INTERNATIONAL HIGHER SCHOOL OF MEDICINE

Fundamental disciplines of department

SYLLABUS
Normal Physiology
2026-2027 academic year for
students of medical faculty 1 course 1 semester, groups 1-42
6 credits (180 h, including auditorial – 108 h, independent work – 72h)

Practical classes:

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Venue: Educational and Morphological Center
Lev Tolstoy street 114/1
Room № 003,102,201,202,203.

The Syllabus is considered
at the meeting of the Fundamental disciplines department
Protocol № 1 dated 07.09.2026

Head of the department _____ Dzh.N. Abdullaev

Course Objective: Mastering the systematic knowledge about the general physiological laws of the vital activity of a healthy organism in various conditions of its existence with knowledge, the formation and development of analytical physiological thinking, the ability and skills of generalizing data from various medical sciences from general

physiological positions, and the ability to comprehend the fundamental and applied tasks of modern medicine.
After study of the discipline the student must demonstrate: **Knowledge:**

- The main physiological processes of the human body's vital activity under various conditions, regulation mechanisms, constants and their significance.

Skill:

- analyze the informational value of various homeostatic indicators (constants),
- apply basic experimental and clinical methods of studying various body functions,
- independently work with scientific, educational, reference and teaching literature,
- independently perform laboratory work, protect the protocol of the study,
- solve test tasks and situational tasks, prepare scientific reports, independently work with scientific references. **Attitude:**
- skills of experimental work, methods of clinical research, presentation of the results of scientific activity **Pre-requisites.** Mastering the discipline "Normal Physiology" requires:
- the cycle of chemical-biological and physical-mathematical disciplines of the school educational program. **Post-requisites:**
- Pathological physiology
- Basic and clinical pharmacology
- Medical genetics
- Internal diseases
- Surgical diseases
- Pediatrics

THEMATIC PLAN OF LECTURES

№	Theme of lectures	Hours	Date
1	The cell as a structural and functional unit of a living organism. Functional systems of the cell. Intercellular connections. Liquid environments of the body: extracellular and intracellular fluids.	2	05.10 - 10.10
2	Cell membrane. Membrane potentials and action potentials. Transport of substances through the cell membrane.	2	12.10 - 17.10
3	Physiological role of skeletal muscles. Mechanisms of muscle contraction. Energy muscle contraction. Neuromuscular connections and impulse transmission.	2	19.10 - 24.10
4	Organization of the nervous system: neuron and neuroglia, main functions of central synapses, neurotransmitters. The structure and function of nerve fibers. Morpho functional characteristics of the central nervous system. The reflex principle of central nervous system activity. Integration and coordination in the central nervous system.	2	26.10 - 31.10
5	The role of various parts of the central nervous system. Fundamentals of the structure and function of the cerebral cortex. Basal ganglia. Reticular formation. The hypothalamus and its homeostatic role. The limbic system.	2	02.11 - 07.11
6	Physiology of the spinal cord. Ascending and descending pathways. Spinal cord reflexes.	2	9.11 - 14.11
7	General physiology of receptors: receptors and their classification. Adaptation of the sensory system.	2	16.11 - 21.11
8	Physiology of sensory systems: visual, auditory, gustatory, olfactory and somatovisceral.	2	23.11 - 28.11
9	Physical and chemical properties of blood. Composition and functions of blood. Plasma proteins. pH and buffer systems in the body. Erythrocytes: functions. Structure and functions compounds of hemoglobin. Leukocytes and thrombocytes: type functions properties.	2	30.11 - 05.12

10	Basic principles of hemostasis: vascular-platelet and coagulation hemostasis Coagulation factors. Anticoagulants and their importance.	2	07.12 - 12.12
11	Antigenic blood system: abo system and rh factor. Blood groups.	2	14.12 – 19.12
12	The structure, functions, and properties of the cardiac muscle. The cardiac conduction system. The cardiac cycle and its phase structure.	2	21.12 –26.12
13	Electrocardiography. Description of ECG waves, intervals, segments and complexes and their clinical significance.	2	28.12 –02.01
14	Physiology of the circulatory system. Functional classification of vessels. Fundamental principles of hemodynamics. Characteristics of blood flow in the microcirculatory bed.	2	04.01 – 09.01
15	Regional and systemic circulation. Levels and mechanisms of regulation of cardiovascular system.	2	11.01 – 16.01
16	Physiology of respiration. External respiration. Lung volumes and capacities.	2	18.01 –23.01
17	Gas exchange in the lungs. Transport of gases by blood. Gas exchange in tissues.	2	25.01 –30.01
18	Features of the regulation of breathing. The first breath of a newborn.	2	01.02 –06.02
	Total:	**36**	

THEMATIC PLAN OF PRACTICAL CLASSES

№	Theme of practical classes	Hours	Date
1	Cell as a structural and functional unit of a living organism. Functional systems of the cell. Intercellular connections. Body fluids: extracellular and intracellular fluids.	2	05.10 – 10.10
2	Introduction with laboratory equipment and methods of work in the laboratory. Safety precautions and basic methods of work in the laboratory.	2	
3	Cell membrane. Membrane potentials and action potentials. Transport of substances across the cell membrane.	2	12.10 -17.10
4	Observation of different types of hemolysis. Osmotic resistance of erythrocytes.	2	
5	Mechanisms of muscle contraction. Neuromuscular transmission and conjugation of excitation and contraction. Energy of muscle contraction	2	19.10 – 24.10
6	Assessment of module 1	2	
7	Organization of the nervous system: neuron and neuroglia, main functions of synapses, neurotransmitters. The role of various parts of the central nervous system in the regulation of physiological functions, movement control. Fundamentals of the structure and function of the cerebral cortex. Basal ganglia. The hypothalamus and its homeostatic role. Basal ganglia. Limbic system.	2	26.10 – 31.10
8	Technique of EEG recording. Normal forms of EEG. Conducting psycho physiological tests.	2	
9	Physiology of the autonomic nervous system.	2	02.11 – 07.11
10	Reflex. Reflex arcs. Simple and complex. Reflex regulation of somatic functions: Sensory and motor pathways, mechanism for maintaining tone, control of body movements, posture and balance.	2	
11	Clinical examination of the nervous system: assessment of the integrative function of the spinal cord. Study of clinical tendon reflexes in humans.	2	09.11 -14.11
12	Assessment of module 2	2	
13	General organization of the senses.	2	16.11 -21.11

14	Special senses: visual, auditory, gustatory, olfactory and somato- visceral.	2	
15	Assessing sensory functions: • Visual acuity assessment. • Hearing acuity assessment. • Qualitative olfactory assessment test.	2	23.11 – 28.11
16	Assessment of module 3	2	
17	Composition and functions of blood and plasma. Plasma proteins. Erythrocytes: functions. Structure, functions, and compounds of hemoglobin. Leukocytes, platelets: types, functions, properties.	2	30.11 – 05.12
18	Determination of the main indicators of blood cells: Hemoglobin, erythrocytes and leukocytes.	2	
19	Hemostasis. Physical and chemical characteristics of platelets. Mechanism of blood coagulation.	2	07.12 -12.12
20	ABO system and Rh factor. Transfusion reactions in ABO incompatibility and Rh incompatibility.	2	
21	Hemostasis parameters and blood grouping. Determination of coagulation time (CT) (Buerker method). Determination of bleeding time (BT) (Duke method). Blood typing. Determination of the Rh factor.	2	14.12 – 19.12
22	Assessment of module 4	2	
23	Physiology of the cardiac muscle. Structural and functional characteristics of the cardiac muscle. Cardiac muscle action potential. Phases of the cardiac cycle.	2	21.12 -26.12
24	Electrocardiography. Description of ECG waves, intervals, segments and complexes and their clinical significance.	2	
25	Factors influencing heart rate, regulation of cardiac output, blood pressure.	2	28.12 -02.01
26	Functional evaluation of the cardiovascular system: Observation of heart sounds (auscultation).	2	
27	Physiology of the circulatory system. Functional classification of vessels. Fundamental principles of hemodynamics. Characteristics of blood flow in the microcirculatory bed.	2	04.01 – 09.01
28	Measurement of blood pressure according to the Korotkov's method. Determination of hemodynamic parameters: cardiac output, stroke volume, total peripheral vascular resistance.	2	
29	Determination of heart rate at rest and under load. Conducting the (Ruffier test).	2	11.01 – 16.01
30	Assessment of module 5	2	
31	Physiology of respiration.	2	18.01 – 23.01
32	Transport of gases in blood. Gas exchange in the lungs and tissues. Lung volumes and capacities. Saturation of hemoglobin with oxygen. Oxygen consumption and its utilization. Partial pressure of gases in atmospheric and alveolar air.	2	
33	Assessment of the functional state of the respiratory system: Thoracometry. Determination of respiratory rate at rest and during exercise Saturation of oxyhemoglobin.	2	25.01 – 30.01
34	Features of breathing regulation.	2	
35	Assessment of the functional state of the respiratory system: Determination of lung volumes and capacity, and its analysis.	2	01.02 – 06.02
36	Assessment of module 6	2	

	Total	**72**	

THEMATIC PLAN OF INDEPENDENT WORK OF STUDENTS

Unit №	**Theme of independent work**	**Hours**	**Date**
UNIT №1 Introduction to Physiology: Cellular and General Physiology. Physiology of Excitable Structures	Apoptosis - programmed cell death (abstract). Fill up the table: cells: organelles and main functions	2	During the unit
	Prepare an abstract on the topic: “Mechanisms of transport across cell membranes.”	2	
	Prepare an abstract on the topic: Neuromuscular transmission and conjugation of excitation and contraction	2	
	Reference review	6	
UNIT №2 Physiology of the nervous system.	Prepare an abstract on the topic: “Using modern methods to determine the mechanism of dominant regulation.”	2	During the unit
	Prepare a clinical case: “Functions of the autonomic nervous system”.	2	
	Reference review	8	
UNIT №3 Physiology of sensory systems.	Fill out the table: "Skin receptors."	2	During the unit
	Practical work: Determination of taste sensitivity	2	
	Practical Work: Determining Pain threshold reception.	2	
	Reference review	12	
UNIT №4 Physiology of blood	Prepare an abstract on the topic: “Physiological and pathological variations of different types of leukocytes.”	2	During the unit
	Prepare a presentation on the topic: "Blood Clotting: What is Known About COVID-19 and Abnormal Blood Clotting."	2	
	Prepare a clinical case: Respiratory and metabolic alkalosis and acidosis	2	
	Reference review	6	
UNIT №5 Physiology of the cardiovascular system.	Practical work: Functional assessment of cardiovascular system at rest and during exercise	2	During the unit
	Reference review	4	
UNIT №6 Physiology of the respiratory system.	Prepare a clinical case: “The importance of the hypothalamus and limbic system in the regulation of breathing.”	2	During the unit
	Prepare a clinical case: “The importance of the medulla oblongata and pons in the regulation of breathing.”	2	
	Practical work: study of sweating using the Minor method (assessment of the excretory function of the body).	2	
	Reference review	6	
	Total	**72**	

Recommended reading for the discipline: Main:

1. Textbook of Medical Physiology. Guyton A.C.,1-part. 10th. ed. Elsevier Inc., 2004.
2. Textbook of Medical Physiology. Guyton A.C.,2-part. 10th. ed. Elsevier Inc., 2004.
3. Textbook of Medical Physiology. 2nd South Asia ed/ J.E.Hall// - Elsevier Inc., 2016.
4. Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019.
5. Medical Physiology. 14th ed. Hall J.E. // Guyton A.C. //2020
6. Essential of Medical Physiology. 9th ed // Sembulingam K. //2023

Additional:

1. Barrett. Ganang's Review of Physiology - Minion Pro by Cenve., Publisher Services., 2010.
2. Jain A.K. Manual of Practical Physiology - Avichal Publishing Company., 2010.
3. Sembulingam K. Essential of Medical Physiology. 9th ed., 2023
4. Jain A.K. Textbook of Physiology. Vol 1.7th ed., 2018

Grading policy and procedures for all types of work

For the period of studying the discipline, the student gains points for the relevant parameters (per unit):
current score - 40 points independent
work - 20 points
control score (final assessment of knowledge per unit) - 40 points
Maximum score - 100 (40+20+40)

GRADING SYSTEM FOR STUDENT'S ACHIEVEMENTS

Grading criteria per discipline				
Maximum score	Intervals			
	«unsatisfactory»	«satisfactory»	«good»	«excellent»
Current control - 40	0-23	24-30	31-35	36-40
Interval description	The student does not know the basic patterns of functioning of cells, tissues, organs and systems of a healthy organism and the mechanisms of its regulation, does not know how to analyze the value of homeostatic indicators (constants), does not know the methods for studying various functions of the body.	The student knows the basic patterns of functioning of cells, tissues, organs and systems of a healthy organism and the mechanisms of its regulation, but does not know how to analyze the value of homeostatic indicators (constants), and does not fully know and use methods for studying various functions of the body.	The student knows the basic patterns of functioning of cells, tissues, organs and systems of a healthy organism and the mechanisms of its regulation, has difficulty analyzing the value of homeostatic indicators (constants), knows the methods of studying various functions of the body, but makes mistakes in their use.	The student fully understands the fundamental principles of functioning of cells, tissues, organs and systems of a healthy organism and the mechanisms of its regulation, is able to analyze the value of homeostatic indicators (constants), and knows the methods of studying various functions of the body.
Independent work - 20	0-11	12-15	16-17	18-20

Interval description	• cannot independently work with scientific, educational, and reference literature, • cannot independently perform laboratory work or defend the protocol of the study, • cannot solve test assignments and situational problems, • cannot prepare scientific reports.	• can independently work with scientific, educational, and reference literature, but cannot identify the main, • can independently perform laboratory work, but makes significant mistakes in the design of the protocol, conducted research, • solves test tasks and situational tasks with errors, • prepares unproductive scientific reports without outlining the basic concept	• can independently work with scientific, educational, and reference literature, • can independently perform laboratory work, • can issue a research protocol, • makes mistakes in solving test tasks and situational tasks, • can prepare scientific reports that need to be finalized	• can independently work with scientific, educational, and reference literature, • can independently perform laboratory work, protect the protocol of the conducted research, • can solve test tasks and situational tasks, • can prepare scientific reports.
Control work (module)	0-23	24-30	31-35	36-40
Interval description	The test results correspond to 0-59% of the correct answers from the total number of questions.	Testing corresponds to the results of 6075% of the correct answers from the total number of questions.	Testing corresponds to the results of 7689% of the correct answers from the total number of questions.	Testing corresponds to the results of 90100% of the correct answers from the total number of questions.

Conduct Policy: (lateness, absence, behavior in the auditorium, late submission of work).

- Punctuality and completion of tasks.
- Mandatory attendance of classes.
- Attending class in a clean medical uniform.
- Eliminating conversations on a cell phone in the classroom.
- Active participation in the learning process.
- Doing homework on time.
- Academic detention at the time specified by the teacher.

For violations of the Conduct Policy, the total points for discipline might be reduced to 1-10 points.

Academic Ethics Policy.

- Be tolerant, respect the opinions of others.
- Formulate objections in the correct form.
- Constructively support feedback in all classes.
- Plagiarism and other forms of dishonest work are unacceptable. Plagiarism includes the following: the absence of references when using printed and electronic materials, quotes, thoughts and works of other authors or students. - Prompting and cheating during tests, exams, classes is unacceptable as well as passing an exam for another student, unauthorized copying of materials.

For violations of the Academic Ethics Policy, the total points for the discipline may be reduced to 1-10 points.

Guidelines for the lessons of the discipline.

Key questions covered in Lectute 1. Introduction to Physiology: Cellular and General physiology. Physiology of excitable structures.
Lecture 1. The cell as a structural and functional unit of a living organism. Functional systems of the cell.
Intercellular connections. Liquid environments of the body: extracellular and intracellular fluids.
Key questions covered in Lecture 1:
1.1 Levels of organization of a living system
1.2. Cell organization.
1.3. Internal environment of the body and homeostasis
1.4. Intercellular connections
1.5. Body fluids and electrolytes
1.6. Edema, development of edema 1.7. Principles of homeostatic regulation

Recommended reading:

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 3-9,45-51
[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 3-43,51,131,163
[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp 28-35

Key questions covered in Lecture 2. Cell membrane. Membrane potentials and action potentials. Transport of substances through the cell membrane.
1. The structure of the cell membrane.
2. Transport across the cell membrane. Types and transport mechanisms.
3. Excitability and their measurement. Electrical potentials of tissues. 4. Resting membrane potential. Apoptosis
5. Properties of muscles.
6. Irritability, excitability, reflexivity, conductivity, lability.
7. Physiology of synapses.
8. Neuromuscular junction and impulse transmission.

Recommended reading:

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 35,59,81
[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 31, 171-216
[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 3-27, 35-50

Key questions covered in Lecture 3. Physiological role of the skeletal muscle. Mechanisms of muscle contraction. Energy of muscle contraction. Neuromuscular connection and impulses transmission.
1. Types, properties and functions of muscles. Macro-, micro- and ultrastructure of skeletal muscles. Components of myofibrils and their characteristics.
2. Physiology of smooth muscles.
3. Physical basis of contraction of skeletal and smooth muscles (tetanus, tone and contracture).
4. Muscle tone
5. Energy of muscle contraction 6. Neuromuscular junction

Recommended reading:

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 81-103
[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 171-220
[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 157-199

Key questions covered in Lecture 4. Organization of the nervous system: neuron and neuroglia, main functions of central synapses, neurotransmitters. The structure and function of nerve fibers. Morpho functional characteristics of the central nervous system. The reflex principle of central nervous system activity. Integration and coordination in the central nervous system. Key questions covered in Unit 2:
1. Structural-functional organization of the CNS. Classification and functions of neurons and nerve fibers.
2. Neuroglia and its properties.
3. Reflex arc. Types of reflex arcs. Reflex regulation of organism functions.

Recommended reading:

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 699
[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 817-923
[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 851-893

Key questions covered in Lecture 5. The role of various parts of the central nervous system. Fundamentals of the structure and function of the cerebral cortex. Basal ganglia. Reticular formation. The hypothalamus and its homeostatic role. The limbic system.

1. Integrative Function of CNS Regions in the Regulation of Physiological Functions.
2. Control of Brainstem Functions.
3. The Role of the Cerebellum and Basal Ganglia in Motor Function.

Recommended reading:

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 821-861
[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp.914-991
[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 961, 995-1027

Key questions covered in Lecture 6. Physiology of the spinal cord. Ascending and descending pathways. Spinal cord reflexes.

1. Integration and Coordination in the Central Nervous System (CNS)
2. Neuronal Connections. Neurophysiology: Summation, Occlusion.
3. Principles of Reflex Communication. General Principles of Reflex Communication.
4. Factors Influencing Synaptic Transmission.
5. Spinal Cord: Structural and Functional Physiology.

Recommended reading:

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp.787-805
[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 868-906
[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 935-943

Key questions covered in Lecture 7. General physiology of receptors: receptors and their classification. Adaptation of the sensory system.

1. Physiology of receptors (Types, functions, classification, properties)
2. Physiology of analyzers (types, features)
3. General organization of somatic sensations (tactile, positional, thermal).
4. Physiology of pain

• Types of pain and their qualities
• Pain receptors and their stimulation.

Recommended reading:

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 719-737
[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp.838-914
[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 870-911

Key questions covered in Lecture 8. Physiology of sensory systems: visual, auditory, gustatory, olfactory and somatovisceral.

1. Retina: Photoreceptors and Visual pigments
2. Measures of Visual Sensation
3. Processing and Transmission of visual impulse in visual pathway
4. Applied physiology: Dark adaptation, Vitamin A deficiency, Color blindness
5. Auditory pathways
6. Applied physiology: Types and Degree of Hearing loss, Deafness

Recommended reading:

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp.741-779
[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp.1041-1107
[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp.1055-1123

Key questions covered in Lecture 9. Physical and chemical properties of blood. Composition and functions of blood. Plasma proteins. pH and buffer systems in the body. Erythrocytes: functions. Structure and functions compounds of hemoglobin. Leukocytes and thrombocytes: type functions properties.

1. Blood composition: plasma and blood cells.
2. Functions of blood: transportation, regulation and protection.
3. Physical-chemical properties of blood.
4. Blood pH. Regulation of acid-base balance
5. Buffer systems

Recommended reading:

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 111-114

[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp.58-67

[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 51-59

Key questions covered in Lecture 10. Basic principles of hemostasis: vascular-platelet and coagulation hemostasis. Coagulation factors. Anticoagulants and their importance.

1. Hematopoiesis. Erythropoiesis.
2. Morphology, properties and functions of erythrocytes.
3. Structure and functions of hemoglobin. Types of hemoglobin. Formation of oxyhemoglobin.
4. Classification of leukocytes. Morphology and functions of leukocytes. Variations in white blood cell count. Leukopoesis.
5. Thrombopoesis. Factors affecting thrombopoesis.

Recommended reading:

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp.115-163

[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp.67-131

[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 60-97

Key questions covered in Lecture 11. Antigenic blood system: abo system and rh factor. Blood groups.

1. What are blood antigen systems?
2. ABO system: blood groups, inheritance, compatibility
3. Rh factor: Rh+ and Rh-, importance, pregnancy conflict
4. Blood group determination: methods
5. Clinical significance: transfusion, immune reactions **Recommended reading:**

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 155-170

[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp.133-150

[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 98-116.

Key questions covered in Lecture 12. The structure, functions, and properties of the cardiac muscle. The cardiac conduction system. The cardiac cycle and its phase structure. 1. Morphofunctional characteristics of blood circ ulation.

2. The heart. Macro-, micro- and ultrastructure of myocardium. Physiology of Cardiac muscle.
3. Excitability. Action potentials in Cardiac muscle. Relation of action potential and contraction in Cardiac muscle. Refractory period of Cardiac muscle.
4. Rhythmical excitation of the heart.

Recommended reading:

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp.171-190

[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp.569-594

[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 281-293.

Key questions covered in Lecture 13. Electrocardiography. Description of ECG waves, intervals, segments and complexes and their clinical significance.

1. Introduction to electrocardiography (ECG)
2. Main ECG waves: P wave, Q, R, S waves, T wave
3. ECG intervals: PR interval, QT interval, RR interval
4. ECG segments: PQ (PR) segment, ST segment
5. Complexes: QRS complex
6. Clinical significance of waves, intervals, and segments

Recommended reading:

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 191-210

[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 596-634.

[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 294-312

Key questions covered in Lecture 14. Physiology of the circulatory system. Functional classification of vessels. Fundamental principles of hemodynamics. Characteristics of blood flow in the microcirculatory bed.

1. Basic concepts of Haemodynamics
2. General Haemodynamic parameters
3. Clinical Significance

4. The characteristic of blood flow in the vessels of microcirculation
5. The factors influencing on metabolism in the capillaries
6. The factors of venous return of blood to the heart **Recommended reading:**

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 231-276

[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 643-668

[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 312-337

Key questions covered in Lecture 15. Regional and systemic circulation. Levels and mechanisms of regulation of cardiovascular system.

1. Regional regulatory mechanisms of CVS
2. Factors Affecting Heart Rate and regulation of it.
3. Factors Affecting Cardiac Output and regulation of Cardiac Output
4. Factors Affecting Stroke volume
5. Central (systemic) regulatory mechanisms of CVS
6. Humoral regulation of CVS
7. Clinical considerations in vascular homeostasis

Recommended reading:

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp.277-315

[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 680-698

[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 358-387

Key questions covered in Lecture 16. Physiology of respiration. External respiration. Lung volumes and capacities.

1. Respiratory and non-respiratory functions of the lungs.
2. Gas exchange in the lungs and in the tissues
3. Partial pressure of oxygen and carbon dioxide
4. Saturation of hemoglobin with oxygen
5. Respiratory volumes and capacities

Recommended reading:

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 327-349

[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 729-757

[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 403-433

Key questions covered in Lecture 17. Gas exchange in the lungs. Transport of gases by blood. Gas exchange in tissues.

1. Transport of gases by blood.
2. Gas exchange in the lungs. Gas exchanges in the tissues.
3. Lungs volumes and capacities
4. Saturation of hemoglobin with oxygen.
5. Oxygen consumption and utilization.
6. Partial pressure of gases in atmospheric and alveolar air.
7. Calculation of partial pressure of atmospheric and alveolar and exhaled air.

Recommended reading:

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp.349-395

[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 760-807

[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 434-460

Key questions covered in Lecture 18. Features of the regulation of breathing. The first breath of a newborn.

1. Mechanisms of regulation
2. Receptors of respiratory system
3. Muscle and lung receptors
4. Variations in breathing
5. Fetal "Breathing" and first independent birth Recommended reading:

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp.381-405

[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp.773-793

[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 411--433

Key questions covered in Seminar 1. Homeostatic regulatory system. The cell as a structural and functional unit of a living organism. Functional systems of the cell. 1.1 "Internal environment". Total body fluids.

1.2. Body electrolytes

1.3. Measurement of body fluid volumes

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 3-9,45-51

[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 3-43,51,131,163

[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp 28-35

Key questions covered in Seminar 2. Cell membrane. Membrane potentials and action potentials. Transport of substances across the cell membrane.

1.1. Structure of the cell membrane

1.2. Types of transport of substances through the cell membrane

1.3. Basic principles of osmosis

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 35,59,81

[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 31, 171-216

[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 3-27, 35-50

Key questions covered in Seminar 3. Mechanisms of muscle contraction. Neuromuscular transmission and conjugation of excitation and contraction. Energy of muscle contraction

1.1. Structure of muscle

1.2. Types of muscle tissue

1.3. Mechanisms of muscle contraction

1.4. Neuromuscular transmission and excitation-contraction coupling

1.5. Energy of muscle contraction

1.6. Regulation of muscle contraction

1.7. Muscle fatigue and recovery

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 81-103

[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 171-220

[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 157-199

Key questions covered in Seminar 4. Assessment of module 1 1.1 "Internal environment". Total body fluids.

1.2. Body electrolytes

1.3. Measurement of body fluid volumes

1.4. The main physiological parameters measured using laboratory equipment include heart rate, blood pressure, and respiratory rate.

1.5. Following safety precautions ensures the accuracy and reliability of physiological experiments.

1.6. Basic methods in the physiology laboratory involve the proper preparation and analysis of biological samples.

1.7. Safety precautions when working with biological media, electrical appliances, reagents 1.8. Name and purpose of laboratory equipment and chemical glassware

1.9. The structure of the cell membrane.

1.10. Transport across the cell membrane. Types and transport mechanisms.

1.11. Excitability and their measurement.

1.12. Electrical potentials of tissues.

1.13. Resting membrane potential.

1.14. Apoptosis.

1.15. Structure of the cell membrane

1.16. Types of transport of substances through the cell membrane 1.17. Basic principles of osmosis

1.18. The concept of hemolysis and its physiological significance

1.19. Structure and function of erythrocytes (red blood cells)

1.20. Types of hemolysis: osmotic, mechanical, chemical, and others

1.21. Mechanisms of erythrocyte destruction during hemolysis

1.22. Factors causing hemolysis (changes in osmotic pressure, toxic substances, mechanical impact)

1.23. Structure of muscle

1.24. Types of muscle tissue
1.25. Mechanisms of muscle contraction
1.26. Neuromuscular transmission and excitation-contraction coupling
1.27. Energy of muscle contraction
1.28. Regulation of muscle contraction
1.29. Muscle fatigue and recovery

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp.3-9, 45-51, 59,81, 81-103
[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 4-43, 31, 51,131,163, 171-216, 171-220
[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp.3-27,28-50, 157-199

Key questions covered in Seminar 5. Organization of the nervous system: neuron and neuroglia, main functions of synapses, neurotransmitters. The role of various parts of the central nervous system in the regulation of physiological functions, movement control. Fundamentals of the structure and function of the cerebral cortex. Basal ganglia. The hypothalamus and its homeostatic role. Basal ganglia. Limbic system.

1.1. Structure of neurons and neuroglia
1.2. Main functions of synapses
1.3. Neurotransmitters: types and roles
1.4. Influence of the CNS on internal organs
1.5. Fundamentals of the structure and function of the cerebral cortex
1.6. Structural features of the cortex
1.7. Functional zonal organization
1.8. Basal ganglia. Main structures and functions. Role in motor control
1.9. The hypothalamus and its homeostatic role. Regulation of internal environment balance Influence on endocrine and autonomic systems.
1.10. Limbic system. Structure and functions. Influence on emotions and behavior.

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 699
[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 817-844,949-977
[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 851-893

Key questions covered in Seminar 6. Physiology of the autonomic nervous system.

1.1. General structure and functions of the autonomic nervous system
1.2. Sympathetic and parasympathetic nervous systems: anatomy and functions
1.3. Mechanisms of nerve impulse transmission in the autonomic system
1.4. Regulation of internal organ activity by the autonomic nervous system.
1.5. Reflex arcs of the autonomic nervous system
1.6. Influence of the autonomic nervous system on circulation, digestion, respiration, and other physiological processes

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 801, 827
[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 817, 1030
[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp.923-935

Key questions covered in Seminar 7. Reflex. Reflex arcs. Simple and complex. Reflex regulation of somatic functions: Sensory and motor pathways, mechanism for maintaining tone, control of body movements,posture and balance.

1.1 Reflex and reflex arcs
1.2 Simple and complex reflexes
1.3 Reflex regulation of somatic functions
1.4 Sensory and motor pathways
1.5 Mechanisms for maintaining muscle tone
1.6 Control of body movements, posture, and balance

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 719, 801
[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 859-868
[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 880-893

Key questions covered in Seminar 8. Assessment of module 2

1.1. Structure of neurons and neuroglia
1.2. Main functions of synapses
1.3. Neurotransmitters: types and roles
1.4. Influence of the CNS on internal organs
1.5. Fundamentals of the structure and function of the cerebral cortex
1.6. Structural features of the cortex
1.7. Functional zonal organization
1.8. Basal ganglia. Main structures and functions. Role in motor control
1.9. The hypothalamus and its homeostatic role. Regulation of internal environment balance Influence on endocrine and autonomic systems.
1.10. Limbic system. Structure and functions. Influence on emotions and behavior.
1.11. Technique of EEG recording. Preparation of the patient and electrodes. Placement of electrodes and skin preparation. Recording procedure and conditions
1.12. Normal forms of EEG. Characteristics of main rhythms (alpha, beta, theta, delta). Features of normal EEG in healthy individuals.
1.13. Conducting psychophysiological tests. Types of tests (e.g., reaction to light, sound stimuli). Methodology and interpretation of results
1.14. General structure and functions of the autonomic nervous system
1.15. Sympathetic and parasympathetic nervous systems: anatomy and functions
1.16. Mechanisms of nerve impulse transmission in the autonomic system
1.17. Regulation of internal organ activity by the autonomic nervous system.
1.18. Reflex arcs of the autonomic nervous system
1.19. Influence of the autonomic nervous system on circulation, digestion, respiration, and other physiological processes 1.20. Reflex and reflex arcs
1.21. Simple and complex reflexes
1.22. Reflex regulation of somatic functions
1.23. Sensory and motor pathways
1.24. Mechanisms for maintaining muscle tone
1.25. Control of body movements, posture, and balance
1.26. Clinical examination of the nervous system
1.27. Assessment of the integrative function of the spinal cord
1.28. Study of clinical tendon reflexes in human

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 699, 703-737, 801, 827
[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019 pp. 817-955, 1001-1041
[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 851-893

Key questions covered in Seminar 9. General organization of the senses.

1.1. General organization and classification of sensory organs
1.2. Major types of sensory receptors and their physiological properties
1.3. Principles of transmission and processing of sensory information in the nervous system
1.4. Role of the central nervous system in integration of sensory signals
1.5. Principal sensory pathways from peripheral receptors to the cerebral cortex

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 713-737.
[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. pp. 895-906, 955-970.
[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 870-880, 951-961,1015-1047.

Key questions covered in Seminar 10. Special senses: visual, auditory, gustatory, olfactory and somato- visceral.

1.1. Vision: anatomy of the eye and basic mechanisms of light perception
1.2. Hearing: structure of the ear and mechanism of sound wave perception
1.3. Taste: taste receptors and perception of gustatory sensations
1.4. Smell: anatomy of the olfactory system and mechanisms of odor recognition
1.5. Somato-visceral senses: receptors of the body and internal organs, their role in perception of various stimuli

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.**741-779.

[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.**1041-1107.

[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 1057-1088.

Key questions covered in Seminar 11. Assessment of module 3

1.1. General organization and classification of sensory organs
1.2. Major types of sensory receptors and their physiological properties
1.3. Principles of transmission and processing of sensory information in the nervous system
1.4. Role of the central nervous system in integration of sensory signals
1.5. Principal sensory pathways from peripheral receptors to the cerebral cortex
1.6. Vision: anatomy of the eye and basic mechanisms of light perception
1.7. Hearing: structure of the ear and mechanism of sound wave perception
1.8. Taste: taste receptors and perception of gustatory sensations
1.9. Smell: anatomy of the olfactory system and mechanisms of odor recognition
1.10. Somato-visceral senses: receptors of the body and internal organs, their role in perception of various stimuli 1.1. Visual acuity assessment

- Using the Snellen chart or other standard charts to test visual acuity
- Interpretation of results and detection of abnormalities

1.2. Hearing acuity assessment

- Conducting audiometric tests or basic noise tests (e.g., Weber and Rinne tests)
- Determining hearing thresholds and identifying possible hearing impairments

1.3. Qualitative olfactory assessment test

- Using sets of odors for identification (e.g., recognition tests with standard scents)
- Evaluating the sharpness and quality of olfactory perception

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.**741-779.

[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.**1041-1107.

[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 1057-1088.

Key questions covered in Seminar 12. Composition and functions of blood and plasma. Plasma proteins. Erythrocytes: functions. Structure, functions, and compounds of hemoglobin. Leukocytes, platelets: types, functions, properties

1.1. Composition of blood and plasma. Main components of blood and their roles. Structure and functions of plasma
1.2. Plasma proteins. Major types: albumins, globulins, fibrinogen. Their functions and significance
1.3. Erythrocytes: structure and functions. Primary function — transport of oxygen and carbon dioxide. Structure, components of hemoglobin. Properties of hemoglobin and its role in gas transport.
1.4. Leukocytes and platelets: types, functions, properties. Types of leukocytes (neutrophils, lymphocytes, monocytes, etc.) and their roles. Platelets: structure, role in blood clotting and vessel repair

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.**111-139.

[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.**51-110.

[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 51-94.

Key questions covered in Seminar 13. Hemostasis. Physical and chemical characteristics of platelets. Mechanism of blood coagulation.

1. Hemostasis: Overview
1.1 What is hemostasis and why is it important?
1.2. Main stages: vascular spasm, platelet plug formation, blood coagulation
2.Physical and Chemical Characteristics of Platelets
2.1. Structure and size of platelets
2.2. Chemical composition: granules, enzymes, receptors
2.3. Platelet functions in hemostasis and wound healing
3. Mechanism of Blood Coagulation
3.1. The coagulation cascade: intrinsic, extrinsic, and common pathways
3.2. Role of coagulation factors and calcium ions

3.3. Formation and stabilization of fibrin clot
3.4. Regulation to prevent excessive clotting

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.**155-163.
[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.**131-133.
[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 94-109.

Key questions covered in Seminar 14. ABO system and Rh factor. Transfusion reactions in ABO incompatibility and Rh incompatibility.

1.1. Introduction to the ABO system: structure of antigens and agglutinins
1.2. Blood group determination according to the ABO system.
1.3. Key properties of the Rh factor: Rh-positive and Rh-negative.
1.4. Mechanisms of reactions during transfusion due to ABO and Rh incompatibility.
1.5. Clinical manifestations and consequences of incompatible transfusions.
1.6. Prevention measures and treatment of transfusion reactions.

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.**155-163.
[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.**131-133.
[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 109-122.

Key questions covered in Seminar 15. Assessment of module 4

1.1. Composition of blood and plasma. Main components of blood and their roles. Structure and functions of plasma
1.2. Plasma proteins. Major types: albumins, globulins, fibrinogen. Their functions and significance
1.3. Erythrocytes: structure and functions. Primary function — transport of oxygen and carbon dioxide. Structure, components of hemoglobin. Properties of hemoglobin and its role in gas transport.
1.4. Leukocytes and platelets: types, functions, properties. Types of leukocytes (neutrophils, lymphocytes, monocytes, etc.) and their roles.
1.5. Platelets: structure, role in blood clotting and vessel repair.

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.**111-163.
[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.**51-163.
[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 51-122.

Key questions covered in Seminar 16. Physiology of the cardiac muscle. Structural and functional characteristics of the cardiac muscle. Cardiac muscle action potential. Phases of the cardiac cycle.

1.1. Structure and functions of cardiac muscle:Morphological features and tissue composition. Differences from skeletal muscles: presence of intercalated discs, numerous mitochondria, automaticity.
1.2. Excitability and action potential of cardiac muscle:Phases of action potential formation.Ion mechanisms — sodium, potassium, calcium channels. Features of repolarization phase and duration.
1.3. Phases of the cardiac cycle: Systole and diastole. Main stages: atrial contraction, ventricular contraction, isometric contraction, relaxation. Importance of coordination and timing.

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.**171-184,261-271.
[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.**561-569,619-630.
[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp.281-294.

Key questions covered in Seminar 17. Factors influencing heart rate, regulation of cardiac output, blood pressure.

1.1. Factors influencing heart rate
1.2. Mechanisms of cardiac output regulation
1.3. Regulation of blood pressure

1.4. Analysis of examples of influence of various factors (stress, physical activity, body position)

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.**227-231,211-216.

[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.**635-643, 650-665.

[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 339-388.

Key questions covered in Seminar 18. Physiology of the circulatory system. Functional classification of vessels. Fundamental principles of hemodynamics. Characteristics of blood flow in the microcirculatory bed.

1.1.Introduction: main functions of the circulatory system

1.2.Functional classification of vessels (arteries, veins, capillaries)

1.3.Fundamental principles of hemodynamics (pressure, resistance, blood volume)

1.4.Characteristics of blood flow in the microcirculatory bed

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.** 231-245, 211-216.

[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.**643-650.

[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 312-339.

Key questions covered in Seminar 19. Assessment of module 5

1.1. Structure and functions of cardiac muscle. Morphological features and tissue composition. Differences from skeletal muscles: presence of intercalated discs, numerous mitochondria, automaticity.

1.2. Excitability and action potential of cardiac muscle: Phases of action potential formation.Ion mechanisms — sodium, potassium, calcium channels. Features of repolarization phase and duration.

1.3. Phases of the cardiac cycle: Systole and diastole. Main stages: atrial contraction, ventricular contraction, isometric contraction, relaxation. Importance of coordination and timing.

1.4. Placement of electrodes and preparation of the ECG recording device.

1.5. Record ECGs on participants (or students).

1.6. Analyze the obtained ECGs: Identify and describe P wave, QRS complex, T wave.

1.7. Measure intervals (PR, QT, RR) and segments (ST).

1.8. Evaluate rhythm, heart rate, and detect any abnormalities (arrhythmias, blocks, ischemic changes).

1.9. Discuss results, distinguish between normal and pathological findings.

1.10. Factors influencing heart rate

1.11. Mechanisms of cardiac output regulation

1.12. Regulation of blood pressure

1.13. Analysis of examples of influence of various factors (stress, physical activity, body position)

1.14. Introduction to the importance of auscultation of heart sounds

1.15. Equipment setup and preparation (stethoscope selection, correct patient positioning)

1.16. Demonstration of listening to heart sounds (connection to cardiac anatomy and physiology)

1.17. Practical work: students listen to heart sounds in peers

1.18. Discussion of distinguishing systolic and diastolic sounds, pathological conditions

1.19. Introduction: main functions of the circulatory system

1.20. Functional classification of vessels (arteries, veins, capillaries)

1.21. Fundamental principles of hemodynamics (pressure, resistance, blood volume)

1.22. Characteristics of blood flow in the microcirculatory bed

1.23. Introduction: importance of blood pressure and hemodynamic parameter measurements

1.24. Explanation of Korotkov's method for blood pressure measurement

1.25. Demonstration of the procedure using a sphygmomanometer and stethoscope

1.26. Determination of key hemodynamic parameters:Cardiac output. Stroke volume. Total peripheral vascular resistance

1.27. Practical session: measuring blood pressure and calculating hemodynamic parameters among students

1.28. Discussion of results, common errors, and their causes

1.29. Introduction: importance of measuring heart rate at rest and under load for assessing cardiac functional status

1.30. Explanation of heart rate measurement methods

1.31. Instructions and demonstration of the Ruffier test

1.32. Practical session: measuring heart rate at rest and after physical exertion, conducting the Ruffier test among students

1.33. Calculation of the Ruffier index and interpretation of results

1.34. Discussion of factors affecting test outcomes

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.**171-277.

[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.**561-677.

[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp.281-388.

Key questions covered in Seminar 20. Physiology of respiration

1.1. Introduction: importance of respiratory physiology for overall organism function
1.2. Main functions of the respiratory system: ventilation, gas exchange, regulation of acid-base balance
1.3. Structure of the respiratory pathways and lungs: brief overview of anatomy and physiology
1.4. Mechanism of inspiration and expiration: pressure gradients, involvement of respiratory muscles
1.5. Regulation of breathing: role of central and peripheral chemoreceptors

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.** 327-365.

[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.** 729-768.

[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 403-434.

Key questions covered in Seminar 21. Transport of gases in blood. Gas exchange in the lungs and tissues. Lung volumes and capacities. Saturation of hemoglobin with oxygen. Oxygen consumption and its utilization. Partial pressure of gases in atmospheric and alveolar air.

1.1. Introduction: importance of gas transport and gas exchange for organism viability
1.2. Mechanisms of oxygen and carbon dioxide transport in blood
1.3. Gas exchange in lungs and tissues: diffusion principles and the role of the alveolar-capillary membrane
1.4. Lung volumes and capacities: key concepts (tidal volume, reserve volumes, vital capacity, etc.)
1.5. Hemoglobin oxygen saturation: dissociation curves and influencing factors
1.6. Oxygen consumption and its utilization by tissues
1.7. Partial pressures of gases in atmospheric and alveolar air: explanation and significance

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.** 365-381.

[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.** 768-773.

[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp.434-461.

Key questions covered in Seminar 22. Features of breathing regulation

1.1. Introduction: role of breathing regulation in maintaining organism homeostasis
1.2. Overview of main respiratory regulation mechanisms: Respiratory centers in the medulla oblongata. Chemoreceptors (central and peripheral) and their response to CO2, O2, pH. Influence of neural and humoral factors
1.3. Demonstration of the effects of various factors on respiratory activity (e.g., breath holding, deep breathing, physical exercise)

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.** 381-405.

[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.** 773-810.

[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 461-480.

Key questions covered in Seminar 23. Assessment of module 6

1.1. Introduction: importance of respiratory physiology for overall organism function
1.2. Main functions of the respiratory system: ventilation, gas exchange, regulation of acid-base balance
1.3. Structure of the respiratory pathways and lungs: brief overview of anatomy and physiology
1.4. Mechanism of inspiration and expiration: pressure gradients, involvement of respiratory muscles
1.5. Regulation of breathing: role of central and peripheral chemoreceptors
1.1. Introduction: importance of gas transport and gas exchange for organism viability
1.2. Mechanisms of oxygen and carbon dioxide transport in blood
1.3. Gas exchange in lungs and tissues: diffusion principles and the role of the alveolar-capillary membrane

1.4. Lung volumes and capacities: key concepts (tidal volume, reserve volumes, vital capacity, etc.)
1.5. Hemoglobin oxygen saturation: dissociation curves and influencing factors
1.6. Oxygen consumption and its utilization by tissues
1.7. Partial pressures of gases in atmospheric and alveolar air: explanation and significance
1.8. Introduction: importance of evaluating respiratory function for health and physical performance
1.9. Explanation of thoracometry (measurement of chest volume and shape)
1.10. Demonstration of thoracometry procedure: securing and measuring chest parameters
1.11. Determining respiratory rate:at rest,during exercise (e.g., light walking or marching in place)
1.12. Measuring oxygen saturation: using a pulse oximeter
1.13. Practical session: student measurements and data recording
1.14. Data analysis: comparison, assessment of respiratory health
1.15. Introduction: role of breathing regulation in maintaining organism homeostasis
1.16. Overview of main respiratory regulation mechanisms:Respiratory centers in the medulla oblongata. Chemoreceptors (central and peripheral) and their response to CO2, O2, pH. Influence of neural and humoral factors 1.17. Demonstration of the effects of various factors on respiratory activity (e.g., breath holding, deep breathing, physical exercise)
1.18. Main lung volumes and capacities (tidal volume, reserve volume, vital capacity, etc.)
1.19. Methods for measuring volumes using spirometry
1.20. Performing measurements in different body positions
1.21. Analysis and interpretation of results to assess respiratory function

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.** 327-405.
[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.** 729-810.
[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 403-482.

Key questions covered in Laboratory work 1. Introduction with laboratory equipment and methods of work in the laboratory Safety precautions and basic methods of work in the laboratory.

1.1. The main physiological parameters measured using laboratory equipment include heart rate, blood pressure, and respiratory rate.
1.2. Following safety precautions ensures the accuracy and reliability of physiological experiments.
1.3. Basic methods in the physiology laboratory involve the proper preparation and analysis of biological samples.
1.4. Safety precautions when working with biological media, electrical appliances, reagents
1.5. Name and purpose of laboratory equipment and chemical glassware

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.** 3-59.
[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.** 3-43.
[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 3-35.

Key questions covered in Laboratory work 2. Observation of different types of hemolysis. Osmotic resistance of erythrocytes.

1.1. The concept of hemolysis and its physiological significance
1.2. Structure and function of erythrocytes (red blood cells)
1.3. Types of hemolysis: osmotic, mechanical, chemical, and others
1.4. Mechanisms of erythrocyte destruction during hemolysis
1.5. Factors causing hemolysis (changes in osmotic pressure, toxic substances, mechanical impact)

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.155-163.**
[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. pp. 98-101.
[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 98-109.

Key questions covered in Laboratory work 3. Technique of EEG recording. Normal forms of EEG. Conducting psychophysiological tests

1.1. Technique of EEG recording. Preparation of the patient and electrodes. Placement of electrodes and skin preparation. Recording procedure and conditions
1.2. Normal forms of EEG. Characteristics of main rhythms (alpha, beta, theta, delta). Features of normal EEG in healthy individuals.

1.3. Conducting psychophysiological tests. Types of tests (e.g., reaction to light, sound stimuli). Methodology and interpretation of results

Recommended reading

[1] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. pp. 1001-1004.

[2] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp. 845-849.**

[3] **Textbook** of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 985-995.

Key questions covered in Laboratory work 4. Clinical examination of the nervous system: assessment of the integrative function of the spinal cord. Study of clinical tendon reflexes in humans.

1.1. Clinical examination of the nervous system

1.2. Assessment of the integrative function of the spinal cord

1.3. Study of clinical tendon reflexes in humans

Recommended reading:

[1] Medical Physiology. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. pp. 787-791.

[2] Essentials of Medical Physiology.8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. pp. 868-895.

[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 935-961.

Key questions covered in Laboratory work 5. Assessing sensory functions: Visual acuity assessment. Hearing acuity assessment. Qualitative olfactory assessment test.

1.4. Visual acuity assessment

- Using the Snellen chart or other standard charts to test visual acuity
- Interpretation of results and detection of abnormalities

1.5. Hearing acuity assessment

- Conducting audiometric tests or basic noise tests (e.g., Weber and Rinne tests)
- Determining hearing thresholds and identifying possible hearing impairments

1.6. Qualitative olfactory assessment test

- Using sets of odors for identification (e.g., recognition tests with standard scents)
- Evaluating the sharpness and quality of olfactory perception

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.**741-779.

[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.**1041-1107.

[3] Textbook of Physiology. Vol 2.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd, 2017. pp. 1057-1088.

Key questions covered in Laboratory work 6. Determination of the main indicators of blood cells: Hemoglobin, erythrocytes and leukocytes.

1.1. Hemoglobin determination — using reagents and photometry.

1.2. Erythrocyte count — blood smear microscopy or automated analyzer.

1.3. Leukocyte count — blood smear microscopy or automated analyzer.

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.**111-163.

[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.**51-163.

[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 51-122.

Key questions covered in Laboratory work 7. Hemostasis parameters and blood grouping. Determination of coagulation time (CT) (Buerker method). Determination of bleeding time (BT) (Duke method). Blood typing.Determination of the Rh factor.

1.1. Determination of clotting time (CT) using the Buerker method: Measure the time for clot formation after reagent addition.

1.2. Determination of bleeding time (BT) using the Duke method:Perform a skin puncture and record bleeding duration.

Blood grouping and Rh factor determination:Conduct agglutination tests with anti-A, anti-B, and anti-Rh sera.

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.**155-163.

[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.**131-133.

[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 94-109.

Key questions covered in Laboratory work 8. Electrocardiography. Description of ECG waves, intervals, segments and complexes and their clinical significance.

1.1. Placement of electrodes and preparation of the ECG recording device.
1.2. Record ECGs on participants (or students).
1.3. Analyze the obtained ECGs: Identify and describe P wave, QRS complex, T wave.
1.4. Measure intervals (PR, QT, RR) and segments (ST).
1.5. Evaluate rhythm, heart rate, and detect any abnormalities (arrhythmias, blocks, ischemic changes).
1.6. Discuss results, distinguish between normal and pathological findings.

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.**191-197.
[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.** 596-604.
[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 294-312.

Key questions covered in Laboratory work 9. Functional evaluation of the cardiovascular system: Observation of heart sounds (auscultation).

1. Principles and technique of cardiac auscultation.
2. Anatomical sites of cardiac auscultation.
3. Mechanisms and characteristics of the first and second heart sounds.
4. Assessment of heart rate, rhythm, and physiological variations of heart sounds.
5. Identification of abnormal heart sounds and cardiac murmurs.

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.** 211--217.
[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.** 589-596.
[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 287-294.

Key questions covered in Laboratory work 10. Measurement of blood pressure according to the Korotkov's method

1. Characteristics of blood flow in vessels of different caliber
2. The relationship of pulse and blood pressure
3. Measurement of blood pressure by the Korotkov method at rest and during physical exertion;
4. Conduct experimental work to determine the pressure at rest and under loads
5. Calculate the main parameters: cardiac output, peripheral vascular resistance, blood flow rate, average blood pressure.
6. Solve clinical problems with different parameters.

Recommended reading

[4] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.**225-227.
[5] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.** 650-665, 619-630.
[6] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 349-358.

Key questions covered in Laboratory work 11. Determination of heart rate at rest and under load. Conducting the (Ruffier test).

1.1. Introduction: importance of measuring heart rate at rest and under load for assessing cardiac functional status
1.2. Explanation of heart rate measurement methods
1.3. Instructions and demonstration of the Ruffier test
1.4. Practical session: measuring heart rate at rest and after physical exertion, conducting the Ruffier test among students
1.5. Calculation of the Ruffier index and interpretation of results
1.6. Discussion of factors affecting test outcomes

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.**227-231,211-216.
[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.**635-643, 650-665.
[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 339-388.

Key questions covered in Laboratory work 12. Assessment of the functional state of the respiratory system: Thoracometry. Determination of respiratory rate at rest and during exercise. Saturation of oxyhemoglobin

1.1. Introduction: importance of evaluating respiratory function for health and physical performance
1.2. Explanation of thoracometry (measurement of chest volume and shape)
1.3. Demonstration of thoracometry procedure: securing and measuring chest parameters
1.4. Determining respiratory rate:at rest,during exercise (e.g., light walking or marching in place)
1.5. Measuring oxygen saturation: using a pulse oximeter
1.6. Practical session: student measurements and data recording
1.7. Data analysis: comparison, assessment of respiratory health

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.** 381-405.
[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.** 773-810.
[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 461-480.

Key questions covered in Laboratory work 13. Assessment of the functional state of the respiratory system: Determination of lung volumes and capacity, and its analysis.

1.22. Main lung volumes and capacities (tidal volume, reserve volume, vital capacity, etc.)
1.23. Methods for measuring volumes using spirometry
1.24. Performing measurements in different body positions
1.25. Analysis and interpretation of results to assess respiratory function

Recommended reading

[1] Medical Physiology. 14th edition/ Pr. A.C. Guyton and Pr. J.E. Hall// - Elsevier Inc., 2016. **pp.** 327-365.
[2] Essentials of Medical Physiology. 8th edition/ K. Sambulingam and Prema Sambulingam// - Jaypee Brothers Medical Publishers (P) Ltd, 2019. **pp.** 729-768.
[3] Textbook of Physiology. Vol 1.7th ed. Jain A.K. Jaypee Brothers Medical Publishers (P) Ltd,2017. pp. 403-434.

Methodological instructions for the implementation of independent work on the discipline.
Registration of the practical work protocol

In the notebook for practical work, it is necessary to write down the protocol of the laboratory work performed, indicating the purpose, objectives, equipment and reagents, the course of the experiment, results, conclusions.

Preparation of an abstract report or presentation

At each lesson, students can prepare an abstract report or a presentation on their chosen topics. The volume of the abstract report is 5-15 pages, the number of slides in the presentation is 10-20. The duration of the report is 10 minutes. The report is presented orally, reading out the text is unacceptable. Presentation It should be designed using diagrams, illustrations, and the test should be brief and contain only the most important information.

Unit 1 Introduction to Physiology: Cellular and General physiology. Physiology of excitable structures

1. Draw a diagram: "Apoptosis - programmed cell death".
2. Fill in the table: cells: organelles and main functions.
3. Prepare an abstract on the topic: "Mechanisms of transport through cell membranes".
4. Prepare an abstract on the topic: "Neuromuscular transmission and coupling of excitation and contraction".
5. Work with literature

Unit 2 Physiology of the central nervous system

1. Practical work: clinical examination of the nervous system: functions, motor system, reflexes.
2. Prepare an abstract on the topic: "Using modern methods to determine the mechanism of dominant regulation." 3. Prepare a clinical case: "Functions of the autonomic nervous system."
4. Work with literature.

Unit 3 Physiology of the sense organs

1. Prepare a presentation on the topic: "Sensory organs".
2. Practical work: determining taste sensitivity.
3. Practical work: determining the threshold of pain sensitivity.
4. Fill in the table: "Skin receptors".
5. Working with literature.

Unit 4 Physiology of blood

1. Prepare an abstract on the topic: "Structure and functions of hemoglobin. Synthesis and breakdown of hemoglobin. T- and R-forms of hemoglobin."
2. Prepare an abstract on the topic: "Physiological and pathological variations of different types of leukocytes." 3. Prepare a presentation on the topic: "Blood clotting: what is known about COVID-19 and abnormal blood clotting."
4. Prepare a clinical case: "Respiratory and metabolic alkalosis and acidosis." 5. Work with literature.

Unit 5 Physiology of the cardiovascular system

1. Prepare an abstract on the topic: "Functional assessment of the cardiovascular system at rest and under load." 2. Prepare an abstract on the topic: "Calculation of average pressure, cardiac output and peripheral resistance in human vessels at rest."
3. Work with literature.

Unit 6 Physiology of Respiration

1. Prepare a clinical case: "The importance of the hypothalamus and limbic system in the regulation of breathing."
2. Prepare a clinical case: "The importance of the medulla oblongata and pons in the regulation of breathing." 3. Prepare an abstract on the topic: "The influence of smog on the condition and functions of the respiratory system."
4. Practical work: study of sweating using the Minor method (assessment of the excretory function of the body).
5. Work with literature.