



MINISTRY OF EDUCATION AND SCIENCE OF THE RUSSIAN FEDERATION
Federal state autonomous educational institution
of higher education
«Far Eastern Federal University»
(FEFU)

SCHOOL OF BIOMEDICINE

«AGREED»

Head of education program
«General medicine»



(signature) Khotimchenko Yu.S.
(Full name)
«09» of July 2019

«APPROVED»

Director of the Department of Clinical
Medicine




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«09» of July 2019

WORKING PROGRAM OF ACADEMIC DISCIPLINE (WPAD)

«Normal Physiology»

Educational program

Specialty 31.05.01 «General medicine»

Form of study: full time

year 2 semester 3,4
lectures 36 hours
practical classes 72 hours
laboratory works 54 not provided
total amount of in-classroom work 162 hours
independent self-work 90 hours
including exam preparation 36 hours
control works ()
credit not provided
exam 2 year, 4 semester

The working program is drawn up in accordance with the requirements of the Federal state educational standard of higher education (level of training), approved by the order of the Ministry of education and science of the Russian Federation from 09.02.2016 № 95.

The working program of the discipline was discussed at the meeting of the Department of fundamental and clinical medicine. Protocol No. 8, 09 of July 2019

Author: A.A. Dei

ANNOTATION

The work program of the discipline (ROL) “Normal Physiology” was developed for students in the direction of 31.05.01 “General Medicine” in accordance with the requirements of the Federal State Educational Standard of Higher Education in this area, approved by order of the Ministry of Education and Science of the Russian Federation of February 9, 2016 approving the layout of the work program of the academic discipline for educational programs of higher education - undergraduate programs, specialties, magistracies of FEFU ”(approved on 12.05.2015 No. 12-13-824). The discipline is basic and is implemented in the 2nd year in the 3rd and 4th semesters. The total complexity of the discipline is 8 credit units, 252 hours.

Discipline relies on knowledge of humanities and social disciplines, including philosophy, bioethics, psychology and pedagogy, the history of medicine; disciplines of mathematical and natural - scientific direction: physics and mathematics, medical informatics, chemistry, anatomy, histology, cytology, etc. It is prior to the study of disciplines: internal diseases, disaster medicine, pathophysiology, pharmacology, etc.

The goal is to form students' systemic knowledge about the vital activity of the whole organism and its individual parts, about the basic laws of functioning and the mechanisms of their regulation when interacting with each other and with environmental factors, about the physiological bases of clinical and physiological research methods used in functional diagnostics and in studying human integrative activity.

Tasks:

- Formation of students' skills in analyzing the functions of the whole organism from the position of integral physiology, analytical methodology and basic medicine

- Formation of a systematic approach for students in understanding the physiological mechanisms underlying the interaction with environmental factors and the implementation of adaptive strategies of the human body to maintain normal functioning from the standpoint of the concept of functional systems

- Study by students of the methods and principles of studying the state of the body's regulatory and homeostatic systems in laboratory practice and their applicability in clinical practice

- Study by students of the role of higher nervous activity in the regulation of the physiological functions of a person and the targeted management of the body's normal abilities and pathology

- Acquaintance of students with the basic principles of modeling physiological processes and creating computer models for the study and purposeful management of body functions

- Formation of the foundations of clinical thinking based on the analysis of the nature and structure of inter organ and inter system interactions from the position of integrative physiology.

As a result of studying this discipline, students form the following professional competencies:

Competence code and formulation	Stages of competence formation	
the capacity for the assessment of morphological and physiological states and pathological processes in the human body for solving professional tasks (GPC – 9)	Knows	<ul style="list-style-type: none"> • * patterns of functioning of individual organs and systems under normal conditions • * changes in the body in the process of growth and aging, age physiological characteristics of the body
	Can	<ul style="list-style-type: none"> • use the basic methods of assessing the functional state of the human body • * explain the nature of physiological changes in adaptive activities to changing environmental conditions
	Master	<ul style="list-style-type: none"> • * medical and physiological conceptual apparatus • * skills of evaluation of physiological

		parameters of functional systems and human organs
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The following methods of active/ interactive learning are used to form the above competences within the discipline "Normal Physiology":

Lectures:

- * Lecture-visualization
- * Lecture-conversation
- * Lecture-press conference

Practical class:

- Discussion
- Detailed conversation
- Press conference

I. THE STRUCTURE AND CONTENT OF THE THEORETICAL PART OF THE COURSE(36 HOURS., INCLUDING THE USE OF METHODS OF ACTIVE LEARNING-8 HOURS).

Module 1. Excitable tissue (6 hours.)

Topic 1. Introduction to physiology (1 hour.)

Subject and tasks of normal physiology. Analytical and systems approaches in the study of physiological processes and functions. The history of the development of physiology. The physiological function, its normal. Relationship of structure and function. The unity of the body and the environment. The concept of physiological constants. Representations of soft and hard constants. Concepts of homeostasis, homeokinesis.

Topic 2. General physiology of excitable tissues (2 hours.)

Structure and functions of biological membranes. Types of membrane transport proteins, classification and properties of ion channels. History of discovery of bioelectric phenomena in living tissues (L. Galvani, E. Dubois-Raymond, K. Matteuchi). Membrane and ionic mechanisms of biopotentials origin at rest. Method for measuring membrane potentials.

Physiological properties of excitable tissues. Types of irritation of excitable tissues. The characteristics of the local and propagating the excitation. Electrophysiological characteristics of the excitation process (A. Hodgkin, A. Huxley, B. Katz). Action potential and its phases. Ionic mechanisms of excitation. Changes in the permeability of the cell membrane during excitation. Excitement and excitability. The change in excitability during excitation. Characteristics of refractoriness and exaltation.

The laws of irritation of single and integral excitable structures: "force", "all or nothing", "force-duration" (Weiss-Lapik). The concept of reobase, chronaxy, useful time. The laws of irritation under the action of constant current on excitable tissues: physiological elektroton, the polar action of the constant current (C.

Pfluger). The concept of cat - and anelectrotonus, katolicheskoy depression, anodic exaltation.

The concept of parabiosis (N. E.Vvedensky), phases of development of parabiosis. The change of excitability of the tissue, the slow increase of depolarizing current, the property of accommodation.

Topic 3. Physiology of muscle contraction (2 hours.)

Physical and physiological properties of skeletal muscles. The concept of motor units, physiological characteristics of fast and slow motor units. Structural features of the membrane and sarcomeres of skeletal muscle fibers. The mechanism of muscle contraction. Electromechanical coupling. The dependence of the force of muscle contraction from its original length. Characteristics of types and modes of muscle contraction. Time ratio of excitation cycle, excitability and single contraction of skeletal muscle fiber. The mechanism of tetanic contractions. Conditions for the emergence of optimum and pessimism. Electromyography. Energy of muscle contraction. Path resynthesis of ATP. The power and capacity of the body's energy systems. A functional system of energy supply of muscular activity.

Physiological features and properties of smooth muscles. Their importance in the myogenic regulation of motor functions of internal organs.

Topic 4. Nervous tissue (1 hour.)

Morphofunctional organization of the neuron as a unit of the nervous system. The emergence of local and spreading excitation in the neuron. Integrative function of the neuron. Classification of neurons.

Classification of nerve fibers. Mechanisms of excitation along nerve fibers. The laws of excitation in the nerves. Types of signal transmission between excitable cells. The concept of synapse. Classification of synapses. Functional

properties of electrical and chemical synapses. The mechanism of signal transmission in the chemical synapse. Types of synaptic neurotransmitters and neuromodulators. Features of signal transmission in neuromuscular and Central synapses; in excitatory and inhibitory synapses.

Module 2. Control body functions (6 hours.)

TOPIC 1. CENTRAL NERVOUS SYSTEM. REGULATION OF MOVEMENT (2 HOURS)

The concept of neural networks, their types. Block-modular concept of the Central nervous system. The concept of the nerve center in the broad and narrow sense of the word. Physiological properties of nerve centers. The basic principles of propagation of excitation in the nerve centers, in neural networks. The principles of coordinating activities of the Central nervous system.

Reflex principle of the nervous system and the principles of reflex theory. Reflex-the main mechanism of adaptive response to changes in the conditions of the internal and external environment. Links, components of the morphological basis of the reflex from the positions of R. Descartes and P. K. Anokhin. Morphological basis of the simplest somatic reflex. The concept of the adaptive result of reflex activity. Types of reflexes.

The value of inhibition in the CNS. The history of the discovery of the peripheral and Central inhibition. Braking functions (protective and coordinating). Types of Central inhibition (depolarization and hyperpolarization; presynaptic and postsynaptic; translational, lateral, recurrent, reciprocal) and its mechanisms. Unitary and binary chemical-chemical theory of Central inhibition. Mechanisms of interaction of excitatory (VPSP) and inhibitory (TPSP) effects on the neuron.

The role of different CNS departments in the regulation of physiological functions. Afferent, efferent and associative areas of the cerebral cortex. Column organization of the crust. Irradiation and convergence of excitations of different modality in the cortex. The role of inhibitory neurons in providing analytical and

synthetic activity of the cortex. Plasticity of the crust (E. A. Asratyan). Cortical-subcortical and cortical-visceral relationships (K. M. Bykov).

The concept of muscle tone. Reflex nature and functional value of muscle tone. Types of proprioceptors, their localization, structure, role in maintaining muscle tone. Morphological basis of tendon reflex. The mechanism of occurrence and regulation of muscle tone at the spinal level (spinal tone). Ways and mechanisms of influence of structures of the medulla oblongata and cerebellum on muscle tone. The mechanism of the state of decerebration rigidity (contractile tone) in a bulbar animal. Structures of the middle brain involved in the formation of mesencephalic tone. Plastic tone diencephalitis animal. Part components striopallidarnoy system and cerebral cortex in the regulation of muscle tone. The concept of tonic reflex. Types of tonic reflexes (static and statokinetic). Conditions of their occurrence. Part of the structures of the spinal cord, medulla and mid-brain in their implementation.

Topic 2. Autonomic nervous system (2 hours.)

Autonomous (vegetative) nervous system. Its function. The main features of the sympathetic, parasympathetic and metasympathetic parts of the autonomic nervous system. The arc of the autonomic reflex. The main types of mediators and receptors. General characteristics of the effects of sympathetic, parasympathetic and metasympathetic systems on the body.

The role of different parts of the Central nervous system (spinal, bulbar, mesencephalic centers, hypothalamus, cerebellum, reticular formation, cerebral cortex) in the regulation of the autonomic nervous system.

Representation of typological features of autonomic regulation of hemodynamics. Methods for determining dysfunction of the autonomic nervous system. Types of response to emotional stress in terms of the autonomic nervous system.

Topic 3. Endocrine system (2 hours.)

The main components of the endocrine system (local and diffuse endocrine systems). The concept of endocrine and neuroendocrine cells. Secretory cycle.

The concept of endocrine glands. Types of endocrine glands. Central and peripheral glands. Working systems of endocrine glands (hypothalamic-pituitary, sympathetic-adrenal, gastroenteropancreatic, etc.).

Types of biologically active substances: hormones, hormone-like peptides, neurohormones, neurotransmitters, modulators. Functional characteristics of hormones that distinguish them from other biologically active substances. Classification of hormones based on chemical nature (protein, peptide, steroid, amino acid derivatives), on a functional basis (isotropic, start-up, effector).

Form of transfer of regulatory effects through biologically active substances (autocrine, sokrena, paracrine, endocrine, Neurocrine). Methods of transportation of hormones by blood. The importance of hormone transport in the bound state.

Mechanisms of action of hormones on target cells (membrane, cytosol-nuclear). Types of physiological action (metabolic, morphogenetic, kinetic, corrective) and the value of hormones.

Nervous (TRANS and paralipomena) and humoral regulation of the endocrine glands. The role of negative feedbacks (ultrashort, short, long) in the self-regulation of endocrine glands.

Hormones of the anterior pituitary (adenocorticotrophic hormone, thyrotropic hormone, follicle stimulating hormone, luteinizing hormone, somatotropin, melanocytestimulating hormone, prolactin) and their role in the body. Neurohypophysis hormones: ADH and oxytocin and their role in the body. Thyroid hormone. Physiological role of thyroid hormones (thyroxine, triiodothyronine and thyrocalcitonin). Parathyroid glands and their role in calcium metabolism (parathyroid hormone). Thymus as the organizer of the body's immune system. Epiphysis hormones, their role in the body. Pancreatic hormones (insulin and glucagon) and their role in the body. Adrenal cortical hormones

(mineralocorticoids, glucocorticoids and sex hormones) their role in the body. Adrenal medulla hormones (adrenaline and norepinephrine) their role in the body. Sex hormones and placental hormones, their effect on metabolic processes and body functions.

Module 3. Physiology of organs and systems (18 hours.)

SECTION I. THE PHYSIOLOGY OF BLOOD (4 HOURS.)

TOPIC 1. THE COMPOSITION AND PROPERTIES OF BLOOD (2 HOUR.)

Blood composition. Blood plasma. Basic homeostatic parameters of blood. Shaped blood elements, their characteristics, functions. Hemopoiesis. Regulation of hematopoiesis. Blood group. Rhesus factor.

The concept of blood, blood system. The amount of circulating blood, its composition. Function of blood. The main constants of blood, their size and functional value. The concept of osmotic blood pressure. The idea of the self-regulating principle of the mechanism of maintaining blood constants. Functional systems that maintain constant pH and osmotic blood pressure. The concept of hemolysis, its types and plasmolysis.

Shaped elements of blood, their physiological value. Concept of Erythro -, LEUCO - and thrombocytopoiesis, their nervous and humoral regulation. Hemoglobin, its compounds, functional value. Lymph, its composition and functions. Understanding of the protective function of blood and its manifestations (immune reactions, blood clotting). Blood groups as manifestations of the immune specificity of the body. Kinds of systems of blood groups (AB0, rhesus – belonging). Their importance for obstetric and surgical practice.

Topic 2. The system of maintaining the aggregate state of blood (2 hours.)

The process of blood clotting (hemostasis), its value. The main factors involved in the process of blood clotting (tissue, plasma, thrombosis, Erythro-and leukocyte), their functional characteristics. Representation of external (tissue) and internal (blood) blood coagulation systems, blood coagulation phases, retraction and fibrinolysis processes. Factors that accelerate and slow blood clotting. The concept of the first and second anticoagulant blood systems. An idea of the principles of their functioning. The idea of a functional system that maintains the liquid state of the blood. Coagulating, anticoagulant and fibrinolytic blood systems as the main reaction apparatus of this functional system.

Section II. Physiology of the cardiovascular system (4 hours.)

Topic 1. Physiology of the cardiovascular system: heart function, myocardium and its properties, ECG (2 hours.)

The concept of physiological circulatory system (cardiovascular system). Pumping (pumping) function of the heart. Morpho-functional features of the organization of the heart. Typical and atypical (P - and T-cells) cardiomyocytes, cardiac conduction system, valve apparatus, heart cavity. Physical and physiological properties of the heart muscle. The concept of the functional syncytium of the heart. The emergence and spread of excitement in the heart. Automation, its nature, centers and gradient. Ionic mechanisms of excitation of atypical myocardiocytes. The mechanism of the slow diastolic depolarization. Changes in excitability in the excitation of typical cardiomyocytes. Electromechanical coupling. Extrasystole. Compensatory pause. Cardiac cycle, its phase structure. Changes in the tone of the muscle walls of the heart cavities, changes in their volumes, blood pressure and the state of the valve apparatus in different phases of the cardiocycle.

External manifestations of the heart (electrical, sound, mechanical). Methods of investigation of sound manifestations of the heart (auscultation,

phonocardiography). The origin of heart tones, their types and places of the best listening.

Mechanisms of EMF of the heart. Einthoven's Theory. Methods of registration of electrical manifestations of cardiac activity. Basic ECG leads in humans (standard, enhanced, thoracic). Bipolar and monopolar ECG leads. Excitation propagation in the myocardium (depolarization and repolarization waves). De- and repolarization potentials on the active electrode. Vector theory of the Genesis of the ECG. Structural analysis of normal ECG in II standard lead. Teeth, complexes, intervals, segments; their time and amplitude characteristics. The electrical axis of the heart. Physiological variants of its location (normal, horizontal and vertical). Characteristic features of these options in standard leads. ECG type "rS" in the right thoracic, "Rs" in the left thoracic leads. The concept of the transition zone.

The idea of Chrono -, batmo -, dromo -, Ino- and tonotropic effects as manifestations of regulatory effects on the heart. Types of regulation of cardiac activity. Autoregulation: myogenic (heterosexual and homeopathic) and neurogenic mechanisms. Regularities of myogenic autoregulation manifestations (Frank – Starling law; Anrep law; rhythmoinotropic dependence). Nervous and humoral mechanisms of extracardial regulation of cardiac activity. Humoral effects of hormones, electrolytes, mediators and other factors on the parameters of the heart. Nervous regulation. Features of sympathetic and parasympathetic innervation of the heart muscle. Mechanisms of parasympathetic and sympathetic effects on the heart. Reflex regulation of the heart. Nerve centers of regulation of cardiac activity.

Topic 2. Regulation of the heart, vascular tone and blood pressure (2 hours.)

Functional classification of blood vessels (elastic, resistive, metabolic, capacitive, shunt). The basic laws of hydrodynamics and their use to explain the

physiological functions and patterns of blood flow through the vessels. Factors that ensure the movement of blood through the vessels. Parameters of peripheral blood circulation (blood pressure, linear and volumetric blood flow rate, blood circulation time). Changes in resistance, blood pressure and blood flow rate in different parts of the vascular bed.

Concepts of systolic, diastolic, pulse and mean blood pressure. Methods of investigation of arterial (sphygmography) and venous (phlebography) pulse. Clinical assessment of human pulse. Methods for measuring blood pressure (direct and indirect). Methods of Riva-Rochi and Korotkov, technique of their application. The concept of vascular tones, the idea of the mechanisms of their occurrence. Factors determining the amount of blood PRESSURE. A functional system that maintains a normal level of blood pressure. Nervous, humoral and myogenic regulation of vascular tone. The concept of the basal tone of the vessel and the autoregulation of vascular tone. Endocrine function of the heart. The influence of atrionatriuretic peptide on vascular tone and the process of urination. Vasomotor center (Pressor and depressor departments). Peripheral and Central effects on the activity of neurons of the vasomotor center.

Microcirculation and its role in the mechanisms of fluid metabolism and various substances between blood and tissues. Vascular module of microcirculation. Capillary blood flow. Types of capillaries. Mechanisms of transcapillary metabolism in the capillaries of large and small circles of blood circulation.

Determination of the index of functional changes (IFI) as a method of rapid diagnosis of the cardiovascular system. Method of variation pulsometry. Statistical analysis of the ECG, its use to assess the nature of the regulatory Viani heart rhythm. Cardiac activity during exercise. Cardiac output-an integral indicator of the heart. The mechanism of change in cardiac output during exercise. Changes in the structure of cardiac rhythm in terms of physically strenuous activities. Regulation of vascular tone during exercise. Mechanisms of strengthening of

venous return at muscular work (venous, muscular, respiratory “pumps”). Methods of assessing the physical performance of a person in terms of heart: Harvard step test, PWC170 (methods of testing, evaluation data for middle-aged people).

Section III. Physiology of breathing (2 hours.)

Topic 1. Physiology of breathing (2 hours.)

The importance of breathing for the body. The main stages of the process. External respiration. Biomechanics of inhalation and exhalation. Pressure in the pleural cavity, its changes during inhalation and exhalation. Pulmonary volumes and capacities. Reserve capabilities of the respiratory system. Spirometry, spirometry. The composition of the inhaled, exhaled and alveolar air. Anatomical, physiological and functional dead spaces. Ventilation-perfusion coefficients, their value in clinical practice. Nasal and oral breathing, their features. Functional connection of breathing, chewing and swallowing processes. Speech breathing.

Aerogemateski barrier. Diffusion capacity of the lungs. Transport of gases by blood. A graph of the dissociation of oxyhemoglobin. Factors affecting the formation and dissociation of oxyhemoglobin. The concept of oxygen capacity of blood.

The concept of the respiratory center in the broad and narrow sense of the word. The idea of localization and organization of the structure of the respiratory center in the broadest sense Of the word types of respiratory neurons of the medulla oblongata, their automation. The role of different receptors and divisions of the respiratory center in the mechanisms of change of phases of respiration. The idea of the regulation of breathing on the principle of perturbation and the principle of deviation. Protective respiratory reflexes. The mechanism of the first breath of a newborn.

Breathing at elevated and reduced barometric pressure. The scheme of the functional system (FUS), which ensures the maintenance of the constancy of the gas environment of the body. Breathing during exercise. Estimation of minute

volume of breath. Regulation of breathing during muscular work (humoral and nervous mechanisms). Maximum oxygen consumption (MPC). The relationship between oxygen consumption and heart rate. True steady state. Oxygen demand, oxygen consumption and oxygen debt during exercise.

Section IV. Physiology of digestion, metabolism and excretion (4 hours.)

Topic 1. Physiology of digestion. (2 hours.)

Digestion, its meaning, types and forms. Neuro-humoral mechanisms of hunger and saturation. Analysis of the components of the functional system to maintain a constant level of nutrients in the blood. Regularities of the organization of the gastrointestinal tract on the principle of the digestive conveyor. General principles of neuro-humoral regulation of digestive tract functions.

Chewing, its nature, self-regulation. Features chewing when chewing food of different consistency. Masticatory, analysis of masticatory. Salivation and salivation. Nervous and humoral mechanisms of regulation of these processes. Phase salivation, sljunotdelitelnye reflex, the adaptive significance of salivation. Swallowing, its phases and mechanisms.

The function of the stomach. The amount, composition and properties of gastric juice. The value of hydrochloric acid and other components of gastric juice. Phases of gastric secretion, their neuro-humoral mechanisms. Understanding of the features of experimental operations on the stomach and their use to study the nervous and humoral effects on gastric secretion. Motor activity of the stomach. Nervous and humoral factors affecting motor and evacuation functions of the stomach. The importance and role of digestion in the duodenum. The function of the pancreas. The amount, composition and properties of pancreatic juice. Enzymes of pancreatic juice, released in the active state and in the form of zymogens. Mechanisms of regulation of pancreatic secretion. Contours of self-regulation of pancreatic secretion, their value. Liver function. Bile, its amount, composition, value for digestion. Mechanisms of bile formation, deposition and

bile secretion, their regulation. Intestinal-hepatic recirculation of bile acids. The importance and role of digestion in the small intestine. The mechanism of formation of intestinal juice. Quantity, property, enzymatic composition of intestinal juice. Regulation of intestinal juice separation.

Cavity and membrane digestion, their relationship and severity in different parts of the gastrointestinal tract. Intracellular digestion. Immunocompetent cells of the gastrointestinal tract. Motor activity of the small and large intestine, its features, value, mechanisms of regulation. The enzyme composition of the juice of the colon. Microflora value. The act of defecation as the end result of digestion in the colon. Absorption of digestive products in various parts of the digestive tract, its mechanisms.

Topic 2. Physiology of metabolism and energy (2 hours.)

Metabolism-as the main condition for life and preservation of homeostasis. Plastic and energy role of nutrients (proteins, fats, carbohydrates). Processes of assimilation and dissimilation of substances. Regulation of nutrients in the body. The importance of water for the body. The idea of the regulation of water and mineral metabolism, the self-regulating principle of these processes. Vitamins, their value.

Representation of the energy balance of the body. Caloric value of various nutrients. Methods of direct and indirect (complete and incomplete gas analysis) calorimetry. The concept of caloric value, respiratory coefficient and caloric equivalent of oxygen, their values for different types of oxidized nutrients. Daily exchange and its components. The main exchange, the conditions for determining the main exchange, the factors affecting its value. SPE-digital dynamic action of nutrients. Work raise, work exchange. The value of the working exchange in different types of labor.

Principles of the organization of rational nutrition. Food standards.

Topic 3. Physiology of excretion. (2 hours.)

The concept of allocation, its role in maintaining homeostasis. The kidney is the main excretory organ. Morphofunctional characteristic of nephron, especially its blood supply. Glomerular filtration mechanism, its regulation. The primary urine, the difference of its composition from blood plasma. Reabsorption. Mandatory (obligate) and selective (optional) reabsorption. Active and passive processes underlying reabsorption. The concept of threshold and non-threshold substances. Rotary-countercurrent mechanism of urine concentration at the level of Henle loop and collecting tube. Mechanisms of regulation of the resorption process. The role of the main humoral factors: aldosterone and antidiuretic hormone. Secretion in the renal tubules. Secondary urine. The mechanism of urination, its regulation.

The idea of homeostatic kidney functions (regulation of fluid volume, osmotic pressure, acid-base balance, the amount of inorganic and organic substances, blood pressure, hematopoiesis).

Module 4. The physiology of the whole organism (6 hours.)

TOPIC 1. PHYSIOLOGY OF SENSORY SYSTEMS (2 HOURS.)

The concept of the sensor system. The concept of the analyzer from the standpoint of the teachings of I. p. Pavlov. Correlation of concepts "sensor system" and " analyzer". The concept of the sense organ. Representation of the main and auxiliary structures of the sense organ. The concept of peripheral (receptor) Department of the sensory system, receptor, receptive field of the neuron. Functional properties and features of receptors: specificity, high excitability, low accommodation, adaptability; rhythmic generation of excitation pulses. Classification of receptors by criteria: reception of internal or external stimuli; the nature of the adequate stimulus; the nature of sensations; the modalities; the irritation threshold; speed of adjustment; communication of the receptor with sensory neuron. Mechanism of receptor excitation. Receptor and generator potentials. Coding of signals in receptors. Functional properties and

features of the organization of the conductor Department of the sensor system (multilevel, multi-channel, the presence of "sensory funnels", specific and non-specific ways of information transmission). The idea of the three-neuron organization of the conductor Department. Participation of the conductor's Department in conducting and processing of afferent excitations. Features of the organization of the cortical Department of the sensor system. Functional differences of neurons that are part of different cortical zones. The idea of mono- and polymodality of neurons, the mechanism of interaction of sensory systems (convergence and divergence of excitations, lateral and recurrent inhibition, mediator interaction, synthesis of synaptic receptors). Coding of information in different departments of sensor systems. The ratio of the intensity of irritation and the intensity of the sensations. Weber-Fechner Law. The main methods of regulating the activity of sensor systems based on the use of different forms of braking downward influences from the overlying to the underlying departments. The concept of functional mobility. Adaptation of sensor systems.

Morpho-functional characteristics of the visual sensory system. The concept of visual field and visual acuity. Methods of their determination. The concept of refraction, accommodation and adaptation of the eye. Mechanisms of these processes, their anomalies (astigmatism, myopia, farsightedness, presbyopia). Pupillary reflex. Mechanisms of reception and color perception. The main types of color perception disorders.

Auditory sensory system. Sound-education, conductive paths, and a sound apparatus auditory system. Mechanisms of sound reception. Binaural hearing. Methods of investigation of the auditory sensory system.

General morphological and functional organization of the skin sensory system. Tactile and temperature sensor systems as its components. Classification of tactile receptors, their structural and functional differences. Research methods of tactile sensory system. The concept of spatial threshold of tactile sensitivity. Classification of thermoreceptors. Research methods of temperature sensor system.

General morphological and functional organization of taste sensory system departments. Receptors of the taste sensor system. Taste buds, taste buds. Types of taste papillae of the tongue. The mechanism of reception and perception of taste. Methods of research of taste sensory system (gustometry and functional mobility).

General morphological and functional organization of the olfactory sensory system departments. The mechanism of reception and perception of smell. Research methods of olfactory sensory system (olfactometry). The role of interaction of olfactory and other sensory systems in the formation of taste sensations.

Topic 2. Physiology of higher nervous activity. (2 hours.)

The concept of higher nervous activity (GNI). Representation of the manifestations of GNI (congenital and acquired forms of behavior, higher mental functions). The concept of conditioned reflex. The history of the discovery of conditioned reflexes. The value of the works of I. p. Pavlov and his followers in the creation of the doctrine of conditioned reflexes and physiology of GNI. Comparative characteristics of conditioned and unconditioned reflexes. The value of conditioned reflexes in the adaptation of animals and humans to the conditions of existence. Rules and stages of development of conditioned reflexes. Classification of conditioned reflexes according to the criteria: the ratio of the nature of conditional and unconditional stimuli (natural and artificial); biological significance of the unconditional stimulus (food, defensive, etc.); type of receptors excited by the conditional stimulus (sound, light, etc.); the ratio of the conditional stimulus to the first or second alarm systems; the complexity of the conditioned reflex (reflexes 1, 2, 3, etc. orders); the nature of changes in the body (positive, negative); the ratio of the time of action of conditional and unconditional stimuli (cash, lagging, trace). The concept of time connection. Pavlov and modern ideas about the levels of localization of time communication and mechanisms of its formation. Inhibition of GNI, its types: absolute (transcendent and external), conditional (postelnoe, differentiated, a conventional brake, the trailing), the

conditions of their occurrence. Modern understanding of the mechanisms of braking in the GNI. The value of inhibition of conditioned reflexes for the organization of adaptive human activity.

The concept of GNI (according to I. P. Pavlov). Classification and characteristics of GNI types. The role of types of GNI and other individual-typological characteristics of a person in the implementation of adaptive activities. The concept of the psyche and higher mental functions. Types of basic mental functions (sensation, perception, presentation, attention, emotion, motivation, memory, speech, thinking, consciousness). The concept of sensation. An idea of the nature of sensation. The concept of perception. The idea of its mechanism. The concept of attention. Types of attention. The idea of attention mechanisms from the positions of Pavlov, Ukhtomsky and modern science. Physiological correlates of attention. The concept of motivation. Classification of motivations. The idea of the mechanism of their occurrence. The role of the hypothalamus and the cerebral cortex in this process. The concept of emotion. Types of emotions. The idea of the mechanism of their occurrence. The role of different brain structures in the formation of emotional States. The importance of emotions for the organization of behavior. The concept of memory. Type of memory. Understanding the mechanisms of short-term and long-term memory. The concept of thinking. Kind of thinking. The role of different brain structures in the realization of the thinking process. Development of abstract thinking in human ontogenesis. The concept of speech. Types of speech and speech functions. Understanding of the mechanisms of speech and functional asymmetry of the cerebral cortex associated with the development of speech in humans. The concept of consciousness. The idea of sub- and super-consciousness, their relationship with consciousness.

The idea of physiological and psycho-physiological methods of research of mental functions. The concept of purposeful behavior. Analysis of the components of the functional system of behavioral act. Biologically and socially determined

types of purposeful activity. The idea of work as one of the manifestations of purposeful human activity. "Quant" of behavior as stages of activity.

Topic 3. Physiology of functional States (2 hours.)

The concept of functional state. Methods for assessing the functional state. Scale of functional States. Optimal level of functional state. Individual differences in functional States. Regulation of functional States. Sleep. Sleep stages.

The relationship of level of a functional state with an efficiency and productivity enabler. Functional state of a person in the conditions of emotionally intense activity. The peculiarities of architectonics-oriented behavioral act in a physically strenuous activity. Concept and types of physical activity. Features of labor activity in the conditions of modern production (hypokinesia, monotonous work). The concept and types of monotonous work. Features of the functional state in monotonous work. The state of monotony as a consequence of monotonous work. Factors contributing to and hindering the development of the state of monotony. The role of human personality characteristics in the development of monotony. Prevention of monotony. Efficiency. Stages of health. Fatigue, its mechanisms. The strain of his performance. Restoration, its types. Heterochronism of recovery processes. Super recovery. The concept of passive and active recreation.

Concepts of health and disease. Evaluation criterion. Factors affecting health. Features of health preservation in modern conditions. Health and work. The concept of a healthy lifestyle. Features of a way of life and work of students.

The concept of stress. Types of stress. The stages of stress according to Hans Selye. Stress-relieving and stress-limiting systems. The role of emotional stress in the development of somatic pathology. The role of individual-typological features in the formation of resistance to psycho-emotional stress. Prevention of psycho-emotional stress. Modern ideas about adaptation. Biorhythms. Classification of biorhythms. Desynchronosis.

II. THE STRUCTURE AND CONTENT OF THE PRACTICAL PART OF THE COURSE

PRACTICAL CLASSES (_72_HOUR.)

THIRD SEMESTER (36 HOURS.)

Practical lesson №1. Introduction to physiology, principles of management in the body, functional systems (2 hours.)

Practical lesson №2. Electrical phenomena in excitable tissues. Methods of investigation of excitable tissues. Physiology of muscle contraction. Nervous tissue. Synapses. Mediators. (4 hours.)

Practical lesson №3. General physiology of the Central nervous system (4 hours.)

Practical lesson № 4. Physiology of motion control (2 hours.)

1. Human tendon reflexes

2. Study of motor functions of the cerebellum

Practical lesson №5. Physiology of the autonomic nervous system (4 hours.)

Practical lesson № 6. Physiology of endocrine system (2 hours.)

Practical lesson № 7. Basic properties and functions of blood (4 hours.)

Demonstration of the educational film " Blood»

The method of active learning "Round table" is used to discuss the issues of self-training»

Practical lesson № 8. Regulation of blood aggregation. Individual properties of blood. (2 hours.)

The method of active learning "Round table»

Practical lesson № 9. Physiology of the human cardiovascular system (4 hours.)

TSO: visual AIDS "Heart".

The method of active learning "Round table»

Practical lesson № 10. Cardiac conduction system, electrocardiography (4 hours.)

TSO: posters "Location of diagnostic ECG electrodes", " Typical ECG curves for different types of arrhythmias."

Demonstration of the educational film "ECG – it's just»

Practical lesson № 11. Regulation of the heart (2 hours.)

The method of active learning "Round table»

Practical lesson № 12. The human vascular system. Hemodynamics. Regulation of hemodynamic parameters of the human vascular system. (2H.)

The method of active learning "Round table»

1. Blood pressure measurement in humans Korotkoff method and the Riva-Rocchi.
2. Study pulse at rest and after exercise.

FOURTH SEMESTER (36 HOURS.)

Practical lesson №1. Physiology of the human respiratory system (4 hours.)

Practical lesson №2. Regulation of respiration. Breathing in different conditions (2 hours.)

The method of active learning round table is used.

Practical lesson №3. Final lesson on the topic "physiology of the respiratory system" (2 hours.)

Practical lesson № 4. Physiology of digestion (4 hours.)

Practical lesson №5. Physiology of metabolism and thermoregulation (4 hours.)

The method of active learning "discussion" is used»

1. Calculation of the main exchange
2. Analysis of the energy value of the daily diet
3. Discussion-discussion of the resulting diet
4. Students prepare reports on the topic of "theory of nutrition", distributing the theory in advance
5. Discussion on the question of which theory of power best to stick (to be discussed main theories individually or all together).

Practical lesson № 6. Final lesson on the topic "physiology of digestion and metabolism". (2 hours.)

Practical lesson № 7. Physiology of the excretory and reproductive systems. (2 hours.)

Demonstrates visual aid "of the Nephron»

Practical lesson № 8. Physiology of sensory systems: visual analyzer, auditory, vestibular, olfactory, taste analyzers (4 hours.)

A. Demonstration of visual AIDS "human Eye" poster " The Eye»

1. Definition of visual acuity
2. Spherical aberration
3. Pupil reaction to light

4. Consecutive image

B. Demonstration of visual AIDS "human Ear", " Nose and sinuses»

1. The definition of the basic taste qualities
2. Definition of taste adaptation
3. Study the accuracy of localization of the sound source

Practical lesson № 9. Physiology of sensory systems: tactile, proprioceptive and visceral analyzers, pain. (2 hours.)

The method of active learning "Round table»

1. Determination of spatial thresholds of skin sensitivity
2. Identifying the role of proprioceptors
3. Detection of temperature adaptation of skin receptors

Practical lesson № 10. Final lesson on the topic "physiology of sensory systems" (2 hours.)

Practical lesson № 11. Physiology of higher nervous activity (6 hours.)

1. Demonstration of educational film.

2. Implementation of practical tasks:

* Development of conditional blinking reflex

* Study of the predominant type of temperament by the method of identification of

A. Belov (1971)

• Identification of the type of higher nervous activity according to Eysenck.

* Identification of the ratio of signal systems by the method of E. A. Klimov

* Attention research (distribution, selectivity, switching)

* The study of memory by the method of A. R. Luria (ten words)

* Method of visualization of emotions and decision-making " Six hats»

• Identification of functional brain asymmetry (form, "interlocking fingers", the sample of the Rosenbach, "the pose of Napoleon»)

3. Discussion of completed tasks that assess the student's GNI.

Practical lesson № 12. Physiology of functional state (2H.)

Practical lesson № 13. Adaptation, Biorhythms (4h.)

1. Determination of biological age

2. Determination of chronobiological type
3. Determining the duration of an individual minute
4. Determining the phase of the physical, emotional and intellectual cycle

III. TRAINING AND METHODOLOGICAL SUPPORT INDEPENDENT WORK OF STUDENTS

Educational and methodological support of independent work of students in the discipline "name of discipline" is presented in Annex 1 and includes:

schedule of independent work on the discipline, including approximate time standards for each task;

characteristics of tasks for independent work of students and guidelines for their implementation;

requirements for presentation and registration of the results of independent work;

criteria for evaluating the performance of independent work.

CONTROL OF COURSE GOAL ACHIEVEMENT

№	Course topics	Codes and stages of skill development		Evaluation tools	
				Control during the course	Midterm control / exam
1.	Module 1. Excitable tissue Module 2. Control body functions Module 3. Physiology of organs and systems Module 4. The physiology of the whole organism	the capacity for the assessment of morphological and physiological states and pathological processes in the human body for solving professional tasks (GPC – 9)	Know	Interview	Exam questions 1-108
			Able	Test	Test
			Master	Test	Test

Standard control tasks, methodical materials defining procedures of assessment of knowledge, abilities and skills and (or) experience of activity, and also the criteria and indicators necessary for an assessment of knowledge, abilities, skills and characterizing stages of formation of competences in the course of development of the educational program are presented in Appendix 2.

II. A LIST OF TEXTBOOKS AND METHODOLOGICAL SUPPORT OF THE DISCIPLINE

BASIC LITERATURE

1. Pulmonary Physiology and Response to Exercise, Carli M. Peters, A. William Sheel
2. Physiology of the Normal and Failing Heart, M. Chadi Alraies, Daniel J. Garry 2017 https://link.springer.com/chapter/10.1007/978-3-319-44577-9_2
3. Normal Hepatic Function and Physiology, Achuthan Sourianarayanan 2017 https://link.springer.com/chapter/10.1007/978-3-319-66432-3_1

Additional literature

1. Coronary physiology revisited, J. J. Piek 2017 <https://link.springer.com/article/10.1007/s12471-017-0982-3>
2. Venous Physiology and Pathophysiology, James Laredo 2017 https://link.springer.com/chapter/10.1007/978-3-319-65226-9_2

Перечень ресурсов информационно-телекоммуникационной сети «Интернет»

1. Научная библиотека ДВФУ
<http://www.dvfu.ru/library/>
2. Электронная библиотека «Консультант студента»

<http://www.studentlibrary.ru/>

3. IPRBooks

<http://www.iprbookshop.ru/>

LIST OF INFORMATION TECHNOLOGIES AND SOFTWARE

The location of the computer equipment on which the software is installed, the number of jobs	List of licensed software
Multimedia auditorium Vladivostok Russian island, Ayaks 10, building 25.1, RM. M723 Area of 80.3 m2 (Room for independent work)	Windows Seven enterprice SP3x64 Operating System Microsoft Office Professional Plus 2010 office suite that includes software for working with various types of documents (texts, spreadsheets, databases, etc.); 7Zip 9.20 - free file archiver with a high degree of data compression; ABBYY FineReader 11 - a program for optical character recognition; Adobe Acrobat XI Pro 11.0.00 - software package for creating and viewing electronic publications in PDF; WinDjView 2.0.2 - a program for recognizing and viewing files with the same format DJV and DjVu.

In order to provide special conditions for the education of persons with disabilities all buildings are equipped with ramps, elevators, lifts, specialized places equipped with toilet rooms, information and navigation support signs.

VI. METHODOICAL INSTRUCTIONS ON SUBJECT STUDYING

During the course "Histology. Cytology. Embryology" a variety of methods and tools are used: lectures, practical, tests, independent work of students.

Lecture is the main form of activity in the classroom, which involves intense mental activity of the student, and it may be difficult for first-year students. Lectures help to assimilate the theoretical material of the discipline. During the lecture it is necessary for students to note the most important points in their own words in order to better remember the material.

During the lecture teacher gives only a small proportion of material, which is described in more detailed in textbooks. Therefore, it is always necessary to use the

basic textbook while student works with lecture notes and additional literature. Such a serious work with the lecture notes and textbook allows to reach success in subject memorization.

During the course "Histology. Cytology. Embryology" the following forms of active learning are used: lecture, discussion, lecture – visualization. Lecture material is based on the knowledge of «Biology», "Chemistry" and "Physics" courses.

To illustrate the verbal information teachers, use presentations, spreadsheets and diagrams.

Lecture - visualization

Lecture is accompanied by any types of visual aids, that contributes to better and easier understanding of the material. During lecture - visualization verbal presentation of the material must be accompanied by visual aids. The information should be present in the form of diagrams on the blackboard, tables, slides. This allow you to create the problematic issues, and contribute to the development of professional thinking of future specialists.

Lecture - conversation

Lecture- conversation (or dialogue with the audience) it is the most common form of active learning; it allows students to be engaged in the learning process, as there is direct contact between the teacher and students. Such contact is achieved during the lecture, when students ask questions on different issues. Questions are asked by entire audience, and any of the students can answer it, other students can make some comments and add additional information. In this way we can identify active students and try to involve students who do not participate in the work. This form of lectures allows students to be engaged in work, increases their attention, thinking, get an experience of collective work, give understanding on how to form questions. The main advantage of lecture-conversation is that it allows to attract

the students' attention to the most important issues of the theme and to determine the content and speed of educational material presentation.

Practical

Practical training is a collective form of education. It includes seminars, which are also one of the main types of work for deep study of practical discipline. Each practical related to one of the topics and includes quiz for students in order to exam their knowledge and discussion, which is aimed at formation of skills to debate, develop independence and critical thinking, the student ability to work with large information flows, to develop and defend their own position on issues. Other active learning methods includes press conference and debate.

Press conference. For this type of activity 3-4 students prepare reports on different topics, that are related to the topic of current practical. Each students makes a presentation. After this, other students asked questions, and based on these questions and answers creative discussion appears, guided by the teacher.

MATERIAL AND TECHNICAL EQUIPMENT OF SUBJECT

For performing practical work, as well as for organizing independent work, students have access to the following laboratory equipment and specialized classrooms that meet applicable sanitary and fire regulations, as well as safety requirements for educational and research and production work:

For performing practical work, as well as for organizing independent work, students have access to the following laboratory equipment and specialized classrooms that meet applicable sanitary and fire regulations, as well as safety requirements for educational and research and production work:

Name of equipped premises and rooms for independent work	List of equipment;
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<p>Computer class of the School of Biomedicine room M723, 15 seats</p>	<p>Screen with an electric drive 236 * 147 cm Trim Screen Line; DLP Projector, 3000 ANSI Lm, WXGA 1280x800, 2000: 1 EW330U Mitsubishi; The subsystem of specialized fixing equipment CORSA-2007 Tuarex; Video switching subsystem: DVI DXP 44 DVI Pro Extron matrix switcher; DVI extension cable for twisted pair DVI 201 Tx / Rx Extron; Audio switching and sound reinforcement subsystem; ceiling speaker system SI 3CT LP Extron; DMP 44 Extron digital audio processor; extension for the control controller IPL T CR48; Wireless LANs for students are provided with a system based on 802.11a / b / g / n access points 2x2 MIMO (2SS).</p> <p>Monoblock HP RgoOpe 400 All-in-One 19.5 (1600x900), Core i3-4150T, 4GB DDR3-1600 (1x4GB), 1TB HDD 7200 SATA, DVD +/- RW, GigEth, Wi-Fi, BT, usb kbd / mse, Win7Pro (64-bit) + Win8.1Pro (64-bit), 1-1-1 Wty</p>
<p>Multimedia audience</p>	<p>Monoblock HP ProOne 400 G1 AiO 19.5 "Intel Core i3-4130T 4GB DDR3-1600 SODIMM (1x4GB) 500GB; Projection Screen Projecta Elpro Electrol, 300x173 cm; Multimedia Projector, 4000 Mitsubishi FD630U, 4000 ANSI Lumen, 1920x1080; Embedded Interface, Mitsubishi FD630U, 4000 ANSI Lumen, 1920x1080; Embedded, Embedded, Mitsubishi FD630U, 4000 ANSI Lumen, 1920x1080; Embedded; TLS TAM 201 Stan cables; Avervision CP355AF Document Camera; Sennheiser EW 122 G3 Microphone UHF-band microphone system as part of a wireless microphone and receiver; LifeSizeExpress 220-Codeconly-Non-AES video conferencing codec; Multipix MP-HD718 Network Video Camera; Dual LCD Panels 47 ", Full HD, LG M4716CCBA; Audio switching and sound reinforcement subsystem; central uninterrupted power supply</p>
<p>Reading rooms of the FEFU Scientific Library with open access to the book collection (Building A - Level 10)</p>	<p>HP RgoOpe 400 All-in-One 19.5 (1600x900), Core i3-4150T, 4GB DDR3-1600 (1x4GB), 1TB HDD 7200 SATA, DVD +/- RW, GigEth, Wi-Fi, BT, usb kbd / mse, Win7Pro (64-bit) + Win8.1Pro (64-bit), 1-1-1 Wty Internet access speed 500 Mbit / s. Jobs for people with disabilities are equipped with braille displays and printers; equipped with: portable devices for reading flat-printed texts, scanning and reading machines with a video optimizer with the ability to adjust color spectra; magnifying electronic loops and ultrasonic markers</p>
<p>690922, Primorsky Krai, Vladivostok, Russky Island, Saperny Peninsula, Ajax Village, 10, room M628 Multimedia-equipped room</p>	<p>Microscope light Alto BIO4 (20 pieces);</p> <p>Light microscope with digital camera BIO8 Altos (1 pc);</p> <p>Monoblock Lenovo C360G-I34164G500UDK (1 pc);</p> <p>LED TV Samsung UE40D6510WS (1 pc).</p> <p>A set of histological preparations (basics of cytology, cell structure of various types, main types of living tissues, embryology basics, cell multiplication, fundamentals of parasitology), slides, coverslips, immersion medium, Pasteur pipette, Romanovsky-Giemsa dye, glycerin, Petri dishes, test tube Falcon type 50 ml, container for samples of</p>

	biomaterials
690922, Primorsky Krai, Vladivostok, Russky Island, Saperny Peninsula, Ajax Village, 10, room M627	<p>Light microscope Carl Zeiss GmbH Primo Star 3144014501 (13 pcs.);</p> <p>Microscope light with a digital camera BIO8 Altos (2 pieces).</p> <p>A set of histological preparations (basics of cytology, cell structure of various types, main types of living tissues, embryology basics, cell multiplication, fundamentals of parasitology), slides, coverslips, immersion medium, Pasteur pipette, Romanovsky-Giemsa dye, glycerin, Petri dishes, test tube Falcon type 50 ml, container for samples of biomaterials</p>
690922, Primorsky Krai, Vladivostok, Russky Island, Saperny Peninsula, Ajax Village, 10, room M625	<p>Microscope light Carl Zeiss GmbH Primo Star 3144014501 (11 pcs.)</p> <p>A set of histological preparations ((basics of cytology, cell structure of various types, main types of living tissues, embryology basics, cell reproduction, basics of parasitology), slides, coverslips, immersion medium, Pasteur pipette, Romanovsky-Giemsa dye, glycerin, Petri dishes, test tube of Falcon type 50 ml, container for samples of biomaterials</p>



MINISTRY OF EDUCATION AND SCIENCE OF RUSSIAN FEDERATION
The Federal state autonomous educational institution
higher education
"Far Eastern Federal University"
(FEFU)

SCHOOL OF BIOMEDICINE

EDUCATIONAL AND METHODOLOGICAL SUPPORT OF STUDENTS
INDEPENDENT WORK
on the subject " Normal physiology "
Specialty 31.05.01 General Medicine
Full-time training

Vladivostok

2017

Independent work includes:

- 1) library or homework with educational literature and lecture notes,
- 2) preparation for practical training,
- 3) preparation of testing and control interview (offset),
- 4) preparation for laboratory classes.

The order of performance of independent work by students is defined by the schedule of performance of independent work on discipline.

Schedule of independent work on discipline

№ п/п	Date/deadline	Type of independent work	Approximate time standards for implem entatio n	Form of control
3-4 semester				
1	Section 1	Work with literature and lecture notes, preparation for the control lesson	12	Work during practical classes with microscopic preparations, oral response, computer testing
2	Section 2	Work with literature and lecture notes, preparation for the control lesson	12	Work during practical classes with microscopic preparations, oral response, computer testing
3	Section 3	Work with literature and lecture notes, preparation for control work	6	Work during practical classes with microscopic preparations, oral response, computer testing
4	Section 4	Work with literature and lecture notes, preparation for control work	6	Work during practical classes with microscopic preparations, oral response, computer testing
		Preparing to exam	54	

The content of the compulsory independent work of students on discipline "Normal Physiology" (examples)

№ п/п	Topic	Content of independent work of students, the number of hours	The number

			of hours
Topic	Excitable tissues	<ol style="list-style-type: none"> 1. To define (in writing): irritability of cells, the excitability of the cells 2. Draw a diagram of the structure of the cell membrane (structure, composition, receptors, conducting channels) Sign components 3. Record the main differences between local excitation and spreading 4. Draw a graph of the potential for action and excitability, sign the stage 5. To write down in the form of an abstract or table what ion channels work at different stages of action potential Abstracts (at the request of students): <ol style="list-style-type: none"> 1. Information exchange and intercellular interactions 	1 hour
Topic	Physiology of muscle contraction	<ol style="list-style-type: none"> 1. Define (in writing): sarcomere, motor unit, muscle fiber 2. Draw the structure of the sarcomere, identify the main structural components 3. Draw a diagram of the motor unit, designate structural components 4. To sketch the graph of correspondence the action potential of muscle tissue and its excitability and reduce Abstracts (at the request of the student): <ol style="list-style-type: none"> 1. Mechanism of muscle fiber contraction of striated muscle 2. Electromyography 	1 hour
Topic	Nervous tissue	<ol style="list-style-type: none"> 1. Define (in writing): neuron, synapse 2. Sketch a diagram of the structure of the myelin and nerve fibers bezmalinovic and excitation transfer in these fibers 3. Sketch a diagram of the synapse, to the structural components 4. Record sequentially the processes of transmission of excitation in the neuromuscular synapse 5. List the properties of the chemical synapse 	1 hour 15 min
Topic	Central nervous system	<ol style="list-style-type: none"> 1. Define (in writing): reflex, reflex arc, neural network 2. Draw a diagram of the structure of the spinal cord on 	1 hour

		<p>the cross section</p> <p>3. Draw a diagram of the reflex arc, identify structural components</p> <p>4. To sketch types of neural networks</p>											
Topic	Motion control	<p>1. Draw a diagram of the stretching reflex</p> <p>2. Make a table of static and statokinetic reflexes in the following scheme:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>The name of the reflex</th> <th>Conditions of occurrence</th> <th>Localization of receptors</th> <th>Level of circuits in the CNS</th> <th>muscles involved</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> <p>Abstracts:</p> <ol style="list-style-type: none"> 1. The function of the cerebral hemispheres of the brain 2. The function of the cerebellum 3. The function of the thalamus and hypothalamus 4. Reticular formation of the medulla oblongata, structure and function. 	The name of the reflex	Conditions of occurrence	Localization of receptors	Level of circuits in the CNS	muscles involved						<p>1 hour 30 min</p>
The name of the reflex	Conditions of occurrence	Localization of receptors	Level of circuits in the CNS	muscles involved									
Topic	Vegetative nervous system	<p>1 Draw a diagram of the Autonomous reflex, identify structural components</p> <p>2. Draw and sign the localization of nuclei and vegetative nodes of sympathetic and parasympathetic parts of the autonomic nervous system</p> <p>Abstracts:</p> <ol style="list-style-type: none"> 1. Sympathetic nervous system function 2. Function of the parasympathetic nervous system <p>Abstracts (at the request of the student):</p> <ol style="list-style-type: none"> 1. Structure, departments and mediators of the sympathetic nervous system 2. Structure, departments and divisions of the parasympathetic nervous system 	<p>1 hour</p>										

Topic	Endocrine system	<ol style="list-style-type: none"> 1. Define (in writing): secretion, hormone, exocrine gland, endocrine gland. 2. Record classification of glands by type of secretion with explanations 3. Draw a scheme of self-regulation of hormone release with the participation of the hypothalamic-pituitary system 4. Make a table of "hormone Functions" according to the scheme: 5. Hormone site of secretion Functions <p>Abstracts (at the request of the student):</p> <ol style="list-style-type: none"> 1. Thyroid. Thyroid hormones, their effect on metabolic processes. The role of iodine in the regulation of thyroid function 2. Glucocorticoids, their functional value 3. Catecholamines, their functional significance Sex glands and sex hormones 4. Kontrinsuljarnye insulin and hormones in the regulation of carbohydrate metabolism 	1 hour																											
Topic	Основные свойства и функции крови	<ol style="list-style-type: none"> 1. To define (in writing): hypovolemia, hypovolemia, acidosis, alkalosis, osmotic pressure of blood plasma, blood plasma pressure oncotic. 2. Make a scheme " blood Composition» 3. Make a table of "blood Constants" according to the scheme: <table border="1" data-bbox="603 1290 1302 2047"> <thead> <tr> <th data-bbox="603 1290 847 1402">Indicator</th> <th data-bbox="847 1290 1094 1402">The normal range</th> <th data-bbox="1094 1290 1302 1402">Unit</th> </tr> </thead> <tbody> <tr> <td data-bbox="603 1402 847 1469">Blood volume</td> <td data-bbox="847 1402 1094 1469"></td> <td data-bbox="1094 1402 1302 1469"></td> </tr> <tr> <td data-bbox="603 1469 847 1536">Blood viscosity</td> <td data-bbox="847 1469 1094 1536"></td> <td data-bbox="1094 1469 1302 1536"></td> </tr> <tr> <td data-bbox="603 1536 847 1715">The contents of formed elements of blood:</td> <td data-bbox="847 1536 1094 1715"></td> <td data-bbox="1094 1536 1302 1715"></td> </tr> <tr> <td data-bbox="603 1715 847 1783">Erythrocytes</td> <td data-bbox="847 1715 1094 1783"></td> <td data-bbox="1094 1715 1302 1783"></td> </tr> <tr> <td data-bbox="603 1783 847 1850">Leukocytes</td> <td data-bbox="847 1783 1094 1850"></td> <td data-bbox="1094 1783 1302 1850"></td> </tr> <tr> <td data-bbox="603 1850 847 1917">Platelets</td> <td data-bbox="847 1850 1094 1917"></td> <td data-bbox="1094 1850 1302 1917"></td> </tr> <tr> <td data-bbox="603 1917 847 1984">Hematocrit</td> <td data-bbox="847 1917 1094 1984"></td> <td data-bbox="1094 1917 1302 1984"></td> </tr> <tr> <td data-bbox="603 1984 847 2047">Osmotic</td> <td data-bbox="847 1984 1094 2047"></td> <td data-bbox="1094 1984 1302 2047"></td> </tr> </tbody> </table>	Indicator	The normal range	Unit	Blood volume			Blood viscosity			The contents of formed elements of blood:			Erythrocytes			Leukocytes			Platelets			Hematocrit			Osmotic			1 hour 30 min
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		<p>pressure of blood</p> <p>Oncotic pressure of blood</p> <p>the pH of the blood</p> <p>The content of glucose in the blood</p> <p>The protein content in the blood</p> <p>Albumin content in the blood</p> <p>The content of globulins in the blood</p>			
		<p>4. Make a summary of " blood Proteins and their function»</p> <p>5. List the factors that determine erythrocyte sedimentation rate</p> <p>6. Sketch the dissociation curve of oxyhemoglobin. Specify the factors that affect the shift of the curve to the right and left</p>			
Topic	Regulation of blood aggregation	<p>1. Draw a diagram of the stages and phases of blood clotting</p> <p>2. Abstract "the Basic parameters of coagulation and Universiada of the blood system in normal»</p>			45 min
Topic	Individual properties of blood	<p>1. Define (in writing): immunity, antigen, antibody</p> <p>2. Draw a diagram of hematopoiesis</p> <p>3. Draw a diagram of the functional system that ensures the constancy of the blood elements</p> <p>4. Make a table of "blood Group system AB0" scheme</p>			1 hour 30 min

		<table border="1"> <tr> <td>blood type</td> <td>Antigens</td> <td>Antibodies</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table> <p>5. Write down the normal leukocyte formula</p> <p>6. Write down the formula and normal indicators of the nuclear shift index</p> <p>Abstracts (at the request of the student):</p> <ol style="list-style-type: none"> 1. Blood substitute 2. Blood group 3. Sisters coagulation, antitorture and fibrinolysis blood 4. Mechanisms of immunity (skin and mucous barriers, humoral and cellular factors of immunity) 	blood type	Antigens	Antibodies								
blood type	Antigens	Antibodies											
Topic	The structure of the human cardiovascular system	<ol style="list-style-type: none"> 1. To define (in writing) the cardiac cycle, systole, diastole 2. Draw a diagram of the human heart, sign valves, incoming and outgoing vessels 3. Sketch the General scheme of the large and small circle of blood circulation 4. Draw a projection of the heart valves on the front surface of the human chest 5. Make a table of the "Phase of the heart cycle" in the following scheme: <table border="1"> <thead> <tr> <th>Phase</th> <th>Period</th> <th>Duration</th> <th>The status of the atrioventricular valves</th> <th>Status of semilunar valves</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Phase	Period	Duration	The status of the atrioventricular valves	Status of semilunar valves						<p>1 hour</p> <p>15 min</p>
Phase	Period	Duration	The status of the atrioventricular valves	Status of semilunar valves									
Topic	Cardiac conduction system, electrocardiography	<ol style="list-style-type: none"> 1. Give a definition (in writing): the driver of the heart rhythm, cardiac conduction system, electrocardiogram, phonocardiogram. 2. Draw a curve of the electrocardiogram (ECG), denote the teeth and intervals 3. Make a table of "Teeth and ECG intervals" according to the scheme: <table border="1"> <thead> <tr> <th>deflection/</th> <th>duration</th> <th>Amplitude</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	deflection/	duration	Amplitude	Description					<p>45 min</p>		
deflection/	duration	Amplitude	Description										

		interval					
Topic	Regulation of the heart	<p>1. Make a summary of "Regulation of the heart" (intracardiac and extracardial mechanisms with examples)</p> <p>2. List the types of influence that sympathetic and vagus nerves have on the heart, give their definition</p>					30 min
Topic	Human vascular system, hemodynamics	<p>1. To define (in writing): microcirculatory bed, hemodynamics, volume of circulating blood, volume of vascular bed, shock volume of the heart</p> <p>2. Draw a diagram of the structure of the artery wall</p> <p>3. Draw a diagram of the structure of the vein wall</p> <p>4. Draw an arterial pulse curve (sphygmogram). Identify anacrota, catacrota, incisura, dicrotic rise, indicate their origin</p> <p>5. To sketch the curve of the venous pulse (phlebogram). Denote the teeth (α, C, v) and the retraction (x, y), indicate their origin</p> <p>Abstracts:</p> <p>1. Blood pressure, types of blood pressure, normal values of blood pressure in different parts of the bloodstream</p> <p>2. Functional classification of blood vessels (shock-absorbing, distribution, resistance, exchange, shunt, capacitive)</p> <p>3. Composition and function of lymph, structure and function of the human lymphatic system</p>					2 hours
Topic	Regulation of hemodynamics	<p>1. Scheme of pressure in the vascular bed, in arterial and venous vessels</p> <p>2. Make a summary of the regulation of vascular tone (mechanisms of short-term, intermediate and long-term action)</p> <p>3. Draw a functional system that maintains constant blood pressure</p> <p>Abstracts (at the request of the student):</p> <p>1. Heart rhythm disturbance</p> <p>2. Mechanisms of blood pressure regulation</p>					1 hour
Topic	Respiratory system	<p>1. Define (in writing): upper respiratory tract, lower respiratory tract, pleural cavity, mediastinum, surfactant, hypoxia, hypercapnia</p> <p>2. Draw a General diagram of the structure of the respiratory system with the designation of anatomical formations</p> <p>3. Make a summary of "the Volume and capacity of the lungs." Specify the name of the volume,</p>					1 hour

		<p>the definition for the capacity-of what volumes it consists of, physiological norms</p> <p>4. Draw a diagram of the structure of the respiratory unit of the lungs.</p> <p>Abstracts (at the request of the student):</p> <ol style="list-style-type: none"> 1. The mechanism of voice formation and anatomical structures involved in the process of voice formation 2. Gas exchange between alveoli and blood 3. Factors contributing to and preventing gas exchange in the lungs 4. Instrumental methods of diagnosis of lung function 	
Topic	Regulation of respiration. Breathing in different conditions	<p>Draw a diagram of the functional system that supports the concentration of gases in the body</p> <p>Abstracts:</p> <ol style="list-style-type: none"> 1. The effect of blood O₂, CO₂ and H⁺ on respiration. 2. Central regulation of respiratory movements 	45 min
Topic	Physiology of digestion	<ol style="list-style-type: none"> 1. To define (in writing): digestion, chyme, the peritoneum, the abdominal cavity 2. Make an overview table (or abstract) "the action of digestive juices." For each digestive juice (saliva, gastric juice, pancreatic secretion, bile, intestinal juice) indicate its constituent enzymes, the state of these enzymes in the production (active or not), pH of the medium, where their catalytic activity is manifested, which substances act this enzyme and the products of hydrolysis formed in this case 3. Draw a General diagram of the structure of the digestive system with the designation of anatomical formations. 4. Draw a projection of the liver on the front surface of the body <p>Abstracts (at the request of the student):</p> <ol style="list-style-type: none"> 1. Liver structure and function 2. Structure and function of the pancreas 3. Digestion in the stomach 4. Digestion in the small intestine 	1 hour

		<p>5. Digestion in the colon</p> <p>6. Regulation of the digestive system, local and Central mechanisms</p> <p>7. Microflora of the colon and its role in digestion</p> <p>8. The digestion of fats</p> <p>9. Protein digestion</p> <p>10. Carbohydrate digestion</p> <p>11. Absorption and utilization of nutrients</p>									
Topic	Physiology of metabolism and thermoregulation	<p>1. Define (in writing): metabolism homeostasis, homeokinesis, nitrogen balance, hyperthermia, fever</p> <p>2. To make the table "the Importance of vitamins and Value of the minerals" under the scheme</p> <table border="1" data-bbox="603 898 1267 1084"> <thead> <tr> <th>Vitamin/ micro element</th> <th>Physiological value</th> <th>Food</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>3. Write down the food eaten per day and the number of meals separately for each meal</p> <p>4. Report of a presentation on selected theories of power</p> <p>5. Draw a diagram of the local temperature of the skin</p> <p>6. Draw a functional system to maintain blood glucose levels</p>	Vitamin/ micro element	Physiological value	Food				1 hour 45 min		
Vitamin/ micro element	Physiological value	Food									
Topic	Urinary and reproductive systems	<p>1. Define (in writing): nephron, filtration, reabsorption, diuresis, anuria</p> <p>2. Draw a diagram of the urinary system</p> <p>3. Make a table of "Basic processes of urination" according to the scheme:</p> <table border="1" data-bbox="603 1805 1342 2040"> <thead> <tr> <th>Part of nephron</th> <th>The main processes</th> <th>Mechanism</th> <th>The resulting liquid</th> </tr> </thead> <tbody> <tr> <td>Glomerular</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Part of nephron	The main processes	Mechanism	The resulting liquid	Glomerular				1 hour 15 min
Part of nephron	The main processes	Mechanism	The resulting liquid								
Glomerular											

		<p>The proximal tubule</p>					
		<p>The Loop Of Henle:</p> <ol style="list-style-type: none"> 1. descending knee 2. rising knee 					
		<p>Distal tubule and collecting tubules</p>					
		<p>4. Make a summary of the main indicators of the General analysis of urine in the normal</p> <p>5. Describe the main events of the ovarian cycle</p> <p>Abstracts (at the request of the student):</p> <ol style="list-style-type: none"> 1. Research methods (laboratory, ultrasound, x-ray) urinary system 2. Functional tests for diseases of the genitourinary system 3. Mechanism of action of diuretics 4. Water-salt exchange. Liquid space of the body. The main electrolytes in the blood. The role of the kidneys in maintaining water-electrolyte balance. 5. Structure and function of the skin (excretory function) 6. Excretory function of the respiratory tract 7. Excretory function of the gastrointestinal tract 					
Topic	Physiology of sensory systems: visual analyzer	<ol style="list-style-type: none"> 1. Define(in writing): sensory organs, sensory analyzer, sensation, perception, sensitivity threshold 2. Draw a block diagram of the sensor system 3. Draw a diagram of the structure of the eye, sign the main elements 4. Draw a diagram of the course of the rays in the optical system of the eye 5. Make a diagram of the photochemical processes occurring in the retinal receptors under the action of light and in the dark 					<p>1 hour 15 min</p>

Topic	Physiology of sensory systems: auditory, vestibular, olfactory, taste analyzer	<ol style="list-style-type: none"> 1. Draw a diagram of the structure of the middle and inner ear 2. Draw a diagram of the structure of the vestibular apparatus 3. Draw a diagram of the taste buds 4. Draw a diagram of the taste sensitivity of the tongue 	1 hour
Topic	Physiology of sensory systems: tactile, proprioceptive and visceral analyzers, pain	<ol style="list-style-type: none"> 1. Draw and mark the types of receptors of skin and kinesthetic sensitivity 2. Draw block diagrams of pain, tactile, motor, taste and olfactory analyzers 3. Draw a diagram of the reflex arc of pain sensitivity <p>Abstracts (at the request of the student):</p> <ol style="list-style-type: none"> 1. Methods of study of the visual system 2. Methods of study of the auditory system 3. Methods of anesthesia 4. The structure of the retina. Conversion of light energy in the retina. The receptive fields of the retina. 5. The structure of the inner ear. Conversion of sound energy in the inner ear. 6. Skin structure and function 	45 min
Topic	Physiology of higher nervous activity	<ol style="list-style-type: none"> 1. Define (in writing): conditioned reflex, unconditional reflex, instinct 2. Make a table showing the differences between unconditional and conditioned reflexes 3. Draw a scheme of formation of a conditioned reflex by I. P. Pavlov 4. Draw a diagram of the structures of the limbic system 5. Draw a diagram of the functional system of P. K. Anokhin, providing adaptive behavior 6. Make a summary of the "Basic rhythms of EEG" scheme: the name of the rhythm, its description <p>Abstracts:</p>	1 hour 30 min

		<ol style="list-style-type: none">1. Methods study of Central nervous system function2. Ukhtomsky's doctrine of the dominant, the stage of development of the dominant and its correction3. Sleep	
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MINISTRY OF EDUCATION AND SCIENCE OF RUSSIAN FEDERATION
The Federal state autonomous educational institution
higher education
"Far Eastern Federal University"
(FEFU)

SCHOOL OF BIOMEDICINE

FUND OF ASSESSMENT TOOLS
on the subject " Normal physiology "
Specialty 31.05.01 General Medicine
Full-time training

Vladivostok

2017

Fund of assessment tools passport

This part of the program is filled in accordance with the Regulations on the Funds of assessment tools of educational programs of higher education - undergraduate, specialist's and master's programs of Far Eastern Federal University, approved by order of the rector of 12.05.2015 №12-13-850.

Competence code and formulation	Stages of competence formation	
the capacity for the assessment of morphological and physiological states and pathological processes in the human body for solving professional tasks (GPC – 9)	Knows	<ul style="list-style-type: none"> • * patterns of functioning of individual organs and systems under normal conditions • * changes in the body in the process of growth and aging, age physiological characteristics of the body
	Can	<ul style="list-style-type: none"> • use the basic methods of assessing the functional state of the human body • * explain the nature of physiological changes in adaptive activities to changing environmental conditions
	Master	<ul style="list-style-type: none"> • * medical and physiological conceptual apparatus • * skills of evaluation of physiological parameters of functional systems and human organs

CONTROL OF COURSE GOAL ACHIEVEMENT

№	Course topics	Codes and stages of skill development		Evaluation tools	
				Control during the course	Midterm control / exam
1.	Module 1. Excitable tissue Module 2. Control of body functions Module 3. Physiology of organs and systems Module 4. The physiology of the whole organism	the capacity for the assessment of morphological and physiological states and pathological processes in the human body for solving professional tasks (GPC – 9)	Know	Interview	Exam questions 1-108
	Able		Test	Test	
	Master		Test	Test	

Scale of course achievements

Code and formulation of competence.	Stages of formation of competence		Criteria	Indicators	Points
GPC-9 the capacity for the assessment of morphological and physiological states and pathological processes in the human body for solving professional tasks	Knows (entry level)	<ul style="list-style-type: none"> • patterns of functioning of individual organs and systems under normal conditions • changes in the body in the process of growth and aging, age physiological characteristics of the body 	<ul style="list-style-type: none"> • Knowledge of patterns of functioning of individual organs and systems under normal conditions • changes in the body in the process of growth and aging, age physiological characteristics of the body 	<ul style="list-style-type: none"> • The ability to define functioning of individual organs and systems under normal conditions • changes in the body in the process of growth and aging, age physiological characteristics of the body 	65-71
	Able (advanced level)	<p>use the basic methods of assessing the functional state of the human body</p> <ul style="list-style-type: none"> • explain the nature of physiological changes in adaptive activities to changing environmental conditions 	<p>to use the basic methods of assessing the functional state of the human body</p> <p>explain the nature of physiological changes in adaptive activities to changing environmental conditions</p>	<p>The ability to use the basic methods of assessing the functional state of the human body</p> <p>explain the nature of physiological changes in adaptive activities to changing environmental conditions</p>	71-84
	Master (high level)	<ul style="list-style-type: none"> • medical and physiological conceptual apparatus • skills of evaluation of physiological parameters of functional systems and human organs 	<p>Ability to work with tools</p>	<p>The ability to work with simple research tools and its correct application</p>	85-100

Methodical instructions on passing the exam/test

In the standings as the assessment tools used submission of tests on Tors and reports on laboratory work. On the exam as a means of evaluation used Interview on tickets, the solution of situational problems.

Exams and tests are taken by the leading teacher. The form of the test and examination (oral, written) is approved at the meeting of the Department.

Exams are held on tickets signed by the head of the Department. The teacher takes test and examination sheets in advance before the beginning of reception of tests and examinations at the administrator of educational programs. During the examination or test, students can use the work program of the discipline. If the student uses the funds for cheating, the examiner has the right to remove the student from the exam, and in the examination sheet to put an unsatisfactory assessment. When appearing at the exam and competition students are required to have their gradebook, which they presented to the examiner. The teacher fills in the appropriate columns of the student's record book: the name of the discipline in accordance with the curriculum, also indicate the name of the teacher, grade, date, signature, the complexity of the discipline.

6-8 students are invited to take the oral exam in the classroom at the same time. Students are not allowed to leave the classroom while preparing for answers without the permission of the examiner.

The time given to the student to prepare for the answer to the oral exam is 30 minutes.

During the examination, the examination card is chosen by the student. When taking the oral exam, the examiner may ask additional questions. If the student finds it difficult to answer questions on the selected ticket, he can be offered to take another ticket, while the score is reduced by a point.

With interim assessment set assessment. On examinations and differentiated credits: "excellent", "good", "satisfactory" and "unsatisfactory"; on credits - "credited"and" not credited".

In case of absence of student for the exam (sect) without good cause statement is "never".

The marks given by the examiner on the results of examinations are not subject to revision. A student who does not agree with the assessment, has the right to apply to the Director of the School. In case of validity of the submitted application the Director of School creates the Commission consisting of three teachers on the corresponding Department.

The assessment received by the student during the re-examination of the Commission is final.

Questions to offset on the subject "Normal physiology" – 3rd semester

1. Excitable tissues and their basic properties.
2. Bioelectric phenomena in living tissues. Membrane potential.
3. Stimulus, classification. Types of electrical responses depending on the strength of the stimulus.
4. Excitation. Action potential, mechanism of origin, phases.
5. Contractile apparatus of muscle fiber. The mechanism of muscle contraction.
6. The mechanism of excitation of nerve fibers. The laws of excitation. Lability.
7. Synapse. Classification. Structure. Features of excitation transmission in a chemical synapse. The properties of the synapses.
8. Mediator. Types of mediators. Properties of mediators. Ways to remove mediators from the synaptic slit.
9. Cholinergic receptors, types, localization. Activators and blockers of acetylcholine receptors. Effects of interaction of acetylcholine with cholinergic receptors.
10. Adrenergic receptors, types, localization. Activators and blockers of adrenergic receptors. The interaction between the mediator (norepinephrine, dopamine, etc.) with the adrenergic receptors.

11. Distribution of cholinergic and adrenergic structures in the human body.
12. Reflex. Classification of reflexes. Reflex arc and its analysis.
13. Nerve center. Properties of nerve centers. Coordination in the Central nervous system. The concept of the house.
14. Central braking. The main functions of the braking process. Types of braking in the Central nervous system.
15. Braking synapses, the braking neurotransmitters and receptors for them. The role of inhibitory synapses.
16. The role of different parts of the Central nervous system (spinal cord, brain stem, subcortical nuclei, cerebellum, cerebral cortex) in motion control.
17. Midbrain. Cerebellum. Reticular formation. Functions.
18. Diencephalon (thalamus, hypothalamus) and their functions.
19. Structural organization of the autonomic nervous system. The influence of the autonomic nervous system on life.
20. Structural and functional features of the sympathetic part of the autonomic nervous system.
21. Structural and functional features of the parasympathetic part of the autonomic nervous system.
22. Reflexes and autonomic centers regulating autonomic functions.
23. Interaction of sympathetic and parasympathetic parts of the autonomic nervous system. Metasympathetic division of the autonomic nervous system.
24. Heart, structure, function. Factors that ensure the movement of blood in the right direction.
25. Heart cycle and its phases.
26. Properties of the heart muscle. Saccadic. Conducting heart system.
27. Electrical processes of the heart muscle. Action potential in different parts of the conducting system and in the working myocardium. Change of excitability in the process of excitation.
28. Extracardial regulation of the heart.

29. Intracardial regulation of the heart. Cellular, intercellular and intracardiac mechanisms.
30. Hemodynamics. Factors that determine the movement of blood through the vessels. The main indicators of hemodynamics.
31. Blood pressure and factors affecting its magnitude. Blood pressure in different parts of the vascular bed.
32. Cardiovascular center.
33. Nervous mechanisms of vascular tone regulation.
34. Humoral regulation of vascular tone.
35. Physical and chemical properties of blood. The amount and composition of blood. Blood plasma.
36. The formed elements of blood. Red blood cells, erythrocyte sedimentation rate. Resistance of red blood cells. Hemoglobin.
37. Blood type and RH factor. Blood transfusion rules.
38. Leukocytes, number, types, functions. Leukocytic formula.
39. Platelets. Hemostasis. Fibrinolysis. Fibrinolysis.
40. Biological role of endocrine regulation. Endocrine glands. Hormones. Classification of hormones.
41. The main ways of influence of hormones. Antagonistic and synergistic effect of hormones.
42. Regulation of the endocrine system. Nervous and humoral mechanisms. The interaction of the endocrine glands.

Exam questions normal physiology.

Excitable tissues.

1. Membrane-ion theory of the origin of biopotentials. Resting potential. Local excitation and its properties.
2. Action potential, its phases and properties.
3. Properties of excitable tissues. The change in excitability during excitation.

4. The laws of irritation (the law of force, all-or-nothing, power – off time, the phenomenon of accommodation). The concept of parabiosis.
5. The mechanism of muscle contraction. The ratio of excitation, contraction and excitability in skeletal muscle.
6. Muscle strength and performance. Muscle fatigue. Features of smooth muscle functioning.
7. The spread of excitation along the nerve fibers.
8. Synapses, structure, classification. Peculiarities of excitation transmission in chemical synapses.

Central nervous system and basics of neurohumoral regulation of functions.

9. Reflex principle of the Central nervous system. Reflex arc.
10. Development of the doctrine of reflex. Functional systems of the body (P. K. Anokhin)
11. Nerve center. Properties of nerve centers.
12. Inhibition in the CNS. Types and mechanisms of Central braking.
13. Basic principles of coordination in the CNS. The concept of the house.
14. The role of different parts of the Central nervous system (spinal cord, brain stem, cerebellum, subcortical nucleus, CKD) in motion control.
15. Features of the structure and functioning of the autonomic nervous system. Autonomic reflexes.
16. Sympathetic, parasympathetic and metasympathetic parts of the autonomic nervous system. Neurotransmitters of the ANS.
17. Comparative characteristics of the effects of sympathetic and parasympathetic nervous system on the functions of the body.
18. Features of humoral regulation. Properties and mechanisms of action of hormones.
19. Samoregulyatsii the principle of separation of hormones. Hypothalamic-Pituitary system.
20. Hormones of the pituitary gland, its functional connection with the hypothalamus and woylie in the regulation of the endocrine glands.

Blood physiology.

21. The concept of the blood system, its functional value.
22. Blood composition. Functional system that provides the maintenance of the fundamental constants of the blood (pH, weight blood osmotic pressure)
23. Respiratory function of blood. Physiological characteristics of red blood cells.
24. Protective function of blood. Leukocytes. Leukocytic formula.
25. Blood clotting and anti-clotting systems. Stages and phases of blood clotting.
26. Blood type and RH factor. Blood transfusion rules.

Physiology of blood circulation.

27. Physiological properties and features of the heart muscle. Automaticity of the heart.
28. The spread of excitation in the heart. Analysis of the ECG.
29. Hemodynamic function of the heart. Phases of the cardiac cycle. Systolic and minute blood volume.
30. The ratio of excitation, contraction and excitability in the heart muscle. Extrasystoles. Compensatory pause.
31. Methods of investigation of hemodynamic function of the heart.
32. Heart tones and their origin.
33. Myogenic mechanism of regulation of cardiac activity (hetero - and homeometric).
34. Reflex regulation of the heart.
35. The influence of the extracardial nerves on heart activity.
36. Functional organization of the vascular bed.
37. Factors that ensure the movement of blood through the vessels. The main indicators of hemodynamics.
38. Blood pressure, its components. Methods of determination.
39. Arterial and venous pulse. Analysis of sphygmogram and phlebogram.

40. Vasomotor center (SDC). Sdts efferent influence on vascular tone. Vasoconstrictors and vasodilators.

41. The afferent influence on the sdts.

42. Reflex regulation of vascular tone.

43. Humoral regulation of vascular tone.

44. Functional sectors providing a constancy of blood pressure. Analysis of its peripheral and Central components.

Physiology of breathing.

45. Functional sectors that support constancy of blood gas composition.

The Executive branch.

46. External respiration. Mechanism of inhalation and exhalation.

47. Indicators of respiratory function and methods of their determination.

48. Gas exchange in the lungs. Partial pressure of gases in alveolar air and tension of blood gases.

49. Respiratory center: structure, localization.

50. Neurohumoral regulation of breathing. Respiration in the conditions of changed atmospheric pressure.

51. Reflex regulation of breathing.

52. The mechanism of the first breath of a newborn.

Physiology of digestion.

53. Functional sectors ensure the consistency of nutrients in the blood. The role of digestive processes in it. Functions of the digestive system.

54. Conveyor organization of digestion. Types of digestion. The main departments of the digestive conveyor.

55. Digestion in the oral cavity. Regulation of salivation.

56. Digestion in the stomach. The composition of gastric juice. Regulation of gastric secretion.

57. Digestion in the 12-duodenum. Composition and properties of pancreatic juice. Regulation of pancreatic secretion.

58. The role of the liver in digestion, bile function. Regulation of biliary excretion.
59. Features of digestion in the small and large intestine. Properties of intestinal juice. Regulation of secretory and motor function of the intestine.
60. General principles and mechanisms of digestion regulation. Physiological basis of hunger and satiety. Metabolism and energy. Thermoregulation.
61. The role of proteins, fats, carbohydrates in plastic and energy metabolism. Energy value of nutrients.
62. The main exchange of energy, methods of determining.
63. Working exchange. Population groups by energy costs.
64. Human body temperature and its fluctuations. Temperature scheme of the human body.
65. Chemical thermoregulation.
66. Physical thermoregulation.
67. Regulation of isothermal conditions. Functional sectors providing the temperature constancy of the internal environment. Physiology of excretion.
68. The organs of excretion. Homeostatic functions of the kidneys.
69. Glomerular filtration. Composition and amount of primary urine. Filtering estimation methods.
70. Mechanisms of secondary urine formation. Reabsorption in different parts of the nephron.
71. Regulation of urination and urinary excretion. Higher nervous activity and sensory systems.
72. General principles of the structure and functioning of sensory systems. Physiological characteristics of receptors.
73. Modern ideas about nociception and the formation of pain. Antinociceptive mechanisms.

74. Physiological characteristics of the auditory analyzer. Methods of research of the auditory analyzer.
75. Physiological characteristics of the visual analyzer. Methods of studying the visual analyzer.
76. Characteristics of innate forms of behavior.
77. Conditioned reflex. Rules of development. Neurophysiological mechanisms of conditioned reflexes formation.
78. The phenomenon of inhibition in the higher nervous activity. Unconditional and conditional braking, types and mechanisms.
79. Physiological basis of sleep. Phase of sleep. Theory of sleep.
80. The types of GNI according to I. P. Pavlov and their characteristics.
81. Features of the man HNA. I and II signal systems. Hemispheric asymmetry of KBP.
82. Architecture of the integral behavioral act from the point of view of the theory of functional systems.
83. Motivation, physiological significance. Classification of needs and motivations.
84. The biological role of emotions. Neurophysiological mechanisms of emotions.
85. Physiological basis of memory.
86. General laws of adaptation of the organism to environmental conditions. Types of adaptation. Adaptation mechanism.
87. Modern ideas about stress. Stress-implementing and stress-limiting systems.