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ФИО: Кубанов Сергей Исмаилович
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**MINISTRY OF SCIENCE AND HIGHER EDUCATION
RUSSIAN FEDERATION**

**Federal State Autonomous Educational Institution of Higher Education
NORTH-CAUCASUS FEDERAL UNIVERSITY**

APPROVED
Assoc. Prof. Kubanov S.I.
PhD in Medical Sciences
Dean
Faculty of Medicine and Biology

ASSESSMENT TOOLS FUND FOR THE DISCIPLINE

NORMAL PHYSIOLOGY

Name of the discipline (module)

- Specialty: 31.05.01 General Medicine
- Mode of training: Full-time
- Year of commencement of studies: 2026
- Delivered in Semester 3-4

Introduction

1. Intended for carrying out current control of academic performance progress and intermediate attestation in the discipline of «Normal physiology» for students of the specialty (majoring in) 31.05.01 General Medicine.

2. The ATF is an appendix to the program of the discipline (module) «Normal physiology»

3. Developer(s): L.I. Gubareva, D.Sc. (Biology), Professor, Professor of the Department of Physiology and Pathology; N.G. Belyaev, D.Sc. (Biology), Professor, Professor of the Department of Physiology and Pathology; I.N. Chadova, Ph.D. (Biology), Associate Professor of the Department of Physiology and Pathology

4. Expert examination of the ATF has been completed.

Expert group:

Chairperson: T.N. Pakhomova, Chairman of the Educational and Methodological Commission of the Faculty of Medicine and Biology

Committee members: Butova O.A., Head of the Department of Physiology and Pathology;
Bicheva G.V., Associate Professor of the Department of Physiology and Pathology.

Employer organization representative: Vilensky I.L., Chief Physician of Independent CDL, LLC

Expert conclusion – the ATF allows evaluating the level of competency levels and is recommended to be employed in the educational process.

5. The validity period for the ATF shall be determined by the period of implementation of the educational program.

1. Description of Evaluation Criteria at Various Stages of Their Formation, Description of Evaluation Scales

Levels of formation of competence(s), indicator(s)	Descriptors			
	Minimum level not achieved (Unsatisfactory) 2 points	Minimum level (Satisfactory) 3 points	Intermediate level (Good) 4 points	High level (Excellent) 5 points
<i>Competency:</i> GPC-5. Capable of assessing morphofunctional, physiological states and pathological processes in the human body to solve professional tasks.				
Learning outcomes for the discipline (module): <i>Indicator:</i> ID-1 _{GPC-5} Assesses morphofunctional and physiological states and processes in the human body at individual, group, and population levels to solve professional tasks.	Does not assess morphofunctional and physiological states	Assesses morphofunctional and physiological states	Assesses morphofunctional and physiological states and processes in the human body at individual, group, and population levels	Assesses morphofunctional and physiological states and processes in the human body at individual, group, and population levels to solve professional tasks
<i>Indicator:</i> ID-2 _{GPC-5} Identifies Pathological states and processes in the human body to solve professional tasks	Does not identify pathological states	Identifies pathological states	Identifies pathological states and processes in the human body	Identifies pathological states and processes in the human body to solve professional tasks

The evaluation of the competency formation level in the discipline is carried out on the basis of the Regulations on conducting current control of academic progress and intermediate attestation of students in higher education educational programs – Bachelor’s programs, Specialist’s programs, Master’s programs – at the Federal State Autonomous Educational Institution of Higher Education NORTH-CAUCASUS FEDERAL UNIVERSITY in its current edition.

ASSESSMENT TOOLS FOR CHECKING THE LEVEL OF COMPETENCY DEVELOPMENT

Task Number	Correct Answer	Content of the Question	Competency
1.	b)	The structural and functional unit of the nervous system is: a) astrocyte b) neuron c) glial cell d) macrophage	GPC-5
2.	a) c)	In terms of its structure, a nerve cell: a) does not significantly differ from the structure of any other cell in our body b) significantly differs in structure from other cells in our body c) differs in having a large number of cellular processes (extensions)	GPC-5
3.	a) c)	According to its functions, the nervous system is subdivided into: a) somatic b) central c) autonomic (vegetative) d) peripheral	GPC-5
4.	b)	The form of contact between one nerve cell and another is: a) syncytium b) synapse c) protoplasmic connection	GPC-5
5.	c)	What types of summation are characteristic of central neurons? a) complete and incomplete b) summation of action potentials c) spatial and temporal	GPC-5
6.	a) c) e)	Central structures of the parasympathetic nervous system are located in the... a) Midbrain b) Diencephalon c) Medulla oblongata d) Thoracic spinal cord e) Sacral spinal cord	GPC-5
7.	Reflex	A body's response to external and internal environmental factors mediated by the central nervous system is...	GPC-5
8.	A1 Б3 or 4 B3 or 4 Г2 Д5	Matching the number of segments to the region of the spinal cord: a. 8 b. 5 c. 5 d. 12 e. 1	GPC-5

		1. Cervical 2. Grudnoy (Thoracic) 3. Poyasnichny (Lumbar) 4. Kresttsovy (Sacral) 5. Kopchikovy (Coccygeal)	
9.	c)	Deterioration of conditioned reflex activity in school-age children is noted: a) in the period from 7 to 9 years old b) in high school (senior classes) c) in adolescence (puberty)	GPC-5
10.	b)	All types of conditioned (internal) inhibition reach a certain level of maturity by: a) 3–4 years of age b) 6–7 years of age c) 18 years of age d) 13–14 years of age	GPC-5
11.	b)	The connection between the adenohypophysis and the hypothalamus is carried out by means of: a) the processes of neurosecretory cells of the hypothalamus b) the portal vein system c) no connection exists	GPC-5
12.	c)	Liberins and statins are formed by... a) secretory cells of the adenohypophysis b) cells of the intermediate lobe of the pituitary gland c) neurosecretory cells of the hypothalamus d) nerve cells of the reticular formation	GPC-5
13.	a) c) d)	Hormones possess the following properties: a) high biological activity b) low biological activity c) distant action (distantiality) d) act on a strictly defined organ	GPC-5
14.	c)	Deficiency of thyroid hormones in early childhood causes... a) development of diabetes mellitus b) dwarfism c) development of myxedema	GPC-5
15.	a)	Calcitonin and parathyroid hormone are: a) antagonist hormones b) synergist hormones c) perform completely different functions	GPC-5
16.	c)	Secretion of sex hormones is carried out by: a) exclusively by the gonads b) the gonads and the adrenal medulla c) the gonads and the adrenal cortex	GPC-5
17.	d)	Internal respiration is defined as: a) gas exchange between blood and alveolar air, b) transport of gases by blood, c) gas exchange between blood and tissues, d) biological oxidation in cells	GPC-5
18.	b)	Independent rhythmic respiration in children is established:	GPC-5

		a) by the end of the 7 th month of life b) immediately after birth c) by the end of the 1 st year of life d) even in utero (prenatally) e) by the end of the first 10 days of life	
19.	c)	The primary muscles responsible for quiet inspiration (inhalation) include: a) pectoralis major and minor b) trapezius and scalene c) diaphragm and external intercostals d) internal intercostals and abdominal muscles	GPC-5
20.	b)	The total surface area of the alveoli (respiratory surface of the lungs) is: a) 80 m ² b) 120 m ² c) 12 m ² d) 0,8 m ²	GPC-5
21.	c)	The depth of inspiration is limited by the stream of impulses from mechanoreceptors of the respiratory system (stretch receptors) entering the respiratory center via afferent fibers of the: a) carotid nerve b) phrenic nerve c) vagus nerve	GPC-5
22.	a) c) d)	Which of the listed muscles are inspiratory? a) scalene and rhomboids b) internal intercostals c) external intercostals d) diaphragm	GPC-5
23.	a) b)	Under normal conditions, the rhythmic alternation of the acts of inhalation and exhalation is caused by: a) the automatism of the respiratory center b) reciprocal relationships between the inspiratory and expiratory parts of the respiratory center c) the regulatory influence of the cerebral cortex	GPC-5
24.	a)	The true generator of inspiratory activity, from which the stream of impulses is delivered to the muscles of inspiration, is located: a) in the medulla oblongata b) in the pons (Varolii) c) in the hypothalamus d) in the cerebral cortex	GPC-5
25.	b)	If the integrity of the pleural cavity is compromised, respiration becomes impossible because: a) gas exchange in the lungs is disrupted b) the pressure in the pleural cavity becomes equal to atmospheric pressure c) pressure	GPC-5
26.	b)	The systemic (greater) circulation: a) begins in the left atrium and ends in the right ventricle b) begins in the left ventricle and ends in the right	GPC-5

		atrium c) begins in the right ventricle and ends in the left atrium d) begins in the left atrium and ends in the right atrium e) begins in the left ventricle and ends in the right ventricle	
27.	e)	The ductus arteriosus (duct of Botallo) connects the: a) aortic arch and left atrium b) aortic arch and right atrium c) pulmonary artery and pulmonary vein d) right and left atrium e) aortic arch and pulmonary artery	GPC-5
28.	a) b) d)	A distinguishing feature of placental (fetal) circulation is: a) the pulmonary circulation does not function b) there is an oval opening (foramen ovale) between the left and right atria c) there is an oval opening between the left and right ventricles d) there is a ductus arteriosus (duct of Botallo) between the pulmonary trunk and the aorta e) the systemic circulation does not function	GPC-5
29.	b) c)	Blood consists of: a) interstitial (tissue) fluid b) plasma c) formed elements (blood cells) d) lymph	GPC-5
30.	d)	The optical system of the eye includes the: a) ciliary muscle b) iris c) receptor cells of the retina d) vitreous body	GPC-5
		Exam Questions 1. Physiology as an independent science. Key stages in the development of physiology. 2. Contributions of domestic and foreign scientists to the development of physiology. 3. Features of the modern period in the development of physiology. 4. The reflex principle of nervous system activity (R. Descartes, J. Procházka), and its development in the works of I.M. Sechenov, I.P. Pavlov, and P.K. Anokhin. 5. Analytical and systemic approaches to the study of body functions. 6. Humoral regulation: characteristics and classification of physiologically active substances. Interrelation between neural and humoral regulatory mechanisms. 7. P.K. Anokhin's theory of functional systems and self-regulation of functions. Nodal mechanisms of a functional system.	

		8. Irritability and excitability as the basis of tissue response to irritation. Stimuli: their types and characteristics. 9. Modern concepts of membrane structure and function. Active and passive transport across membranes. 10. Electrical phenomena in excitable tissues. The history of their discovery. 11. Membrane potential and its origin. 12. Structure and contraction mechanisms of skeletal muscle cells. 13. Energetics of muscle contraction. 14. Tetanus and its types. 15. Modern theory of muscle contraction and relaxation. 16. Determination of muscle contraction strength. Dynamometry. 17. Structural and functional characteristics of smooth muscles. 18. Structure and classification of synapses. Mechanism of synaptic transmission (electrical and chemical). 19. Structural features and transmission of excitation in neuromuscular junctions. Neurotransmitters, their synthesis, secretion, and receptor interaction. 20. The neuron as a structural and functional unit of the CNS, its physiological properties, and interaction with glial cells. 21. General principles of CNS coordination activity. 22. Properties of nerve centers. 23. Structural and functional features of the somatic and autonomic nervous systems. 24. CNS inhibition (I.M. Sechenov), its types and role. Modern concepts of central inhibition mechanisms. 25. Key principles and features of excitation propagation in the CNS. Convergence, divergence, and unidirectional conduction. 26. The role of the spinal cord in regulating the musculoskeletal system and autonomic body functions. Characteristics of spinal animals. Spinal reflexes. 27. Medulla oblongata and pons, their involvement in the self-regulation of functions. Centers of the medulla oblongata. 28. Physiology of the midbrain and its reflex activity. Decerebrate rigidity and the mechanism of its origin. The role of the midbrain and medulla oblongata in muscle tone regulation. 29. Physiology of the cerebellum, its influence on motor skills and autonomic body functions. 30. Reticular formation of the brainstem. Ascending activating effects on the cerebral cortex (H. Magoun, G. Moruzzi).	
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		31. Hypothalamus. Characteristics of the main nuclear groups. Involvement of the hypothalamus in the regulation of autonomic functions and in the formation of emotions and motivations. 32. Thalamus. Functional characteristics of the main nuclear groups. 33. Comparative characteristics of the sympathetic and parasympathetic divisions of the autonomic nervous system, synergism and relative antagonism of their effects. 34. I.P. Pavlov's doctrine of analyzers. 35. Receptor division of analyzers. Classification, functional properties, and features of receptors. 36. Characteristics of the visual analyzer. Receptor apparatus. Photochemical processes in the retina under the action of light. 37. Conducting part of the visual analyzer. Features of the optic chiasm. 38. Adaptation of analyzers, its peripheral and central mechanisms. 39. Auditory analyzer. Sound-collecting and sound-conducting apparatus. Mechanism of receptor potential generation in the hair cells of the spiral ganglion. Theory of sound perception (H. Helmholtz, G. von Békésy). 40. Classification of reflexes. Reflex pathway. Feedback afferentation, its significance. The concept of an adaptive result. 41. Motor function impairment in human cerebellar lesions. 42. Development of I.P. Pavlov's concepts on the mechanisms of temporary connection formation. 43. Conditioned reflex as a form of animal and human adaptation to changing environmental conditions. Classification of conditioned reflexes. 44. Mechanism of conditioned reflex formation. 45. I.P. Pavlov's views on the mechanisms of temporary connection formation. (Примечание: пункт дублирует тему 43). 46. I.P. Pavlov's doctrine of the primary and secondary signal systems in humans. 47. I.P. Pavlov's doctrine of the types of higher nervous activity. Types of inhibition. 48. Innate forms of behavior (unconditioned reflexes and instincts) and their significance for adaptive activity. 49. Dynamic stereotype, its physiological essence, and significance. 50. Physiological mechanisms of sleep. Sleep stages. Theories of sleep.	
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		51. The concept of metabolism in the body. Processes of assimilation and dissimilation of substances. Plastic and energetic role of nutrients. 52. Heat production. Metabolism as a source of heat generation. The role of individual organs in heat production. 53. Heat transfer. Methods of heat loss from the body surface. Physiological mechanism of heat dissipation. 54. Significance of minerals, trace elements, and vitamins in the body. 55. Digestion in the oral cavity. Composition and physiological role of saliva. Salivation and its regulation. 56. Digestion in the stomach. Composition and properties of gastric juice. Regulation of gastric secretion. Phases of gastric juice secretion. 57. Absorption of substances in different parts of the gastrointestinal tract. Types and mechanisms of substance absorption through biological membranes. 58. Digestion in the duodenum. Exocrine activity of the pancreas. Regulation and adaptive nature of pancreatic secretion to food types and dietary patterns. 59. Features of digestion in the large intestine. 60. Pituitary hormones, its functional connections with the hypothalamus, and involvement in regulating endocrine organ activity. 61. Physiology of the adrenal glands. The role of adrenal cortex and medulla hormones in regulating body functions. 62. Physiology of the thyroid and parathyroid glands. 63. Blood composition. Main physiological blood constants and mechanisms of their maintenance. 64. Electrolyte composition of blood plasma. Osmotic blood pressure. 65. Humoral regulation of erythro- and leukopoiesis. 66. Characteristics of formed elements of blood (erythrocytes, leukocytes, platelets), their role in the body. 67. Oxygen transport by blood. Oxyhemoglobin dissociation curve, its characteristics. 68. Carbon dioxide transport by blood. The significance of carbonic anhydrase. 69. Leukocytes and their types. White blood cell (WBC) differential count. Functions of various types of leukocytes. 70. Physiology of the immune system. Mechanisms of non-specific (innate) immunity. Mechanisms of specific acquired immunity. 71. Erythrocytes, their functions. Types of hemoglobin, its compounds, and their physiological significance.	
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		72. Functional system maintaining the stability of the acid-base balance. 73. Coagulation, anticoagulation, and fibrinolytic systems of the blood as the main mechanisms of the functional system for maintaining its liquid state. 74. Lymph, its composition, and functions. 75. Sex hormones. 76. Physiological properties and features of the myocardium. Cardiac automatism (autorhythmicity). Modern concepts of the substrate, nature, and gradient of automatism. 77. The heart, the significance of its chambers and valvular apparatus, changes in blood pressure and volume in the heart cavities during different phases of the cardiac cycle. Stroke volume and cardiac output. 78. Heart sounds and their origin. 79. Regulation of cardiac activity (myogenic, humoral, and nervous). 80. Humoral regulation of cardiac activity. 81. Reflex regulation of cardiac activity. Characteristics of the effects of parasympathetic and sympathetic nerve fibers on cardiac activity. 82. Phase analysis of the cardiac cycle. 83. Reflex regulation of systemic arterial pressure. The significance of vascular reflexogenic (baroreceptor and chemoreceptor) zones. The vasomotor center. 84. Gas exchange in the lungs. Partial pressure of (O_2) and (CO_2) gases in the alveolar air and gas tension in the blood. 85. Basic physiological mechanisms of respiratory changes during ascent to high altitude. 86. Regulatory influence on the respiratory center from the higher regions of the brain (hypothalamus and cerebral cortex). 87. The role of humoral factors in the regulation of respiration. The role of carbon dioxide. The mechanism of the newborn's first breath. Pleural cavity pressure, its origin, and significance during different phases of the respiratory cycle.	
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2. Description of the Evaluation Scale

Within the framework of the rating system, students' academic progress in each discipline is evaluated during current control and intermediate attestation. The rating system for assessing students' knowledge is based on the use of a combination of control activities to check the covered material (checkpoints), optimally located throughout the entire time interval of studying the discipline. The principles of the rating system for assessing students' knowledge are based on the requirements described in the Regulations on the organization of the educational process based on the rating system for assessing students' knowledge at NCFU.

3. Criteria for Evaluating Competencies

The grade **Excellent** shall be awarded to a student if the theoretical content of the course has been mastered completely, without gaps; the material is presented exhaustively, consistently, clearly, and logically; the student freely copes with tasks, questions, and other types of knowledge application; uses additional material in the answer; all tasks provided for by the program are completed, and the quality of their execution is evaluated by a number of points close to the maximum; analyzes the obtained results; demonstrates independence when performing tasks.

The grade **Good** is to be awarded to a student if the theoretical content of the course is mastered completely, the necessary practical competencies are mainly formed, all educational tasks provided for by the training program are completed, and the quality of their execution is sufficiently high. The student firmly knows the material, presents it competently and strictly on the merits of the matter, without allowing significant inaccuracies in answering the question.

The grade **Satisfactory** is awarded to a student in case the theoretical content of the course has been mastered in part only, but the gaps are not of a significant nature, most of the tasks provided for by the program are completed, but contain errors, the student allows inaccuracies and insufficiently correct wording when answering the question, and violations of logical sequence are observed in the presentation of the program material.

The grade **Unsatisfactory** is awarded to a student if they do not know a significant part of the program material, allow significant errors, perform practical works with great difficulty and uncertainty, the necessary practical competencies are not formed, most of the educational tasks provided for by the training program are not completed, and the quality of their execution is evaluated by a number of points close to the minimum.