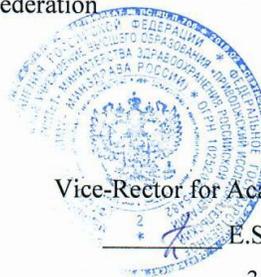


Federal State Budgetary Educational Institution of Higher Education
"Privolzhsky Research Medical University"
Ministry of Health of the Russian Federation



APPROVED
Vice-Rector for Academic Affairs
E.S. Bogomolova
31 August 2021

WORKING PROGRAM

Name of the academic discipline: **PHYSIOLOGY WITH THE BASICS OF ANATOMY**

Specialty: **33.05.01 Pharmacy**

(code, name)

Qualification: **Pharmacist**

Department: **DEPARTMENT OF NORMAL PHYSIOLOGY NAMED AFTER N.YU. BELENKOV**

Mode of study: **FULL-TIME**

Labor intensity of the academic discipline: **126 academic hours**

Nizhny Novgorod
2021

The working program has been developed in accordance with the Federal State Educational Standard of Higher Education in the qualification 33.05.01 "Pharmacy", approved by Order of the Ministry of Science and Higher Education of the Russian Federation No. 219 dated March 27, 2018.

Developers of the working program:

Mukhina I.V., PhD, DrSci, Professor, Head of the Normal Physiology Department named after N.Yu. Belenkov

Volkova I.F., PhD, Associate Professor, Associate Professor of the Normal Physiology Department named after N.Yu. Belenkov

The work program was reviewed and approved at the meeting of the Department of Normal Physiology named after N.Y. Belenkov on 15.04.2021 (Protocol No. 4)

Head of the Normal Physiology Department
named after N.Yu. Belenkov, PhD, DrSci, Prof



Mukhina I.V.

(signature)

15.04.2021

AGREED

Deputy Head of EMA ph.d. of biology



Lovtsova L.V.

(signature)

15.04.2021

1. The purpose and objectives of mastering the discipline "Physiology with the basics of anatomy":

1.1. The purpose of mastering the discipline:

To form students' systemic knowledge about the vital activity of an integral organism, about the functioning of its individual parts (cells, tissues, organs and physiological systems), about the mechanisms of their regulation and functional research methods, on the basis of which to form the ability to apply knowledge about morphofunctional features and physiological conditions in the human body to solve professional tasks (general professional competencies GPC-2).

1.2. Objectives of the discipline:

As a result of mastering the discipline, the student has to:

Know:

- The structure of the organs of the human body.
- Basic physiological processes of the human body;
- The main mechanisms of regulation of functions under the influence of factors of internal and external environment;
- Methods of functional and laboratory diagnostics (methods of pulse and blood pressure research, spirometry and spirometry, methods of sensory systems research, thermometry, hematological studies).

Be able to:

- Measure the most important indicators of human vital activity (pulse, blood pressure);
- To analyze the results of the study of physiological functions in the norm.

Possess:

- Skills of self-measurement of the main functional characteristics of the body (pulse, blood pressure) and interpretation of the results.
- Skills of independent use of the physiological terms.

2. Position of the academic discipline in the structure of the General Educational Program of Higher Education (GEP HE) of the organization.

2.1. The discipline "Physiology with the basics of anatomy" (B1.O.17) belongs to the Mandatory part of Block 1 (B1.O) Disciplines of the general educational program of higher education.

2.2. To study the discipline "Physiology with the basics of anatomy", knowledge, skills and abilities formed by previous disciplines are necessary:

- *Latin language*
- *Physics*
- *Mathematics*
- *Computer Science*
- *Biology*
- *General and inorganic chemistry*
- *Physical and colloidal chemistry*
- *Biophysics*

2.3. The study of the discipline "Physiology with the basics of anatomy" is necessary for the knowledge, skills and abilities formed by subsequent disciplines:

- *Biological Chemistry*

- Pathology
- Pharmacology
- Clinical pharmacology with the basics of pharmacotherapy
- Life safety and emergency medicine
- Human anatomy
- General hygiene

3. Results of discipline development and indicators of competence achievement

The study of the discipline is aimed at the formation of the following general professional competencies (GPC) among students:

| No. | Competence code | The content of the competence (or part of it) | Code and name of the competence achievement indicator | As a result of studying the discipline , students should: | | |
|-----|-----------------|--|---|--|---|---|
| | | | | Know | Be able to | Master |
| 1. | GPC-2 | Able to apply knowledge about morphofunctional features, physiological conditions and pathological processes in the human body to solve professional tasks | <p>GPC-2.1 Analyzes the pharmacokinetics and pharmacodynamics of medicines based on knowledge about morphofunctional features, physiological conditions and pathological processes in the human body</p> <p>GPC-2.2 Explains the main and side effects of drugs, the effects of their combined use and interaction with food, taking into account morphofunctional features, physiological conditions and pathological processes in the human body</p> <p>GPC-2.3 Takes into account morphofunctional features, physiological conditions and pathological processes in the human body when choosing non-prescription medicinal products and other pharmacy products</p> | Physiological processes occurring in human organs and systems, mechanisms of their regulation. Methods of functional and laboratory diagnostics (methods of pulse and blood pressure research, spirometry and spirometry, methods of sensory systems research, thermometry, hematology studies). | Measure the most important indicators of human vital activity (pulse, blood pressure); Analyze the results of the study of the physiological functions in the normal condition. | Skills of measurement of the main functional characteristics of the body (pulse, blood pressure) and interpretation of the results; skills of using of the physiological terms. |

4. Sections of the discipline and competencies that are formed during their study:

| No. | Competence code | Section name of the discipline | The content of the section in didactic units |
|-----|-----------------|--------------------------------|---|
| 1. | GPC-2 | General physiology | <p>Introduction to the subject Normal physiology is a science that studies the vital processes of a healthy organism. The concept of physiological function.</p> |

| | | | |
|----|-------|--------------------|--|
| | | | <p>Physiology of excitable tissues. Structure and functions of biological membranes. Active and passive transport of substances across the membrane. Ion channels and pumping mechanisms. The history of the discovery of biological currents (Galvani, Matteuchi experiments). Currents of rest and currents of action. The resting membrane potential, its origin. Excitation as a response of an excitable biosystem. Action potential. Phases of the action potential and their electrogenesis. Conditions for the occurrence of excitation. Excitability, conductivity, lability are the main physiological properties of highly differentiated biosystems (nervous, muscular and glandular tissues). Measures of excitability, conductivity and lability. Change in excitability during excitation. The laws of irritation are laws reflecting the influence of the parameters of the stimulus on the nature of the response of excitable biosystems. The laws of irritation for the cell and for the tissue.</p> |
| 2. | GPC-2 | Special physiology | <p>Physiology of nerve conductors Structural and physiological features of nerve fibers and nerves. The mechanism of excitation through the membrane of an excitable cell. Laws of conduction of excitation along nerve fibers.</p> <p>Physiology of muscles Physiological properties of muscles. The mechanism of muscle contraction. Single and tetanic contraction of skeletal muscles. Morphofunctional features of smooth muscles.</p> <p>Metabolism and energy exchange. The basal exchange and energy consumption during physical work. Direct and indirect calorimetry. Regulation of metabolism. Nutrition, caloric content of food products. Nutrition standards.</p> <p>Blood Physiology. Blood composition. Blood functions. Blood plasma, its composition. Functions of plasma proteins. Forming elements of blood, their morphological characteristics and functions. Hemolysis, its types. Hemoglobin, its compounds, functional significance. Hematopoiesis. Regulation of hematopoiesis. The main homeostatic indicators of blood. Hemostasis, its phases. Factors involved into the blood clotting process. Anticoagulation mechanisms. Factors that accelerate and slow down blood clotting. Blood groups as the sytem of the immune specificity of the body. Varieties of blood group systems (AB0, Rh).</p> <p>Cardiovascular system. The structure and topography of the heart. The valvular apparatus of the heart. Large and small circles of blood circulation. Structural and functional features of cardiomyocytes. The concept of functional syncytium of the heart. Automaticity. The structure of the conducting system of the heart. The</p> |

| | | | |
|--|--|--|---|
| | | | <p>gradient of automaticity. Ionic mechanisms of excitation of atypical myocardiocytes. Mechanisms of occurrence of slow diastolic depolarization.</p> <p>Excitability and the process of excitation of the contractile myocardium. Action potential, phases, ionic mechanisms. The change in excitability during the excitation of typical cardiomyocytes. Electromechanical coupling. Conductivity of the heart. Features of excitation in various parts of the heart.</p> <p>Contractility of the heart muscle. Features of contraction compared to skeletal muscle. The role of Ca^{2+}, Na^{+}, K^{+} in the mechanism of cardiac muscle contraction.</p> <p>Cardiac cycle. Stroke and minute heart volumes.</p> <p>Mechanisms of regulation of cardiac activity: hemodynamic, humoral, nervous. Features of the effects of the sympathetic and parasympathetic divisions of the autonomic nervous system on the activity of the heart.</p> <p>Extracardial reflexes.</p> <p>The structure of blood vessels, their morpho-functional classification. Blood pressure and methods of its measurement. The value of blood pressure in various parts of the vascular bed. Changes in the volume and linear velocity of blood flow in various parts of the vascular bed.</p> <p>Mechanisms of vascular tone regulation: myogenic, humoral, nervous. Reflex regulation of vascular tone. Reflexogenic vascular zones. Vasoconstrictive and vasodilating substances.</p> <p>Respiratory system.</p> <p>The structure and functions of the respiratory tract. Pressure in the pleural cavity. External breathing. The mechanism of inhalation and exhalation. The main indicators of external respiration. Exchange of gases in the lungs. Partial pressure and tension of gases in alveolar air and blood of pulmonary capillaries. Transport of gases by blood. Exchange of gases in tissues. Mechanisms of regulation of respiration. The respiratory center, its departments.</p> <p>Digestive system.</p> <p>Digestion, its meaning. Digestive conveyor, features of its organization and functioning. General principles of neuro-humoral regulation of digestive conveyor functions. Mechanisms of hunger and satiety.</p> <p>Digestion in the oral cavity. Salivary glands. Composition and properties of saliva. Swallowing. Regulation of salivation. Digestion in the stomach. Composition and properties of gastric juice. Neuro-humoral regulation of gastric secretion. The structure of the small intestine. Hydrolysis of nutrients in the small intestine. Abdominal and parietal digestion. Motor activity of the small intestine. Regulation of the secretion of the small intestine. The composition and properties of pancreatic juice. Nervous and humoral regulation of pancreatic secretion. The structure and functions of the liver: digestive and non-digestive. Features of blood supply to the liver. The composition and role of bile in digestion. Regulation of bile production and bile secretion. The structure and functions of the large intestine. The</p> |
|--|--|--|---|

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|----|-------|--------------------------------------|--|
| | | | <p>value of the intestinal microflora. Regulation of the motor function of the gastrointestinal tract. Absorption in various parts of the digestive tract.</p> <p>Excretory system. The concept of excretion, its role in maintaining homeostasis. Kidney function. The structure of the nephron. Features of blood supply to the kidney. The process of urination. Glomerular filtration. Tubular reabsorption and secretion. The amount and composition of urine. Neuro-humoral regulation of urine formation and excretion. The role of the kidneys in the excretion of medicinal substances.</p> |
| 3. | GPC-2 | Integrative activity of the organism | <p>Regulation of physiological functions The concept of regulation of physiological functions. Basic principles, levels and mechanisms of regulation of functions. The concept of the internal environment of the body and its components (blood, lymph, intercellular fluid). The concept of physiological constants. Concepts of homeostasis, homeokinesis. The unity of the organism and the external environment. The idea of self-regulation of the constancy of the internal environment of the body.</p> <p>Physiology of the central nervous system Structural and physiological features of nerve cells. The concept of synapse. Classification of synapses. The structure of synapses. The mechanism of signal transmission in the chemical synapse. Mediators. Reflex as the main form of nervous activity. Reflex arc of the somatic reflex. The concept of the nerve center. The main patterns of excitation along the reflex arc. Inhibition in the central nervous system. The history of the discovery of central braking. Braking mechanisms. Interactions of excitatory (VPSP) and inhibitory (TPSP) influences on the neuron. Types of braking (lateral, recurrent, reciprocal). The importance of inhibition in the activity of the body. Principles of the coordinating activity of the Central Nervous System. The main departments of the central nervous system and their functions. Morphophysiological features of the autonomic nervous system. The arc of the vegetative reflex. General characteristics of the effects of sympathetic, parasympathetic and metasymphathetic systems on the body.</p> <p>Glands of internal secretion. The role of the endocrine glands in the humoral regulation of the body's activity. Characteristics of hormones. The structure of the endocrine glands. Adenohypophysis hormones: ACTH, TTH, FSH, LH, STH, prolactin and their role in the body. Neurohypophysis hormones: ADH and oxytocin and their role in the body. Thyroid hormones, their physiological role. Parathyroid glands and their role in calcium metabolism (parathyroid hormone). Internal secretion of the pancreas. Insulin and glucagon and their role in the body. Hormones of the adrenal medulla: adrenaline and norepinephrine, their role in the body. Central and peripheral mechanisms of regulation of endocrine functions.</p> |

| | | | | | | | | | |
|--|------|--------------------------------------|-----------|-----------|--|--|--|-----------|------------|
| | 1 | General physiology | 2 | 15 | | | | 17 | 34 |
| | 1, 2 | Special physiology | 10 | 42 | | | | 31 | 83 |
| | 1 | Integrative activity of the organism | 12 | 27 | | | | 24 | 63 |
| | | TOTAL | 24 | 84 | | | | 72 | 180 |

* - L – lectures; LP – laboratory practicum; P – practicals; S – seminars; SIW – student's individual work.

6.2. Thematic plan of lectures:

| No. | Name of lecture topics | Volume in academic hours (AH) | |
|-----|--|-------------------------------|------------|
| | | Semester 1 | Semester 2 |
| 1 | Physiology of excitable tissues. Conditions for the occurrence of arousal. Physiology of muscles and nerves. | 2 | |
| 3 | Anatomy and physiology of the central nervous system. | 2 | |
| 4 | Physiology of sensory systems. | 2 | |
| 5 | Physiology of higher nervous activity. | 2 | |
| 6 | Regulation of physiological functions. | 2 | |
| 7 | Physiology of the endocrine system. | 2 | |
| 8 | Physiology of the circulatory system. Physiology of the heart. | | 2 |
| 9 | Physiology of the vascular system. | | 2 |
| 10 | Physiology of respiration. | | 2 |
| 11 | Physiology of digestion. | | 2 |
| 12 | Physiology of excretion. | | 2 |
| 13 | The physiology of pain. | | 2 |
| | TOTAL (total - 24 AH) | 12 | 12 |

6.2.2. Thematic plan of laboratory practicum: not provided by GEF.

6.2.3. Thematic plan of practicals:

| No. | Topic of practicals | Volume in academic hours (AH) | |
|-----|--|-------------------------------|------------|
| | | Semester 1 | Semester 2 |
| 1 | <i>Introduction to the subject. The subject and tasks of human anatomy and physiology. Introduction to physiological equipment.</i> PHYSIOLOGY AND BIOPHYSICS OF EXCITABLE TISSUES <i>The history of the discovery of biocurrents.</i> 1. Preparation of a neuromuscular preparation. 2. The first experiment of Galvani. | 3 | |
| 2 | <i>Resting potential and action potential.</i> 1. Secondary tetanus (Matteucci's experiment). | 3 | |

| | | | |
|----|---|---|---|
| 3 | <i>Excitability. Conditions for the occurrence of excitation</i> 1. Determination of excitability of nervous and muscular tissue. 2. Determination of the relationship between the strength of a single irritation and the magnitude of the tissue response (the law of force relations). | 3 | |
| 4 | <i>Physiology of skeletal muscles and nerves</i> 1. Getting different types of muscle contractions. | 3 | |
| 5 | Final lesson on the section "Physiology and biophysics of excitable tissues" | 3 | |
| 6 | <i>PHYSIOLOGY OF THE CENTRAL NERVOUS SYSTEM. Synaptic transmission.</i> 1. Determination of the dependence of the time and amplitude of the spinal reflex on the strength of irritation. | 3 | |
| 7 | <i>Regularities of excitation along the reflex arc.</i> 1. Investigation of the phenomenon of summation of excitations in nerve centers. 2. Investigation of the phenomenon of irradiation of excitations in the central nervous system. | 3 | |
| 8 | <i>Inhibition in the central nervous system.</i> 1. Study of the interaction of reflex acts (Goltz's experience). | 3 | |
| 9 | <i>SPECIFIC PHYSIOLOGY OF THE CENTRAL NERVOUS SYSTEM</i> 1. The study of reflexes in human. | 3 | |
| 10 | Final lesson on the section "Physiology of the central nervous system" | 3 | |
| 11 | <i>MORPHOLOGY AND PHYSIOLOGY OF SENSORY SYSTEMS. General properties of analyzers.</i> 1. Investigation of the phenomenon of receptor adaptation. 2. Determination of spatial thresholds of tactile sensitivity. | 3 | |
| 12 | <i>Physiology of the auditory and visual sensory systems.</i> 1. Determination of the range of sound frequencies perceived by person. 2. The study of visual acuity. | 3 | |
| 13 | <i>PHYSIOLOGY OF HIGHER NERVOUS ACTIVITY. Conditioned reflexes. Types of HNA.</i> 1. Express diagnostics of strength and mobility of nervous processes by psychomotor indicators (tapping test). | 3 | |
| 14 | <i>REGULATION OF PHYSIOLOGICAL FUNCTIONS.</i> 1. Analysis of the reflex arc of the somatic reflex. 2. Study of humoral effects on heart activity. | 3 | |
| 15 | <i>Morphology and physiology of the cardiovascular system. Cardiac cycle. Physiological properties of the heart. Automaticity. Conductivity.</i> 1. Observation of the frog's cardiac cycle and graphical registration of heart contractions (cardiography). 2. Determination of the leading role of the sinoatrial node in the automatization of the heart (Gaskell's experience). | | 3 |

| | | | |
|----|--|----|----|
| 16 | <i>Physiological properties of the heart. Excitability. Contractility.</i> 1. Obtaining ventricular extrasystole. | | 3 |
| 17 | <i>Regulation of cardiac activity.</i> 1. Study of reflex effects on cardiac activity. | | 3 |
| 18 | <i>The main indicators of hemodynamics. Blood pressure.</i> 1. Measurement of blood pressure in human by the Riva-Rocci method and the Korotkov method. | | 3 |
| 19 | <i>Systemic regulation of hemodynamics.</i> 1. Study of the effect of physical activity on blood pressure and pulse characteristics. | | 3 |
| 20 | <i>Final lesson on the section "Morphology and physiology of the cardiovascular system".</i> | | 3 |
| 21 | <i>PHYSIOLOGY OF RESPIRATION. External breathing. Gas exchange in lungs and tissues. Transportation of gases by blood.</i> 1. Spirometry. 2. Control work "Gas exchange in lungs and tissues. Transportation of gases by blood". | | 3 |
| 22 | <i>Regulation of external respiration.</i> 1. Investigation of the influence of various conditions on pulmonary ventilation. | | 3 |
| 23 | <i>ANATOMY AND PHYSIOLOGY OF DIGESTION</i> 1. Study of the effect of acetylcholine and adrenaline on intestinal motility. 2. Control work "Digestion". | | 3 |
| 24 | <i>Physiology of metabolism and energy</i> 1. Calculation of the main exchange. 2. Calculation of daily energy costs. | | 3 |
| 25 | <i>EXCRETION. MORPHOLOGY AND PHYSIOLOGY OF THE KIDNEY.</i> 1. The study of diuresis in various conditions. 2. Control work "Selection". | | 3 |
| 26 | <i>BLOOD PHYSIOLOGY</i> <i>The composition and functions of blood. Hemoglobin, hemolysis.</i> 1. Determination of hemoglobin content in the blood by the Sali method. 2. Observation of various types of hemolysis. | | 3 |
| 27 | <i>Blood clotting and anticoagulant factors. Blood groups.</i> 1. Coagulography. | | 3 |
| 28 | <i>Final lesson in the section "Blood Physiology"</i> | | 3 |
| | <i>Total</i> | 42 | 42 |

*(Full-time form of education)

6.2.4. Thematic plan of seminars: not provided by the Federal State Educational Standard.

6.2.5. Types and topics of student's individual work (SIW)

| No. | Name of the type of SSW | Volume in academic hours (AH) | |
|-----|--|-------------------------------|------------|
| | | 1 semester | 2 semester |
| 1 | Study of lecture notes and educational literature. | 12 | 12 |
| 2 | Completing homework for classes. | 12 | 12 |
| 3 | Preparation for laboratory work. | 6 | 6 |
| 4 | Preparation for control works and colloquium. | 6 | 6 |
| | TOTAL (total - 72 AH) | 36 | 36 |

6.8. Student research work: not provided

7. Types of assessment formats for ongoing monitoring and mid-term assessment

| № | Semester No. | Types of control | Name of section of academic discipline | Competence codes | Assessment formats | | |
|----|--------------|--|--|------------------|--------------------|--------------------------|--|
| | | | | | types | number of test questions | number of test task options |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1. | 1 | Control of the development of the topic, control of the student's independent work | General physiology | | Tests | 10 | 20 (testing on paper) 2 (computer testing on DES) |
| | | | | | | 25 | |
| | | | | | Control questions | 3 | 5 |
| | | | | | Situational tasks | 1-2 | 7 |
| 2. | 1, 2 | Control of the development of the topic, control of the student's independent work | Special physiology | | Tests | 10 | 20 (testing on paper) 2 (computer testing on DES) |
| | | | | | | 25 | |
| | | | | | Control questions | 3 | 10 |
| | | | | | Situational tasks | 1-3 | 9 |
| 3. | 1 | Control of the development of the topic, control of the student's independent work | Integrative activity of the organism | | Tests | 10 | 20 (testing on paper) 2 (computer testing on DES) |
| | | | | | | 25 | |
| | | | | | Control questions | 3 | 5 |
| | | | | | Situational | 1-4 | 6 |

| | | | | | tasks | | |
|----|---|------|--------------------------------|--|-------------------|----|--|
| 4. | 2 | Exam | All sections of the discipline | | Tests | 20 | Not limited (Computer testing, the variant is formed by random sampling) |
| | | | | | Control questions | 4 | 29 |

8. Educational, methodological and information support for mastering the academic discipline (printed, electronic publications, the Internet and other network resources)

8.1. Key literature references

| No. | Name according to bibliographic requirements | Number of copies | |
|-----|---|-------------------|----------------|
| | | At the department | In the library |
| 1 | Costanzo, Linda S. Physiology / L.S. Costanzo; Costanzo, Linda S. - 6th ed. - Philadelphia : Elsevier, 2018. - 516 p | 1 | 180 |
| 2 | Hall, John E. Textbook of medical physiology / J.E. Hall, A.C. Guyton; Hall, John E. ; Guyton, Arthur C. - 13th ed. - Philadelphia : Elsevier, 2016. - 1145 p. | 2 | 100 |
| 3 | Физиология с основами анатомии: учебник / под ред. А. И. Тюкавина, В. А. Черешнева, В. Н. Яковлева, И. В. Гайворонского. - М. : ИНФРА-М, 2020. - 574 с. 1 45 | 1 | 45 |

8.2. Further reading

| No. | Name according to bibliographic requirements | Number of copies | |
|-----|--|-------------------|----------------|
| | | At the department | In the library |
| 1 | Гайворонский, И. В. Анатомия и физиология человека : учебник / И. В. Гайворонский ; Гайворонский И. В. - Москва : ГЭОТАР-Медиа, 2019. - 672 с. - ISBN 978-5-9704-4594-5. - Текст : электронный. http://nbk.pimunn.net/MegaPro/UserEntry?Action=Link_FindDoc&id=163809&idb=0 | | |
| 2 | Дегтярев, В. П. Нормальная физиология : учебник / В. П. Дегтярев, Н. Д. Сорокина ; Дегтярев В. П. ; Сорокина Н. Д. - Москва : ГЭОТАР-Медиа, 2019. - 480 с. - ISBN 978-5-9704-5130-4. - Текст : электронный. - URL: https://www.studentlibrary.ru/book/ISBN9785970451304.html . | | |
| 3 | Ноздрачев, А. Д. Нормальная физиология : учебник / А. Д. Ноздрачев, П. М. Маслюков - Москва : ГЭОТАР-Медиа, 2021. - 1088 с. - ISBN 978-5-9704-5974-4. - Текст : электронный. - URL: http://www.studmedlib.ru/book/ISBN9785970459744.html | | |

| | | | |
|----|---|----|----|
| 4 | Мушина, И.В. Физиология дыхания: учебное пособие / И. В. Мушина, О. А. Горева , В. А. Плеханов , Нижегородская государственная медицинская академия . – 5-е изд., доп. и перераб. – Н.Новгород: Изд-во НижГМА, 2014. – 60 с. : ил. | 20 | 5 |
| 5 | Физиология человека: Атлас динамических схем : учебное наглядное пособие / К. В. Судаков, В. В. Андрианов, Ю. Е. Вагин, И. И. Киселев ; Судаков К. В. ; Андрианов В. В. ; Вагин Ю. Е. ; Киселев И. И. - Москва : ГЭОТАР-Медиа, 2020. - 416 с. - ISBN 978-5-9704-5880-8. - Текст:электронный.-URL: https://www.studentlibrary.ru/book/ISBN9785970458808.htmlдиа, 2020. - 416 с. | | |
| 6 | Холл, Д. Э. Медицинская физиология по Гайтону и Холлу / Д. Э. Холл ; Д. Э. Холл. - 2-е, испр. и доп. - М. : Логосфера, 2018. - 1328 с. - ISBN 9785986570600. - Текст : электронный - URL: https://www.books-up.ru/ru/read/medicinskaya-fiziologiya-po-gajtonu-i-hollu-4911587/ | | |
| 7 | Marieb, Elaine N. Essentials of human anatomy and Physiology +1 electronic disk / E.N. Marieb; Marieb, Elaine N. - 9th ed. - San Francisco : Pearson Benjamin Cummings, 2009. - 632 p. | - | 3 |
| 8 | Shier, D. Hole`s essentials of human anatomy & physiology / D. Shier, J. Butler, R. Lewis; Shier, D. ; Butler, J. ; Lewis, Ricki. - 12th ed. - New York : McGraw-Hill Education, 2015. - 632 p. : il. | - | 1 |
| 9 | Waugh, Anne. Ross and Wilson anatomy and physiology in health and Illness / A. Waugh, A. Grant; Waugh, Anne ; Grant, A. - 12th ed.- Edinburgh : Churchill Livingstone, 2014. - 509 p | - | 1 |
| 10 | Silbernagl, S. Color atlas of physiology / S. Silbernagl, A. Despopoulos. - 6th ed. - Stuttgart : Thieme, 2009. - 441 c | - | 11 |

8.3. List of guidelines for classroom and independent work of students

| No. | Name according to bibliographic requirements | Number of copies | |
|-----|---|-------------------|----------------|
| | | At the department | In the library |
| 1 | Physiology practical manual: learning materials for practical classes / I. V. Mukhina; Mukhina, I. V. - N. Novgorod : Publishing House of PRMU, 2019. | 20 | 5 |

8.4. Electronic educational resources used in the process of teaching the discipline:

8.4.1. Internal Electronic Library System of the University (IELSU)

| Name of the electronic resource | Brief description (content) | Access conditions | Number of users |
|--|--|--|-----------------|
| Internal Electronic Library system of the University | Works of the teaching staff of the University: textbooks, textbooks, collections of tasks, | From any computer and mobile device using an | Not limited |

| | | | |
|---|--|---|--|
| (In ELS) http://nbk.pimunn.net/MegaPro/Web | methodological manuals, laboratory work, monographs, collections of scientific papers, scientific articles, dissertations, abstracts of dissertations, patents | individual login and password. Access mode: http://nbk.pimunn.net/MegaPro/Web | |
|---|--|---|--|

8.4.2. Electronic educational resources acquired by University

| No. | Name of the electronic resource | Brief description (content) | Access conditions | Number of users |
|-----|--|---|--|--|
| 1. | EBS "Student Consultant" (Electronic database "Student Consultant". Database "Medicine. Healthcare (VO) and "Medicine. Healthcare (SPO)") http://www.studmedlib.ru | Educational literature, additional materials (audio, video, interactive materials, test tasks) for higher medical and pharmaceutical education | From any computer and mobile device using an individual login and password. Access mode: http://nbk.pimunn.net/MegaPro/Web | |
| 2. | Database "Doctor's consultant. Electronic Medical Library" https://www.rosmedlib.ru | National guidelines, clinical guidelines, textbooks, monographs, atlases, pharmaceutical reference books, audio and video materials, ICD-10 and ATX | From any computer and mobile device using an individual login and password. Access mode: http://nbk.pimunn.net/MegaPro/Web | Not limited Validity period: until 31.12.2021 |
| 3. | Electronic library system "Bukap" https://www.books-up.ru | Educational and scientific medical literature of Russian publishers, including translations of foreign publications. Within the framework of the "Big Medical Library" project, publications of universities participating in the project are available | From any computer and mobile device using an individual login and password; access is automatic from university computers. Publications from the "My Books" section are available for reading. Access mode: http://nbk.pimunn.net/MegaPro/Web | Not limited Validity period: until 31.05.2022 |
| 4. | Electronic periodicals as part of the database "Scientific Electronic Library ELibrary" https://elibrary.ru | Electronic medical journals | From university computers. Access mode: https://elibrary.ru | Not limited Validity period: until 31.12.2021 |
| 5. | Integrated Information and Library system (IBS) of the scientific and educational medical cluster of the Volga Federal District - "Srednevolzhsky" (contract on a free basis) | Electronic copies of scientific and educational publications from the collections of libraries participating in the scientific and educational medical cluster of the Volga Federal District "Srednevolzhsky" | Access by individual login and password from any computer and mobile device. Access mode: websites of libraries participating in the project | Not limited Validity period: Not limited |
| 6. | National Electronic Library (NEB) (contract on a free | Electronic copies of publications | Scientific and educational works that have not been | Not limited |

| | | | | |
|--|--|---|---|------------------------------|
| | basis) http://нэб.рф | (including scientific and educational) on a wide range of knowledge | reprinted in the last 10 years are in the public domain. Works restricted by copyright – from the computers of the scientific library. Access mode: http://нэб.рф | Validity period: Not limited |
|--|--|---|---|------------------------------|

8.4.3 Open access resources

| No. | Name of the electronic resource | Brief description (content) | Access conditions | Number of users |
|---|--|---|---|-----------------|
| Domestic resources | | | | |
| 1. | Federal Electronic Medical Library (FEMB) http://нэб.рф | Full-text electronic copies of printed publications and original electronic publications on medicine and biology | From any computer located on the Internet. Access mode: http://нэб.рф | Not limited |
| 2. | Scientific Electronic Library eLIBRARY.RU https://elibrary.ru | Abstracts and full texts of scientific publications, electronic versions of Russian scientific journals | From any computer located on the Internet. Access mode: https://elibrary.ru | Not limited |
| 3. | Open Access Scientific Electronic Library CyberLeninka http://cyberleninka.ru | Full texts of scientific articles with annotations published in scientific journals of Russia and neighboring countries | From any computer located on the Internet. Access mode: https://cyberleninka.ru | Not limited |
| Foreign resources within the framework of a National subscription | | | | |
| 1. | Electronic collection of the publishing house Springer https://rd.springer.com | Full-text scientific publications (journals, books, articles, scientific protocols, conference materials) | From university computers. Access mode: https://rd.springer.com | Not limited |

9. Material and technical support for mastering an academic discipline

9.1. List of premises for classroom activities for the discipline

1. A large lecture hall of the Building No.2 (70 Gagarin Ave.) equipped with multimedia equipment and a microphone.

2. Classrooms № 301, 302, 303, 305, 312, 318 of the Building No.2 (70 Gagarin Ave.) for practical classes, consultations, ongoing monitoring and intermediate certification, independent work of students with the ability to connect to the Internet to provide access to the electronic library of the university.

3. Computer class (testing center) (3 Meditsinskaya str.) for test control, with the possibility of connecting to the Internet, conducting independent work and providing access to the electronic library of the university.

9.2. List of equipment for classroom activities for the discipline

| No. | Equipment | Meaning | Quantity |
|-----|---|-----------|----------|
| 1. | Multimedia equipment Epson EB-X72; a laptop (Office Professional Plus 2010, Windows Starter | Lecturing | 1 |

| | | | |
|-----|---|---|----|
| | https://www.microsoft.com/Licensing/servicecenter/LicensingInfo/LicenseSummary/Summary.aspx Kaspersky Endpoint Security for business - Advanced Russian Edition. 150-249Node 1year Educational Renewal License № 1150170421101518337264) | | |
| 2. | Polygraph BIOPAC MP 30B-CE (Biopac Student Lab 3.7.1 s/n2029; Biopac Student Lab Pro 3.7.1 s/n2029) | Demonstration of methods and results of instrumental studies of physiological functions | 1 |
| 3. | Computers with screens (Office Professional Plus 2010, Windows Starter https://www.microsoft.com/Licensing/servicecenter/LicensingInfo/LicenseSummary/Summary.aspx) Kaspersky Endpoint Security for Business - Advanced Russian Edition. 150-249Node 1 year Educational Renewal License № 1150170421101518337264) | Processing of scientific and educational information. | 5 |
| 4. | Testing Center computers (Office 2010, Windows 7 https://www.microsoft.com/Licensing/servicecenter/LicensingInfo/LicenseSummary/Summary.aspx) Testing program on the platform Moodle https://moodle.org/?lang=ru) | Conducting independent work with the possibility of connecting to the Internet and providing access to the electronic library of the university | 16 |
| 5. | Electrocardiographs ЭК1Т-1/3-07 | ECG registration | 10 |
| 6. | Neurological hammers | The study of human reflexes | 5 |
| 7. | Tonometers | Blood pressure measurement | 25 |
| 8. | Tonometers OMRON RX-3 | Blood pressure measurement | 1 |
| 9. | Electrocoagulographs H334 | Study of hemocoagulation | 4 |
| 10. | Pneumotachometers ИТ-1 | Breath research | 5 |
| 11. | Perimeters | Definition of visual fields | 5 |
| 12. | Panchenkov's apparatus | Determination of ESR | 5 |
| 13. | Pulsoximeters | Determination of saturation | 5 |
| 14. | Tuning forks | The study of sound conduction | 7 |

9.3. A set of licensed and freely distributed software, including domestic production

| Item no. | Software | number of licenses | Type of software | Manufacturer | Number in the unified register of Russian software | Contract No. and date |
|----------|--|--------------------|------------------------------|------------------------------|--|---|
| 1 | Wtware | 100 | Thin Client Operating System | Kovalev Andrey Alexandrovich | 1960 | 2471/05-18 from 28.05.2018 |
| 2 | MyOffice is Standard. A corporate user license for educational organizations, with no expiration date, with the right to receive updates for 1 year. | 220 | Office Application | LLC "NEW CLOUD TECHNOLOGIES" | 283 | without limitation, with the right to receive updates for 1 year. |
| 3 | LibreOffice | | Office Application | The Document Foundation | Freely distributed software | |
| 4 | Windows 10 Education | 700 | Operating systems | Microsoft | Azure Dev Tools for Teaching Subscription | |
| 5 | Yandex. Browser | | Browser | «Yandex» | 3722 | |
| 6 | Subscription to MS Office Pro for 170 PCs for FGBOU VO "PIMU" of the Ministry of Health of Russia | 170 | Office Application | Microsoft | | 23618/HN10030 LLC "Softline Trade" from 04.12.2020 |

10. List of changes to the working program of the discipline

Federal State Budgetary Educational Institution of Higher Education
 "Privolzhsky Research Medical University"
 Ministry of Health of the Russian Federation
 (FSBEI HE "PRMU" of the Ministry of Health of Russia)

Department of
 Normal Physiology named after N.Yu. Belenkov

CHANGE REGISTRATION SHEET

working program for the academic discipline
PHYSIOLOGY WITH THE BASICS OF ANATOMY

Field of study / specialty / scientific specialty: _____ Pharmacy (33.05.01)
 (code, name)

Training profile: _____
 (name) - for master's degree programs

Mode of study: _____ full-time _____
 full-time/mixed attendance mode/extramural

| Position | Number and name of the program section | Contents of the changes made | Effective date of the changes | Contributor's signature |
|----------|---|---------------------------------------|-------------------------------|-------------------------|
| 1 | Correct paragraph 8.1 "List of key literature" and 8.2 "List of additional literature" (Appendix 1) | Corrections in the list of literature | 29.08.2022 | Volkova I.F. |

Approved at the department meeting
 Protocol No. _____ of _____ 20__

Head of the Department of Normal Physiology
 named after N.Yu. Belenkov, PhD, DrSci, Prof. _____ / Mukhina I.V.
 signature

Appendix 1

8. Educational, methodological and informational support of the discipline (printed, electronic publications, the Internet and other network resources).

8.1. Key literature references

| No. | Name according to bibliographic requirements | Number of copies | |
|-----|---|-------------------|----------------|
| | | At the department | In the library |
| 1. | Costanzo, Linda S. Physiology / L.S. Costanzo; Costanzo, Linda S. - 6th ed. - Philadelphia : Elsevier, 2018. - 516 p | 1 | 180 |
| 2. | Hall, John E. Textbook of medical physiology / J.E. Hall, A.C. Guyton; Hall, John E. ; Guyton, Arthur C. - 13th ed. - Philadelphia : Elsevier, 2016. - 1145 p. | 2 | 100 |
| 3 | Физиология с основами анатомии: учебник / под ред. А. И. Тюкавина, В. А. Черешнева, В. Н. Яковлева, И. В. Гайворонского. - М. : ИНФРА-М, 2020. - 574 с. 1 45 | 1 | 45 |

8.2. Further reading

| No. | Name according to bibliographic requirements | Number of copies | |
|-----|--|-------------------|----------------|
| | | At the department | In the library |
| 1 | Гайворонский, И. В. Анатомия и физиология человека : учебник / И. В. Гайворонский ; Гайворонский И. В. - Москва : ГЭОТАР-Медиа, 2019. - 672 с. - ISBN 978-5-9704-4594-5. - Текст : электронный. http://nbk.pimunn.net/MegaPro/UserEntry?Action=Link_FindDoc&id=163809&idb=0 | | |
| 2 | Дегтярев, В. П. Нормальная физиология : учебник / В. П. Дегтярев, Н. Д. Сорокина ; Дегтярев В. П. ; Сорокина Н. Д. - Москва : ГЭОТАР-Медиа, 2019. - 480 с. - ISBN 978-5-9704-5130-4. - Текст : электронный. - URL: https://www.studentlibrary.ru/book/ISBN9785970451304.html . | | |
| 3 | Ноздрачев, А. Д. Нормальная физиология : учебник / А. Д. Ноздрачев, П. М. Маслюков - Москва : ГЭОТАР-Медиа, 2021. - 1088 с. - ISBN 978-5-9704-5974-4. - Текст : электронный. - URL: http://www.studmedlib.ru/book/ISBN9785970459744.html | | |
| 4 | Мухина, И.В. Физиология дыхания: учебное пособие / И. В. Мухина, О. А. Горева , В. А. Плеханов , Нижегородская государственная медицинская академия . – 5-е изд., доп. и перераб. – Н.Новгород: Изд-во НижГМА, 2014. – 60 с. : ил. | 20 | 5 |
| 5 | Физиология человека: Атлас динамических схем : учебное наглядное пособие / К. В. Судаков, В. В. Андрианов, Ю. Е. | | |

| | | | |
|----|---|---|----|
| | Вагин, И. И. Киселев ; Судаков К. В. ; Андрианов В. В. ; Вагин Ю. Е. ; Киселев И. И. - Москва : ГЭОТАР-Медиа, 2020. - 416 с. - ISBN 978-5-9704-5880-8. - Текст: электронный.-URL: https://www.studentlibrary.ru/book/ISBN9785970458808.html диа, 2020. - 416 с. | | |
| 6 | Холл, Д. Э. Медицинская физиология по Гайтону и Холлу / Д. Э. Холл ; Д. Э. Холл. - 2-е, испр. и доп. - М. : Логосфера, 2018. - 1328 с. - ISBN 9785986570600. - Текст : электронный - URL: https://www.books-up.ru/ru/read/medicinskaya-fiziologiya-po-gajtonu-i-hollu-4911587/ | | |
| 7 | Marieb, Elaine N. Essentials of human anatomy and Physiology +1 electronic disk / E.N. Marieb; Marieb, Elaine N. - 9th ed. - San Francisco : Pearson Benjamin Cummings, 2009. - 632 p. | - | 3 |
| 8 | Shier, D. Hole`s essentials of human anatomy & physiology / D. Shier, J. Butler, R. Lewis; Shier, D. ; Butler, J. ; Lewis, Ricki. - 12th ed. - New York : McGraw-Hill Education, 2015. - 632 p. : il. | - | 1 |
| 9 | Waugh, Anne. Ross and Wilson anatomy and physiology in health and Illness / A. Waugh, A. Grant; Waugh, Anne ; Grant, A. - 12th ed.- Edinburgh : Churchill Livingstone, 2014. - 509 p | - | 1 |
| 10 | Silbernagl, S. Color atlas of physiology / S. Silbernagl, A. Despopoulos. - 6th ed. - Stuttgart : Thieme, 2009. - 441 с | - | 11 |