

**Academic programme  
component**

**31.05.01 General Medicine  
programme**

**Б1.0.21**

**discipline code**

**ASSESSMENT MATERIALS**

**Discipline**

**Normal Physiology**

Author(s):  
Poludnyakova L.V.

Associate Professor

Advance Doctor in Biological Sciences, Docent

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Clinical Medicine Department  
Record no. 7 dated 12.03.2024

Head of the Department  
Krivenko O.G.

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signature

### Criteria and assessment of competencies and their mastery indicators, formed by the discipline

Code and competence name	Code and indicator of competence mastery Competency	Results of training in the discipline			Formative assessment	Interim assessment
		<i>To know</i>	<i>To be able to</i>	<i>To have</i>		
<b>ОПК-5</b> – Can analyse morphofunctional and physiological indicators as well as pathological processes in human body to achieve professional goals	ИД 1 - ОПК-5.4. Determines and analyses morphological, functional, physiological states and pathological processes of the human body based on knowledge about body systems, their functions, regulation of activity	<ul style="list-style-type: none"> <li>- normal structure and topography of organs and body systems;</li> <li>- patterns of functioning of organs and systems, their regulation;</li> <li>- structure and functions of cells, their metabolism; development of tissues and their functions;</li> <li>- chemical composition and properties of the substances that make up living systems, their interconversions in the metabolic process, as well as the role of metabolic processes in the functioning of various organs and tissues under normal conditions and in pathology.</li> </ul>	- evaluate and compare normal and altered morphofunctional indicators	- skills of an integrated approach to assessing the functions of body systems	<ul style="list-style-type: none"> <li>- a set of tasks for practical work;</li> <li>- case tasks;</li> <li>- unit progress check;</li> <li>- colloquium;</li> <li>- final test</li> </ul>	Examination cards Formative assessment results

## 2. Competencies mastery (indicators of their mastery) level assessment

Competencies mastery (their indicators) indices	Criteria and grading system of competencies mastery (indicators of their mastery) assessment			
	Insufficient <i>(«unsatisfactory»)</i>	Sufficient <i>(«satisfactory»)</i>	Above average <i>(«good»)</i>	Advance <i>(«excellent»)</i>
<b>Extent of knowledge</b>	Knowledge level is below the required. Major mistakes occurred.	Minimally allowed knowledge level. Minor mistakes occurred.	Knowledge level corresponds well to the educational programme. Minor errors occurred.	Knowledge level corresponds well to the educational programme.
<b>Ability mastery</b>	Basic abilities were not demonstrated during standard tasks completion. Major mistakes occurred.	Basic abilities were demonstrated. All tasks were completed in full, yet with few errors. All tasks were completed, yet not in full (clarifications are absent, conclusions are incomplete).	Basic abilities were demonstrated. All tasks were completed in full, yet with few errors. All tasks were completed in full, yet with few errors.	Basic abilities were demonstrated. All main and additional tasks were completed without mistakes or errors. All tasks were completed in full without errors.
<b>Skill mastery (having experience)</b>	Basic abilities were not demonstrated during standard tasks completion. Major mistakes occurred.	Minimum set of skills for standard tasks completion, with minor error, is acquired.	Basic skills were demonstrated in completing standard tasks, yet with few errors.	Basic abilities were demonstrated. All main and additional tasks were completed without mistakes or errors. A creative approach to solving non-standard tasks is demonstrated.
<b>Competence mastery characteristics</b>	Competencies have not been acquired. The acquired knowledge, skills, and abilities are not enough to solve practical (professional) tasks.  or Insufficient number of credit points as per the established range.	Competencies mastery is adequate. The acquired knowledge, skills, and abilities are mostly sufficient to solve practical (professional) tasks.  or Sufficient number of credit points is earned as per the established range	Competencies mastery mainly satisfies the requirements. The acquired knowledge, skills, and abilities are mainly sufficient to solve practical (professional) tasks.  or Sufficient number of credit points is earned as per the established range	Competencies mastery satisfies the requirements to the full extent. The acquired knowledge, abilities, and skills are fully sufficient to complete difficult professional tasks, including non-standard.  or Sufficient number of credit points is earned as per the established range

### 3. Criteria and grading system of the formative assessment tasks

#### 3.1 Criteria and grading system of practical tasks

The list of practical tasks, task completion and presentation recommendations, requirements for results, structure, and contents of practical task report, etc., are presented in methodological guidelines on mastering the discipline as well as in MAU LMS Moodle.

Grade/points	Assessment criteria
<i>Excellent/2</i>	The task is completed correctly and in full. The report on practical work has been prepared in accordance with the requirements. Answers to the teacher's questions (during the presentation) are full.
<i>Good/1.5</i>	The task is completed in full, yet without sufficient justification or a minor error, which does not impact the argumentation sequence, occurred. All task completion requirements are satisfied.
<i>Satisfactory/1</i>	The task is completed partially, with mistakes. The tasks are completed at the average level. Majority of task completion requirements are satisfied.
<i>Unsatisfactory/0</i>	The task is completed with a significant number of mistakes and at a low level. Many requirements for the assignment have not been satisfied. or The task has not been completed.

#### 3.2 Criteria and grading system of tests

The list of test questions and tasks, as well as test procedure description are presented in methodological guidelines on mastering the discipline, as well as in MAU LMS Moodle.

Assessment materials include a typical test variant:

#### **Unit 1. Excitable Tissues Physiology.**

Choose one correct answer.

##### **1. Indicators of excitability**

- 1) lability, rheobase, chronaxia, irritation threshold, accommodation
- 2) irritability, rheobase, accommodation, chronaxia, irritation threshold
- 3) conduction, reactivity, irritation threshold, accommodation

##### **2. Accommodation is**

- 1) the habituation of the tissue to a slowly increasing stimulus
  - 2) gradual increase in the irritation threshold with rapidly increasing intensity of the stimulus
  - 3) gradual lowering of the irritation threshold with rapidly increasing stimulus strength
- 3. The minimum stimulus level, under the action of which an action potential arises, is the threshold of**

- 1) stimulus
- 2) sensitivity
- 3) absolute

##### **4. The stationary potential difference between the inner and outer surface of the membrane is called**

- 1) membrane potential
- 2) resting potential
- 3) action potential

##### **5. When applying a stimulus, which channels open on the excitable membrane?**

- 1)K<sup>+</sup>
- 2)Na<sup>+</sup>
- 3)Ca<sup>2+</sup>

**6. The rapid oscillation of the membrane potential is called**

- 1) action potential
- 2) resting potential
- 3) stationary potential

**7. The period of absolute refractoriness corresponds to the phase of**

- 3) rapid repolarization
- 2) slow depolarization
- 3) rapid depolarization

**8. The motor unit is**

- 1) a group of muscle fibres that are innervated by the processes of one axon
- 2) a group of muscle fibres that are innervated by axons of several motor neurons
- 3) a group of motor neurons that innervate muscle fibres

**9. Graphical record the contractions of muscles is called**

- 1) electromyography
- 2) myography
- 3) electroneurogram

**10. Strong and prolonged muscle contraction is called**

- 1) tonus
- 2) tetanus
- 3) optimum

Grade/points	Assessment criteria
<i>Excellent/5</i>	90-100% of correct answers
<i>Good/3.75</i>	70-89% of correct answers
<i>Satisfactory/2.5</i>	50-69% of correct answers
<i>Unsatisfactory/0</i>	49% or less correct answers

3.3 Criteria and grading system of colloquiums

The recommendations for colloquium preparation are presented in the methodological guidelines on mastering the discipline, as well as in MAU LMS Moodle.

Assessment materials include typical colloquium topics:

**Colloquium on “General properties of excitable tissues. Neuromuscular Physiology”.**

**Questions:**

1. Irritability, excitability as the basis of tissue reaction to irritation. Stimuli, their definition and classification.
2. General properties of excitable tissues. Excitability. Indicators of excitability.
3. The all-or-none law. The law of force–duration. Chronaximetry.
4. Membrane potential: definition, meaning, theory of its origin.
5. Action potential (AP): definition, phases and origin, meaning. The critical level of depolarization.
6. Excitability. Definition. The ratio of the phases of excitability to the phases of the action potential.
7. The effect of direct current on excitable tissues. The Polar law.
8. A, B, C type nerve fibres: characteristics of their excitability and lability.
9. Excitation propagation of along myelinated and unmyelinated fibres.
10. The laws of conducting excitation along nerve fibres and nerve trunks.
11. Parabiosis according to Nikolai Vvedensky.
12. Physiology of synapses. Structural features and classification. Mechanisms of signal transmission in chemical and electrical synapses.
13. Functional properties of synapses. Features of the neuromuscular junction.

14. Mediators, their synthesis, secretion, interaction with receptors.
15. The structure of the muscles. The concept of a motor unit. Neuromotor, motor unit.
16. Physiological properties of muscles.
17. Single muscle contraction.
18. A change in the excitability of a muscle fibre.
19. Summation and tetanus. Optimum and pessimum of muscle contraction.
20. The modern theory of muscle contraction and relaxation.
21. Muscle strength and work. Dynamometry.
22. Isolated muscle fatigue and general fatigue.
23. Physiological features of smooth muscles.

Grade/points	Assessment criteria
<i>Excellent/5</i>	A complete, detailed answer to the question(s) posed. Student uses terminology fluently. Deep understanding of the programme material, as well as consistent, competent answers. Fluency in the material, correct justification of the decisions made.
<i>Good/3.75</i>	A complete, detailed answer to the question(s) posed. Clear structure and logical sequence in the answer. Understanding of the programme material, its competent and consistent presentation, but minor inaccuracies in definitions are made.
<i>Satisfactory/2.5</i>	An insufficiently detailed and consistent answer to the question(s) posed. Knowledge of only the basic material. Inaccuracies and difficulties with the formulation of definitions are made.
<i>Unsatisfactory/0</i>	Incomplete answer to the question posed, fragmented knowledge on the topic, with significant mistakes in terminology and its use. The answer is illogical. Knowledge of the material is partial, only relative to the questions asked. No conclusions, concretization and evidence-based presentation. or No answer has been given to the basic questions on the discipline.

### 3.4. Criteria and grading system of class attendance

Student attendance is determined in percentage correlation

Points	Assessment criteria
10	attendance 75-100%
5	attendance 50-74%
0	attendance is less than 50%

### **Criteria and grading system of the discipline results during the interim assessment**

#### Criteria and grading system for the discipline results (examination)

For the disciplines that are graded upon examination, the interim assessment result is comprised of points gained during the formative assessment and after the examination.

Assessment materials include the list of questions and tasks for the examination:

#### **Exam questions:**

1. Physiology as the science of life: the subject of study, the main tasks. Physiological research methods.
2. Irritability, excitability as the basis of tissue reaction to irritation. Stimuli, their definition and classification.
3. General properties of excitable tissues. Excitability. The law of force–duration. Chronaximetry. The all-or-none law.
4. Membrane potential: definition, meaning, theory of its origin.
5. Action potential (AP): definition, phases and origin, meaning.
6. Excitability. Definition. The ratio of the phases of excitability to the phases of the action potential.
7. Nerve fibres classification. The mechanism of conducting a nerve impulse along myelinated and unmye-

linated fibres. The laws of excitation conduction through the nerves.

8. The structure and classification of synapses. The mechanism of excitation transmission in synapses (electrical and chemical). Ionic mechanisms of postsynaptic potential.

9. Mediators, their synthesis, secretion, interaction with receptors.

10. The modern theory of muscle contraction and relaxation.

11. Physiological properties of muscles. Types of muscle contraction. Single muscle contraction and its phases. Tetanus, and factors affecting its level. Optimum and pessimum.

12. Structure and functioning of smooth muscles.

13. Motor units, their classification. Physical properties of muscles. Muscle strength and work. The law of force–duration.

14. A neuron as a structural and functional unit of the central nervous system. Classification and functional structures of neurons. The mechanism of neuron excitation.

15. The reflex principle of the nervous system (R. Descartes, I. Prokhozka, I.M. Sechenov, I.P. Pavlov, P.K. Anokhin). The reflex arc. Reverse afferentation, and its degree.

16. Inhibition in the central nervous system, its importance for the body. Sechenov inhibition. Modern ideas about the mechanism of presynaptic inhibition.

17. Inhibition in the central nervous system, its importance for the body. Postsynaptic inhibition, its mechanisms and types.

18. Physiological properties of nerve centres: spatial and temporal summation of excitations, rhythm transformation, post-mechanical potentiation, low lability, fatigue, sensitivity to neurotropic agents.

19. The basic principles of excitation in the central nervous system: convergence, divergence, irradiation, reverberation, unilateral conduction.

20. The basic principles of the coordination activity of the central nervous system: reciprocity, relief, occlusion, feedback, a common “final” path, dominance.

21. Structural and functional features of the vegetative nervous system. Vegetative nervous system division, synergism and relative antagonism of their effect on innervated organs.

22. Spinal cord and the regulation of the musculoskeletal system and vegetative functions of the body.

23. Oblongated marrow and pons Varolii, the participation of their centres in the regulation of vegetative functions.

24. The physiology of the oblongated marrow, its reflex activity and the processes of vegetative functions regulation. Decerebrate rigidity and the mechanism of its occurrence.

25. Static and statokinetic reflexes (R.Magnus).

26. Physiology of the cerebellum. Cerebellum in the regulation of movements. Afferent inputs and descending paths.

27. Features of the neural organization of the brain stem reticular formation. Ascending and descending reticular formation effect on the structures of the central nervous system.

28. The thalamus. Functional characteristics and features of the nuclear groups of the thalamus.

29. Hypothalamus, functional characteristics of the main cell nuclear groups.

30. Hormones formation and secretion, their transport by blood, effect on cells and tissues, depending on the chemical structure of hormones.

31. Hypothalamus. The role of the hypothalamus in the integration of vegetative and endocrine functions in the formation of motivation and stress. Hypothalamic-pituitary system.

32. Pituitary hormones, the regulation of endocrine organs.

33. The role of hormones of the adrenal cortex in the regulation of body functions.

34. The role of hormones of the adrenal gland medulla in the regulation of body functions.

35. Thyroid (iodine-containing) hormones of the thyroid gland.

36. Hormones regulating calcium metabolism in the body (calcitonin, parathyroid hormone, calcitriol).

37. Endocrine function of the pancreas and its role in the regulation of metabolism.

38. Male reproductive glands. Male reproductive hormones and their physiological role in sex formation and regulation of reproduction processes.

39. Female reproductive glands. Female reproductive hormones and their physiological role in sex formation and regulation of reproduction processes. Neuro-humoral regulation of the menstrual cycle.

40. Methods of studying the energy expenditure of the body. The main exchange, the meaning of its definition for the clinic.

41. The energy balance of the body. Basic metabolism. The energy expenditure of the body in different types of work. Body surface area.

42. Protein metabolism. The plastic and energy role of proteins. Nitrogen balance. Regulation of protein

metabolism.

43. Fat metabolism. The plastic and energy role of fat. Regulation of fat metabolism.
44. Carbohydrate metabolism. The plastic and energy role of carbohydrates. Regulation of carbohydrates metabolism.
45. The importance of minerals in the body (the role of  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Cl}^-$ , Fe, phosphate ions).
46. The importance of vitamins in the body.
47. Heat generation (chemical thermoregulation). Metabolism as a source of heat generation. The role of organs in heat production. Nervous and humoral mechanisms of heat loss.
48. Heat loss (physical thermoregulation). Heat loss from the surface of the body. Physiological mechanisms of heat loss. Nervous and humoral mechanisms of heat loss.
49. The concept of the blood system and its functions. Physiological parameters of blood.
50. Electrolyte composition of blood plasma, osmotic blood pressure.
51. Plasma proteins, their characteristics and functional significance, oncotic blood pressure and its role.
52. Red blood cells and their functions. Erythrocyte Sedimentation Rate (ESR) Humoral and nervous regulation of erythropoiesis.
53. Types of hemoglobin, its compounds, and their physiological significance.
54. Leukocytes, their types, leukocyte formula, functions of various types of leukocytes.
55. Humoral and nervous regulation of leukopoiesis.
56. Platelets and their functions. Vascular-platelet hemostasis and its stages.
57. The hemostasis system. Enzymatic coagulation hemostasis and its stages. Factors that accelerate and slow down blood clotting.
58. Fibrinolytic and anticoagulation systems of the blood.
59. Blood groups. The Rhesus (Rh) factor. Rules of blood transfusion.
60. The importance of blood circulation for the body. The structure of the circulatory system. The heart, the significance of its chambers and valvular apparatus.
61. The cardiac cycle, its structure, changes in blood pressure and volume in the cavities of the heart in different phases of the cardiac cycle. Systolic and minute blood volume. The tones of the heart, their origin, and auscultation.
62. Physiological properties and features of the myocardium. Modern ideas about the substrate, nature, and gradient of automation. The action potential of the cardiac conductive system.
63. Ionic mechanisms of cardiomyocyte occurrence action potential. The ratio of excitation, excitability, and contractility in different phases of the cardiac cycle. Extrasystoles, and the mechanism of compensatory pause.
64. Vector theory of excitation in the heart, the genesis of ECG. Physiological analysis of the ECG.
65. Intracardiac regulation mechanisms.
66. Extracardiac regulation mechanisms (humoral, nervous).
67. Reflex regulation of the heart and blood vessels. Reflexogenic zones of the heart and blood vessels.
68. The basic laws of hemodynamics, their use to explain the movement of blood through the vessels. Linear and volume flow rates in the circulatory system.
69. Functional classification of blood vessels. Factors ensuring the blood flow through high and low pressure vessels.
70. Types of blood pressure. Blood pressure in the circulatory system. Factors determining its level. Methods of blood pressure research.
71. Arterial and venous pulse, their origin. Analysis of the sphygmography.
72. Physiological mechanisms of vascular tone regulation (local, nervous, humoral). Vasomotor centre. Local factors of vascular tone regulation.
73. Morphofunctional characteristics of the microcirculation components. Capillary blood flow and its features. The role of microcirculation in the mechanism of fluid and various substances exchange between blood and tissues.
74. Physiological mechanisms ensuring the blood pressure stability.
75. Lymphatic system. Lymphatic functions. Mechanisms of lymph formation and lymph outflow regulation.
76. Breathing, its main stages. The mechanism of external respiration. Inhalation and exhalation mechanism. Elastic recoil of the lungs. Pressure in the pleural cavity, its origin, change in breathing.
77. Spirometry. Spirometry indicators.
78. The physiology of the respiratory ways. Regulation of their lumen.
79. The diffusion capacity of the lungs. Factors affecting gas exchange in the lungs. The aero-hematic barrier. Surfactant, its role in breathing.
80. Gas exchange in the lungs. The partial pressure of gases (oxygen and carbon dioxide) in the alveolar air



and the tension of gases in the blood. The percentage composition of atmospheric, exhaled and alveolar air. Alveolar ventilation. The concept of the anatomic dead space.

81. Oxygen transport by blood. Oxyhemoglobin dissociation curve, its characteristics. The oxygen capacity of the blood.

82. Transport of carbon dioxide by blood. The value of carbonic anhydrase.

83. Gas exchange in tissues.

84. Respiratory centre. A modern understanding of its structure and localization. Automation of the respiratory centre. The mechanism of respiratory phase change.

85. Types of receptors involved in reflex regulation of respiration. Hering-Breuer reflexes and conjugate reflexes.

86. Types of receptors involved in the humoral regulation of respiration. The role of carbon dioxide, oxygen and blood pH in the humoral regulation of respiration.

87. Regulatory effects on the respiratory centre from the high-level parts of the brain (hypothalamus, limbic system, cerebral cortex).

88. Functional respiratory system, ensuring the gas composition stability in blood. Analysis of its central and peripheral components.

89. Elimination as a component of systems ensuring the constancy of the internal environment of the body. Excretion organs participating in maintaining the most important parameters of the internal environment. Kidney function.

90. Physiological features of blood supply in the kidneys. Nephron, its structure, blood supply.

91. The mechanism of formation of primary urine, its quantity and composition. The concept of clearance.

92. The formation of the final urine, its composition and properties. Tubular reabsorption, and the mechanism of its regulation.

93. The formation of the final urine, its composition and properties. The processes of tubular secretion, the mechanisms of its regulation. Urinalysis.

94. Endocrine function of the kidneys.

95. The process of urination, and its regulation.

96. Functions of the digestive tract. Types of digestion, depending on the origin and localization of hydrolysis.

97. A functional system ensuring the consistency of nutrients in the blood. Food motivation. The physiological basis of hunger and satiety.

98. Digestion in the oral cavity. The composition and physiological role of saliva. Salivation and its regulation.

99. Self-regulation of chewing. Swallowing, its phases, self-regulation of this act. Functional features of the esophagus.

100. Digestion in the stomach. The composition and properties of gastric juice. Regulation of gastric secretion. Phases of gastric juice separation.

101. Motor and evacuation activity of the stomach, and its regulation.

102. External secretory activity of the pancreas. The composition and properties of pancreatic juice. Regulation of pancreatic secretion. Digestion in the duodenum.

103. The role of the liver in digestion. Regulation of bile formation, its excretion into the duodenum. Digestion in the duodenum.

104. The composition and properties of gastric juice. Regulation mechanism of intestinal secretion. Cavity and membrane hydrolysis of nutrients in various parts of the small intestine.

105. Motor activity of the small intestine and its regulation.

106. Features of digestion in the colon, motility of the colon. Colon microflora.

107. Absorption of substances in various parts of the digestive tract. Types and mechanism of substances absorption through biological membranes of enterocytes.

108. Pavlov's analysers study. The receptor area of the analysers. Receptors: concepts, classification, basic properties, functional mobility, adaptation, mechanism of excitation.

109. Visual analyser, receptor apparatus. Photochemical processes in the retina in the light. The formation of a visual image. The role of subcortical structures and hemispheres in visual perception.

110. An auditory analyser. Sound-trapping and sound-conducting apparatus. The receptor area of the auditory analyser. The mechanism of the receptor potential in the hair cells of the spiral organ. Theories of sound perception. The conductor and cortical area of the auditory analyser. Binaural hearing.

111. Physiological characteristics of the taste analyser. The receptor, conductor and cortical areas Classification of taste sensations.

112. Physiological characteristics of the olfactory analyser. The receptor, conductor and cortical areas  
Classification of odours.
113. An innate form of behaviour (unconditioned reflexes and instincts), their significance for adaptive activity. Comparative characteristics of conditioned and unconditioned reflexes.
114. Conditioned reflex as a form of adaptation of animals and humans to changing conditions of existence. Classification of conditioned reflexes. Rules for the conditioned reflexes formation. Physiological mechanisms of reflex formation. Their structural and functional basis.
115. Inhibition in higher nervous activity.
116. I.P. Pavlov's theory on the types of higher nervous activity, their classification and characteristics.
117. Pavlov's teaching on the 1st and 2nd human signalling systems.
118. The biological role of emotions. The theory of emotions. Vegetative and somatic components of emotions. The role of emotions in purposeful human activity. Emotional tension and stress.
119. Memory and its importance in the formation of holistic adaptive reactions. Types of memory and mechanisms of memory formation.

### Typical examination card variant

<p>MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION FEDERAL STATE AUTONOMOUS EDUCATIONAL INSTITUTION OF HIGHER EDUCATION “MURMANSK ARCTIC UNIVERSITY” EXAMINATION CARD no. 1  on the discipline “Normal Physiology”</p> <p>1. Irritability, excitability as the basis of tissue reaction to irritation. Stimuli, their definition and classification.</p> <p>2. The cardiac cycle, its structure, changes in blood pressure and volume in the cavities of the heart in different phases of the cardiac cycle. Systolic and minute blood volume. The tones of the heart, their origin, and auscultation.</p> <p>3. Protein metabolism. The plastic and energy role of proteins. Nitrogen balance. Regulation of protein metabolism.</p> <p>The examination cards were reviewed and approved at the department meeting dated « _____ » _____ 2024, record no. _____</p> <p>Head of the Clinical Medicine Department _____ Krivenko O.G</p>
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Grade	Answer assessment criteria
<i>Excellent</i>	Student understands the material thoroughly; reproduces it fully, clearly and logically; applies theory to practice; has no inhibitions in answering an altered question. Uses specific terminology; demonstrates extensive knowledge in the subject; provides references to specialized resources, including online-resources, while answering the questions.
<i>Good</i>	Student understands the material thoroughly; reproduces it logically and to the point, without major errors in answering the question; uses specific terminology well; may experience some difficulties in answering clarifying questions on the subject; generally demonstrates extensive knowledge in the subject.
<i>Satisfactory</i>	Student understands only basic material without details; makes mistakes and not fully correct wording; is poorly familiar with specific terminology; makes significant mistakes in answering; poorly uses special information resources.
<i>Unsatisfactory</i>	Student does not understand a major part of the material, makes significant mistakes, violations of the logical sequence in presenting the material, does not know special terminology, does not use special information resources. No answer to the posed question was given.

The grade, earned at the examination, is then converted into points (“5/excellent” – 20 points; “4/good” – 15 points; “3/satisfactory” – 10 points) and is added to the points, earned during the formative assessment.

Final grade	Total sum of points	Assessment criteria
<i>Excellent</i>	91-100	All milestones of the formative assessment have been completed at a high level. The exam is passed.
<i>Good</i>	81-90	All milestones of the formative assessment have been completed. The exam is passed.
<i>Satisfactory</i>	70-80	The milestones of the formative assessment have been completed partially. The exam is passed.
<i>Unsatisfactory</i>	69 or less	The milestones of the formative have not been completed, or the exam is not passed.

**5. Diagnostic tasks for the assessment of the educational results in the discipline within the framework of internal and external independent assessment of the quality of education**

Assessment materials contain tasks for assessing knowledge, skills and abilities that demonstrate the level of competence mastery and indicators of their mastery.

The set of tasks is designed to assess each competence in written form.

The set of tasks includes: *test, case tasks*.

**Set of diagnostic tasks**

<b>OIIK-5</b> Can analyze morphofunctional and physiological indicators as well as pathological processes in human body to achieve professional goals	
1	<p>Test:</p> <ol style="list-style-type: none"> <li><b>1. Heart tone occurs as a result of</b> <ol style="list-style-type: none"> <li>1) <b>atrioventricular valves closure</b></li> <li>2) semilunar valves closure</li> <li>3) vibrations of the ventricular wall with rapid blood flow into the ventricles at the beginning of their filling</li> <li>2) semilunar valves opening</li> </ol> </li> <li><b>2. The method of graphical registration of electrical potentials arising from the work of the heart from the surface of the body is called</b> <ol style="list-style-type: none"> <li>1) phonocardiography</li> <li><b>2) electrocardiography</b></li> <li>3) ballystocardiography</li> <li>4) sphygmography</li> </ol> </li> <li><b>3. The linear velocity of blood flow is defined as</b> <ol style="list-style-type: none"> <li><b>1) the speed of blood flow along the vessel</b></li> <li>2) the ratio of the volumetric velocity of blood flow to the radius of the vessel</li> <li>3) the volume of blood flowing through the cross-section of the vessel per unit of time</li> <li>4) pulse wave propagation velocity</li> </ol> </li> <li><b>4. The pressure in the aorta in the diastole of a young adult decreases to</b> <ol style="list-style-type: none"> <li>1) 100 mmHg.</li> <li>2) 120 mmHg.</li> <li><b>3) 80 mmHg.</b></li> <li>4) 25 mmHg.</li> </ol> </li> <li><b>5. The average normal value of respiratory volume in middle-aged men is</b></li> </ol>

	<p>1) 1700 ml  2) 1500 ml  <b>3) 700 ml</b>  4) 300 ml</p> <p><b>6. The compound of hemoglobin with carbon dioxide is called</b></p> <p>1) carboxyhemoglobin  2) carbogen  <b>3) carbhemoglobin</b>  4) carbonic anhydrase</p> <p><b>7. The reserve volume of inspiration is the amount of air that can be additionally inhaled</b></p> <p>1) after maximum exhalation  <b>2) after a calm breath</b>  3) after a calm exhalation  4) after maximum inhalation</p> <p><b>8. Pancreatic juice medium:</b></p> <p>1) acidic  <b>2) alkaline</b>  3) neutral  4) sharply acidic</p>
2	<p><i>Case tasks</i></p>
	<p><i>Task 1</i></p> <p><i>When the brain stem is transversely cut, a state of decerebrate rigidity is observed in an experimental animal.</i></p> <p><b>Questions:</b></p> <ol style="list-style-type: none"> <li>How does this condition manifest itself?</li> <li>Which structures should be cut between to achieve the specified state?</li> <li>What mechanisms underlie decerebrate rigidity?</li> </ol> <p><b>Answers:</b></p> <ol style="list-style-type: none"> <li>The state of decerebrate rigidity is manifested by an increase in the tone of the extensor muscles of the trunk and limbs.</li> <li>The state of decerebrate rigidity is achieved by a transverse section of the brain below the red nuclei.</li> <li>The cutting leads to the elimination of the inhibitory effect of red nuclei on the segmental apparatus of the spinal cord.</li> </ol> <p><i>Task 2</i></p> <p><i>It is known that fatigue is one of the main properties of excitable tissue. In an experiment on a frog's neuromuscular preparation, a rhythmic indirect muscle irritation was performed.</i></p> <p><b>Questions:</b></p> <ol style="list-style-type: none"> <li>How will the amplitude of muscle contraction change after prolonged nerve irritation?</li> <li>How will the amplitude and frequency of action potentials in nerve fibres change with the development of fatigue in the muscle?</li> </ol> <p><b>Answers:</b></p>

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|  | <ol style="list-style-type: none"><li>1. With prolonged irritation, the amplitude of muscle contractions decreases due to the process of muscle fatigue.</li><li>2. The amplitude and frequency of the action potentials of the nerve fibres will not change, since the nerves obey the law of relative tirelessness.</li></ol> |
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