

**Assessment tools for conducting attestation in discipline «Normal Physiology»
for students of 2025, 2026 year of admission
under the educational programme 31.05.01 General Medicine,
specialisation (profile) General Medicine (Specialist's degree),
form of study full-time for the 2026-2027 academic year**

Assessment tools for conducting continuous assessment during classes (CA), evaluating the independent work of students (IW), and conducting intermediate certification (IC), allowing to verify the students' acquisition of the knowledge (k) / abilities (a) / skills (s) stipulated by the discipline program:

GPC-5.1.1 Knows general biological principles, the basics of heredity and variation, anatomy, histology, embryology, topographic anatomy, physiology, pathological anatomy and physiology of human organs and systems.

Educational Program (EP) Learning Outcomes (Competences)	Competence Achievement Indicators	Discipline Learning Outcomes
GPC-5. Able to evaluate morphofunctional, physiological states, and pathological processes in the human body to solve professional problems.	GPC-5.1.1 Knows: Knows general biological principles, the basics of heredity and variation, anatomy, histology, embryology, topographic anatomy, physiology, pathological anatomy and physiology of human organs and systems.	k-1. Knows the physiology of human organs and systems.

No.	Discipline section forming this KAS (module)	Task type	Task content	Correct answer	CA	IW	IC
1	Module 1 General Physiology Modular unit 1. Introduction to the subject. Electrical phenomena in excitable tissues. Physiology of excitable tissues. Basic laws of stimulation	1. Choice of several correct answers	Choose three correct answers out of six. Physiological features of smooth muscles include: 1. Smooth muscle has the ability of automatism, contributing to spontaneous contraction without external stimulation.	1. Smooth muscle has the ability of automatism, contributing to spontaneous contraction without external stimulation. 3. Smooth muscle fibers are able to maintain tension for a long	yes	no	no

Modular unit 2. Physiology of excitable tissues. Muscle contraction. Muscle strength and work. Fatigue Modular unit 3. Control of knowledge, abilities, skills on the topic 'Physiology of excitable tissues' Modular unit 4. General physiology of the central nervous system. Reflex and reflex arc. Properties of nerve centers Modular unit 5. Basics of coordination of reflex activity. Special physiology of the central nervous system. Structure and functions of subcortical brain structures Modular unit 6. Autonomic nervous system. Neural regulation of autonomic functions Modular unit 7. Hormonal regulation of physiological functions (part 1) Modular unit 8. Hormonal regulation of physiological functions (part 2) Modular unit 9. Control of knowledge, abilities, skills on the topics 'Mechanisms of regulation of physiological processes. Physiology of the central nervous system', 'Hormonal regulation of physiological functions' Modular unit 10. Physiology of analyzers (part 1). Visual		2. Smooth muscle contraction is regulated primarily by adrenergic fibers of the sympathetic nervous system. 3. Smooth muscle fibers are able to maintain tension for a long time, expending a minimal amount of energy. 4. Smooth muscle cells are characterized by the presence of well-defined transverse striations. 5. Unlike skeletal muscles, the contraction of smooth muscles develops and stops much faster. 6. A lower concentration of calcium is sufficient to activate smooth muscle than to excite striated fibers.	time, expending a minimal amount of energy. 6. A lower concentration of calcium is sufficient to activate smooth muscle than to excite striated fibers.			
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analyzer. Auditory analyzer Modular unit 11. Higher nervous activity. Physiology of the conditioned reflex. Modular unit 12. Features of human higher nervous activity. Modular unit 13. Control of knowledge, abilities, skills on the topics 'Physiology of analyzers' and 'Higher nervous activity'. Modular unit 14. Metabolism and energy. Thermoregulation. Nutrition. Module 2 Special physiology Modular unit 1. Heart activity. Properties of the heart muscle Modular unit 2. Heart activity. Methods of examining the heart. Electrocardiography Modular unit 3. Regulation of heart activity. Humoral regulation of the heart. Modular unit 4. Basics of hemodynamics Modular unit 5. Regulation of vascular tone. Regional blood circulation. Lymph and lymph circulation Modular unit 6. Physiology of the excretory system (part 1) Modular unit 7. Physiology of the excretory system (part 2) Modular unit 8. Control of knowledge, abilities, skills on the topics 'Physiology of the						
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	cardiovascular system', 'Physiology of the excretory system' Modular unit 9. Physiology of the blood system. Physicochemical properties of blood Modular unit 10. Physiology of the blood system. Formed elements of blood Modular unit 11. Physiology of the blood system. Leukocyte formula. Blood types. Immune system Modular unit 12. External respiration Modular unit 13. Regulation of respiration Modular unit 14. Control of knowledge, abilities, skills on the topics 'Physiology of blood' and 'Physiology of respiration'. Modular unit 15. Digestion in the oral cavity and stomach Modular unit 16. Digestion in the intestines						
2		2. Situational tasks/cases	Situational task on neuromuscular transmission disorders in the synapse. Patient A., 38 years old, applied to the polyclinic with complaints of increasing weakness of the muscles of the face, neck, arms, and legs, especially pronounced in the evening and after physical exertion. The complaints appeared about a month ago and gradually progressed. The patient also noted the appearance of diplopia and double vision	myasthenia gravis	yes	no	yes

			when looking up and horizontally. She has problems with speech and swallowing food. Examination revealed the following symptoms: Asymmetrical drooping of the upper eyelid (ptosis). Impaired movement of the eyeballs (ophthalmoplegia), inability to look up and oblique movements of the eyeballs cause double vision. Slurred speech ("nasal", dysarthria). Noticeable muscle weakness in the extremities, predominantly in the proximal parts of the arms and legs. There are no sensory impairments or skin trophic disorders. Laboratory examination revealed an elevated level of antibodies to acetylcholine receptors (AChR-ab). Electromyographic examination confirmed the diagnosis — the presence of pathological fatigue and a decrease in the amplitude of motor unit potentials upon repeated stimulation. Question What disease is most likely in the patient?			
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GPC-5.2.1 Able to evaluate basic morphofunctional data, physiological states, and pathological processes in the human body

Educational Program (EP) Learning Outcomes (Competences)	Competence Achievement Indicators	Discipline Learning Outcomes
GPC-5. Able to evaluate morphofunctional, physiological states, and pathological processes in	GPC-5.2.1 Able to:	a-1. Able to evaluate physiological states and

the human body to solve professional problems.	Able to evaluate basic morphofunctional data, physiological states, and pathological processes in the human body	processes in the human body
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No.	Discipline section forming this KAS (module)	Task type	Task content	Correct answer	CA	IW	IC
1	Module 1 General Physiology Module 2 Special physiology	1. Establish the sequence/Match concepts	Match the concepts 1. Sympathetic division 2. Parasympathetic division 3. Metasympathetic division A. Definition: The division of the autonomic nervous system that is activated in a state of stress, anxiety, or physical exertion ("fight or flight response"). It is responsible for the rapid mobilization of body resources, increased heart rate, increased blood pressure, dilated pupils, and decreased digestive activity B. Definition: The division of the autonomic nervous system that turns on in a state of rest and relaxation ("rest and digest response"). It is responsible for slowing down heart activity, lowering blood pressure, enhancing digestive processes, secreting from endocrine glands, and ensuring regeneration and energy accumulation by the body. C. Definition: The local autonomic nervous system located within the organs themselves and directly regulating their functions without the participation of the higher parts of the brain. For example, it regulates the activity of the heart,	1. Sympathetic division Definition: The division of the autonomic nervous system that is activated in a state of stress, anxiety, or physical exertion ("fight or flight response"). It is responsible for the rapid mobilization of body resources, increased heart rate, increased blood pressure, dilated pupils, and decreased digestive activity. 2. Parasympathetic division Definition: The division of the autonomic nervous system that turns on in a state of rest and relaxation ("rest and digest response"). It is responsible for slowing down heart activity, lowering blood pressure, enhancing digestive processes, secreting from endocrine glands, and ensuring regeneration and energy accumulation by the body. 3. Metasympathetic division Definition: The local autonomic nervous system located within	yes	no	no

			gastrointestinal tract, and urinary system, controlling the contractility of smooth muscle structures and the functioning of exocrine and endocrine glands.	the organs themselves and directly regulating their functions without the participation of the higher parts of the brain. For example, it regulates the activity of the heart, gastrointestinal tract, and urinary system, controlling the contractility of smooth muscle structures and the functioning of exocrine and endocrine glands.			
2		2. Situational tasks/cases	A young man underwent a preventive examination and a high cholesterol level was found in his blood test. Ultrasound examination revealed atherosclerotic plaques in the carotid arteries. Question: What complications are possible with this condition?	acute cerebrovascular accident	yes	yes	yes

GPC-5.3.1 Has the skill of evaluating basic morphofunctional data, physiological states, and pathological processes in the human body when solving professional problems.

Educational Program (EP) Learning Outcomes (Competences)	Competence Achievement Indicators	Discipline Learning Outcomes
GPC-5. Able to evaluate morphofunctional, physiological states, and pathological processes in the human body to solve professional problems.	GPC-5.3.1 Has the skill Has the skill of evaluating basic morphofunctional data, physiological states, and pathological processes in the human body when solving professional problems.	s-1. Has the skill of evaluating physiological states and their disorders in the human body.

No.	Discipline section forming this KAS (module)	Task type	Task content	Correct answer	CA	IW	IC
1	Module 1 General Physiology Module 2 Special physiology	1. Choice of several correct answers	Choose three correct answers out of six. Which factors affect the level of arterial blood pressure?	Correct options: A. Heart rate B. Circulating blood volume C. Vessel diameter	yes	no	no

			A. Heart rate B. Circulating blood volume C. Vessel diameter D. Hormonal background of the body E. Eye color F. Air temperature				
2		2. Situational tasks/cases	Situational task on the topic "External respiration": Patient A., a 38-year-old man, visited the clinic complaining of shortness of breath occurring during physical exertion, a feeling of lack of air even at rest, a cough with a small amount of sputum, and general weakness. According to the medical history, it is known that the patient has been smoking for the last 15 years, smoking approximately one pack of cigarettes daily. Objectively, paleness of the skin, cyanosis of the lips, weakened breathing on the right, and wheezing in the lower lungs are noted. Auscultation reveals harsh breath sounds and dry wheezing. Which changes in spirometry parameters are most likely to be detected in the patient?	decrease in vital capacity (VC)	yes	no	yes

GPC-10.1.1 Knows: the capabilities of reference and information systems and professional databases; the methodology of searching for information, information and communication technologies; modern biomedical terminology; the principles of evidence-based and personalized medicine; the basics of information security in professional activities, legal norms in the field of personal data protection, corporate ethics, medical and state secrets.

Educational Program (EP) Learning Outcomes (Competences)	Competence Achievement Indicators	Discipline Learning Outcomes
GPC-10. Able to understand the principles of modern information technologies and use them to solve professional activity tasks.	GPC-10.1.1 Knows: the capabilities of reference and information systems and professional databases; the methodology of searching for information, information and	k-1. Knows: the basics of a healthy human lifestyle as a factor in safe living; methods for diagnosing the functioning of human organs and systems.

	communication technologies; modern biomedical terminology; the principles of evidence-based and personalized medicine; the basics of information security in professional activities, legal norms in the field of personal data protection, corporate ethics, medical and state secrets.	
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No.	Discipline section forming this KAS (module)	Task type	Task content	Correct answer	C A	IW	IC
1	Module 1 General Physiology Module 2 Special physiology	1. Choice of several correct answers	Choose three correct answers out of six. Test on the topic "Features of the physiology of cerebral circulation" Question: Choose the statements that correctly reflect the features of cerebral circulation: 1. The brain receives approximately 15% of the total circulating blood volume. 2. Blood supply to the brain is provided by two systems: vertebrobasilar and carotid. 3. Cerebral circulation is absolutely autonomous and does not depend on blood pressure. 4. Blood pressure inside the skull is significantly higher than in other parts of the body. 5. To be adequately supplied with oxygen, the brain requires a constant, stable blood flow. 6. A decrease in blood supply to the brain is accompanied by serious impairments of consciousness and motor coordination.	Correct answers: 1, 2, 5 1. The brain receives approximately 15% of the total circulating blood volume. 2. Blood supply to the brain is provided by two systems: vertebrobasilar and carotid. 5. To be adequately supplied with oxygen, the brain requires a constant, stable blood flow.	yes	yes	no
2		2. Situational tasks/cases	Situational task on the topic "Physiology of blood"	erythrocytosis	yes	no	yes

			During a medical check-up, a young man was found to have elevated hematocrit (Ht = 55%) and red blood cell count ($RBC = 6.5 \times 10^{12}/L$), with the norm being $Ht \approx 40-50\%$, $RBC \approx 4.5-5.5 \times 10^{12}/L$. The man reported that he had recently returned from a mountainous area where he spent his vacation at an altitude of about 3000 meters above sea level. Other laboratory parameters are within normal limits. Question 1. What do the detected changes in laboratory blood parameters indicate?			
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GPC-10.2.1 Able to carry out an effective search for information necessary to solve professional activity tasks using reference systems and professional databases; use modern biomedical terminology; master and apply modern information and communication technologies in professional activities, taking into account the main requirements of information security.

Educational Program (EP) Learning Outcomes (Competences)	Competence Achievement Indicators	Discipline Learning Outcomes
GPC-10. Able to understand the principles of modern information technologies and use them to solve professional activity tasks.	GPC-10.2.1 Able to carry out an effective search for information necessary to solve professional activity tasks using reference systems and professional databases; use modern biomedical terminology; master and apply modern information and communication technologies in professional activities, taking into account the main requirements of information security.	a-1. Able to use the basic concepts of general and special physiology when mastering medical literature.

No.	Discipline section forming this KAS (module)	Task type	Task content	Correct answer	CA	IW	IC
1	Module 1 General Physiology	1. Establish the	Establish the sequence of events during the	1. The action potential reaches	yes	no	no

	Module 2 Special physiology	sequence/Match concepts	transmission of excitation and write down the corresponding sequence of numbers. 1. The action potential reaches the presynaptic terminal of the motor neuron axon. 2. Voltage-gated calcium channels in the presynaptic terminal open, calcium rushes into the cell. 3. Calcium entry initiates the fusion of vesicles filled with acetylcholine with the presynaptic membrane and the exocytosis of acetylcholine into the synaptic cleft. 4. Acetylcholine molecules bind to nicotinic acetylcholine receptors of the postsynaptic membrane (sarcolemma) of the muscle cell. 5. Bound acetylcholine opens the ion channels of the receptors, allowing a flow of sodium and potassium ions to change the transmembrane potential. 6. The change in the transmembrane potential causes the appearance of an end-plate potential (EPP) propagating along the sarcolemma. 7. Further propagation of the electrical signal along the T-tubules and Ca^{2+} channels in the sarcoplasmic reticulum initiates the process of muscle fiber contraction. 8. Acetylcholine is destroyed by acetylcholinesterase located in the synaptic cleft, which prevents prolonged excitation and returns the synapse to its initial state of readiness to receive the next impulse.	the presynaptic terminal of the motor neuron axon. 2. Voltage-gated calcium channels in the presynaptic terminal open, calcium rushes into the cell. 3. Calcium entry initiates the fusion of vesicles filled with acetylcholine with the presynaptic membrane and the exocytosis of acetylcholine into the synaptic cleft. 4. Acetylcholine molecules bind to nicotinic acetylcholine receptors of the postsynaptic membrane (sarcolemma) of the muscle cell. 5. Bound acetylcholine opens the ion channels of the receptors, allowing a flow of sodium and potassium ions to change the transmembrane potential. 6. The change in the transmembrane potential causes the appearance of an end-plate potential (EPP) propagating along the sarcolemma. 7. Further propagation of the electrical signal along the T-tubules and Ca^{2+} channels in the sarcoplasmic reticulum initiates the process of muscle fiber contraction. 8. Acetylcholine is destroyed by acetylcholinesterase located in the synaptic cleft, which prevents			
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				prolonged excitation and returns the synapse to its initial state of readiness to receive the next impulse.			
2		2. Situational tasks/cases	A 65-year-old patient is diagnosed with chronic heart failure. One of the clinical features of the disease is peripheral edema of the legs. Why does the heart affect the state of the lymphatic system? Question: What mechanism underlies the appearance of edema of the lower extremities in chronic heart failure?	lymph flow deteriorates	yes	yes	yes

2. Questions for intermediate certification:

1. Concept of homeostasis and homeokinesis. Self-regulatory principles of maintaining the constancy of the internal environment of the body.
2. Main forms of regulation of physiological functions. Relationship between neural and humoral mechanisms of regulation.
3. General and specific properties of excitable tissues. Stimuli, their classification. Measure of excitability.
4. Biological membranes, their structure and functional features. Ion channels, their classification and role. Types of transport of substances across biological membranes.
5. Resting membrane potential. Modern concepts of the mechanism of its origin. Method of its registration.
6. Action potential, its phases. Modern concept of the generation mechanism.
7. Types of electrical responses of excitable tissues (electrotonic potential, local response, action potential). Mechanism of their occurrence.
8. Excitability. Changes in excitability during excitation.
9. The law of strength. The 'all-or-none' law and its relative nature.
10. The 'strength-duration' law. Concept of utilization time, rheobase, and chronaxie. Chronaximetry and its clinical significance.
11. Polar law of stimulation. Physiological electrotonus. Cathodal depression.
12. Law of gradient. Accommodation, speed of accommodation, and its measure.
13. Ultramicroscopic structure of myofibrils at rest and during contraction. Contractile and regulatory proteins. Modern concept of the mechanism of muscle contraction and relaxation.
14. Summation of contractions and its types. Tetanus and its types.
15. Modes of muscle contraction (isotonic, isometric, mixed). Muscle strength and work. The rule of medium loads.
16. Morphofunctional features of smooth muscles.
17. Myoneural synapse, structure. Mechanism of excitation transmission in it. End-plate potential.

18. Classification of nerve fibers. Propagation of excitation along unmyelinated and myelinated nerve fibers. Characteristics of their excitability and lability. Laws of excitation conduction along a nerve.
19. Principles of coordination activity of the CNS (convergence, final common pathway, divergence, irradiation, reciprocal inhibition, dominant focus).
20. Neuron as a structural and functional unit of the CNS. Physiological properties of a neuron. Structure and classification of neurons.
21. The doctrine of the reflex (R. Descartes, J. Prochaska), its development in the works of I.M. Sechenov, I.P. Pavlov, P.K. Anokhin. Classification of reflexes. Reflex arc, reverse afferentation (feedback) and its significance. Reflex time. Receptive field of a reflex.
22. P.K. Anokhin's theory of functional systems and self-regulation of physiological functions. Nodal mechanisms of a functional system. Regional component. P.K. Anokhin's contribution to the development of national physiological science.
23. Structure, classification, and functional properties of synapses. Morphofunctional features of electrical and chemical synapses.
24. Excitatory synapses, their neurotransmitters, and receptors. Features of excitation transmission. Mechanisms of development of excitatory postsynaptic potential (EPSP). Properties of synapses.
25. Inhibitory synapses and their neurotransmitters. Mechanism of development of inhibitory postsynaptic potential (IPSP). Interaction of inhibitory and excitatory synapses.
26. Nerve center. Anatomical and physiological concept of a nerve center. Properties of nerve centers.
27. Inhibition in the CNS. The role of I.M. Sechenov in its discovery. Types of inhibition.
28. Primary inhibition. Its types. Mechanism of occurrence.
29. Secondary inhibition. Its types. Mechanism of occurrence.
30. Structural and functional features of the somatic and autonomic nervous systems.
31. Autonomic nervous system. Structural and functional features. Synapses, neurotransmitters, and receptors of the ANS.
32. Sympathetic, parasympathetic, and metasympathetic divisions of the ANS, their morphofunctional features.
33. Autonomic reflexes. Features of the reflex arc, classification, and clinical significance. Examples of autonomic segmental and suprasegmental reflexes.
34. Levels of regulation of autonomic functions. Hypothalamus as the highest subcortical center for the regulation of autonomic functions.
35. Conditioned reflex as a form of human adaptation to changing environmental conditions. Differences between conditioned and unconditioned reflexes. Regularities of the formation and manifestation of conditioned reflexes.
36. Structural and functional basis of a conditioned reflex. Modern concepts of the mechanisms of temporary connection formation.
37. Inhibition of conditioned reflexes, its types. Modern concepts of inhibition mechanisms.
38. Features of human higher nervous activity (HNA). I.P. Pavlov's doctrine on the types of higher nervous activity, the 1st and 2nd signaling systems.
39. Emotions, their genesis, classification, and significance in purposeful human activity. Emotional stress and its role in the formation of psychosomatic diseases.
40. Sleep, its electrophysiological characteristics, and significance for the body. Sleep phases. Theories of sleep.
41. Bioenergetics of the body. Methods for determining energy metabolism. Basal metabolic rate and factors affecting its value. Clinical significance of basal metabolism.
42. Working metabolism, energy expenditure of the body during various types of labor. Working increment. Specific dynamic action of food. Distribution of the population into groups depending on energy expenditure.
43. Human body temperature. Temperature of the skin and internal organs. Heat production and heat loss and their mechanisms. Isothermia and its regulation.
44. Digestion in the oral cavity. Composition and physiological role of saliva. Regulation of the secretory activity of the salivary glands. Adaptive nature of

salivation.

45. Digestion in the stomach. Composition and properties of gastric juice. Regulation of gastric secretion. Phases of gastric juice secretion. Adaptive nature of the secretory activity of the stomach.
46. Digestion in the duodenum. Composition and properties of pancreatic secretion. Regulation of pancreatic secretion.
47. The role of the liver in digestion. Composition and properties of bile. Regulation of bile formation and its excretion into the duodenum.
48. Cavity and parietal (membrane) digestion. Absorption of nutrients. Motor activity of the small intestine and its regulation.
49. Functional features of the neurohumoral regulation of digestion. Gastrointestinal hormones.
50. Blood, its functions, volume, and composition. Hematocrit. Blood plasma and its physicochemical properties. Osmotic pressure of blood and its functional role. Regulation of the constancy of blood osmotic pressure.
51. Blood plasma proteins, their physiological significance. Oncotic pressure of blood and its role. Erythrocyte sedimentation rate (ESR), factors affecting its value. Clinical significance of ESR.
52. Erythrocytes, structure, quantity, functions. Hemoglobin, quantity, types, compounds, and their physiological significance.
53. Leukocytes, structure, quantity, types, functions. Leukocyte formula (differential white blood cell count) and its clinical significance.
54. Concept of hemostasis. Vascular-platelet hemostasis. Platelets and their role in blood coagulation. Concept of the coagulation and anticoagulation systems of blood.
55. Concept of hemostasis. Coagulation hemostasis. Factors and phases of blood coagulation.
56. Blood groups. ABO system. Determination of blood groups in humans. Rules for blood transfusion.
57. Rh factor. Accounting for Rh blood group in the clinic. Rh conflict between mother and fetus.
58. Respiration, its main stages. Mechanisms of external respiration. Biomechanics of inspiration and expiration. Respiratory muscles. The role of the pleural cavity in the act of breathing.
59. Modern concepts of the structure and localization of the respiratory center. Automatism of the respiratory center.
60. Gas exchange in the lungs. Partial pressure and gas tension. Physiological bases of gas exchange in the lungs. Basic laws of gas transition across the membrane.
61. Transport of O₂ by blood. Oxyhemoglobin dissociation curve, its characteristics. Oxygen capacity of blood. Transport of CO₂ by blood.
62. Reflex-humoral mechanisms of respiration regulation. Mechanism of the first breath of a newborn.
63. Gas exchange between blood and tissues. Causes of tissue hypoxia. Breathing under conditions of low and high barometric pressure.
64. Basics of hemodynamics. Factors ensuring the forward movement of blood.
65. Main properties of the heart muscle. Automatism of the heart. Anatomical substrate and nature of automatism. Conduction system of the heart. Gradient of automatism. Leading role of the sinus node in automatism.
66. Changes in the excitability of the heart muscle during excitation (ratio of phases of excitability, excitation, and muscle contraction). Features of the refractory period. Extrasystole.
67. Features of excitation of the heart muscle. Action potential of typical cardiomyocytes and cells of the conduction system of the heart.
68. Cardiac cycle and its phases. Blood pressure in the heart cavities during different phases of the cardiac cycle. Function of the valvular apparatus of the heart.
69. Classification of mechanisms for regulating blood circulation. Intracardiac regulation of heart activity. Intracellular, intercellular, and intracardiac neural regulation. Endocrine function of the heart. Physiological effects of atriopeptin (ANP).
70. Extracardiac neurohumoral regulation of cardiac activity. Innervation of the heart. Influence of sympathetic and parasympathetic nerves on heart function.

- Influence of hormones, neurotransmitters, and electrolytes on the heart.
71. Morphofunctional classification of vessels. Vascular tone and its components. Innervation of vessels. Mechanisms of vasoconstriction and vasodilation. Humoral regulation of vascular tone.
 72. Main hemodynamic parameters of blood flow through vessels (volumetric and linear velocity of blood flow). Blood pressure in various parts of the vascular system. Arterial pressure and factors determining its value. Main indicators of arterial pressure.
 73. Vasomotor center. Reflex regulation of systemic arterial pressure. Significance of vascular reflexogenic zones. Vascular reflexes (proprioceptive and exteroceptive).
 74. Microcirculation, its components, characteristics. Classification of capillaries. Mechanisms of transcapillary exchange. Capillary blood flow, its functional characteristics and parameters.
 75. Arterial pulse: origin, characteristics, and methods of registration.
 76. I.P. Pavlov's doctrine on analyzers. Structure and functions of analyzers. Mechanism of excitation generation in receptors. Receptor and generator potentials.
 77. Physiology of the visual analyzer. Receptor apparatus. Photochemical processes in the retina under the action of light. Theories of color vision (M. Lomonosov, H. Helmholtz, P. Lazarev).
 78. Physiology of the pain analyzer. Antinociceptive system.
 79. Physiology of the auditory analyzer. Sound-catching and sound-conducting apparatus of the organ of hearing. Electrophysiological characteristics of the receptor part. Theories of sound perception (H. Helmholtz, G. von Békésy).
 80. Physiology of the vestibular analyzer. Static and statokinetic reflexes.
 81. Organs and processes of excretion. Functions of the kidneys. Nephron as a structural and functional unit of the kidney. Mechanisms of urine formation. Glomerular ultrafiltration. Tubular reabsorption. Tubular secretion. Regulation of urine formation.
 82. Homeostatic function of the kidneys. Mechanisms of urine excretion and urination. Composition and properties of final urine. Excretory function of the kidneys. Metabolic function of the kidneys. Hemodialysis. The role of the kidneys in regulating blood pressure.
 83. Rheobase, chronaxie and their significance in clinical practice. Chronaximetry.
 84. Receptors: concepts, classification, basic properties, and features of excitation.
 85. Fatigue. Fatigue of an isolated muscle, neuromuscular preparation, and neuromotor unit in an intact organism. Theories of fatigue.
 86. Features of mental labor. Overwork. Prevention of fatigue. Active and passive rest.
 87. Cutaneous and tendon reflexes in humans and their clinical significance.
 88. Sensory and motor disorders with complete and partial transection of the spinal cord (spinal shock, Brown-Séquard syndrome).
 89. Electroencephalography. EEG rhythms and their characteristics.
 90. Sleep, its physiological significance. Phases of sleep, theories of sleep. Characteristics of human electroencephalogram under conditions of natural sleep and wakefulness.
 91. Protein metabolism. Protein minimum and optimum. Nitrogen balance, its types. Protein starvation.
 92. Physiological norms of nutrients in the daily diet. Dietary regimens. Modern approaches to rational nutrition.
 93. Physiological bases of hunger and satiety.
 94. Analysis of typical curves of gastric secretion for bread, meat, and milk. Adaptive nature of gastric secretion to different types of food.
 95. Methods for studying the secretory and motor functions of the human stomach. Starter (appetite) juice and its significance.
 96. Carbohydrate metabolism. Normo-, hypo-, and hyperglycemia. Mechanism of maintaining a constant blood glucose level.

97. Endocrine function of the pancreas and its role in the regulation of metabolism.
98. Endocrine role of the thyroid gland and its role in metabolism.
99. Endocrine function of the adrenal and sex glands. Human reproductive system.
100. Hypothalamic-pituitary system and its role in regulating body functions.
101. Regulation of blood calcium levels. Role of thyroid and parathyroid hormones.
102. Minute respiratory volume, its determination. 'Dead space' and alveolar ventilation, its efficiency depending on the frequency and depth of breathing. Restrictive and obstructive types of ventilation impairment.
103. Pressure in the pleural cavity, its changes in different phases of the respiratory cycle and role in the mechanism of external respiration. Pneumothorax.
104. Partial pressure of gases O₂ and CO₂ in alveolar air and their tension in blood. Gas exchange in the lungs.
105. Physiological bases of artificial respiration. Effect of a mixture of 96% O₂ and 4% CO₂. Reaction of external respiration to hypoxia.
106. Physiological mechanisms of decompression sickness and diving-related conditions. Breathing during muscular work. Artificial respiration.
107. Breathing in altered environmental conditions. Mountain (altitude) sickness, decompression sickness, their physiological mechanisms. Predisposing factors. Measures to eliminate consequences.
108. Functions of the respiratory tract. Protective respiratory reflexes. The role of irritant and juxtapulmonary receptors in the regulation of respiration. Pathological types of breathing.
109. Acid-base balance of blood and mechanisms ensuring its constancy.
110. Erythrocyte sedimentation rate, factors affecting its value. Clinical significance of ESR (interpretation of ESR values).
111. Blood-substituting solutions. Classification and indications for use.
112. Physiological bases of immunity. T- and B-lymphocytes.
113. Neural and humoral regulation of hematopoiesis. Concept of hematopoietins.
114. Changes in excitability of the heart muscle during various phases of the cardiac cycle. Extrasystole.
115. Biophysical bases of electrocardiography. Main ECG leads. Clinical significance.
116. Heart sounds and their origin. Components of the first and second heart sounds. Phonocardiography.
117. Physiological mechanisms of regulation of transplanted heart activity. Arterial pulse, its main indicators. Sphygmogram.
118. Physiological bases of hypertension. Features of pulmonary circulation.
119. Features of coronary circulation. Features of cerebral circulation.
120. Features of renal blood flow. Role of blood hydrostatic pressure in ultrafiltration.
121. Renin-angiotensin-aldosterone system and its role in blood pressure regulation.
122. Biological significance of pain. Types of pain. Modern concepts of pain reception. Physiological bases of analgesia and anesthesia.

1.2.4. Example of an examination ticket

Federal State Budgetary Educational Institution of Higher Education
"Volgograd State Medical University"
of the Ministry of Health of the Russian Federation

Discipline: Normal Physiology

Specialist degree program in specialty 31.05.01 General Medicine, specialization (profile) General Medicine

Academic year: 2026 - 2027

Examination ticket No. 1

1. Concept of homeostasis and homeokinesis. Self-regulatory principles of maintaining the constancy of the internal environment of the body.
2. Bioenergetics of the body. Methods for determining energy metabolism. Basal metabolic rate and factors affecting its value. Clinical significance of basal metabolism.
3. Minute respiratory volume, its determination. 'Dead space' and alveolar ventilation, its efficiency depending on the frequency and depth of breathing. Restrictive and obstructive types of ventilation impairment.

Head of the Department _____ S.V. Klauchek

The full volume of the fund of assessment tools for the discipline is available in the Electronic Information and Educational Environment (EIEE) of the FSBEI HE VolgSMU of the Ministry of Health of Russia.

Approved at the Department of Normal Physiology meeting

Minutes dated «25» May 2026 № 9

Head of the Department



S.V.Klauchek