FUND
OF ASSESSMENT TOOLS

for the discipline “Normal Physiology”

Higher Education Level

SPECIALIST DEGREE PROGRAM

Field of Study

560001 – KR General Medicine for International Students

(code and name of the field of study)

Qualification

Physician

2026

The Assessment Tools Fund is intended to assess the knowledge of students enrolled in the General Medicine program (specialty) for international students in the discipline (practical training) "Normal Physiology."

The Assessment Tools Fund was reviewed and approved at a meeting of the Department

Anatomy, Histology and Physiology
name of department

Minutes No. 1 dated "26" august 2026

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1. LIST OF COMPETENCIES INDICATING THE STAGES OF THEIR DEVELOPMENT DURING THE STUDY OF THE DISCIPLINE

Competencies to Be Developed	Planned learning outcomes for the discipline characterizing the stages of competency development	Types of assessment tools/ section code in this document
GPC-6: Able to assess morphofunctional and physiological states and pathological processes in the human body in order to solve professional tasks	KNOW: Structural and functional properties and specific features of the regulation of contraction of striated and smooth muscles. The role of various parts and structures of the central nervous system in regulating somatic and visceral functions of the body. Reflex arcs with visceral and somatic components. The blood system and its role in maintaining and regulating the body's homeostatic constants; blood functions; characteristics and functional features of physiological blood constants; blood groups, the Rh factor and its role in pathology, blood transfusion rules, and mechanisms of hemostasis. The main stages and parameters of external respiration and the respiratory center and its structure. Digestion as a process necessary for the energy and plastic functions of the body; specific features and patterns of the structural and functional organization of gastrointestinal tract functions; formation of hunger and satiety. The main processes and mechanisms maintaining constant body temperature. The main stages of urine formation and the mechanisms regulating them. The main homeostatic functions of the kidneys. The main properties of cardiac muscle and their differences from skeletal muscles; mechanisms of electromechanical coupling; the chambers and valvular apparatus of the heart. The cardiac cycle and the main mechanisms regulating cardiac activity. The principle of calculating energy expenditure by indirect	Blocks A, D – reproductive-level tasks - test; - oral questioning

Competencies to Be Developed	Planned learning outcomes for the discipline characterizing the stages of competency development	Types of assessment tools/ section code in this document
	calorimetry. Specific features of the microcirculatory system, transcapillary exchange, and its regulation. The main morphofunctional features of the organization of various divisions of sensory systems. Manifestations of higher nervous activity (HNA) in humans; classification and characteristics of HNA types. Mechanisms of conditioned reflex formation and its inhibition, its role in clinical practice, and components of the functional system of a behavioral act. The concept and classification of pain; specific features of the morphofunctional organization of nociceptive and antinociceptive systems.	
	BE ABLE TO: Analyze: manifestations of blood functions; specific features of the organization of different stages of respiration and their regulation; specific features of human higher nervous activity. Conduct examinations of: the state of the body's coagulation system; blood groups and Rh factor; the main physiological properties of excitable tissues; reflex activity of the nervous system and autonomic reactivity; functions of sensory systems; pain sensitivity; individual typological characteristics of a person; and parameters of somatic and visceral systems (respiratory and cardiovascular) under different functional states of the body.	Blocks B, D – reconstructive-level tasks - preparation of diagrams and calculation of physiological parameters; - written homework assignments.
	BE PROFICIENT IN: Methods for: determining blood groups and Rh factor; assessing complete blood count results; assessing blood clotting time; assessing erythrocyte osmotic resistance; counting erythrocytes	Blocks C, D – practice-oriented and/or research-level tasks - completed practical work reports.

Competencies to Be Developed	Planned learning outcomes for the discipline characterizing the stages of competency development	Types of assessment tools/ section code in this document
	and leukocytes; assessing urinalysis results; palpating the pulse; measuring blood pressure; auscultating heart sounds; performing spirometry and peak flowmetry; assessing basal metabolic rate and the degree of its deviation; and assessing types of higher nervous activity.	

2. TECHNOLOGICAL MAP OF THE DISCIPLINE/PRACTICAL TRAINING

Technological Map of the Discipline "Normal Physiology"

Course/semester: 1/2
Number of credits (credit units): 4
Assessment: pass

Discipline module name according to the Work Program	Assessment	Assessment format	Minimum passing score	Maximum passing score	Assessment schedule
Module 1					
Internal Environment of the Body. Blood Physiology. Humoral Regulation.	Ongoing assessment	Testing; attendance and independent student work (ISW): completion of written homework are taken into account.	1	3	28
	Midterm assessment	Testing	8	12	
Module 2					
General Physiology of Excitable Structures	Ongoing assessment	Testing; attendance and independent student work (ISW): completion of written homework are taken into account.	1	3	32
	Midterm	Colloquium	10	18	

Module 3					
Physiology of the Central Nervous System	Ongoing assessment	Testing; attendance and independent student work (ISW): completion of written homework are taken into account.	1	3	36
	Midterm assessment	Oral interview	9	14	
Module 4					
Physiology of the Autonomic Nervous System and Sensory Systems	Ongoing assessment	Testing; attendance and independent student work (ISW): completion of written homework are taken into account.	1	3	40
	Midterm assessment	Oral interview	9	14	
TOTAL for the semester			40	70	
Interim assessment (Pass)			20	30	
Semester rating for the discipline			60	100	

Technological Map of the Discipline
"Normal Physiology"

Course/semester: 2/3
Number of credits (credit units): 5
Assessment: examination

Discipline module name according to the Work Program	Assessment	Assessment format	Minimum passing score	Maximum passing score	Assessment schedule
Module 1					
Physiology of Blood Circulation and Lymph Circulation	Ongoing assessment	Testing, attendance, and independent student work (ISW): completion of written homework.	1	3	5
	Midterm assessment	Oral interview	8	15	
Module 2					
Physiology of Respiration	Ongoing assessment	Testing; attendance is taken into account. ISW: completion of written homework.	1	3	8
	Midterm assessment	Testing	8	11	
Module 3					
Physiology of Metabolism, Nutrition, Thermoregulation, and Excretion	Ongoing assessment	Testing; attendance is taken into account. ISW: completion of written homework.	1	3	10
	Midterm assessment	Testing	7	9	
Module 4					
Physiology of Digestion	Ongoing assessment	Testing; attendance and independent student work (ISW): completion of written homework are taken into account.	1	3	13
	Midterm assessment	Colloquium	6	10	
Module 5					
Physiology of Higher Nervous Activity	Ongoing assessment	Testing; attendance and independent student work (ISW): completion of written homework are taken into account.	1	3	16
	Midterm assessment	Testing	6	10	
TOTAL for the semester			40	70	
Interim assessment (Examination)			20	30	
Semester rating for the discipline			60	100	

3. STANDARD ASSESSMENT TASKS AND OTHER MATERIALS REQUIRED TO ASSESS THE PLANNED LEARNING OUTCOMES IN THE DISCIPLINE/PRACTICAL TRAINING (ASSESSMENT TOOLS)

Block A

A.1. Test Questions

1. Filtration occurs in the following part of the nephron:
a) distal tubule
b) proximal tubule
c) ascending limb of the loop of Henle
d) renal corpuscle.

2. Name the functions of hydrochloric acid in gastric juice:
a) causes protein denaturation and activates pepsinogen
b) denatures proteins and activates salivary amylase
c) inhibits the secretion of hormones of the duodenum
d) emulsifies fats and inhibits the action of lipase

3. Basal metabolic rate depends on:
a) sex, body weight, height, and age
b) age, physical activity, and intelligence
c) physical activity and ambient temperature
d) emotional arousal

4. The hormone that increases blood glucose levels is:
a) aldosterone
b) glucagon
c) insulin
d) parathyroid hormone

5. The main role in heat loss is played by:
a) the liver and heart
b) muscles and connective tissue
c) the skin and lungs
d) brown adipose tissue

6. Local excitation is characterized by the following features:
a) it occurs in response to subthreshold stimuli, can undergo summation, and spreads with decrement
b) it occurs in response to threshold stimuli and cannot undergo summation
c) it propagates in a saltatory manner over long distances
d) it produces a specific response; excitability is reduced

7. The following changes are caused by activation of the parasympathetic system:
a) inhibition of cardiac activity and increased gastric secretion
b) increased gastric secretion and vasoconstriction
c) increased blood pressure and increased secretion by intestinal glands
d) vasodilation and tachycardia.

8. Vasodilation occurs under the action of:
a) vasopressin
b) acetylcholine, histamine, and prostaglandins
c) the renin–angiotensin system
d) aldosterone

9. The term “resistance vessels” refers to:
a) small arteries and arterioles
b) veins and venules
c) the aorta and capillaries
d) venules and arteriovenous anastomoses

10. The following is not characteristic of chemical synapses:
a) synaptic delay
b) high fatigability
c) low lability
d) bidirectional conduction of excitation

11. The main vascular reflexogenic zones containing chemoreceptors
are located in:
a) aortic arch and carotid sinus
b) openings of the venae cavae
c) small arteries
d) capillary bed and arteriovenous anastomoses

12. I. P. Pavlov based the classification of people into types of higher nervous activity
on the properties of nervous processes:
a) plasticity, lability, and fatigability
b) excitability, conductivity, and irritability
c) strength, mobility, and balance of excitation and inhibition processes
d) lability, conductivity, and mobility.

13. In humans, instincts:
a) are absent
b) are developed throughout life
c) exist from birth
d) disappear during life

14. Enzymes of pancreatic juice include:
a) gastrixin and rennin
b) pepsin and enterokinase
c) amylase, lipase, trypsin, and chymotrypsin
d) bile acids and bilirubin

15. Formation of a conditioned reflex requires repeated:
a) reinforcement of the conditioned stimulus by the unconditioned stimulus
b) presentation of the conditioned stimulus
c) reinforcement of the unconditioned stimulus by the conditioned stimulus
d) presentation of the unconditioned stimulus

16. Apnea following voluntary hyperventilation occurs as a result of:
a) hypercapnia
b) hyperoxia
c) hypoxemia
d) hypocapnia

17. An excitatory postsynaptic potential is a local depolarization process that develops in the membrane of the:
a) sarcoplasmic membrane
b) mitochondrial membrane
c) presynaptic membrane
d) postsynaptic membrane

18. The phenomenon in which excitation of the nerve center of one muscle is accompanied by inhibition of the center of its antagonist muscle is called:
a) occlusion
b) facilitation
c) fatigue
d) reciprocal inhibition

19. The osmotic pressure of blood plasma does not change when the following solution is introduced into the bloodstream:
a) 10% sodium chloride
b) 0.2% sodium chloride
c) 20% potassium chloride
d) 0.9% sodium chloride

20. The result of the third phase of blood coagulation is:
a) platelet adhesion and aggregation
b) formation of prothrombinase
c) formation of thrombin
d) formation of fibrin

21. The cardiac output at rest in an adult is:
a) 1.5–2 L
b) 13.0–13.5 L
c) 4.5–5.0 L
d) 8.0–9.0 L

22. Stimulation of baroreceptors in the aorta and carotid artery causes:
a) depressor reflexes
b) pressor reflexes
c) unloading reflexes
d) associated reflexes

23. Second-order waves on the blood pressure curve are associated with:
a) cardiac activity
b) the tone of the vasomotor center
c) the phases of respiration
d) the tone of the somatic system

24. The oxygen capacity of blood depends on:
a) atmospheric pressure
b) the protein content of plasma
c) the number of leukocytes
d) the amount of hemoglobin
e) the partial pressure of oxygen

25. The general pause of the heart is important for:
a) filling the heart with blood and restoring myocardial energy
b) movement of blood from the ventricles into the atria
c) opening of the semilunar valves
d) creating a pressure gradient for blood to enter the vessels

26. “Vis a fronte” (force from the front) refers to:
a) the action of venous valves
b) the suction effect of the thoracic cavity
c) contraction of skeletal muscles
d) the residual energy of the heart

27. Parietal (membrane) digestion occurs in the:
a) oral cavity
b) small intestine
c) large intestine
d) stomach

28. Local mechanisms play the leading role in regulating the secretory and motor functions of the small and large intestines:
a) central nervous mechanisms
b) humoral mechanisms
c) local mechanisms
d) complex reflex mechanisms

29. Receptor adaptation during prolonged exposure to a stimulus consists of:
a) a decrease in the stimulus threshold
b) sensitization
c) an increase in excitability
d) a decrease in excitability

30. The site where the optic nerve exits the eyeball is called the:
a) macula lutea
b) final pathway
c) fovea centralis
d) blind spot.

A.2. Questions for Midterm Assessment
QUESTIONS FOR THE COLLOQUIUM

Section “General Physiology of Excitable Structures”

Biological membranes: definition, functions, structure, and properties.
Transport of substances across membranes: significance, types, and characteristics.
The concepts of irritability and excitability. Types of stimuli. Measures of excitability.
The concept of bioelectric potentials. Their types (resting membrane potential, action potential), recording, and mechanism of generation.
The all-or-none law. Conditions for its manifestation.
Changes in excitability during excitation and their phases. Relationship between the phases of excitability changes and the action potential.
Neuron: structural features and functions of its components.
Nerve fibers: structure, functions of structural elements, and properties.
Mechanism of conduction of excitation along nerve fibers.
Laws of conduction of excitation along a nerve and their characteristics.
Synapse: concept, structure, classification, and properties.
Neurotransmitters and their characteristics.
Stages and mechanisms of synaptic transmission of excitation.
Postsynaptic potential (PSP): characteristics and types.
Types of muscles and their functions.
Macrostructure, microstructure, ultrastructure, and properties of skeletal muscles.
Biomechanics and bioenergetics of muscle contraction and relaxation.
Types of muscle contraction.

Single muscle contraction: phases and duration.
Tetanus: types and mechanism of development.
Muscle work and strength. Regulation of muscle contraction strength.
Contracture: types and mechanism of development.
Muscle fatigue: conditions of onset, manifestations, active and passive rest.
Smooth muscles: structure, functions, and properties.

Section “Physiology of Digestion”

Digestion and its significance.
Principles of gastrointestinal tract function.
The main processes involved in food digestion and their characteristics.
Secretion. Characteristics of gastrointestinal enzymes. Types of digestion and their characteristics.
Gastrointestinal motility. Types and functions of gastrointestinal motor activity.
Absorption in the gastrointestinal tract. Conditions required for absorption. Degree of absorption in different parts of the gastrointestinal tract.
Mechanisms of absorption of various substances in the gastrointestinal tract.
Incretion and excretion in the gastrointestinal tract. Specific features of the action of gastrointestinal hormones.
Regulation of gastrointestinal tract activity: basic principles and mechanisms; the extent of different regulatory mechanisms in various parts of the gastrointestinal tract.
Methods for studying gastrointestinal tract function.
Digestion in the oral cavity: specific features. Functions of the oral cavity. Methods for examining the oral cavity.
Secretion in the oral cavity; salivary glands; composition and functions of saliva.
Regulation of salivation.
The acts of chewing and swallowing and their mechanisms.
Functions and structure of the stomach. Specific features of digestion in the stomach.
Methods of studying the stomach.
Gastric juice: quantity, composition, and functions of its components.
Regulation of gastric secretion (general principles and phases).
Gastric motility and its functions. Mechanism of chyme passage from the stomach into the duodenum; role of mechanical and chemical stimuli.
Specific features of protein, fat, and carbohydrate digestion in the stomach. Adaptive nature of gastric secretion.
Pancreas: structure and function. Composition of pancreatic juice and functions of its components.
Regulation and adaptive nature of pancreatic juice secretion.
Liver: structure and main functions; Eck–Pavlov fistula.
Bile: composition and functions.
Bile formation and bile secretion; mechanisms of regulation.
Structure of the small intestine. Specific features of digestion in the duodenum.
Intestinal juice: composition, functions, and regulation of secretion.

Types of movement (motility) of the small intestine, their functions and regulation.
Digestion in the large intestine and its specific features. Large intestinal motility. Defecation.
Physiological basis of hunger and satiety.

QUESTIONS FOR ORAL INTERVIEW

Section “Physiology of the Central Nervous System and Sensory System Functions”

Nervous system: functions and classification.
Neuron: classification, structure, functions, and properties.
Neuroglia: cell types and their functions.
Synapses in the central nervous system: specific features, properties, and mechanism of transmission of excitation.
Reflex: classification and biological role.
Structure of the somatic nervous system reflex arc; functions and localization of its components.
Reflex time and factors determining its duration.
Inhibition: classification and functions.
Differences between excitation and inhibition in the central nervous system.
Presynaptic inhibition in the central nervous system: localization and functions.
Postsynaptic inhibition: localization and functions.
Reciprocal inhibition in antagonist centers.
The concept of nerve centers and their properties.
Summation in the central nervous system: types and significance.
Interaction of reflexes (common final pathway, irradiation).
Dominance: types, significance, properties, and conditions for its emergence and disappearance.
Structure and functions of the spinal cord; main spinal reflexes.
Conduction function of the spinal cord; spinal shock.
Functions of the medulla oblongata.
Physiology of the midbrain; orienting reflexes.
Physiology of the cerebellum.
Physiology of the thalamus.
Physiology of the hypothalamus.
Functions of the limbic system.
Cerebral cortex: cytoarchitecture and functions of the neocortex.
Motor functions of the somatic nervous system and general plan of its organization.
Differences between the somatic and autonomic nervous systems.
Sympathetic nervous system: structure, functions, and reflex arc.
Parasympathetic nervous system: structure, reflex arcs, and functions.
Metasympathetic nervous system.
Higher autonomic centers.
The concept of an analyzer, its structure, and the main processes occurring in analyzers.

Classification of receptors.
Properties of receptors, their characteristics, and sensory thresholds.
Specific features of the conducting and central divisions of an analyzer.
Eye: structure and functions of its components.
Optical system of the eye, refraction and accommodation, and their disorders.
Light and color perception.
Auditory analyzer and sound perception.
Olfactory analyzer.
Gustatory analyzer.
Somatovisceral analyzer; tactile, temperature, and pain reception.
Visceroreception and its role in regulating the activity of internal organs.
Pain (nociceptive) reception and the antinociceptive system.

Section “Physiology of Blood Circulation and Lymph Circulation”

Functions of the cardiovascular system, the role of the heart, and its macroscopic structure.
Properties of the myocardium (automaticity, excitability, conductivity, and contractility), their specific features and disorders.
Cardiac cycle: duration, structure, and functions of its components.
Phase analysis of cardiac activity; characteristics of periods and phases.
Cardiohemodynamics and the conditions that ensure it.
Electrocardiography (Einthoven triangle, leads, ECG analysis).
Acoustic manifestations of cardiac activity; mechanism of heart sound generation, auscultation, and phonocardiography.
Functional classification of the cardiovascular system according to B. Folkow.
Main hemodynamic parameters (pressure, resistance, blood flow velocity): characteristics, formulas, and graphs.
Circulation time of blood and methods of its determination.
Factors ensuring continuity of blood flow.
Cardiac output: calculation method and value.
Arteries: structure, functions, and characteristics of blood flow. Arterial pressure and pulse: parameters, recording methods, and characteristics.
Microcirculatory system (arterioles, capillaries, arteriolovenular shunts, venules): functions and hemodynamic features.
Veins: structure, functions, and characteristics of venous blood flow. Factors determining venous return to the heart (vis a tergo, vis a fronte).
Lymph and lymph circulation.
Blood reservoirs.
Basic principles of blood circulation regulation and its levels (local and central).
Intracardiac and intravascular regulation (myogenic and neurogenic mechanisms).
Innervation of the heart; classification of the trophic effects of the vagus and sympathetic nerves on the heart.
Concept of the medullary circulatory center and its structure.
Innervation of blood vessels (vasoconstrictor and vasodilator neural mechanisms).

Reflexes regulating blood circulation: intrinsic and associated reflexes.
Humoral regulation of blood circulation.

Block B

B.1. Tasks for assessing the learning outcome “BE ABLE TO”
Semester 3
- Calculate the volume of blood in a person.
- Draw a diagram of the structure of the cell membrane.
- Draw an action potential (AP) graph for skeletal muscle.
- Draw a diagram of the structure of a nerve fiber.
- Draw a diagram of the structure of a synapse.
- Draw a diagram of the structure of a muscle fiber.
- Draw a graph of a single muscle contraction.
- Draw a diagram of a reflex arc.
- Draw a diagram of the various types of central inhibition.
- Draw diagrams illustrating the interaction of reflexes.
- Draw a diagram of a tonic spinal cord reflex.
- Draw diagrams of autonomic reflex arcs.
- Draw a diagram of the structure of an analyzer.

Semester 4
- Draw a diagram of the circulatory loops.
- Draw a diagram of the cardiac conduction system.
- Draw AP graphs for typical and atypical myocardium.
- Draw a graphical representation of the cardiac cycle.
- Calculate the duration of the cardiac cycle.
- Draw an ECG diagram in standard lead II.
- Draw graphs showing changes in blood pressure, resistance, and linear blood flow velocity along the vascular bed.
- Explain the operating principle of Weber’s open model of blood circulation.
- Draw the Starling diagram (exchange of water and substances in capillaries).
- Draw diagrams of intrinsic and associated reflexes regulating blood circulation.
- Calculate pulse pressure and mean dynamic pressure, volumetric blood flow velocity, and peripheral resistance in a person.
- Calculate the predicted vital capacity of the lungs depending on sex, height, and age.
- Draw diagrams of the reflex arcs of intrinsic respiratory reflexes.
- Calculate basal metabolic rate standards using the Harris–Benedict tables.
- Calculate the degree of deviation of basal metabolic rate using the Reed formula.
- Draw a diagram of the structure of the nephron.
- Calculate the glomerular filtration rate using inulin.
- Draw a diagram of the main digestive processes.
- Draw diagrams of the absorption of nutrients (proteins, fats, and carbohydrates).

Block C

C.1. List of Practical Assignments

Semester 3

- Demonstrate the method for counting erythrocytes in a Goryaev counting chamber.
- Demonstrate the method for determining the erythrocyte sedimentation rate (ESR) according to Panchenkov.
- Demonstrate the method for determining hemoglobin concentration by the colorimetric method (Sahli method).
- Demonstrate the method for counting leukocytes in a Goryaev counting chamber.
- Demonstrate the method for determining blood antigen properties using monoclonal reagents (coliclones).
- Demonstrate the method for determining blood clotting time (Burker modification).
- Demonstrate the method for determining bleeding time (Duke method).
- Demonstrate the technique for preparing a frog neuromuscular preparation.
- Demonstrate the method for determining the stimulation threshold of excitable tissues.
- Demonstrate Galvani's second experiment.
- Demonstrate Matteucci's experiment.
- Demonstrate the experimental method for confirming the laws of excitation conduction along a nerve.
- Demonstrate the method for recording muscle contraction at different stimulus strengths and frequencies.
- Demonstrate the method for determining spinal reflex time in a frog.
- Demonstrate the experimental method for confirming central inhibition of spinal reflexes (Sechenov's experiment).
- Demonstrate the technique for testing spinal monosynaptic reflexes in humans.
- Demonstrate the technique for testing the coordination function of the cerebellum using special tests.
- Demonstrate the technique for studying postural-tonic reflexes in a rabbit.
- Demonstrate the method for assessing autonomic tone by calculating the Kerdo vegetative index.
- Demonstrate the method for assessing autonomic nervous system reactivity using the Dagnini–Aschner reflex.
- Demonstrate the method for determining sensory thresholds.
- Demonstrate the method for determining the blind spot on the retina (Mariotte's experiment).
- Demonstrate the method for studying sensitization and adaptation of olfactory receptors.

Semester 4

- Demonstrate the experimental method for confirming the leading role of the sinoatrial node in cardiac automaticity (Gaskell's experiment).
- Demonstrate the experimental method for confirming the degree of automaticity in different parts of the heart (Stannius ligature experiment).
- Demonstrate the technique of cardiac auscultation.
- Demonstrate the technique for measuring blood pressure using non-invasive methods (Riva-Rocci and Korotkoff methods).
- Demonstrate the method for determining vital capacity of the lungs using spirometry.
- Demonstrate the method for assessing airway aerodynamic resistance (peak flowmetry).
- Demonstrate the method for performing tests of maximum breath-holding capacity.
- Demonstrate the method for preparing a daily diet for people engaged in intellectual work.
- Demonstrate the method for developing a conditioned blinking reflex.
- Demonstrate the method for assessing different types of memory.
- Demonstrate the method for developing external and internal inhibition.
- Demonstrate the method for determining temperament type according to A. Belov.

Block D

List of questions and tasks for interim assessment (pass/final examination):
Questions for assessing the learning outcome KNOW:
- Physiology as a science and academic discipline; methods of physiology.
- The external and internal environments of the body and their interaction.
- Blood: volume, functions, and composition.
- Physicochemical properties of blood: viscosity, density, osmotic and oncotic pressure.
- Hemolysis and its types.
- Acid–base balance and blood buffer systems. Formed elements of blood (erythrocytes, leukocytes, platelets): quantity, properties, and functions.
- Hemostasis and the anticoagulant system of blood.
- Blood antigen systems.
- Biological membrane. Transport of substances across the membrane.
- Excitability and methods of measuring it.
- Electric currents in living tissues: resting membrane potential and action potential.
- Characteristics of excitation: refractory phases, the all-or-none law, and conditions for its manifestation.
- Physiology of the nerve.
- Physiology of synapses.
- Physiology of muscles.
- Nervous system: functions, evolution, and classification.
- Physiology of neurons and central synapses.
- Reflex: definition, significance, and classification. Reflex arcs. Reflex time.
- Inhibition in the central nervous system.

- Nerve center. Properties of nerve centers.
- Interaction of reflexes.
- Regional physiology of the central nervous system: spinal cord, medulla oblongata, pons, midbrain, cerebellum, diencephalon,
telencephalon.
- Central nervous regulation of somatic and autonomic functions.
- General physiology of analyzers: receptor, communication pathway, and central division.
- Regional physiology of analyzers: visual, auditory, vestibular, somatovisceral, pain, gustatory, and
olfactory analyzers.
- Local and systemic humoral regulation.
- Hormones: classification, functions, properties, and mechanism of action.
- Physiological properties of cardiac muscle. Automaticity, conductivity, excitability, and contractility.
- Phase analysis of the cardiac cycle.
- External manifestations of cardiac activity.
- Basic patterns of hemodynamics.
- Characteristics of blood movement through blood vessels.
- Mechanisms regulating systemic blood circulation.
- External respiration. Mechanisms of inhalation and exhalation. Gas exchange in the lungs and its determining factors. Lung volumes and capacities.
- Transport of gases by the blood. Gas exchange in tissues. Regulation of respiration. Hypobaric and hyperbaric conditions. Hypoxia. Mountain sickness.
- Energy metabolism. Basal metabolism. Thermoregulation. Physiology of nutrition.
- Kidney functions. Mechanisms of urine formation. Regulation of filtration and reabsorption.
- The role of the kidneys in maintaining body homeostasis.
- Characteristics of the main processes involved in digestion (secretion, absorption, motility, incretion,
excretion).
- Digestion in the oral cavity and stomach.
- Pancreatic activity. The role of the liver in digestion. Digestion in the small and large intestines.
- Conditioned and unconditioned reflexes. Memory. Inhibition in the cerebral cortex.
- Specific features of human higher nervous activity. Dynamic stereotype. Types of higher nervous activity.
- Emotions. Motivations. Physiology of sleep.

Questions for assessing the learning outcome BE ABLE TO:
- Calculate the volume of blood in a person.
- Draw a diagram of the structure of the cell membrane.
- Draw an action potential (AP) graph for skeletal muscle.

- Draw a diagram of the structure of a nerve fiber.
- Draw a diagram of the structure of a synapse.
- Draw a diagram of the structure of a muscle fiber.
- Draw a graph of a single muscle contraction.
- Draw a diagram of a reflex arc.
- Draw a diagram of the various types of central inhibition.
- Draw diagrams illustrating the interaction of reflexes.
- Draw a diagram of a tonic spinal cord reflex.
- Draw diagrams of autonomic reflex arcs.
- Draw a diagram of the structure of an analyzer.
- Draw a diagram of the circulatory loops.
- Draw a diagram of the cardiac conduction system.
- Draw AP graphs for typical and atypical myocardium.
- Draw a graphical representation of the cardiac cycle.
- Calculate the duration of the cardiac cycle.
- Draw an ECG diagram in standard lead II.
- Draw graphs showing changes in blood pressure, resistance, and linear blood flow velocity along the vascular bed.
- Explain the operating principle of Weber's open model of blood circulation.
- Draw the Starling diagram (exchange of water and substances in capillaries).
- Draw diagrams of intrinsic and associated reflexes regulating blood circulation.
- Calculate pulse pressure and mean dynamic pressure, volumetric blood flow velocity, and peripheral resistance in a person.
- Calculate the predicted vital capacity of the lungs depending on sex, height, and age.
- Draw diagrams of the reflex arcs of intrinsic respiratory reflexes.
- Calculate basal metabolic rate standards using the Harris–Benedict tables.
- Calculate the degree of deviation of basal metabolic rate using the Reed formula.
- Draw a diagram of the structure of the nephron.
- Calculate the glomerular filtration rate using inulin.
- Draw a diagram of the main digestive processes.
- Draw diagrams of the absorption of nutrients (proteins, fats, and carbohydrates).

Questions for assessing the learning outcome BE PROFICIENT IN:
- Demonstrate the method for counting erythrocytes in a Goryaev counting chamber.
- Demonstrate the method for determining the erythrocyte sedimentation rate (ESR) according to Panchenkov.
- Demonstrate the method for determining hemoglobin concentration by the colorimetric method (Sahli method).
- Demonstrate the method for counting leukocytes in a Goryaev counting chamber.
- Demonstrate the method for determining blood antigen properties using monoclonal reagents (coliclones).
- Demonstrate the method for determining blood clotting time (Burker modification).
- Demonstrate the method for determining bleeding time (Duke method).

- Demonstrate the technique for preparing a frog neuromuscular preparation.
- Demonstrate the method for determining the stimulation threshold of excitable tissues.
- Demonstrate Galvani's second experiment.
- Demonstrate Matteucci's experiment.
- Demonstrate the experimental method for confirming the laws of excitation conduction along a nerve.
- Demonstrate the method for recording muscle contraction at different stimulus strengths and frequencies.
- Demonstrate the method for determining spinal reflex time in a frog.
- Demonstrate the experimental method for confirming central inhibition of spinal reflexes (Sechenov's experiment).
- Demonstrate the technique for testing spinal monosynaptic reflexes in humans.
- Demonstrate the technique for testing the coordination function of the cerebellum using special tests.
- Demonstrate the technique for studying postural-tonic reflexes in a rabbit.
- Demonstrate the method for assessing autonomic tone by calculating the Kerdo vegetative index.
- Demonstrate the method for assessing autonomic nervous system reactivity using the Dagnini–Aschner reflex.
- Demonstrate the method for determining sensory thresholds.
- Demonstrate the method for determining the blind spot on the retina (Mariotte's experiment).
- Demonstrate the method for studying sensitization and adaptation of olfactory receptors.
- Demonstrate the experimental method for confirming the leading role of the sinoatrial node in cardiac automaticity (Gaskell's experiment).
- Demonstrate the experimental method for confirming the degree of automaticity in different parts of the heart (Stannius ligature experiment).
- Demonstrate the technique of cardiac auscultation.
- Demonstrate the technique for measuring blood pressure using non-invasive methods (Riva-Rocci and Korotkoff methods).
- Demonstrate the method for determining vital capacity of the lungs using spirometry.
- Demonstrate the method for assessing airway aerodynamic resistance (peak flowmetry).
- Demonstrate the method for performing tests of maximum breath-holding capacity.
- Demonstrate the method for preparing a daily diet for people engaged in intellectual work.
- Demonstrate the method for developing a conditioned blinking reflex.
- Demonstrate the method for assessing different types of memory.
- Demonstrate the method for developing external and internal inhibition.
- Demonstrate the method for determining temperament type according to A. Belov.

4. METHODOLOGICAL MATERIALS DEFINING THE PROCEDURES FOR ASSESSING KNOWLEDGE, ABILITIES, SKILLS AND/OR EXPERIENCE OF ACTIVITIES CHARACTERIZING THE STAGES OF COMPETENCY DEVELOPMENT
DESCRIPTION OF INDICATORS AND CRITERIA FOR COMPETENCY ASSESSMENT; DESCRIPTION OF ASSESSMENT SCALES

1. Ongoing Assessment

TESTING ASSESSMENT SCALE (ongoing assessment)
At each practical class, the student is given a test consisting of 5 questions with one correct answer.
For test responses:
0–40% of questions (0–2 correct answers) – 0–1 point;
60% of questions (3 correct answers) – 1.5 points;
80% of questions (4 correct answers) – 2 points;
100% of questions (5 correct answers) – 2.5 points.
All test points are added together and divided by the number of classes in the section; that is, the arithmetic mean number of points for the section is calculated.
ATTENDANCE ASSESSMENT SCALE (ongoing assessment)
Attendance:
0–59% of classes in one section – 0–0.25 points
60–69% – 0.5 points
70–84% – 0.75 points
85–100% – 1 point
INDEPENDENT STUDY ASSESSMENT SCALE: WRITTEN HOMEWORK ASSIGNMENT (ongoing assessment)
The student must complete a homework assignment for each practical class:
Completion of 0–59% of assignments in one section – 0–0.9 points
60–69% – 1 point
70–84% – 1.25 points
85–100% – 1.5 points

2. Midterm Assessment

TEST ASSESSMENT SCALE (midterm assessment)
1. Each test contains 20 questions.
2. Each question has a set of answer options: one correct answer and the remaining answers are incorrect.
3. Each correct answer is worth 5%.
4. The overall score is determined as the sum of the percentages earned.
5. The percentage score is converted into points.
For testing in the section “Internal Environment of the Body. Blood Physiology. Humoral Regulation”:
0–60% (0–12 correct answers) corresponds to 0–7 points
65–75% (13–15 correct answers) corresponds to 8–9 points

80–90% (16–18 correct answers) corresponds to 10–11 points
95–100% (19–20 correct answers) corresponds to 12 points
For testing in the section “Physiology of Respiration, Metabolism, Nutrition, Thermoregulation, and Excretion”:
0–60% (0–12 correct answers) corresponds to 0–7 points
65–75% (13–15 correct answers) corresponds to 8–10 points
80–90% (16–18 correct answers) corresponds to 11–13 points
95–100% (19–20 correct answers) corresponds to 14–15 points
For testing in the section “Physiology of Higher Nervous Activity,” each test contains 10 questions. Each question has a set of answer options: one correct answer and the remaining answers are incorrect. Each correct answer is worth 10%.
0–50% (0–5 correct answers) corresponds to 0–5 points
60% (6 correct answers) corresponds to 6 points
70–80% (7–8 correct answers) corresponds to 7–8 points
90–100% (9–10 correct answers) corresponds to 9–10 points
COLLOQUIUM ASSESSMENT SCALE (midterm assessment)
“85–100%”
• thorough and solid mastery of the section material;
• complete, consistent, competent, and logically presented answers;
• demonstration by the student of knowledge within the completed curriculum and information from additional literature;
• reproduction of the educational material with the required degree of accuracy.
“70–84%”
• presence of minor errors that the student confidently corrects after additional and guiding questions;
• demonstration by the student of knowledge within the completed curriculum;
• clear presentation of the educational material.
“60–69%”
• presence of minor errors in the answer that the student does not correct;
• demonstration by the student of insufficiently complete knowledge of the completed curriculum;
• unstructured and incoherent presentation of the educational material in the answer.
“less than 60%”
• lack of knowledge of the section material;
• serious errors occur in the answer.
For a colloquium in the section “Basic Mechanisms of Cell Activity”:
0–59% – 0–9 points
60–69% – 10–12 points
70–84% – 13–15 points
85–100% – 16–18 points
For a colloquium in the section “Physiology of Digestion”:
0–59% – 0–5 points
60–69% – 6–7 points

70–84% – 8–9 points
85–100% – 10 points
ORAL INTERVIEW ASSESSMENT SCALE (midterm assessment)
“85–100%”
• thorough and solid mastery of the section material;
• complete, consistent, competent, and logically presented answers;
• demonstration by the student of knowledge within the completed curriculum and information from additional literature;
• reproduction of the educational material with the required degree of accuracy.
“70–84%”
• presence of minor errors that the student confidently corrects after additional and guiding questions;
• demonstration by the student of knowledge within the completed curriculum;
• clear presentation of the educational material.
“60–69%”
• presence of minor errors in the answer that the student does not correct;
• demonstration by the student of insufficiently complete knowledge of the completed curriculum;
• unstructured and incoherent presentation of the educational material in the answer.
“less than 60%”
• lack of knowledge of the section material;
• serious errors occur in the answer.
For an oral interview in the section “Physiology of the Central Nervous System and Sensory System Functions”:
0–59% – 0–12 points
60–69% – 13–17 points
70–84% – 18–21 points
85–100% – 22–25 points
For an oral interview in the section “Physiology of Blood Circulation and Lymph Circulation”:
0–59% – 0–7 points
60–69% – 8–10 points
70–84% – 11–13 points
85–100% – 14–15 points

3. Interim Assessment

ORAL RESPONSE ASSESSMENT SCALE (interim assessment – “KNOW”)
The following criteria are taken into account when assessing oral responses to determine the level of learning outcome KNOW:
1. Knowledge of the main processes of the discipline being studied; depth and completeness of the answer.
2. Command of terminology and its use in the answer.
3. Ability to explain the essence of physiological mechanisms and processes, draw conclusions and generalizations, and provide reasoned answers.

4. Command of monologue speech, logical and consistent presentation, ability to answer questions and express an opinion on the issue under discussion.
85–100% (6 points): the answer demonstrates sound knowledge of the main physiological processes and is characterized by depth and completeness in covering the topic; command of terminology; ability to explain the essence of mechanisms, draw conclusions and generalizations, provide reasoned answers and examples; fluent monologue speech and logical, consistent presentation.
70–84% (5 points): the answer demonstrates sound knowledge of the main physiological processes and is characterized by depth and completeness in covering the topic; command of terminology; ability to explain the essence of mechanisms, draw conclusions and generalizations, provide reasoned answers and examples; fluent monologue speech and logical, consistent presentation. However, one or two inaccuracies in the answer are acceptable.
60–69% (4 points): the answer generally demonstrates knowledge of physiological processes but lacks sufficient depth and completeness in covering the topic; demonstrates knowledge of the main theoretical issues; shows poorly developed skills in analyzing mechanisms and insufficient ability to provide reasoned answers and examples; monologue speech is not sufficiently fluent, and the answer lacks adequate logic and consistency. Several content errors are acceptable.
0–59% (0–3 points): the answer demonstrates a lack of knowledge of physiological processes and superficial coverage of the topic; lack of knowledge of the main theoretical issues and undeveloped skills in analyzing mechanisms; inability to provide reasoned answers, poor command of monologue speech, and lack of logic and consistency. Serious content errors are acceptable.
ANALYTICAL TASK ASSESSMENT SCALE (interim assessment – “BE ABLE TO”)
The following criteria are taken into account when assessing responses to determine the learning outcome BE ABLE TO:
85–100% (8 points): the student demonstrates complete understanding of the task. All requirements are met.
70–84% (7 points): the student demonstrates substantial understanding of the task. Most requirements are met. Minor errors are present.
60–69% (5–6 points): the student demonstrates partial or limited understanding of the task. No more than half of the task is completed, and a large number of errors are made.
0–59% (0–4 points): the student either does not complete the task at all or completes it only partially.
PRACTICAL TASK ASSESSMENT SCALE (interim assessment – “BE PROFICIENT IN”)
When assessing responses to determine the learning outcome BE ABLE TO, the following criteria are taken into account:
85–100% (10 points): the student fully completes the practical task without making errors and provides an exhaustive interpretation of the results obtained.
70–84% (9 points): the student completes the practical task. Most requirements are met. Minor errors are present. The student is able to interpret the data obtained

with minor difficulty.
60–69% (8 points): the student demonstrates partial completion of the practical task. No more than half of the task is completed, and a large number of errors are made. The student is unable to interpret the results obtained.
0–59% (7 points): the student either does not complete the practical task at all or performs it completely incorrectly.

5. GUIDELINES FOR STUDENTS ON MASTERING THE DISCIPLINE/PRACTICAL TRAINING AND COMPLETING ASSESSMENT TASKS

1. ADVICE ON PLANNING AND ORGANIZING THE TIME REQUIRED TO STUDY THE DISCIPLINE.

It is recommended to organize the time required to study the discipline as follows:

Reviewing lecture notes on the day before a practical class – 15–20 minutes.
Studying theoretical material using the textbook and notes – 1 hour per week.
Preparation for a practical class – 2 hours.
Total per week – 3 hours 20 minutes.

2. STUDENT INDEPENDENT WORK WHILE STUDYING THE DISCIPLINE.

To understand the material and master it effectively, the following sequence of actions is recommended:

- When preparing for a practical class, the student must read the methodological guidelines for the upcoming class (posted on the department notice board).
- Review the relevant material from disciplines studied before Normal Physiology.
- Find answers to the self-study questions in lecture materials, core textbooks, and additional literature.
- Complete the written homework in the workbook (prepare notes, tables, practical work protocols, and draw diagrams and graphs).

3. PREPARATION FOR TESTS

When preparing for tests, students should use lecture materials and read the core and additional literature.

4. PREPARATION FOR COLLOQUIA AND ORAL INTERVIEWS

Review the list of questions. Revise the material covered. In addition to “memorizing” the material, it is very important to achieve a thorough understanding of the topics studied in the discipline.

5. PREPARATION FOR INTERIM ASSESSMENT

When preparing for the examination, students should review the examination questions. They must know the theoretical material in accordance with the list of examination questions. They must be able to prepare diagrams and graphs and perform calculations of certain physiological parameters. They must be proficient in methods for assessing the main indicators of the functioning of human body systems.