomach	2
25.	Research of digestion in the intestine	2
26.	Research of digestion in the intestine	2
27.	Research of mechanisms of urine formation	2
28.	Research of mechanisms of urine formation	2
29.	Research on the involvement of the kidneys in maintaining homeostasis	2
30.	Research on the involvement of the kidneys in maintaining homeostasis	2
31.	Practical skills in the physiology of digestive and excretory systems	2
32.	Research of fatigue and recovery during muscular work and adaptation of the body to exercise	2
33.	<i>Final module control (practical and theoretical training)</i>	2

	<i>Total hours</i>	<i>66</i>
	<i>In all</i>	<i>130</i>

4.3. The tasks for the independent study (Topics of analytical tasks)

MODULE 1. GENERAL PHYSIOLOGY AND HIGHER INTEGRATIVE FUNCTIONS

Topic: Central nervous system synapses. Excitation and inhibition processes in the CNS

1. CNS synapses, their structure, mechanisms of information transmission.
2. Neurotransmitters and neuromodulators.
3. Excitation and inhibition processes in the CNS.
4. Excitatory synapses, their neurotransmitters, cytoceptors, development of excitatory postsynaptic potential, its parameters, physiological role.
5. Brake synapses, their neurotransmitters. Post-synaptic inhibition, development of inhibitory postsynaptic potential. Presynaptic inhibition, mechanisms of development. Central braking.
6. Summation processes at central synapses: spatial summation, temporal summation. Sum of excitation and inhibition of CNS neurons.
7. CNS levels, their interaction while providing adaptive reactions of the body

Topic: The role of the spinal cord in the regulation of motor functions

1. Analysis of sensory information by the spinal cord.
2. Motor systems of the spinal cord, their organization and mechanisms of coordination (convergence, divergence, types of inhibition of motoneurons - reverse, reciprocal).
3. Physiological characteristics of proprioceptors
4. Stretch reflexes (myotatic), their reflex arcs, functions of the gamma system. Activation of alpha- and gamma-motoneurons by supra-spinal motor centers.
5. Role of stretching reflexes in tone regulation (tonic myotatic reflexes) and muscle length (phase myotatic reflexes).
6. Clinical significance of the study of myotatic reflexes.
7. Golgi tendon receptors, their functions, reflexes from tendon receptors, their reflex arcs, physiological significance.
8. Flexural and extensor skin-muscle reflexes.
9. Functionality of the isolated spinal cord. Spinal cord cross section and spinal shock.

Topic: Humoral regulation, its factors, mechanisms of action of hormones on target cells, regulation of hormone secretion

1. Factors of humoral regulation, their characteristics and classification. The nexus of nervous and humoral regulation.
2. Structural and functional organization of the endocrine system. Endocrine glands, endocrine cells, their hormones and values. The main mechanisms of action of hormones. Membrane and intracellular receptors, G-proteins, secondary mediators, their role. Regulation of hormone secretion.
3. Hypothalamo-pituitary system. Functional communication of the hypothalamus with the pituitary gland. Neurosecrets of the hypothalamus. The role of liberins and statins.

Topic: The role of hormones in the regulation of processes of mental, physical development, linear growth of the body

1. Adenohypophysis, its hormones, their effects. The role of somatotropin and somatomedins in supporting growth and development processes. Circuit of regulation of synthesis and secretion of somatotropin, circadian rhythms. Metabolic effects of somatotropin.

2. The thyroid gland, its hormones. Mechanisms of action of iodothyronines on target cells, mental functions, processes of growth and development, metabolic processes, state of visceral systems and the like. Circuit of regulation of synthesis and secretion of thyroxine and triiodothyronine.

3. The role of other hormones that affect growth processes.

Topic: The role of hormones in the regulation of sexual function

1. Gender glands. Gender differentiation, development and functions of the reproductive system. The period of puberty.

2. The male reproductive system, its structure and functions. Spermatogenesis. Endocrine function of the testes, regulation of the function of the testes, contour of regulation with the participation of the hypothalamic-pituitary system. Erection and ejaculation, hormonal and nervous mechanisms of regulation.

3. Female genital system, its structure and functions. Ovarian hormones, their role, regulation of ovarian function. Monthly cycle. Pregnancy. Placenta hormones. Lactation.

MODULE 2. PHYSIOLOGY OF VISCERAL SYSTEMS

Topic: Physiology of red blood cells

1. Erythrocytes, structure, number, function.

2. Hemoglobin, its structure, properties, types, compounds. The amount of hemoglobin. Erythrocyte saturation criteria with hemoglobin: average concentration, color index.

3. Hemolysis, its species. Erythrocyte sedimentation rate, factors that affect it. The concept of erythron as a physiological system, regulation of the number of red blood cells in the blood.

Topic: Types and physiological mechanisms of hemostasis at damage of a vessel wall. Platelet physiology

1. Hemostasis, its types.

2. Modern ideas about the main factors involved in coagulation hemostasis - coagulants. Anticoagulants, their types, mechanisms of action, value. Plasmas and fibrinolysis, its mechanisms, significance.

3. The role of the vascular wall in the regulation of hemostasis and fibrinolysis. Regulation of blood clotting.

4. Physiological bases of methods of research of a condition of hemostasis. Age-related changes in hemostasis.

5. Platelets, their number, functions.

6. Mechanisms of maintenance of a liquid state of blood.

7. Hemopoiesis and its regulation. Age-related changes in the blood system.

8. Extravascular body fluids, their role in ensuring the vital functions of the cells of the body.

Topic: Pumping function of the heart, its role in hemodynamics, physiological bases of research methods

1. Cardiac cycle, its phase structure.
2. Blood pressure in the heart cavities and the operation of the valve apparatus during cardiac activity.
3. Systolic and minute blood volumes, cardiac index.
4. Work of the heart. Physiological bases of research methods.

Topic: Systemic circulation, laws of hemodynamics, role of blood vessels in circulation

1. Systemic circulation. Basic laws of hemodynamics. Mechanism of vascular tone formation. General peripheral vascular resistance. Factors that ensure the movement of blood through the vessels of high and low pressure. Linear and volume velocity of blood movement in different sections of the vascular bed. Time of complete blood circulation.

2. Blood pressure: arterial (systolic, diastolic, pulse, middle), capillary, venous. Factors that determine your blood pressure. Physiological bases of blood pressure measurement in experiment and clinical practice. The arterial pulse, its basic parameters.

3. Functional classification of blood vessels. Physiological characteristics of vessels of compression, resistance (resistive).

4. Microcirculation. Morpho-functional characteristics of vessels of the microcirculatory bed. The movement of blood in the capillaries, its features. Blood pressure in the capillaries. Mechanisms of exchange of fluid and other substances between blood and tissues

5. Physiological characteristics of capacitive vessels. Features of venous movement of blood. Venous pulse. Blood circulation to the heart. Depot of blood, its relativity.

Topic: Blood Gas Transportation

1. Hemoglobin. Myoglobin. Oxyhemoglobin dissociation curve, factors that influence oxyhemoglobin formation and dissociation.

2. Oxygen and carbon dioxide content in arterial and venous blood. Oxygen capacity of blood. Formation and dissociation of bicarbonates and carbohemoglobin

Topic: The role of the kidneys in maintaining homeostasis

1. Regulation of urination. Kidney involvement in maintaining nitrogen balance, homeostasis parameters. Regulation of constancy of osmotic pressure of internal environment, role of vasopressin.

2. Mechanisms of thirst.

3. Regulation of constancy of concentration of sodium ions, potassium, volumes of water and circulating blood in the body involving the kidneys.

4. Regulation of constancy of concentration of calcium ions and phosphates with participation of kidneys.

5. The role of the kidneys in the regulation of the acid-base state of the internal environment.

6. Urination and its regulation.
7. Physiological bases of methods of research of kidney function.
8. Age-related changes in urination and urination.

Topic: General characteristics and functions of the digestive system

1. The structure and functions of the digestive system. Digestive canal and digestive glands. The main functions of the digestive system: secretion, motility, suction.
2. Digestion: its types (cavity, membrane, intracellular), the main stages. Features of secretory cells, mechanisms of secretion, role of calcium ions and cell mediators in the secretory process.
3. Basic principles and mechanisms of regulation of digestion.
4. Gastrointestinal hormones. Phases of secretion of the main digestive glands. Periodic activity of digestive organs.
5. The motility of the digestive canal. Features of the structure and function of the smooth muscles of the digestive canal.
6. Digestion in the oral cavity. The role of taste and olfactory sensory systems
7. Digestion in the stomach
8. Digestion in the 12th intestine. The role of pancreatic juice and bile in digestive processes

Topic: Body temperature and regulation of its constancy

1. The constant temperature of the internal environment as a necessary condition for the normal state of metabolic processes. Poikilothermia, homiothermia. Human body temperature, its daily fluctuations.
2. Temperature of different areas of skin and internal organs. Physical and chemical thermoregulation. Metabolism as a source of heat generation. The role of individual organs in heat production.
3. Heat transfer. Methods of heat recovery from the surface of the body (radiation, conduction, convection, evaporation)

Topic: Physiological bases of behavior

1. The concept of higher integrative functions of the nervous system, methods of its research.
2. Physiological basis of behavior. Internal needs of the body. Biological motivation. Motivational excitement.
3. Congenital (unconditionally reflexive) behaviors. Instincts, their importance for the adaptive activity of the body.
4. Acquired (conditionally reflexive) forms of behavior, their importance for the adaptive activity of the body.
5. The mechanism of formation of temporary communication.
6. Current mechanisms of memory formation.

4.4. Ensuring the studying process

Equipment: tables, diagrams, handouts, slides, training videos, laboratory equipment (various devices)

Methodical provision:

1. Basic and additional literature.

2. List of questions for preparation and preparation of intermediate module control.
3. Multimedia support for lectures and practicals.
4. A set of scientific, educational and teaching videos.
5. A set of computer training programs.
6. Methodical instructions for the practical classes
7. Methodical instructions for the independent students work

5. The final control

List of issues of final control

MODULE 1. GENERAL PHYSIOLOGY AND HIGHER INTEGRATIVE FUNCTIONS

List of theoretical questions

Content module 1: Introduction to physiology

1. Physiology as a science. Function concept. Methods of physiological research.
2. The formation and development of physiology in the nineteenth century.
3. Contribution of works by Sechenov, Pavlov, Anokhin, Kostyuk to the development of world physiology.
4. Ukrainian Physiological School.

Content module 2: Physiology of excitatory structures

1. The resting potential, mechanisms of origin, its parameters, physiological role.
2. Action potential, mechanisms of origin, its parameters, physiological role.
3. Excitability. Critical level of depolarization, threshold of depolarization of the cell membrane.
4. Changes in the excitability of the cell in the development of a single action potential.
5. The value of the parameters of electrical stimuli for the excitation.
6. Mechanisms of excitation by nerve fibers.
7. Patterns of excitation by nerve fibers.
8. Mechanisms of transmission of excitation through the neuromuscular synapse.
9. The conjugation of excitation and reduction. Skeletal muscle contraction and relaxation mechanisms.
10. Types of muscle contractions: single and tetanic; isotonic and isometric.

Content module 3: Biological regulation of body functions

1. Biological regulation, its types and significance for the body. Outlines of biological regulation. The role of feedback in regulation.
2. The concept of reflex. The structure of the reflex arc and the function of its links.
3. Receptors, their classification, mechanisms of excitation.
4. Proprioceptors, their types, functions. The structure and functions of muscular spindles.
5. Mechanisms and regularities of excitation transfer at central synapses.
6. Types of central braking. Mechanisms of development of presynaptic and postsynaptic inhibition.
7. Sum of excitation and inhibition of CNS neurons.

Content module 4: Nervous regulation of locomotor functions

1. Motor reflexes of the spinal cord, their reflex arcs, physiological significance.
2. The conductive function of the spinal cord. Dependence of spinal reflexes on activity of brain centers. Spinal shock.
3. Motor reflexes of the hindbrain, decerebral rigidity.
4. Motor reflexes of the midbrain, their physiological significance.
5. The cerebellum, its functions, symptoms of defeat.
6. The thalamus, its functions.
7. Limbic system, hypothalamus, their functions.
8. Basal nuclei, their functions, symptoms of defeat.
9. Sensory, associative and motor areas of the cerebral cortex, their functions.
10. Interaction of different levels of CNS in regulation of motor functions. Locomotives, their regulation. Functional structure of arbitrary motions. Age-related changes in motor functions.

Content module 5: Nervous regulation of visceral functions

1. General plan for the structure of the autonomic nervous system. Autonomous reflexes, their reflex arcs.
2. Synapses of the autonomic nervous system, their mediators, cytoresceptors and blockers of excitation transmission in synapses.
3. Influence of sympathetic nervous system on visceral functions.
4. Influence of the parasympathetic nervous system on visceral functions.
5. The role of the metasympathetic system in the regulation of visceral functions.
6. The unity of sympathetic and parasympathetic systems in the regulation of functions.

Content module 6. Humoral regulation of visceral functions

1. Humoral regulation, its differences from nervous. Characteristics of factors of humoral regulation.
2. Properties of hormones, their main effects. The mechanism of action of hormones on target cells.
3. Outline of humoral regulation. Regulation of hormone secretion by endocrine glands.
4. The role of the hypothalamic-pituitary system in the regulation of endocrine glands function.
5. The role of somatotropin, thyroxine and triiodothyronine, insulin in the regulation of linear body growth, processes of physical and mental development of the body.
6. Role of calcitonin, parathormone, calcitriol in regulation of constancy of concentration of calcium ions and phosphates in blood.
7. The role of pancreatic hormones in the regulation of body functions.
8. Role of thyroid hormones (T3, T4) in the regulation of body functions.
9. Physiology of the female reproductive system, its function, the role of sex hormones.
10. Physiology of the male reproductive system, the role of sex hormones.
11. General idea of nonspecific adaptation of an organism to a stressful situation. The role of hormones in nonspecific adaptation.
12. The role of the sympatho-adrenal system in the regulation of nonspecific adaptation of the organism to stressful situations.

13. The role of the pituitary-adrenal system in the regulation of nonspecific adaptation of the organism to a stressful situation. The main effects of glucocorticoids and mineralocorticoids on the body.

Content module 7. Physiology of sensor systems

1. Sensor systems, their structure and functions.
2. Taste sensory system, its structure, functions, research methods.
3. The olfactory sensory system, its structure and functions.
4. Somatosensory system, its structure and functions.
5. Physiological mechanisms of pain.
6. Opiate and non-opiateantinocceptive systems of the body, their significance.
7. Physiological mechanisms of anesthesia.
8. Auditory sensory system, its structure and functions.
9. Functions of the outer and middle ear. Inner ear, frequency analysis of sound signals.
10. Visual sensory system, its structure and functions.
11. Basic visual functions and methods of their study.

Content module 8. Physiological bases of behavior

1. Biological behaviors. Needs and motivations, their role in shaping behavior.
2. Congenital behavior. Instincts, their physiological role.
3. Acquired behaviors. Mechanisms of formation of conditioned reflexes, their differences from unconditioned ones.
4. Memory: types and mechanisms of formation.
5. Emotions, mechanisms of formation. Biological and informational theory of emotions. Their role in shaping behavior

Content module 9. Physiological bases of the higher nervous activity of the person

1. Functions of a new cerebral cortex and higher nervous activity of the person.
2. Biological and informational theories of emotions, their role in shaping behavior.
3. Functional asymmetry of the cerebral cortex, its integrative function.
4. Language, its functions, physiological basis of formation.
5. Thinking. Development of abstract thinking in man. The role of brain structures in the thinking process.
6. Types of higher nervous activity of man. Temperatures and character.
7. Sleep, its types, phases, electrical activity of the cortex, physiological mechanisms.
8. Age aspects of higher nervous activity in humans.

List of practical tasks

1. Perform function parameter calculations and graphically display processes occurring in exciting structures.
2. Draw diagrams and explain the structure and mechanisms:
 - contours of biological regulation, reflex arcs of motor reflexes;
 - development of processes of excitation and inhibition in the CNS, processes of their summation and coordination of reflexes;

- reflex arcs of motor reflexes at all levels of the CNS and leading pathways that ensure the interaction of different levels of the CNS;
- reflex arcs of autonomous reflexes that provide regulation of visceral functions;
- effects of various hormones on target cells and regulation of their secretion, circuits of regulation of visceral functions involving hormones.

3. To evaluate the status of sensory systems on the basis of the study of their functions.

4. Draw diagrams of the structure of specific channels of information transmission in sensory systems and explain the mechanisms of formation of relevant sensations and images of external reality.

5. Draw diagrams that explain the formation of biological behaviors and interpret the mechanisms of each of its stages, the role of emotions in behavior.

6. To evaluate and interpret the results of studies characterizing the types of human GNI.

MODULE 2. PHYSIOLOGY OF VISCERAL SYSTEMS

List of theoretical questions

Content module 10. Blood system

1. General characteristics of the blood system. Blood composition and function. The concept of homeostasis.

2. Blood plasma electrolytes. Osmotic blood pressure and its regulation.

3. Blood plasma proteins, their functional significance. Erythrocyte sedimentation rate (ESR).

4. Oncotic blood plasma pressure and its role.

5. Acid-base state of the blood, the role of the buffer blood systems in maintaining its constancy.

6. Erythrocytes, their functions. Regulation of erythropoiesis.

7. Types of hemoglobin and its compounds, their physiological role.

8. Leukocytes, their functions. Regulation of leukopoiesis. Physiological leukocytosis.

9. Platelets, their physiological role.

10. Vascular-platelet hemostasis, its mechanisms and physiological significance.

11. Coagulation hemostasis, its mechanisms and physiological significance.

12. Coagulants, anticoagulants, fibrinolysis factors, their physiological significance.

13. Physiological characteristics of the ABO blood system. Donor and recipient blood compatibility conditions. Samples before blood transfusion.

14. Physiological characteristics of the rhesus blood system (CDE). The value of rhesus accessory in blood transfusion and pregnancy.

Content module 11. Circulatory system

1. General characteristics of the circulatory system. Factors that ensure blood circulation in the blood vessels, its orientation and continuity.

2. Heart automatism. The gradient of automatism. The Stanius Experience.

3. Potential action of atypical cardiomyocytes Sino-atrial node, mechanisms of origin, physiological role.

4. The cardiac system. The sequence and speed of the excitation in the heart.

5. Potential action of typical ventricular cardiomyocytes, mechanisms of origin, physiological role. Ratio in PD time and single myocardial contraction.
6. Refractory periods during PD development of typical cardiomyocytes, their significance.
7. The conjugation of excitation and contraction in the myocardium. Mechanisms of contraction and relaxation of the myocardium.
8. Vector theory of ECG formation. Electrocardiographic leads. Origin of teeth, segments, ECG intervals.
9. Cardiac cycle, its phases, their physiological role.
10. Role of heart valves. Heart tones, mechanisms of their origin. FCG, its analysis.
11. The arterial pulse, its origin. SFG, its analysis.
12. Myogenic mechanisms of regulation of cardiac activity.
13. The nature and mechanisms of the effects of sympathetic nerves on cardiac activity. The role of sympathetic reflexes in the regulation of cardiac activity.
14. The nature and mechanisms of the effects of parasympathetic nerves on cardiac activity. Role of parasympathetic reflexes in regulation of cardiac activity.
15. Humoral regulation of heart activity. Dependence of the activity of the heart on changes in the ionic composition of the blood.
16. Features of structure and function of different departments of blood vessels. The basic law of hemodynamics.
17. The value of blood viscosity for blood circulation.
18. Linear and volumetric blood flow velocity in different areas of the vascular bed. Factors affecting their magnitude.
19. Blood pressure and changes in different sections of the vascular bed.
20. Blood pressure, factors that determine its value. Methods of blood pressure registration.
21. Circulation in capillaries. Mechanisms of fluid exchange between blood and tissues.
22. Circulation in the veins, the effect on it of gravity. Factors that determine the value of venous pressure.
23. Tone arterioles and venules, its value. Influence of vascular-motor nerves on the tone of vessels.
24. Myogenic and humoral regulation of vascular tone. The role of vascular endothelial secretion in the regulation of vascular tone.
25. Hemodynamic center. Reflex regulation of vascular tone. Press and reflex reflexes.
26. Reflex regulation of blood circulation when changing the position of the body in space (orthostatic test).
27. Regulation of blood circulation in muscular work.
28. Peculiarities of blood circulation in cerebral vessels and its regulation.
29. Features of blood circulation in the vessels of the heart and its regulation.
30. Features of pulmonary circulation and its regulation.
31. Mechanisms of lymph formation. Movement of lymph in vessels.

Content module 12. Respiratory system

1. General characteristics of the respiratory system. The main stages of breathing. Biomechanics of inhalation and exhalation.

2. Elastic pulmonary thrust, negative pressure in the pleural cleft.
3. External respiration. External respiratory indices and their evaluation.
4. Anatomical and physiological "dead space", its physiological role.
5. Diffusion of gases in the lungs. The diffusion capacity of the lungs and the factors on which it depends.
6. Oxygen transport by blood. Oxygen capacity of blood.
7. Oxyhemoglobin dissociation curve, factors affecting its course.
8. Transport of carbon dioxide by blood. The role of erythrocytes in the transport of carbon dioxide.
9. Physiological role of the respiratory tract, regulation of their lumen.
10. Respiratory center, its structure, regulation of breathing rhythm.
11. The mechanism of the first inhalation of a newborn baby.
12. Role of receptors of stretching lungs and afferent fibers of vagus nerves in regulation of respiration.
13. The role of central and peripheral chemoreceptors in the regulation of respiration. Blood components that stimulate external respiration.
14. Regulation of external respiration during exercise.

Content module 13. Energy exchange and thermoregulation

1. Sources and ways of using energy in the human body.
2. Methods for determining human energy consumption. Respiratory factor.
3. The main exchange and conditions of its definition, factors affecting its value.
4. Working exchange, the meaning of its definition.

Content module 14. Thermoregulation

1. Human body temperature, its daily fluctuations.
2. The physiological significance of homothermia. Center of thermoregulation, thermoreceptors.
3. Thermal formation in the body, its regulation.
4. Heat transfer in the body, its regulation.
5. Regulation of constancy of body temperature at different ambient temperatures.
6. Physiological basis of quenching.

Content module 15. Digestive system

1. General characteristics of the digestive system. Digestion in the oral cavity. Chewing, swallowing.
2. The composition of saliva, its role in digestion.
3. Mechanisms of saliva formation, primary and secondary saliva.
4. Regulation of salivation. Influence of irritant properties on saliva quantity and quality.
5. Methods of research of secretory function of a stomach at the person. The composition and properties of gastric juice. Mechanisms of hydrochloric acid secretion.
6. Complex reflex ("cephalic") phase of regulation of gastric secretion.
7. Neurohumoral ("gastric and intestinal") phase of regulation of gastric secretion. Enteral stimulants and inhibitors of gastric secretion.
8. Nervous and humoral mechanisms of inhibition of gastric secretion.

9. Gastric motor function and its regulation. Mechanisms of gastric contents transfer to the duodenum.

10. Methods of investigation of secretion of pancreatic juice in humans. The composition and properties of pancreatic juice.

11. Phases of regulation of the secretory function of the pancreas.

12. Methods of research of bile excretion at the person. Composition and properties of bile.

13. Regulation of bile formation and excretion. Mechanisms of bile flow into the duodenum.

14. The composition and properties of intestinal juice. Regulation of its secretion. Cavity and membrane digestion.

15. Suction in the digestive canal. Mechanisms of absorption of sodium ions, water, carbohydrates, proteins, fats.

16. Intestinal motor function, types of contractions, their regulation.

17. Physiological mechanisms of hunger and satiation.

Content module 16. Selection system

1. General characteristics of the selection system. The role of the kidneys in the processes of excretion. Features of blood supply to the kidney.

2. Mechanisms of urination. Filtering in the glomeruli and the factors on which it depends.

3. Reabsorption and secretion in nephrons, their physiological mechanisms.

4. Rotary-countercurrent-multiple system of nephrons, its physiological mechanisms and role.

5. Regulation of reabsorption of sodium and water ions in nephron tubules.

6. The role of the kidneys in providing iso-osmosis. Thirst mechanisms.

7. The role of the kidneys in providing isovolumia.

8. The role of the kidneys in ensuring the stability of the acid-base state of the blood.

9. Urination and its regulation.

Content module 17. Physiological bases of work and sports

1. Physiological basis of human labor activity.

2. Features of physical and mental work. Optimal modes of operation.

3. Physiological mechanisms of fatigue. Active rest and its mechanisms.

4. Age-related changes in human performance.

5. Physiological basis of sport. Principles of building optimal training regimes.

List of practical tasks

1. Determine the content of hemoglobin in the blood by the Sally method, evaluate the results.

2. Identify the blood group in the AB0 system and draw conclusions.

3. To calculate the color index of blood, to draw conclusions.

4. To determine the hematocrit index, to draw conclusions.

5. Determine the level of blood pressure under study, conclude.

6. To determine the duration of the period of tension of the ventricles of the heart based on the analysis of the polycardiogram, to conclude.

7. To determine the duration of the period of expulsion of blood from the ventricles of the heart based on the analysis of the polycardiogram, to conclude.
8. To determine the duration of total ventricular systole based on the analysis of the polycardiogram, to conclude.
9. To determine the duration of the phase of isometric contraction of the ventricles based on the analysis of the polycardiogram, to conclude.
10. Determine the direction and amplitude of the electrocardiogram teeth in standard leads. Draw conclusions.
11. Determine the duration of the cardiac cycle based on ECG analysis. Conclude.
12. Calculate on the basis of the ECG the duration of the P-Q interval. Conclude.
13. Calculate on the basis of ECG analysis the duration of the Q-T interval. Conclude.
14. Calculate on the basis of ECG analysis the duration of the QRS complex. Conclude.
15. Determine on the basis of the ECG analysis that is the driver of the heart rhythm. To reason the conclusion.
16. Calculate the respiratory volume, vital capacity of the lungs by spirogram. Conclude.
17. Calculate by spirogram the reserve volume of inhalation and exhalation. Conclude.
18. Spirogram to calculate the minute breathing volume. Conclude.
19. To calculate on the spirogram maximum ventilation of the lungs, to draw conclusions.
20. Calculate the respiratory reserve by spirogram. Conclude.
21. Determine by the spiograph of oxygen consumption investigated at rest and within the first minute after exercise, draw conclusions.
22. Determine according to the spirogram of oxygen consumption investigated at rest and within three minutes after loading, draw conclusions.
23. To calculate the main exchange of the investigated person, determining the oxygen consumption according to the spirogram registered under standard conditions, to make a conclusion.
24. Perform breathlessness tests. Conduct an analysis of the results.
25. How and why will salivation change after administration of human atropine?
26. Assess the secretory function of the stomach in humans.
27. Why in the increase of acidity of gastric juice recommend a dairy diet?
28. How and why will the secretion of pancreatic juice change with decreasing acidity of gastric juice?
29. What is the effect on the digestive process of reducing the bile acid content of bile? Why?
30. Suggest ways to increase the gut motor function. Give them physiological reasoning.
31. How and why will the amount and composition of gastric and pancreatic juices change upon admission to the duodenum of fats?
32. How and why will the amount and composition of gastric and pancreatic juices change upon admission to the stomach of cabbage juice?
33. Determine the filtration rate in the glomeruli, conclude.
34. Determine the amount of water reabsorption in the nephron. Conclude.

35. Evaluate the results of the study of kidney function by the Zymnitsky method.
36. To estimate a condition of an organism at physical activity on indicators of functions.

Typical tasks to solve

Test tasks

Variant 1

1. A physiological system specialized in the reception, processing and storage of information about the environment and the internal environment of the organism is:

- A) respiratory system
- B) circulatory system
- C) blood system
- D) nervous system
- E) digestive system

2. The afferent link of the reflex arc performs the functions of:

- A) conduction of excitation from the nerve center to the executive structure
- B) conduction of excitation from receptors to the nerve center
- C) perceives the action of the stimulus, converts its energy into the receptor potential and encodes the properties of the stimuli
- D) performs analysis and synthesis of information received, recoding of information and team development
- E) coordinate effector activity

3. In the reflex arc, usually the greatest delay time of the excitation is carried out at:

- A) the afferent link
- B) the efferent link
- C) the central link
- D) the link of afferent afferentation
- E) there is no right answer

4. When cutting the anterior roots of the spinal cord muscle tone:

- A) will practically not change
- B) extensor will increase
- C) will decrease moderately
- D) will virtually disappear
- E) flexor will increase

5. The central link of the reflex arc performs the functions of:

- A) conduction of excitation from the nerve center to the executive structure
- B) conduction of excitation from receptors to the nerve center
- C) perceives the energy of the stimulus, converts it into the receptor potential and encodes the properties of the stimuli
- D) performs analysis and synthesis of information received, recoding of information and team development
- E) perceives the receptor potential and converts it into action potential

Questions

1. What are the functions of the metencephalon?
2. What are the protective reflexes controlled by the medulla oblongata?
3. Describe the vestibular static reflexes of the metencephalon.

4. What is the conduction function of the medulla oblongata?
5. Define the concept of "reflex arc".

Situational tasks

1. In the body of the animal began an acute purulent inflammatory process. What changes can be expected in a hemogram?
2. In the experiment, an alien protein was introduced into the animal's body. Which blood cells provide an immunological response?
3. In the blood test revealed a reduced content of hemoglobin. What function of blood will be broken thus?
4. A woman with Rh- blood is pregnant with Rh+ fetus. Pregnancy first. The baby was born healthy. A few months after giving birth, the woman's blood was transfused with single blood, but the patient died in the phenomenon of hemotransfusion shock. What could have been the cause of it?

"0" test ticket form

Form N - 5.05

Petro Mohyla Black Sea National University

Educational and qualification level - Master

Knowledge area: 22 Health care

specialty 222 Medicine

Discipline - PHYSIOLOGY

Variant № 0

1. Physiological properties of the myocardium and their features. Heart automaticity. Action potential of atypical cardiomyocytes of the heart rhythm driver (pacemakers) - sino-atrial node.
2. Identify the blood group in the ABO system and draw conclusions.
3. General characteristics of the digestive system. Digestion in the oral cavity. Chewing, swallowing.

Situational task.

Explain the main differences between conditional and unconditional reflexes. What reflexes are such reflexes as food, protective, sexual and parental?

Approved at the meeting of the Department of "Medical Biology and Physics, Microbiology, Histology, Physiology and Pathophysiology", Protocol No. 1 of August 28, 2019

Head of the Department

Professor Koziy M.S.

Examiner

Senior Teacher Hilmutdinova M.Sh.

6. Learning methods

I. Methods of organization and implementation of educational and cognitive activity in the study of discipline:

- verbal: lectures with presentations. The lectures reveal the problematic issues of the relevant sections of physiology, clinical cases. Explanation of the regulation of physiological functions.

- visual: observations, illustrations, demonstrations.

- practical classes include: research by students of physiological functions in experimentation on animals, isolated organs, cells, models or on the basis of virtual studies presented in computer programs and other educational technologies; study of the functions of a healthy person; solving of situational problems (estimation of indicators of functions, parameters of homeostasis, mechanisms of regulation, etc.), which are of practical importance in the future professional activity of the future doctor.

II. The methods are different in logic of transfer and perception of educational information: inductive, deductive, analytical, synthetic.

III. Methods of different levels of autonomy of thinking: reproductive, search, research.

Independent work of students: with a book.

7. Evaluation criteria and diagnostic tools for learning outcomes

- Interviews (testing of theoretical knowledge and practical skills).
- Test control.
- Writing a review of scientific literature (abstracts), performing creative tasks, defending them.

Current control. Testing of practical knowledge of theoretical knowledge and mastering of practical skills, as well as the results of students' independent work. They are supervised by teachers according to the specific purpose of the curriculum. Assessment of the level of student preparation is carried out by: student questioning, decision and analysis of situational tasks and test tasks, interpretation of results of experimental and clinical-laboratory researches, control of mastering of practical skills.

Intermediate control. Examination of the possibility of using students for clinical diagnostic analysis of the theoretical knowledge and practical skills acquired on all the studied topics of the content module, as well as the results of students' independent work. It is carried out at the last lesson of the content module by passing practical skills, solving situational problems and testing.

Students with academic debt to the content module are not allowed.

The final module control is carried out upon completion of the study of all topics of the module at the last control lesson of the semester.

Intermediate content module and final module control are allowed students who have attended all the lectures provided, the curriculum, completed the full-time independent work.

The module score is defined as the sum of the grades of the current learning activity (in points), which are exposed during the test of theoretical knowledge and practical skills.

Exam Evaluation Criteria

“Excellent” (maximum 80 points) - meaningful answers and an understanding of the entire curriculum material. Consistent, reasonable and error-free presentation of the material using medical terminology. Independent, confident and correct application of the acquired knowledge to solve practical problems. The student is able to correctly depict and explain the components of the reflex arcs of various types of reflexes, to depict and characterize the action patterns of various hormones on the target cell, the regulation patterns of hormone secretion by the endocrine glands, analyze the structure of the cardiac cycle, analyze changes in the basic physiological constants of blood, evaluate the results of studies using such indicators like: lung capacity, respiratory rate, heart rate, blood pressure, analyzes the results of studies in visual acuity and hearing acuity, is able to interpret the results of studies to determine the types of higher nervous activity.

“Good” (maximum 70 points) - knowledge and understanding of all program material. Reasonable presentation of the material with minor deviations. Correct and without much difficulty applying theoretical knowledge in solving practical problems. The student is able to correctly explain the components of the reflex arcs of various types of reflexes, characterize the action patterns of various hormones on the target cell, accurately analyze the structure of the heart cycle, analyze changes in the basic physiological blood constants, evaluate the results of studies using indicators such as: lung capacity, respiratory rate, heart rate, blood pressure, analyzes the results of studies of visual acuity and hearing, is able to interpret the results of follow-up to determine the types of higher nervous activity.

“Satisfactory” (from 60 to 50 points) - knowledge and understanding of all program material in an amount that is satisfactory to conduct further work. Simplification of the presentation of the material with minor errors that do not affect the overall result. Application of acquired knowledge to solve practical problems with difficulties. The student makes mistakes when interpreting changes in the basic physiological constants of blood, makes mistakes when interpreting studies of visual acuity and hearing, changes in lung capacity, respiratory rate, heart rate, and blood pressure.

“Unsatisfactory” (less than 50 points) - a misunderstanding of most of the program material, its presentation with serious errors. Application of acquired knowledge with the assumption of gross errors that affect the final result. The student cannot accurately analyze changes in the basic physiological constants of blood, evaluate the results of studies using indicators such as: vital capacity of the lungs, respiratory rate, heart rate, blood pressure; cannot explain the components of the reflex arc, as well as characterize the effect of hormones on target cells. The student does not know how to interpret changes in the basic physiological constants of blood.

The final grade is set as the sum of the points when answering individual questions. The answer to each question is rated at a maximum of 20 points.

The maximum number of points that a student can receive as a result of passing the final modular control (exam) is 80. The final modular control (exam) is considered to be credited if the student has scored at least 50 points. The maximum number of points that a student can earn while studying for each module is 200 points.

The evaluation criteria for diagnosing educational outcomes

№ of the p/c	Module 1	Maximum number of points
1	Practical class 1	5
2	Practical class 2	5
3	Practical class 3	5
4	Practical class 4	5
5	Practical class 5	5
6-7	Practical class 6-7	5
8	Control work 1	20
9-10	Practical class 9-10	5
11	Practical class 11	5
12	Practical class 12	5
13	Practical class 13	5
14	Control work 2	20
15-16	Practical class 15-16	5
17-18	Practical class 17-18	5
19-20	Practical class 19-20	5
21	Practical class 21	5
22	Control work 3	20
23	Practical class 23	5
24	Practical class 24	5
25	Practical class 25	5
26	Practical class 26	5
27-28	Practical class 27-28	5
29-30	Practical class 29-30	5
31	Control work 4	20
32	Modular control work	20
	TOGETHER	200

№ of the p/c	Module 2	Maximum number of points
1	Practical class 1	4
2	Practical class 2	4
3	Practical class 3	4
4	Practical class 4	4
5	Control work 1	5
6	Practical class 6	4
7-8	Practical class 7-8	4
9	Practical class 9	4
10-11	Practical class 10-11	4
12	Practical class 12	4
13	Practical class 13	4
14	Practical class 14	4
15	Control work 2	5
16	Practical class 16	4
17	Practical class 17	4
18	Practical class 18	4
19	Practical class 19	4
20	Practical class 20	4
21	Control work 3	5
22-23	Practical class 22-23	4
24	Practical class 24	4
25	Practical class 25	4
26	Practical class 26	4
27-28	Practical class 27-28	4
29-30	Practical class 29-30	4
31	Control work 4	5
32	Practical class 32	4
33	Modular control work	8
	Together for the module	120
	Final modular control (exam)	80
	TOGETHER	200

On a scale ECTS	On a scale of university	On a national scale
A	180 – 200 (excellent)	5 (excellent)
B	160 – 179 (very good)	4 (good)
C	150 – 159 (good)	
D	130 – 149 (satisfactory)	3 (satisfactory)
E	120 – 129 (sufficiently)	
FX	70 – 119 (unsatisfactory - with possible reassembly)	2
F	1 – 69 (unsatisfactory - with a compulsory repeat course)	(unsatisfactory)

8. Recommended literature

Basic

1. Moroz V.M. / Physiology: [textbook] / V.M. Moroz, O.A. Shandra. 2018. – 728 p.
2. Physiology. Edited by I.M.Karvatsky. Textbook for practical studies and individual work for Englishspeaking students. 2-th Vol. – Kyiv. Phenix, 2019. V.1 – 296 p., V.2 – 296 p.
3. Guyton and Hall Textbook of medical physiology. John E. Hall, 13th ed. ElsevierInc. 2016. – 1168 p.
4. Ganong's Review of Medical Physiology 25th ed. McGraw-Hill Education. 2016. – 750 p.
5. Essentials of Medical Physiology. K Sembulingam, Prema Sembulingam, Sixth Edition. Jaypee Brothers Medical Publishers. 2012 – 1113 p.

Additional

1. Human Physiology. Edited by R.F. Schmidt, G.Thews. – Springer-Verlag, Berlin-Heidelberg-New York. 1983. – 725 p.
2. Color Atlas of Physiology. 6th edition. Stefan Silbernagl, Agamemnon Desopoulos. – Thieme New York. 2009. – 455 p.
3. Medical physiology. Costanzo L. 5th Edition / Elsevier Health Sciences – 2013. – 520 p.

9. Information resources

1. <http://www.physiologyinfo.org>
2. <http://www.medicalnewstoday.com>
3. <http://www.physoc.org>
4. <http://www.medtropolis.com>
5. <http://www.physiologyweb.com>
6. <http://www.osmosis.org>