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Federal State Budget Educational Institution
of Higher Education
Pacific State Medical University
of the Ministry of Health of the Russian Federation

APPROVED BY

Head of the Department of Human Physiology
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_____ / Markelova E.V./
"14th" of April 2025

SUBJECT GUIDE FOR TEACHERS AND STUDENTS FOR

Б1.О.10 Human physiology

(Name of discipline)

Specialty	**31.05.01 General Medicine for international students (in English)** (code, name)
Degree	Specialist's degree
Profile	02 "Healthcare" (in the field of providing primary health care to the population in medical organizations: polyclinics, outpatient clinics, inpatient/outpatient facilities of the municipal health care system)
Mode of study	**Full-time**
Period of mastering the BEP	**6 years** (nominal length of study)
Institute	of Human Physiology and Pathophysiology

Vladivostok, 2025

Subject guide for teachers and students for **Б1.О.10 Human physiology** is based on:

1) Federal State Educational Standard of Higher Education for the specialty approved by the Order No. 988 of Ministry of Science and Higher Education of the Russian Federation
dated August 12, 2020.

2) Curriculum for the specialty 31.05.01 General Medicine for international students (in English), profile 02 "Healthcare" (in the field of providing primary health care to the population in medical organizations: polyclinics, outpatient clinics, inpatient/outpatient facilities of the municipal health care system),
approved by the Academic Council of FSBEI HE PSMU of the Ministry of Health of Russia Report No. 8/24-25 dated March 31, 2025.

Subject guide for teachers and students for the discipline was developed by the writing team of the Department of Human Physiology and Pathophysiology of the FSBEI HE PSMU of the Ministry of Health of Russia, under the guidance of the Head of the Department of Human Physiology and Pathophysiology, Doctor of Medical Sciences, Professor Markelova E.V.

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1. GENERAL PROVISIONS

Subject guide for **Б1.О.10 Human physiology** is a set of recommendations and explanations that facilitate to optimal organization of mastering this discipline.

Regular analysis of lecture materials and work with end-of-the-text questions are necessary for better understanding of the material and systematization of knowledge of **Б1.О.10 Human physiology**. Particular attention should be paid to emerging questions, confusing terms, and conflicts of points of view during the independent review of the lecture material. If necessary, a student should contact the teacher for advice. Lecture material streamlines students' thinking, while practical classes provide deeper insight into the material of the discipline.

Special attention should be paid to the content of the main provisions and conclusions, explanation of phenomena and facts, and clarification of the practical application of theoretic aspects of topic when preparing for a practical class. During this process students should aim to understand and remember the main provisions of the material under consideration, examples provided, as well as understand the illustrative material.

Collections of assessment tools are used to organize independent study of topics (questions) of the discipline.

Independent work of students is facilitated by the following:

1. availability and accessibility of the necessary educational and reference material;
2. a system of regular quality control of completed independent work;
3. availability of teacher's advice.

Subject guides for self-study are presented as literary sources and illustrative materials. Subject guides for independent work of students include a list of library resources of the educational institution and other materials accessible to students.

Independent work is a type of in-person extracurricular work of teachers and students of **Б1.О.10 Human physiology**. Control of independent work is conducted by the leading teacher. Evaluation of independent work results is taken into account when conducting interim examination of students throughout the **Б1.О.10 Human physiology** course.

Continuous assessment during the **Б1.О.10 Human physiology** course is implemented in order to check indicators of achieving competencies, to stimulate students' academic work, and improve methods of mastering new knowledge. Continuous assessment during the **Б1.О.10 Human physiology** course is conducted during the semester to assess all types and sections of the academic discipline that encompass the competencies developed by the discipline: classroom questioning, working with tests, working with case studies, and completing practical assignments. Continuous assessment of students' knowledge and results of their preparation for practical classes is conducted during every class session.

Interim assessment aims to determine the level of mastery of competency indicators. It is conducted in the exam format after the student has mastered all sections of **Б1.О.10 Human physiology** and takes into account learning outcomes for all types of student work over the entire period of mastering the **Б1.О.10 Human physiology** course.

Time allotted for interim assessment is indicated in the schedule.

Assignments given during practical classes, as well as assignments aimed to prepare students for continuous and interim assessment, are included in the collection of assessment tools for **Б1.О.10 Human physiology**. If necessary, students should contact the teacher for advice. It is necessary to thoroughly think over questions that need clarification before seeking teacher's advice.

2. SUBJECT GUIDES FOR LECTURE CLASSES

Table 1. Subject Guides for **Б1.О.10 Human physiology** Lectures

Topic No.1 Introduction to physiology. General physiology of excitable systems	
Duration of the lecture (in academic hours):	2
Purpose of the lecture: 1. tell students about fundamental processes that ensure the functioning of living systems; 2. define basic concepts of physiology (excitation and excitability, etc.); 3. examine methods of assessing the excitability of the neuromuscular system.	
Lecture plan, order of presentation of its sections: 1. Subject and objectives of physiology. 2. Live organization levels and integration. 3. Transport of substances through cell membranes. 4. Membrane potentials. 5. Excitability. 6. Graded potential and action potential. 7. Basic low of excitation. 8. Effect of constant electric current on tissues. 9. Parabiosis	
Recommended reading: 1. Избранные лекции по нормальной физиологии = Selected Lectures on Normal Physiology: учебное пособие на русском и английском языках. M. M. Lapkin, E. A. Trutneva / M.: GEOTAR-Media, 2021. – 544 с. URL: http://www.studentlibrary.ru/ 2. Normal physiology: textbook = Нормальная физиология: учебник на английском языке Dorokhov Ye. V., Karpova A.V., Semiletova V.A. et al. / M.: GEOTAR-Media, 2021. – 512 с. URL: http://www.studentlibrary.ru/ 3. Normal physiology: textbook. Ed. K. V. Sudakov./ M.: GEOTAR-Media, 2022. – 728 с. URL: http://www.studentlibrary.ru/	
Topic No.11 Physiology of cardiac function. Examination methods	
Duration of the lecture (in academic hours):	2
Purpose of the lecture: 1. tell students about the properties of the heart muscle and the hemodynamic function of the heart, the phases and periods of the cardiac cycle, the relationship between the processes of excitation, contraction, and excitability in the heart muscle; 2. define basic properties of the myocardium, the gradient of automaticity; 3. examine methods of assessing hemodynamic function and electrical activity of the myocardium, the origin of heart sounds, as well as the waves, segments, and intervals of electrocardiogram (ECG).	
Lecture plan, order of presentation of its sections: 1. Blood circulation (hemodynamics). 2. The cardiac cycle. 3. Heart muscle properties. 4. Specialized excitatory and conductive system of the heart. 5. Electrocardiography. 6. Heart sounds. 7. The main indicators of hemodynamics. 8. Regulation of cardiac activity.	
Recommended reading:	

1. Избранные лекции по нормальной физиологии = Selected Lectures on Normal Physiology: учебное пособие на русском и английском языках. M. M. Lapkin, E. A. Trutneva / M.: GEOTAR-Media, 2021. – 544 с. URL: http://www.studentlibrary.ru/
2. Normal physiology: textbook = Нормальная физиология: учебник на английском языке Dorokhov Ye. V., Karpova A.V., Semiletova V.A. et al. / M.: GEOTAR-Media, 2021. – 512 с. URL: http://www.studentlibrary.ru/
3. Normal physiology: textbook. Ed. K. V. Sudakov./ M.: GEOTAR-Media, 2022. – 728 с. URL: http://www.studentlibrary.ru/

3. SUBJECT GUIDES FOR PRACTICAL CLASSES

Table 2. Subject Guides for Practical **Б1.О.10 Human physiology** Classes

Topic No.11 Humoral regulation of functions. Hypothalamic–pituitary system **Topic No.12 Physiology of the endocrine system**	
Duration of the practical class (in academic hours):	4
Purpose of the practical class: 1. consolidate acquired knowledge about the characteristics, effects and pathway of hormones, regulatory mechanisms of hormones release; 2. during the discussion, outline the hypothalamic-pituitary system in regulating the release of hormones and the main endocrine axes of the body; 3. discuss various pathways of self-regulation of hormone secretion by peripheral glands 4. thoroughly go over definitions and concepts of effector and tropic hormones, synergistic and antagonist hormones, permissive action of hormones; 5. study patterns of change in the function of the peripheral gland under the influence of the hypothalamic-pituitary system; 6. develop an idea of the types of interactions between hormones; 7. study and consolidate the properties of hormones of the main peripheral glands (thyroid gland, adrenal cortex, sex glands); 8. study the properties of parathyroid hormones; 9. study the endocrine functions and hormones of the pancreas; 10. develop an idea of hormones' role in regulating metabolism; 11. develop an idea of the hormonal regulation of carbohydrate metabolism; 12. develop an idea of the hormonal regulation of calcium and phosphorus metabolism.	
Practical classes requirements: classrooms equipped with multimedia equipment, blackboards, personal computers with the "virtual physiology" software, and subject guides for the discipline.	
Independent work of the student: **Extracurricular work (preparation for practical classes):** 1. Working with educational literature 2. Preparing a diagram of self-regulation of hormone secretion involving the hypothalamic-pituitary system, complete a table of the influence of hormones of the hypothalamic-pituitary system on the functions of the body (according to the template) 3. Completing a table describing the properties of peripheral hormones (according to the template) **Independent work in class** 1. Determination of the effect of thyroxin, thyroid stimulating hormone, and propylthiouracil on metabolic rate in a virtual experiment in a healthy rat, a rat with a removed thyroid gland, and a rat with a removed pituitary gland ("Virtual Physiology" software) 2. Determination of the effect of insulin and alloxan on glucose levels ("Virtual Physiology" software)	

Methods of evaluation of acquired knowledge and skills: classroom questioning, working with tests, working with case studies, submitting reports on independent work results.
Recommended reading: 1. Избранные лекции по нормальной физиологии = Selected Lectures on Normal Physiology: учебное пособие на русском и английском языках. M. M. Lapkin, E. A. Trutneva / M.: GEOTAR-Media, 2021. – 544 с. URL: http://www.studentlibrary.ru/ 2. Normal physiology: textbook = Нормальная физиология: учебник на английском языке Dorokhov Ye. V., Karpova A.V., Semiletova V.A. et al. / M.: GEOTAR-Media, 2021. – 512 с. URL: http://www.studentlibrary.ru/ 3. Normal physiology: textbook. Ed. K. V. Sudakov./ M.: GEOTAR-Media, 2022. – 728 с. URL: http://www.studentlibrary.ru/
Topic No.1 Physiology of external respiration

Duration of the practical class (in academic hours):	2

Purpose of the practical class: 1. consolidate acquired knowledge on the mechanisms of inhalation and exhalation, about the main indicators of the function of external respiration; 2. during the discussion, outline the main factors influencing airway patency, chest excursion, and lung volumes; and gas exchange in the lungs; 3. thoroughly go over definitions and concepts of intensity and efficiency of external respiration; pulmonary and alveolar ventilation, anatomical and physiological dead space, total lung capacity and its components; 4. study patterns of fluctuations in gas exchange with different aerodynamic resistance and lung compliance; 5. develop an idea of the normal indicators of external respiration function and methods of their assessment.
Practical classes requirements: classrooms equipped with multimedia equipment, blackboards, personal computers with the "virtual physiology" software, and subject guides for the discipline.
Independent work of the student: **Extracurricular work (preparation for practical classes):** 1. Working with educational literature 2. Completing a table of lung volumes with normal values (according to the template) **Independent work in class** 1. Determine and evaluate chest excursion, respiratory rate, vital capacity of the lungs and its components with spirometry, and expiratory flow rate with peak flowmetry
Methods of evaluation of acquired knowledge and skills: classroom questioning, working with tests, working with case studies, submitting reports on independent work results.
Recommended reading: 1. Избранные лекции по нормальной физиологии = Selected Lectures on Normal Physiology: учебное пособие на русском и английском языках. M. M. Lapkin, E. A. Trutneva / M.: GEOTAR-Media, 2021. – 544 с. URL: http://www.studentlibrary.ru/ 2. Normal physiology: textbook = Нормальная физиология: учебник на английском языке Dorokhov Ye. V., Karpova A.V., Semiletova V.A. et al. / M.: GEOTAR-Media, 2021. – 512 с. URL: http://www.studentlibrary.ru/ 3. Normal physiology: textbook. Ed. K. V. Sudakov./ M.: GEOTAR-Media, 2022. – 728 с. URL: http://www.studentlibrary.ru/

4. GUIDELINES FOR CONTINOUS AND INTERIM ASSESSMENT

Table 3. Guidelines for Conducting Continuous and Interim Assessment during the **Б1.О.10 Human physiology** Course

Type of assessment	Assessment format
Continuous assessment	- conducting and evaluating oral or written quizzes during lectures and practical classes; - assessment and evaluation of completion and results of assignments given during practical classes; - assess and evaluate completion and results of individual assignments and exam tasks given during practical classes; - assessment and evaluation of the quality of lecture notes and practical training result reports.
Interim certification	is conducted in the format of oral exam and a test on a computer; it allows to assess the development of students' competencies correlating with types of professional activity.

5 ASPECTS OF THE IMPLEMENTATION OF THE COURSE FOR STUDENTS WITH DISABILITIES AND SPECIAL NEEDS

5.1. Availability of accessible environment

For students with disabilities and special needs, if a written application is submitted, lectures and practical classes are carried out taking into account health limitations, individual capabilities and medical status (hereinafter referred to as individual characteristics) of the student. Compliance with the following general requirements is ensured: teaching aids for collective and individual use are provided, required technical assistance is provided by an assistant, buildings and premises where lectures and practical classes are taking place meet accessibility requirements, other arrangements lack of which makes it impossible or difficult to master the discipline are made.

5.2. Compliance with general requirements

When lectures and practical classes are carried out at the written application of the student, the following general requirements are met: lectures and practical classes for students with disabilities and special needs take place at the same location as for students who do not have disabilities, if this does not cause difficulties for students; an assistant (assistants), who provide(s) students with the necessary technical assistance taking into account individual characteristics of the student, is (are) provided; necessary teaching aids are provided, taking into account individual characteristics of the student.

5.3. Availability of the internal policies and procedures of FSBEI HE PSMU of the Ministry of Health of Russia to students with disabilities in a form accessible to them.

All internal policies and procedures of FSBEI HE PSMU of the Ministry of Health of Russia concerning the discipline are made available to students with disabilities in a form accessible to them.

5.4. Increase in the duration of interim assessment of students with disabilities and special needs in relation to the established duration

Format of the interim assessment of academic performance within the scope of the discipline for students with disabilities and special needs is selected taking into account individual characteristics (orally, by writing on paper, by typing on a computer, as a test, etc.). The duration of the interim assessment in relation to the established duration is increased at the written application of the student with disabilities. Time limit for the student's preparation for the test is increased by at least 0.5 hours

6. STAFFING REQUIREMENTS OF THE DISCIPLINE

Academic teaching personnel that ensure the implementation of the discipline education process meet the requirements of the Federal State Educational Standard of Higher Education for the

31.05.01 General Medicine for international students (in English) specialty; list of the aforementioned personnel is available on the website of the educational organization.