

Документ подписан простой электронной подписью

Информация о владельце:

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Должность: и.о. декана медико-биологического факультета

Дата подписания: 20.10.2026 10:11:25

Уникальный программный ключ:

bbc0243907972fc80f279c67afb4501106151a7d

MINISTRY OF SCIENCE AND HIGHER EDUCATION

RUSSIAN FEDERATION

Federal State Autonomous Educational Institution of Higher Education

NORTH-CAUCASUS FEDERAL UNIVERSITY

APPROVED

Assoc. Prof. Kubanov S.I.

PhD in Medical Sciences

Dean

Faculty of Medicine and Biology

COURSE OUTLINE OF THE DISCIPLINE (MODULE)

«Pathophysiology, clinical pathophysiology»

Name of the discipline (module)

- Specialty: 31.05.01 General Medicine
- Mode of training: Full-time
- Year of commencement of studies: 2026
- Delivered in Semester 5-6

Developed by:

Associate Professor of the Department of Physiology and Pathology

position

Bicheva G.V.

full name

Stavropol 2026

1. Aim and Objectives of Mastering the Discipline (Module)

- Aim of mastering the discipline: formation of students' ability to effectively solve professional medical problems based on pathophysiological analysis of data on pathological processes, clinical syndromes and diseases using knowledge about the general patterns of their occurrence, development and outcomes, as well as the formation of principles (algorithms, strategy) and methods of their detection (diagnosis), treatment, prevention and rehabilitation.

- Objectives of mastering the discipline:
 - study of molecular, cellular, tissue, organ, systemic and intersystem mechanisms of typical pathological processes;
 - study of the causes, mechanisms of development, principles of detection, treatment and prevention and outcomes of specific diseases developing in individual organs and systems;
 - analysis of the nature of clinical manifestations of the main pathological processes;
 - training in the ability to formulate principles (algorithms, strategy) and methods of detection, treatment and prevention of pathological processes, conditions, reactions and diseases;
 - training in the ability to conduct pathophysiological analysis of data on pathological processes, clinical syndromes, typical forms of pathology and individual diseases;
 - familiarization with the principles of pathogenetic therapy of diseases of individual organs and systems;
 - formation of students' methodological and methodical skills of clinical thinking and rational action of a doctor.

2. Place of the Discipline (Module) in the Structure of the Training (educational) Program

The discipline «Pathophysiology, clinical pathophysiology» belongs to the compulsory part.

3. List of Potential Learning Outcomes for the Discipline (Module), Correlated with the Outcomes of Mastering the Educational Program

Code and definition of the competence	Code and definition of the indicator	Planned learning outcomes for the discipline (module) describing the stages of competency and indicator development
PC-3. Capable of determining a patient's main pathological states, symptoms, disease syndromes, and nosological forms in accordance with the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10)	ID-1 PC-3 Is capable of building an algorithm and selecting criteria for determining the main pathological states, syndromes, and diseases in patients of various profiles in accordance with the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10)	Formation of clinical thinking Acquisition of special medical skills and their application in practical healthcare
	ID-2 PC-3 Identifies main pathological symptoms and syndromes, formulates a clinical diagnosis in accordance with ICD-10	

4. Volume of the Academic Discipline (Module) and Control *

Volume of classes: Total: <u>7</u> ECTS credits, <u>252</u> academic hours.	Full-time type of study, in academic hours
Face-to-face work	118
Lectures / including practical training	34
Laboratory works / including practical training	84
Independent work	98
Forms of control	
Examination	36

* The discipline (module) provides for the use of e-learning and remote learning technologies (unless otherwise set by the educational standard).

5. Content of the Discipline (Module), Structured by Topics (Sections) with an Indication of the Hours and Types of Classes

#	Section (topic) of the discipline and brief content	Competencies and indicators to be developed	Full-time training				Forms of current control of academic progress
			Contact work of students with the teacher / of them practical skills training, hours			Independent work, hours	
			Lectures	Practical classes	Laboratory work		
	5th semester						
1.	General pathophysiology. General nosology. The subject and objectives of pathophysiology, its relationship with other disciplines. The role of pathophysiology in medical education. Brief information from the history of pathophysiology. Main stages its development. The significance of the works of I.M. Sechenov, I.P. Pavlov, I.I. Mechnikov, V.V. Pashutin, A.B. Fokht, A.A. Bogomolets, N.N. Anichkov, S.S. Khalatov, G.P. Sakharov, P.D. Horizontov, P.N. Veselkin, A.M. Filomafitsky, R. Virkhov, Yu. Kongeym, K. Bernard, W. Cannon, G. Selye and other major researchers in the development of pathophysiology. The structure of the educational	ID-1 PC-3 ID-2 PC-3	2		4	6	Interview (discussion)

	course of pathophysiology. General pathological physiology (general nosology; typical pathological processes); private pathological physiology (pathophysiology of systems). General nosology. Concepts "health" and "illness". Stages of the disease, their characteristics. Outcomes of the disease. The concept of the disease as a unity of pathological changes and protective and compensatory reactions. Principles of classification of diseases. The concept of a pathological reaction, a pathological process, a pathological condition. The importance of studying etiology, pathogenesis and sanogenesis. Role causes and conditions in the development of diseases and pathological processes. The concept of the leading link in pathogenesis, "vicious circles", etiotropic and pathogenetic methods of disease treatment. Methods of pathological physiology. Experiment as the main method of pathological physiology. Acute and chronic experiments. Moral and ethical aspects of animal experimentation						
2.	General pathophysiology Reactivity. Reactivity. Types of reactivity (specific, group, individual). Physiological and pathological reactivity. Specific and non-specific mechanisms of reactivity. Hypo-, normo-, hyperergia. Characteristic. Resistance. Mechanisms of resistance realization. Local and general resistance, congenital and acquired. The relationship between reactivity and resistance. The influence of heredity, constitution, gender, age, external influences, social factors ,	ID-1 PC-3 ID-2 PC-3	2		4	6	<i>Interview (discussion)</i>

	etc.) on the level of reactivity and resistance of the body. Stress as a manifestation of reactivity. Stress phases. Changing the body's resistance to stress. Types of stress. The concept of anti-stress immunity. The meaning of stress.						
3.	General pathophysiology Cell pathophysiology. Cell damage. Types of damage. Mechanisms of cell damage. Causes and consequences of the violation energy formation in the cell. Damage to the membrane apparatus and enzyme systems cells. Oxidative stress as universal mechanism cellular damage. Causes and mechanisms of oxidative stress, mechanisms of antioxidant protection. Distribution of electrolytes in the intracellular and extracellular fluids. The role of ions in cell function. Causes and consequences of the imbalance of ions and water in the cell. The main stages of the transfer information inside the cell. Mechanisms of intercellular signaling. The role of eicosanoids, hormones, and cellular growth factors in the regulation of cellular functions. Intracellular mechanisms of cell function regulation. The concept of secondary messengers. The role of calcium in cell function and damage . Consequences of damage to cell organelles: cell membrane, nucleus, mitochondria, ribosomes, lysosomes, apparatus Golgi, peroxisome, cytoskeleton. Apoptosis. Sequence of ultrastructural changes cells during apoptosis. Ways to trigger apoptosis. Stages of apoptosis. Consequences of strengthening and	ID-1 PC-3 ID-2 PC-3	2		4	6	<i>Interview (discussion)</i>

	insufficiency of apoptosis. Comparative characteristics of necrosis and apoptosis. Mechanisms of protection and adaptation of cells under damaging influences. Ways to improve cell resistance to action pathogenic factors and stimulation of repair processes in damaged cells						
4.	General pathophysiology Local disorders blood circulation. The concept of peripheral blood circulation and microcirculation. Factors, determining blood flow and transcapillary metabolism in organs and tissues. Mechanisms of regulation of peripheral blood circulation (nervous, humoral, hormonal, metabolic). The role of the endothelium. Classification of peripheral circulatory disorders. Arterial hyperemia. Causes, types, mechanisms of development, features of blood circulation, symptoms and consequences. Venous hyperemia. Causes, types, mechanisms of development, features of blood circulation, symptoms and consequences. Ischemia. Causes, mechanisms of development, features of blood circulation, symptoms and consequences. The role of endothelial dysfunction in the occurrence of ischemia. Factors influencing the effects of ischemia. The concept of preconditioning (preconditioning). The mechanism of ischemic brain damage. Areas of cerebral ischemia. Post-ischemic reperfusion syndrome. Causes, pathogenesis. The "no reflow" syndrome. Stasis. Kinds. Reasons. Effects. Violations of rheological properties of blood. "Sludge" is a phenomenon. Causes, consequences. Prevention of irreversible changes	ID-1 PC-3 ID-2 PC-3	2		4	6	<i>Interview (discussion)</i>

5.	General pathophysiology Inflammation. Definition of inflammation. Exogenous and endogenous causes of development. The role of infectious a factor in inflammation. Alteration, types, and causes. Zones of alteration. Features of metabolism and physico-chemical changes in the focus of inflammation. Inflammatory mediators and their role in the development of inflammation. The phases of circulatory disorders in the focus of inflammation, the mechanisms of their development and their importance in the inflammatory process. Exudation. Factors, contributing to the development of exudation. Types of exudative inflammation. Characteristic. The biological role of exudation. Emigration of leukocytes. Stages and mechanisms of development. Role integrins and selectins. Phagocytosis. Stages of phagocytosis. The role of opsonins. Bactericidal and digesting systems of leukocytes. The concept of a "respiratory explosion". Factors activation and suppression of phagocytosis. The concept of exophagocytosis. Regenerative processes in the focus of inflammation. Proliferation and regeneration. Stages of the proliferative process. Factors that stimulate proliferation and regeneration. The ratio of proliferation and regeneration. Correlation of alterations, circulatory disorders with exudation, emigration leukocytes and regenerative processes in inflammation. Local signs and general manifestations of acute inflammation and the mechanisms of their	ID-1 PC-3 ID-2 PC-3	2		4	6	<i>Interview (discussion)</i>
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	occurrence. Chronic inflammation. Reasons. The difference from acute in pathogenesis. Classification of inflammations (according to the reactivity of the body, duration of the course, predominant phase) and their characteristics. Principles of anti-inflammatory therapy. Outcomes of inflammation. Factors influencing the outcomes of inflammation. The biological role of inflammation. The ratio of breakdown and protection reactions in the development of inflammation. Features of inflammation in children						
6.	General pathophysiology Pathology of the body's heat metabolism. Pathology of thermoregulation. Fever. Fevers are infectious and non-infectious. Etiology of infectious fever. Primary and secondary pyrogens, their comparative characteristics and role in the occurrence of fever. Pathogenesis of fever. The role of the hypothalamus and the autonomic nervous system in development Fevers. Stages of fever and their characteristics. Mechanisms of changes in heat production and heat transfer in fever. Changes in metabolism and body functions during fever. The biological role of fever. The concept of pyrotherapy. Commercial pyrogenes. The development of fever in phylogeny and ontogenesis. Principles of antipyretic therapy. Types of temperature curves, their features in the conditions of antibacterial therapy. Features of fever in childhood and old age. Systemic effect of endotoxins. The concept of a systemic inflammatory response. Septic shock. Hyperthermia. Causes	ID-1 PC-3 ID-2 PC-3	2		4	6	<i>Interview (discussion)</i>

	and mechanisms of pathogenic effects on the body. Heat and sunstroke. The difference between hyperthermia and fever. Hypothermia. Causes of occurrence, mechanism of pathogenic effect on the body. Artificial hypothermia and its application in medicine						
7.	General pathophysiology Typical metabolic disorders. The biological role of carbohydrates in the body. The main stages of carbohydrate metabolism. Causes and consequences of carbohydrate breakdown and absorption disorders in gastrointestinal tract. Disaccharidase (lactase) deficiency. Mechanisms of glucose regulation in the blood. The role of hormones. Insulin. Chemical nature and biological role in the body. Hyperglycemia. Etiopathogenesis. Diabetes mellitus. Types and their features. Etiology of diabetes mellitus. Metabolic disorders in diabetes mellitus. A test with a sugar load in the diagnosis of diabetes mellitus. The main clinical symptoms of diabetes mellitus and the mechanisms of their development. Complications of diabetes mellitus. General characteristics. Coma (ketoacidotic, hyperosmolar, lactic acidemic). Pathogenesis. Vascular complications of diabetes mellitus (micro- and macroangiopathies). Pathogenesis. Clinical manifestations. Hypoglycemia. Etiopathogenesis. Hypoglycemic coma. Disorders of synthesis and decomposition glycogen levels. Glycogenoses. Pathology of metabolism of water- and fat-soluble vitamins. Atherosclerosis. Metabolic background of	ID-1 PC-3 ID-2 PC-3	2		4	6	<i>Interview (discussion)</i>

atherosclerosis and its consequences. Pathogenesis. Manageable and unmanageable risk factors. Fatness. Classification by etiopathogenesis and degree of obesity. Body mass index (Kettle). Consequences of obesity. Causes of emaciation. Fatty infiltration and organ degeneration. Causes and mechanisms. The concept of nitrogen balance. Causes of violations. Protein and energy insufficiency. Causes and consequences for the body. Disorders of protein digestion and absorption in the gastrointestinal tract. Causes and consequences. Celiac disease. Causes and consequences of disruption of the intermediate metabolism of amino acids (deamination, transamination, decarboxylation). Causes and mechanisms of the violation protein synthesis in tissues. Dysproteinemia. Classification. Causes, consequences. Hyperazotemias, their types. Characteristic. Disorders of nucleic acid metabolism acids. Gout. Etiology and pathogenesis. Starvation. Kinds. Stages of complete starvation. Metabolic and functional disorders with complete starvation. Principles of fattening after fasting. Therapeutic fasting. Usage prospects amino acids as medicinal products. Regulation of water-electrolyte metabolism. The basic laws underlying based on the regulation of the water -electrolyte balance. The role of aldosterone, vasopressin, atrial natriuretic factor and other hormones in the metabolism of water and electrolytes in the body. The concept of the renin-angiotensin -aldosterone system. Types of water -						
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	electrolyte balance disorders. General characteristics. Consequences for the body. Dehydration of the body (hyper-, hypo- and isoosmolar types). Causes, mechanisms and consequences. Positive water balance (hyper-, hypo- and isoosmolar hyperhydration). Water poisoning. Causes, mechanisms and consequences. Principles of therapy of various types of dehydration and hyperhydration of the body. Edema. Factors that play a role in the formation of edema. Characteristic. Classification edema by etiology. Impaired metabolism of Na and K, Cl, Ca, Mg, P in the body. Violation of the metabolism of trace elements (Cu, I, Mn, Se, etc.). The concept of acid-base state. Mechanisms of CBS regulation. Mechanisms for maintaining CBS using buffer systems. The role of the lungs, kidneys, and other organs in maintaining CBS. Indicators characterizing the CBS. Methods of their determination. Violations of the acid-base state. Acidosis and alkalosis. Compensated and decompensated violations. Changes in body functions in case of CBS disorders. Causes, mechanisms of development and compensation, indicators of CBS and ways of correction.						
8.	General pathophysiology Pathophysiology of immunity. Allergy. Pathology of immunological reactivity. Immunodeficiency conditions. Classification. Consequences for the body. The concept of immunological tolerance. Immune reactivity in childhood. Types and features of primary (hereditary) immunodeficiency (severe	ID-1 PC-3 ID-2 PC-3	2		4	6	<i>Interview (discussion)</i>

	combined immune deficiency – TKIN, Dee syndrome Georgie, Nezelof syndrome, a disease Bruton's syndrome, Chediak-Higashi syndrome, etc.). Secondary (acquired) immunodeficiency conditions. Reasons. Mechanisms. AIDS. Etiology. Mechanisms of development, clinical symptoms. Stages. Graft versus host reaction (GVHD). Reasons. Clinical manifestations. Adaptation. Diseases of adaptation. Allergy. The reasons for the increase in the frequency of allergic diseases in humans. Hereditary predisposition to allergies. Allergens, their classification and characteristics. The difference between an allergen and an antigen. Sensitization. Kinds. Pathogenesis of allergic reactions. Characteristics of the immunological, pathochemical and pathophysiological stages of allergy. Mediators of allergic reactions of immediate and delayed type. Classification of allergic reactions according to Jell and Coombs and their characteristics. Anaphylactic shock in humans. Clinical variants of anaphylactic shock. The technique of reproducing anaphylactic shock in the experiment. Characteristics of allergic diseases of the immediate type in humans (pollinosis, serum sickness, bronchial asthma, edema Quincke). Desensitization. Mechanisms of specific and nonspecific desensitization. Local anaphylaxis (phenomenon Artyus et al.). Pseudoallergic reactions. The concept of cross-allergy. Autoimmune diseases. Mechanism of development						
9.	General pathophysiology Tumors. Pathogenesis of tumor growth.	ID-1 PC-3 ID-2 PC-3	2		4	6	<i>Interview (discussion)</i>

Definition of the concepts of "tumor growth" and "tumor". The spread of tumors in nature, in phylogeny and ontogenesis. Etiology of tumors; physical and chemical blastogenic factors, biological carcinogens. Chemical carcinogenic factors, their classification, procancerogens and final (true) carcinogens. Cocancerogens and syncancerogens. Stages of chemical carcinogenesis. Physical carcinogenic factors. Ionizing radiation as the blastomogenic factor. Role ionizing radiation, radioactive isotopes, ultraviolet rays, X-rays, thermal and mechanical factors. Stages of physical carcinogenesis. Biological carcinogens. Types of oncogenic viruses. Stages of viral carcinogenesis. The importance of hereditary factors, gender, age, and chronic diseases in the development of tumors in humans. Biological features of tumor growth, relative autonomy and unregulated tumor growth, simplification of the structural and chemical organization (atypism, its types), similarity and difference of tumors and embryonic tissues. Metastasis (definition, stages, mechanisms). Recurrence of tumors. Malignant and benign tumors, features of their growth. Metabolic, antigenic, and functional properties of malignant cells. Features and mechanisms of invasive and destructive growth. Tumor progression. Theories of tumor pathogenesis. Modern concepts of the molecular and genetic mechanisms of carcinogenesis. The concept of cellular proto-oncogenes and anti-oncogenes, their role in oncogenesis. Transformation mechanisms a proto- oncogene in an active						
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	oncogene. The nature of cancer proteins and possible mechanisms of their action. Role mutational, epigenomic. virogenetic mechanisms in carcinogenesis. Precancerous conditions. Antiblastoma resistance body, immune and non-immune resistance factors. The importance of antiblastoma resistance depressions in the occurrence and development of tumors. The interaction of the tumor and the body. The role and reaction of the nervous and endocrine systems. Systemic manifestations tumor disease. Tumor cachexia. Pathophysiological foundations of tumor prevention and therapy						
	TOTAL in 5 Semester		18		36	54	
10.	Clinical pathophysiology Pathophysiology of the blood system part1. Pathology of the total blood volume. Classification of violations (by the nature of the violation of the total volume circulating blood and hematocrit index). Normovolemia. Types, causes, and consequences for the body. Hypervolemia. Types, causes of development, and consequences for the body. Hypovolemia. Types, causes, and consequences for the body. Blood loss. Types and causes. The pathogenesis of disorders and the main clinical manifestations in acute blood loss. Stages of compensation of the body in acute blood loss, their characteristics. Dynamics of content changes erythrocytes, hemoglobin, and hematocrit after acute blood loss. The blood picture after acute blood loss. Objective criteria for assessing the severity of blood loss. Characteristics of the factors influencing the outcome of blood loss. Hemorrhagic shock.	ID-1 PC-3 ID-2 PC-3	2		4	4	<i>Interview (discussion)</i>

	Principles of blood loss therapy. The role of plasma substitutes. Indicators of erythrocytes, hemoglobin in adults and children. Calculated indices of red blood cells. Erythropoiesis. Stages of erythropoiesis. Erythrocytosis, classification and characterization. Tuberculosis disease. Anemia. Characteristics of common clinical symptoms in anemia and the mechanisms of their development. Classification of anemia (by etiopathogenesis, severity, type hematopoiesis, color index, regenerative capacity, red blood cell size, etc.). Posthemorrhagic anemia. The picture of peripheral blood in acute and chronic posthemorrhagic anemia. Iron deficiency anemia. Etiology, pathogenesis. Iron-spreading and sidero-acute anemia. Sideropenic syndrome. The picture of peripheral blood. Etiology and pathogenesis of B12 deficiency (Addison's disease Biermera) and folate deficiency anemia. The picture of peripheral blood. Pathogenesis of the main syndromes.						
11.	Clinical pathophysiology Pathophysiology of the blood system part 2. Hypo- and aplastic anemia. Etiology, pathogenesis, diagnosis. Hemolytic anemia. Types (acquired, hereditary), causes and mechanisms of development. Clinical manifestations. The picture of peripheral blood. Hereditary hemolytic anemia (membranopathies, hemoglobinopathies, enzymopathies). Hemolytic disease of newborns. Etiopathogenesis. Ways of prevention. White blood cells. Functions of certain types of leukocytes. The concept of lacon. Stages of development.	ID-1 PC-3 ID-2 PC-3	2		4	4	<i>Interview (discussion)</i>

	Characteristic leukocytes at different stages of development. Leukocyte formula. Features of the leukocyte formula in childhood. Disorders in the leukocyte formula. The clinical significance of calculating the leukocyte formula. Leukocytosis. Kinds. Causes and mechanisms of occurrence. Qualitative changes in leukocytes. Causes and mechanisms of development of neutrophilic leukocytosis. The concept of the neutrophil nuclear shift. Types and causes. Index nuclear shift (INR), its significance. Causes and mechanisms of development of eosinophilic, basophilic, lymphocytic and monocytic leukocytosis. Leukopenia. Kinds. Causes and mechanisms of development. Agranulocytosis. Consequences for the body. Leukemia. Etiology of leukemias. Modern theories of origin leukemia. The pathogenesis of leukemia. Features of leukemic cells. Classification of leukemias (acute and chronic). Morphological picture of the blood of patients with acute and chronic myelo- and lymphocytic leukemia. The main clinical forms leukemia. The pathogenesis of anemia and hemorrhagic syndrome in leukemia. Types, causes, and pathogenesis leukemoid reactions. Their difference from leukemias. Principles of diagnosis and therapy of leukemia.						
12.	Clinical pathophysiology Pathophysiology of the cardiovascular system. Circulatory insufficiency. General characteristics. Types of circulatory insufficiency (acute and chronic, left- and right-hearted). The main hemodynamic parameters	ID-1 PC-3 ID-2 PC-3	2		4	4	<i>Interview (discussion)</i>

	characterizing acute and chronic insufficiency blood circulation. Clinical symptoms of circulatory insufficiency and substantiation of the mechanisms of their development. The mechanisms underlying the formation of blood pressure. Types of violations blood pressure. Hypertension. Severity of arterial hypertension. Stages. Pathogenesis of essential hypertension. Risk factors. The role of endothelial dysfunction in the pathogenesis of hypertension. Symptomatic arterial hypertension. Renal (renovascular, renal) hypertension. Clinical manifestations of hypertension. Effects on the body (complications). Experimental hypertension. Hypertension of the small circle blood circulation. Hypotension. Types of hypotensive conditions. Reasons. Blood pressure disorders in children. Neurocirculatory dystonia. Mechanisms of heart rhythm formation. Causes of cardiac arrhythmias. Classification of cardiac arrhythmias. Mechanisms of arrhythmias. Violation of automatism. Kinds. Etiopathogenesis of disorders automatism. Violation of excitability. Mechanisms of occurrence. Kinds. Conduction disturbances. Blockades. Kinds. Causes and mechanisms of development. Consequences of cardiac disorders rhythm for the body. Rhythm assimilation disorders						
13.	Clinical pathophysiology Pathophysiology of the heart. Coronary heart disease. Etiopathogenesis. The concept of stunned myocardium (stunning) and inactive	ID-1 PC-3 ID-2 PC-3			4	4	<i>Interview (discussion)</i>

	myocardium (hibernation). Myocardial infarction. Causes of death in myocardial infarction. The concept of postischemic preconditioning. Causes of non-coronary heart injuries. Types and characteristics of overloaded forms of heart failure. Compensation mechanisms for heart failure (characteristics of cardiac and non-cardiac mechanisms). The concept of heterometric (isotonic) and homeometric (isometric) compensation mechanisms. Manifestations decompensation. Myocardial hypertrophy. Stages of hypertrophy according to F.Z. Meerson. Characteristics of hemodynamic changes in the heart in patients with heart defects (heart valve insufficiency and stenosis of the orifices)						
14.	Clinical pathophysiology. Pathophysiology of external respiration. Insufficiency of external respiration. Reasons. The role of smoking in the pathology of external respiration. Consequences for the body. Indicators characterizing insufficiency of external respiration: pulmonary volumes and capacities; changes in blood gas composition. Violation of alveolar ventilation of the lungs. Kinds. General characteristics. Obstructive type of alveolar ventilation disorder. Causes and consequences of impaired nasal breathing, laryngeal and tracheal functions, bronchial tubes. Pathogenesis of obstructive syndrome for bronchial asthma. Meaning definitions of the Tiffno index. Restrictive type of alveolar ventilation disorder. Characteristic. Changes in lung volumes and capacities in obstructive and restrictive	ID-1 PC-3 ID-2 PC-3	2		4	4	<i>Interview (discussion)</i>

	disorders of alveolar ventilation. Diffusion disorders. Etiopathogenesis. Violation of perfusion. Characteristic. Reasons. The concept of ventilation perfusion coefficient. Acute and chronic respiratory insufficiency. The degree of acute respiratory failure. Dyspnea. Kinds. Mechanisms of development. Types of pathological and periodic respiration. Pathogenesis. Etiology, pathogenesis, and impaired respiratory function in pneumonia, atelectasis, and emphysema. Pneumothorax. Kinds. Characteristic. Pulmonary edema. Cardiac and non-cardiac causes. Pathogenesis. Respiratory distress syndrome. Pulmonary hypertension. Asphyxia. Stages. Mechanisms of development. Pathological types of breathing. Violation of non-respiratory lung functions						
15.	Clinical pathophysiology. Pathophysiology of the gastrointestinal tract. The role of digestive organs. The importance of hormones of the digestive system in the functioning of the gastrointestinal tract. Etiology of diseases of the gastrointestinal tract. The role of alcohol, smoking and other factors in their occurrence. Appetite disorders (anorexia, hyperrexia, bulimia, and polyphagia). Causes of violations. Digestive disorders in the oral cavity (chewing, salivation, swallowing). Causes and consequences. Dental caries. Etiopathogenesis, prevention. Etiopathogenesis of disorders of the esophagus. Achalasia of the cardia. Types of gastric secretion, their characteristics. Quantitative and qualitative disorders of the secretory function of the stomach.	ID-1 PC-3 ID-2 PC-3	2		4	4	<i>Interview (discussion)</i>

Achlorhydria. Ahilia. Disorders of the motor and evacuation functions of the stomach: belching, heartburn, nausea, vomiting. Gastritis. Peptic ulcer of the stomach and duodenum and symptomatic gastric ulcers. Etiopathogenesis (Schey's scales). Role stress factors, Helicobacter pylori. Methods of modeling gastric and duodenal ulcers. Principles of pathogenetic therapy. Violation of intestinal digestion. Reasons. Maldigestion syndromes, malabsorption. Constipation, diarrhea. Effects. Dysbiosis. Reasons. Effects. Intestinal obstruction. Kinds. Pathogenesis of disorders. Pancreatitis. Etiopathogenesis. Pancreatic collapse. Anatomical and physiological features of the liver and biliary tract. The study of liver function in experiment and clinic. Functional tests. Hepatitis. Cirrhosis. Fatty liver disease. The role of alcohol and other factors in the development of liver diseases. Liver failure. Reasons. Stages of development. Their characteristics. Hepatic coma. Kinds. Symptoms and mechanisms of their occurrence. Principles of therapy. The concept of hemosorption. Liver transplant. Portal hypertension. Reasons. Characteristics of the supra-hepatic, hepatic and subhepatic portal hypertension. Jaundice. Kinds. Characteristics of pigment metabolism disorders in certain types of jaundice (hemolytic, parenchymal, mechanical). Cholemia. The main mechanisms and manifestations of cholemia. Cholestasis. Causes of cholestasis. Disorders in the						
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	body with cholestatic syndrome. Cholelithiasis. Etiopathogenesis. Risk factors.						
16.	Clinical pathophysiology. Pathophysiology of the kidneys. The role of kidneys in the body and the main methods of studying kidney function. The purification index (clearance). Pathogenesis of educational disorders urine (impaired filtration, reabsorption, secretion and excretion). Causes and mechanisms of diuresis disorders. Quantitative and qualitative violations of education urine (oliguria, anuria, polyuria). Hypostenuria, isostenuria, hyperstenuria. Reasons. Violations of urine composition. Pathological components of urine that reflect kidney diseases and other disorders in the body. Acute and chronic diffuse glomerulonephritis. Etiology, pathogenesis and main manifestations. Mechanisms of hypertension and edema development in nephritis. Pathogenesis of nephrotic syndrome. Clinical manifestations. The pathogenesis of edema in nephrotic syndrome. Pyelonephritis. Etiopathogenesis. Characteristics of violations. Etiology and pathogenesis of acute renal failure. Stages, their characteristic. Chronic renal failure. Uremia. The concept of hemodialysis (artificial kidney). Urolithiasis. Factors and mechanisms contributing to the formation of stones. Consequences of impaired nondiuretic kidney function	ID-1 PC-3 ID-2 PC-3	2		4	4	<i>Interview (discussion)</i>
17.	Clinical pathophysiology Pathophysiology of the endocrine system. General mechanisms of endocrine disorders.	ID-1 PC-3 ID-2 PC-3	2		4	4	<i>Interview (discussion)</i>

	The hierarchy of organs of the endocrine system. Mechanisms of regulation of endocrine activity. The role of hormones in the vital activity of the body. The chemical structure of hormones and the mechanisms of their action. The role of releasing factors. The role of disorders of the central, glandular and peripheral mechanisms in the development of endocrine diseases. Iatrogenic endocrinopathies. Classification of endocrinopathies. The concept of central (secondary and tertiary) and peripheral (primary) endocrinopathies. Pathology of the hypothalamic-pituitary system. Diseases associated with hypothalamic disorders. Pathology the adenohypophysis. Hyperfunction the adenohypophysis. Diseases, due to a violation of the formation of somatotrophic hormone. The role of somatomedins. Partial and total pituitary insufficiency. Disease Shikhen. Simmonds disease. The main disorders and symptoms. Diabetes insipidus. The syndrome hyperproduction of ADG. The syndrome Sorry.						
18.	Clinical pathophysiology Pathophysiology of the thyroid gland, adrenal glands, parathyroid glands, and gonads. Pathology of the adrenal glands. Hypofunction of the adrenal cortex. Acute adrenal insufficiency. Chronic adrenal insufficiency. Addison's disease. Causes and pathogenesis of disorders. Hyperfunction of the adrenal cortex. Primary and secondary aldosteronism. Pathogenesis and symptoms. Itsenko-Cushing's disease and syndrome. Etiopathogenesis.	ID-1 PC-3 ID-2 PC-3			4	4	Interview (discussion)

	The main manifestations and their justification. Adreno-genital syndrome. Mechanisms of development and its main manifestations. Pathology of the adrenal medulla. Pheochromocytoma. Pathology of the thyroid gland. Classification of disorders (central and peripheral hyperthyroidism). Hyperthyroidism. Basedova disease (Graves' disease). Etiopathogenesis. Symptoms and their rationale. Hypofunction of the thyroid gland. Myxedema. Cretinism. Endemic goiter. Etiopathogenesis. Symptoms and their rationale. Causes and main disorders in hyper- and hypoparathyroidism. Pathology of the genital glands. The biological role of estrogens and androgens. Female and male hyper- and hypogonadism of prepubescent and puberty age. Menopausal syndrome. Menstrual cycle disorders such as the cause of female infertility. The role of the epiphysis.						
19.	Clinical pathophysiology Pathophysiology of nervous system disorders. Neuron pathology. The concept of parabiosis. Phases of parabiosis. Pathology of synaptic transmission. The effect of curare-like substances and organophosphorus compounds on synaptic transmission. Myasthenia gravis. Changes in tissues during denervation. Denervation syndrome. Features of denervation of internal organs. Disorders of motor function. Hypokinesia. Paralysis and paresis. Causes of occurrence. Comparative characteristics of central and peripheral paralysis. Parkinsonism. Hyperkinesia. Kinds. Reasons. Sensitivity disorders. Types of sensitivity	ID-1 PC-3 ID-2 PC-3	2		4	4	<i>Interview (discussion)</i>

	disorders. The nature of sensitivity disorders depends on the level of damage to various parts of the sensitivity analyzer. Dissociated type of sensitivity disorders. Brown syndrome Sekara. Pain, its role in the vital activity of the body. Causes and mechanisms of occurrence. Types of pain (visceral and somatic), their characteristic. Causalgia, phantom pains. Zakharin Ged zones. Pain management methods. The concept of nociceptive and antinociceptive systems of the body.						
20.	Clinical pathophysiology Pathophysiology of higher nervous activity. Causes of disorders of higher nervous activity (HNI). Manifestations of GNI disorders. The role of the generator of pathologically enhanced arousal (GPV), the pathological system in the development of pathology of the nervous system (acad. Kryzhanovsky G. N.). Neuroses. Reasons. Information the triad, its role in the emergence of neurosis in humans. Methods modeling of experimental neuroses. Types of neuroses. Classification of neuroses according to Pavlov. Characteristic. Manifestations. Ways to prevent neurosis. Autonomic dysfunction. The effect of alcohol on the body. Characteristics of the manifestations of acute intoxication. Degree of severity. Alcohol dependence syndrome (alcoholism). Stages and characteristics of violations. Withdrawal syndrome. Mechanisms of occurrence. Korsakov syndrome. Drug addiction. Substance abuse. Reasons. Stages of development. Withdrawal syndrome. The role of disorders of mediator	ID-1 PC-3 ID-2 PC-3			4	2	<i>Interview (discussion)</i>

	metabolism in the occurrence of disorders of intelligence, memory, emotions, behavior, etc. Alzheimer's disease, schizophrenia, parkinsonism, etc. Characteristics of the manifestations and causes of sleep cycle disorders. Pathology of the autonomic nervous system the system.						
21.	Clinical pathophysiology Pathophysiology of extreme conditions. The concept of "extreme conditions". Types of extreme conditions. Shock, collapse, coma. Causes, mechanisms of development, consequences. Collapse, definition, classification. Fainting. Characteristics of the main types of collapse, the mechanism of development, clinical manifestations. Etiological and pathogenetic principles of treatment. Shock, definition, etiopathogenetic classification, mechanism of development of the main syndromes in shock. Mechanisms of damage to organs and systems in shock, the formation of "shock lungs", "shock kidneys". Traumatic shock, etiology, stages of development. The role of neuroendocrine and humoral mechanisms in the development of traumatic shock. Clinical manifestations traumatic shock, assessment of its severity. Prolonged crushing syndrome, causes, mechanism of development. Cardiogenic shock, etiology. The mechanism of development of cardiogenic shock. The role of reducing contractility myocardial capacity, vascular insufficiency, impairment microcirculation, pain syndrome , etc. in the development of cardiogenic shock. Clinical manifestations of cardiogenic shock.	ID-1 PC-3 ID-2 PC-3			2	2	<i>Interview (discussion)</i>

	Etiopathogenetic principles of treatment. Coma, definition of the concept, types. Etiology of comatose states, the main pathogenetic factors of development. Metabolic comas, definition of the concept, classification. Ketoacidotic coma, etiology, mechanism of development, clinical manifestations, pathogenetic principles of treatment. Hyperosmolar coma, causes, mechanism of development, clinical features manifestations, ways of prevention and pathogenetic therapy. Lactatedotic coma, causes, mechanism of development, clinical manifestations, pathogenetic therapy. Hypoglycemic coma, causes, mechanism of development, clinical manifestations and pathogenetic therapy. Chlorhydropenic coma, causes, mechanism of development, clinical manifestations and pathogenetic therapy						
	TOTAL in 6 Semester		16		48	44	
	TOTAL		34		84	98	

6. Assessment Tools Fund for the Discipline (Module)

The assessment tools fund (ATF) for the discipline (module) « Pathophysiology, clinical pathophysiology » is based on the list of competencies to be mastered, indicating the stages of their formation in the process of mastering the discipline (module). The ATF provides an objective control over the achievement of the planned learning outcomes. The ATF includes:

- A description of indicators and criteria for evaluating competencies at various stages of their formation, a description of evaluation scales;
- Methodological materials determining the procedures for evaluating knowledge, skills, abilities and (or) work experience characterizing the stages of competency formation;
- Standard control tasks and other materials necessary for assessing knowledge, skills, and the level of mastery of the formed competencies in the process of mastering the discipline (module).

The ATF is an appendix to this discipline (module) program.

7. Methodological Guidelines for Students on Mastering the Discipline

When starting work, each student must take into account the following provisions.

The discipline (module) is structured on a thematic principle; each topic represents a logically completed section.

The lecture material is dedicated to the consideration of key, basic provisions of the courses and the clarification of learning tasks assigned for the independent work of students.

Laboratory works are aimed at gaining practical experience in the relevant subject area. The independent work of students is aimed at the independent study of additional material, preparation for practical and laboratory classes, as well as the execution of all types of independent work.

In order to successfully master the discipline, it is important to complete all types of independent work employing the recommended sources of information.

8. Educational, Methodological, and Informational Support for the Discipline

8.1. List of Main and Additional Literature Required for Mastering the Discipline (Module)

8.1.1. List of Main Literature:

1. Litvitsky P.F., Pinzhkov S.V., Tezиков E.B. Clinical Pathophysiology. Concise lectures, tests, cases. - GEOTAR-Media, 2019. – 432 p.

2. Litvitsky P.F., Pinzhkov S.V., Tezиков E.B. Pathophysiology: Concise Lectures, Tests, Clinico-Pathophysiological Situations and Clinico-Laboratory Cases. - GEOTAR-Media, 2025. – 376 p.

8.1.2. List of Additional Literature:

1. Hammer Gary D., McPhee Stephen J. Pathophysiology of Disease: An Introduction to Clinical Medicine 8e. - [McGraw-Hill](#), 2018. – 832 p.

8.2. List of Educational and Methodological Support for the Independent Work of Students in the Discipline (Module)

Bicheva, G.V. Methodological guidelines on the discipline "Pathophysiology, clinical pathophysiology" for students of specialty 31.05.01 General Medicine, Stavropol: NCFU (electronic version)

8.3. List of Resources of the Information and Telecommunications Network **Internet Required for Mastering the Discipline (Module)**

1. <http://rudocor.net/> - Medical Portal
2. <http://www.e-reading.club/> - Large Online Library
3. <http://www.pubmed.com/> - database of full-text articles on medicine
4. <http://www.spravocnikpolekarstvam.ru/> - free online reference guide
5. <https://dic.academic.ru/> - Dictionaries and encyclopedias
6. <https://www.rmj.ru/> - Russian Medical Journal
7. <https://www.studentlibrary.ru/> - EBS "Student Consultant"

9. List of Information Technologies Employed through the Discipline (Module), Including a List of Software and Information Reference Systems

When delivering lectures, computer equipment and demonstrations of multimedia presentation materials are used. In seminars and practical classes, students deliver presentations prepared by them during the hours of independent work.

Information Reference Systems:

Information-reference and information-legal systems used in the study of the discipline:

1.	https://studbooks.net
2.	https://chem21.info
3.	https://studme.org/

Software:

1.	Alt Workstation 10
2.	Alt Workstation K
3.	Alt Server
4.	Office software package – P7-Office

10. Description of the Material and Technical Resources Required for the Educational Process for the Discipline (Module)

Lecture classes	A classroom equipped with multimedia equipment and technical training facilities.
Laboratory classes	23-308: a set of educational furniture for 20 seats, a magnetic marker board, a projector, a computer with the necessary set of licensed software. Visual material: Endocrine pathology. Diseases of the male and female genital organs; Circulatory disorders. Thrombosis. Embolisms; Degenerative processes (dystrophy, atrophy, necrosis); Atherosclerosis. Arterial hypertension. Cerebrovascular disease. Coronary heart disease; Benign and malignant tumors. Cancers of organs; Hemoblastosis; Gastritis. Peptic ulcer disease. Appendicitis; Diseases of the liver and gallbladder A set of micro-preparations on pathological anatomy; A set of micro-preparations "Hematology and leukemia"; A demonstration set of models on anemia. A binocular light microscope.
Independent work	A room for the independent work of students, equipped with computer hardware with the capability to connect to the Internet network and provide access to the electronic information and educational environment of the university.

11. Specific Features of Mastering the Discipline (Module) by Persons with Disabilities

Students with disabilities shall be provided with special textbooks, teaching aids, and didactic materials, special technical training facilities for collective and individual use, the services of an assistant (helper) providing the necessary technical assistance to the students, as well as the services of sign language interpreters and tactile sign language interpreters.

The mastery of the discipline (module) by students with disabilities may be organized jointly with other students, as well as in separate groups.

Mastering the discipline (module) by students with disabilities is to be carried out taking into account the peculiarities of psychophysical development, individual capabilities, and health status.

In order to ensure the accessibility of higher education under the educational program for persons with disabilities, the following is provided during the mastery of the discipline (module):

- 1) for persons with visual impairments:
 - the presence of an assistant offering the student the necessary technical assistance, taking into account individual features (help taking the workplace, moving around, reading and formatting the task, including writing under dictation),
 - written tasks, as well as instructions on the procedure for their execution, are formatted in an enlarged font,
 - special textbooks, teaching aids, and didactic materials (having a large font or audio files), individual uniform lighting of at least 300 lux, if necessary, a magnifying device is provided to the student to complete the task;
- 2) for persons with hearing impairments:
 - the presence of an assistant providing the student with the necessary technical assistance, taking into account individual characteristics (helps to take a workplace, move around, read and format the task, including writing with dictation),
 - the availability of sound-amplifying equipment for collective use is ensured; if necessary, sound-amplifying equipment for individual use is provided to the student;
 - provision with proper sound means of reproducing information is ensured;

- 3) for persons with musculoskeletal disorders (including severe motor function impairments of the upper limbs or the absence of upper limbs):
- written tasks are performed on a computer with specialized software or are dictated to an assistant;
 - at the request of the student, tasks may be performed verbally.

12. Specific Features of Implementing the Discipline with the Use of Distance Learning Technologies and E-Learning

Subject to Part 1 of Article 16 of the Federal Law of December 29, 2012, No. 273-FZ On Education in the Russian Federation, e-learning shall be viewed as the arrangement of educational activities employing information contained in databases and used in the implementation of educational programs, as well as information technologies, technical means, and information and telecommunication networks that ensure the processing and transmission of the specified information via communication lines, and the interaction of students and pedagogical workers.

Remote (distance) learning technologies are understood as educational technologies implemented mainly with the use of information and telecommunication networks during the indirect (at a distance) interaction of students and pedagogical workers.

The implementation of the discipline may be carried out with distance learning technologies and e-learning in full or in part. The components of the Educational And Methodological Complex (EMC) of the discipline (working program of the discipline, assessment and methodological materials, forms of attestation) implemented with the use of distance learning technologies and e-learning contain an indication of their use.

When arranging educational activities with distance learning technologies and e-learning, asynchronous and synchronous methods of interaction between participants in educational relations via the information and telecommunications network Internet may be offered.

When using distance learning technologies and e-learning, the schedule for the discipline shall indicate: methods of interaction among participants in educational relations via the information and telecommunications network Internet (VCC – videoconferencing, ET – electronic testing); links to the electronic information and educational environment of NCFU, to educational platforms and resources of other organizations to which open access is provided via the information and telecommunications network Internet; for synchronous learning – the time of online classes and instructors; for asynchronous learning – the authors of online courses.

When arranging intermediate attestation with distance learning technologies and e-learning, the Methodological Recommendations on the use of technical means ensuring the objective reliability of results when conducting intermediate and state final attestation for higher education educational programs – Bachelor's Degree programs, Specialist's Degree programs, and Master's Degree programs with distance learning technologies are used (Letter of the Ministry of Science and Higher Education of Russia dated December 7, 2020, # MN-19/1573-AN On sending methodological recommendations).

The implementation of the discipline with the use of e-learning and distance learning technologies is carried out using the electronic information and educational environment of NCFU, to which students are provided access via the information and telecommunications network Internet, or using the resources of other organizations, including platforms providing services for videoconferencing, online meetings, and distance learning (MTS-Link), as well as using the capabilities of social networks to carry out communication between students and instructors.

The educational and methodological support for a discipline shall be ensured with e-learning and distance learning technologies includes the working program presented in electronic form, educational and methodological manuals or a course of lectures, methodological guidelines for performing various types of educational activities of students provided for by the discipline, and other educational and methodological materials posted in the information and educational environment of NCFU.