

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

Petro Mohyla Black Sea National University

Medical Institute

Department of medical biology, microbiology, histology, physiology and pathophysiology

«APPROVED»

The first-vice rector
Ishchenko N.M.

«__» ____ 2021

THE WORKING EDUCATIONAL PROGRAM IN THE DISCIPLINE

«PATHOPHYSIOLOGY»

in the field of knowledge 22 «Health care»

in the specialty 222 «Medicine»

Developer

Klymenko M.O.



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Guarantor of the Educational
Program

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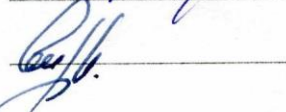
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1. Discription of the educational discipline (annotation)

Title of indices	Characterization of educational discipline	
	«Pathophysiology»	
Field of knowledge	22 «Health care»	
Specialty	222 «Medicine»	
Educational program	Master of Medicine	
Higher education level	Master	
Status of discipline	Normative	
Curriculum	3	
Academic year	2021/2022	
Semester number	Full-time	External form of education
	5 - 6	-
Total ECTS credits / hours	5,5 (3,0/2,5) / 165 (90/75)	
Course structure: <ul style="list-style-type: none"> – lectures – seminars (practical) – hours of students independent work 	Full-time	External form of education
	35 (15/20)	–
	50 (30/20)	
80 (45/35)		
Percentage of classroom load	52 %	
Language of instruction	english	
Interim control form (if there is)	attestation	
Form of final control	6 semester – exam	

2. Purpose, tasks and planned learning outcomes

The purpose of teaching / studying the discipline "Pathophysiology" is for students to master the functional changes in the diseased body and the general patterns and specific mechanisms of occurrence, development, course and consequences of pathological processes, individual diseases and pathological conditions.

Objectives of study: the acquisition by the student of competencies, knowledge, skills and abilities to carry out professional activities in the specialty of:

1) the most general issues of pathology associated with the interpretation of philosophical aspects of medicine (general doctrine of the disease, general etiology, general pathogenesis, the role of external and internal factors in pathology);

2) general patterns of origin, occurrence, development, course and outcome of diseases;

3) development of principles of therapy;

4) experimental development of methods of therapy.

Prerequisites for studying the discipline (interdisciplinary connections).

Pathophysiology as a discipline:

a) is based on students' understanding of basic principles and knowledge of anatomy, histology, medical and biological physics, bioinorganic, bioorganic and biological chemistry, biology, normal physiology, microbiology and integrates with these disciplines;

b) creates a theoretical basis for students to master clinical disciplines (internal medicine, surgery, obstetrics and gynecology, clinical pharmacology, pediatrics, anesthesiology, etc.), which involves both the integration of teaching with basic clinical disciplines and the acquisition of in-depth knowledge of pathophysiology, skills use this knowledge in the process of further training and in the professional activity of a doctor;

c) forms the methodological foundations of clinical thinking;

d) provides the possibility of pathophysiological analysis of clinical situations for further diagnosis, treatment, prevention of diseases.

Expected learning outcomes. As a result of studying the discipline, students have:

- Understand the importance of pathophysiology for medicine and the health care system, its place in the system of medical knowledge, have an idea of its formation, the main stages of development;

- To be able to combine the achievements of clinical research and modern experimental approaches in solving current problems of etiology and pathogenesis of diseases, to have an idea of clinical pathophysiology as a modern direction of pathophysiological science;

- Understand the role of the experimental method in the study of pathological processes and diseases, its possibilities, limitations and prospects.

- Use knowledge of pathophysiology to analyze and assess the state of the organism, disorders of its organs and systems in order to further plan diagnostic tests, treatment and prevention measures;

- Apply knowledge about "purely pathological" and "compensatory-protective" in pathogenesis, its leading and indirect links in the diagnosis and treatment of diseases, be able to distinguish sanogenetic mechanisms from pathological ones;

- Analyze the causal relationships in the pathogenesis, including through the formation of vicious circles (circulus vitiosus);

According to the requirements of the educational and professional program, students must:

KNOW:

- basic concepts of general nosology: health, disease, pathological process, typical pathological process, pathological reaction, pathological condition, etiology, pathogenesis;

- the role of causes, conditions and reactivity and resistance of the organism in the occurrence, development and consequences of diseases;

- the role of etiological factors, risk factors and conditions in the occurrence and development of diseases;

- causal relationships in the pathogenesis of manifestations of environmental factors (to identify local and general changes, pathological and adaptive-compensatory, specific and nonspecific; to determine the leading link

- typical pathological processes (cell damage, local circulatory and microcirculation disorders, inflammation, tumors, fever, hypoxia) according to the principles of their classification, stages of pathogenesis, general manifestations and options for completion;

- causes and mechanisms of development of typical pathological processes, their manifestations and significance for the human body, in particular in the emergence and development of relevant groups of diseases

- causal relationships in the pathogenesis of typical pathological processes (changes in local and general, pathological and adaptive-compensatory, specific and nonspecific; leading and auxiliary links);

- typical metabolic disorders (energy, carbohydrate, protein, fat, water-electrolyte, acid-base) with the definition of their concepts, criteria, principles of classification and consequences, starvation;

- etiology, pathogenesis, clinical manifestations of the main types (1st, 2nd) diabetes mellitus and its complications;

- causes, mechanisms of development and principles of therapy of extreme conditions: shock, collapse, coma;

- patterns of disorders of the cellular composition of peripheral blood in anemia, erythrocytosis, leukocytosis, leukopenia, leukemia; hemostasis disorders;

- pathological conditions and disorders of the circulatory system: circulatory failure; heart failure, cardiac arrhythmias; arterial hypertension, arterial hypotension; arteriosclerosis, atherosclerosis;

- changes in the main parameters of cardio- and hemodynamics in heart failure (heart rate and strength, minute and systolic blood volumes, systolic, diastolic, mean and pulse blood pressure, venous blood pressure);

- causes and mechanisms of coronary insufficiency, explain its possible consequences;

- causes of external respiration insufficiency, the role of alveolar ventilation disorders, gas diffusion through the alveolar-capillary membrane, perfusion in the small circle of blood circulation in the development of respiratory insufficiency; causes and mechanisms of shortness of breath;
- typical pathological conditions in the digestive system: indigestion (for example, maldigestion) and malabsorption (for example, malabsorption), gastric and / or duodenal ulcers as a multifactorial disease;
- etiology, pathogenesis, clinical manifestations of liver failure, hepatic coma, jaundice, portal hypertension. Principles of prevention and treatment;
- causes and mechanisms of disorders of glomerular filtration, tubular reabsorption and secretion in acute and chronic renal failure, glomerulonephritis, nephrotic syndrome, urinary syndrome, uremic coma;
- causes and general mechanisms of development of disorders of endocrine glands, primary and secondary endocrinopathies, consequences of disorders of secretion of hormones of adenohypophysis, neurohypophysis, adrenal glands, thyroid gland, gonads;
- general principles of diagnosis and treatment of disorders of the endocrine system;
- general biological role of stress, its causes and mechanisms of development, to have an idea of the general adaptation syndrome and "adaptation diseases";
- typical disorders of the nervous system: sensory functions, motor function, autonomic function, trophic function and integrative function;
- the role of acute and chronic disorders of cerebral circulation in disorders of the brain and the body as a whole.

BE ABLE:

- to solve situational problems with definition of causal factors, risk factors, the main link of pathogenesis, stages of development, mechanisms of development of clinical manifestations, options of completion, principles of rendering of medical care at typical pathological processes and the most widespread diseases;
- schematically reflect the mechanisms of pathogenesis and clinical manifestations of diseases;
- analyze and interpret the results of blood, urine, lipidograms, electrocardiograms, spiograms, immunograms, hormonal background;
- identify regenerative, degenerative, and forms of pathological regeneration of "red" and "white" blood cells in peripheral blood smears; interpret their presence or absence in the blood;
- on the basis of the results of laboratory and instrumental research to assess the state of functioning of organs and systems of the body in diseases;
- to analyze different options for the development of causal relationships in the pathogenesis of diseases;
- be able to identify and record the leading typical pathological process, its main link and clinical signs;
- make an informed decision for the appointment of laboratory and / or instrumental examination;
- determine the principles of treatment of diseases.

HAVE COMPETENCES:

- on the application of knowledge of pathophysiology to promote a healthy lifestyle, as well as to prevent the occurrence and development of diseases;
- about the main perspective directions of development of pathophysiology and general pathology.

The developed program corresponds to the educational-professional program (EPP) and is focused on the formation of competencies:

general (GC) - GC1-GC10 EPP:

GC1. Ability to abstract thinking, analysis and synthesis, the ability to learn and master modern knowledge.

GC2. Ability to apply knowledge in practical situations.

GC3. Knowledge and understanding of the subject area and understanding of professional activity.

GC4. Ability to adapt and act in a new situation.

GC5. Ability to make an informed decision; work in a team; interpersonal skills.

GC6. Ability to communicate in the state language both orally and in writing; ability to communicate in a foreign language.

GC7. Skills in the use of information and communication technologies.

GC8. Definiteness and perseverance in terms of tasks and responsibilities.

GC9. The ability to act socially responsibly and consciously.

GC10. The desire to preserve the environment.

professional (PC) - PC19 EPP:

PC19. Ability to process state, social, economic and medical information.

According to the educational-professional program, the expected ***program learning outcomes (PLO)*** include the skills of PLO4, PLO12 EPP:

PLO4. Know the types and methods of adaptation, principles of action in a new situation. To be able to apply means of self-regulation, to be able to adapt to new situations (circumstances) of life and activity. Establish appropriate connections to achieve results. Be responsible for the timely use of self-regulatory methods.

PLO12. Evaluate information about the diagnosis in the health care facility, its unit, using a standard procedure, using knowledge about the person, his organs and systems, based on the results of laboratory and instrumental studies (according to list 4).

3. The program of the discipline

The educational process is organized according to the European Credit Transfer and Accumulation System (ECTS).

The curriculum consists of two blocks:

Block 1. General pathophysiology.

SECTIONS:

1. GENERAL NOSOLOGY - GENERAL DOCTRINE ABOUT DISEASE, ETIOLOGY AND PATHOGENESIS. PATHOGENIC ACTION OF THE ENVIRONMENTAL FACTORS. THE ROLE OF INTERNAL FACTORS IN PATHOLOGY.

2. TYPICAL PATHOLOGICAL PROCESSES.

3. TYPICAL METABOLIC DISORDERS.

Block 2. Pathophysiology of organs and systems.

SECTIONS:

1. PATHOPHYSIOLOGY OF THE BLOOD SYSTEM.

2. PATHOPHYSIOLOGY OF SYSTEMIC BLOOD CIRCULATION AND EXTERNAL RESPIRATION.

3. PATHOPHYSIOLOGY OF DIGESTION, LIVER, KIDNEYS.

4. PATHOPHYSIOLOGY OF REGULATORY SYSTEMS (ENDOCRINE, NERVOUS).

BLOCK 1. GENERAL PATHOPHYSIOLOGY

Section 1.

General nosology - a general study of the disease, etiology and pathogenesis. Pathogenic action of environmental factors. The role of internal factors in pathology.

Topic 1. Subject and tasks of pathophysiology. Methods of pathophysiological research. The main stages of development of pathophysiology.

Pathophysiology as a science. The place of pathophysiology in the system of medical knowledge. The role of advances in molecular biology, genetics, biochemistry, physiology, immunology and other sciences in the development of modern pathophysiology. The value of pathophysiology for clinical and preventive medicine. Clinical pathophysiology.

Pathophysiology as a discipline, its components: general pathophysiology, pathophysiology of organs and systems of the body. The place of pathophysiology in the system of doctor training.

Methods of pathophysiology. Experimental modeling of pathological processes (diseases) - the main method of pathophysiology - its possibilities and limitations. Modern methods of conducting the experiment. Experimental therapy. Methods of clinical pathophysiology.

History of pathophysiology development. The value of scientific works by K. Bernard, R. Virkhov, Y. Konheim, I.I. Mechnikov, G. Selye, VV Pashutina, A.B. Vochta and other prominent researchers.

National School of Pathophysiologists (NA Hrzhonshevsky, VV Pidvysotsky, VK Lindeman, OO Bogomolets, MM Sirotinin, OV Repryov, DO Alpern, VV Voronin, MN Zaiko).

Modern scientific schools of pathophysiologists, the main directions of their activity.

Topic 2. General doctrine of the disease, etiology and pathogenesis.

Basic concepts of nosology: health (WHO), norm, pre-disease, disease, pathological process, typical pathological process, pathological reaction, pathological condition.

Disease as a biological, medical and social problem. Abstract and concrete in the concept of "disease".

Principles of disease classification, WHO classification. Basic patterns and periods in the development of the disease. Options for ending the disease. The

concept of terminal states: preagony, agony, clinical death. Biological death. Pathophysiological bases of resuscitation.

The main directions of the doctrine of the disease: humoral (Hippocrates), solidarity (Democritus), cellular (R. Virkhov). The development of these areas at the present stage.

Definition of "etiology". The problem of causality in pathology, the current state of its solution. Modern ideas about causal factors, risk factors, conditions of occurrence and development of diseases.

The main directions of development of the doctrine of etiology: monocausalism, conditionalism, constitutionalism, psychosomatic concept, etc. Modern ideas about causality in pathology.

Classification of etiological factors. External and internal etiological factors. Ecological, genetic, accumulation and ontogenetic concept of human diseases. Diseases of civilization.

Etiotropic principle of treatment and prevention of diseases.

Definition of "pathogenesis". Pathological (destructive) and adaptive-compensatory (protective) phenomena in pathogenesis. Manifestations of damage at different levels: molecular, cellular, tissue, organ, at the level of the organism as a whole.

Protective adaptive reactions. Adaptation, compensation. Mechanisms of immediate and long-term adaptation. The role of nervous and humoral factors in their implementation.

Causal relationships, their variants and "circulus vitiosus". The concept of the "main link" of pathogenesis. Phenomena are local and general, specific and nonspecific in pathogenesis. Unity of structural changes and functional manifestations of the disease.

Pathogenetic principle of classification and treatment of diseases.

Topic 3. Pathogenic action of physical factors.

Patterns of development of mechanical injury. Pathogenic action of thermal factors. Protective, compensatory reactions and actual pathological changes in hyperthermia. Heat and sunstroke. Burns, burn disease. Hypothermia. Protective, compensatory reactions and actually pathological changes. Mechanisms of long-term adaptation to cold. Artificial hypothermia, its use in medicine. Local action of low temperatures: frostbite.

Pathogenic effect of radiant energy. Types of ionizing radiation. Tissue radiosensitivity. Mechanisms of direct and indirect radiation damage of biological structures. Radiolysis of water. Radiotoxins. Manifestations of radiation damage at the molecular, cellular, tissue, organ and system levels. Pathogenesis of radiation sickness, its main forms and syndromes. Immediate and long-term effects of large and small doses of ionizing radiation. Natural mechanisms of radiation protection. Pathophysiological bases of radioprotection.

Pathogenic effect of radiant energy of infrared and ultraviolet spectra. Photosensitization. Danger of insufficient insolation. Damage caused by ultra-high frequency radio waves.

Pathogenic effect of electric current. Factors that determine the nature of the lesions.

Effect on the body of high and low atmospheric pressure. Causal relationships in the pathogenesis of compression and decompression syndromes. Explosive decompression.

Influence on an organism of factors of space flight - acceleration, weightlessness.

Topic 4. Pathogenic action of chemical factors.

Chemical pathogens as a problem of ecology and medicine. Local and general action of chemical factors on the body. The concept of toxicity, carcinogenicity, teratogenicity and allergenicity of chemical compounds.

Exo- and endo-intoxication. General patterns of action of toxins, specific and nonspecific mechanisms of intoxication. Natural mechanisms of protection against toxins. Pathophysiological principles of detoxification.

Pathophysiological aspects of alcoholism, drug addiction, substance abuse.

Topic 5. Pathogenic action of biological factors.

Infectious process, general patterns of development. Classification of infectious agents. Protective barriers against infection, conditions for overcoming them. Distribution and dissemination of infectious agents in the body. Sepsis. Tuberculosis. The role of pathogen properties and reactivity of the organism in the development of infectious diseases.

Topic 6. The role of heredity, constitution, age-related changes in pathology.

Heredity as a cause and condition of disease development. The ratio of hereditary and acquired in the pathogenesis. Hereditary and congenital diseases. Geno- and phenocopies. Classification of hereditary diseases.

Mutations. Principles of their classification. Types of mutations. Causes of mutations. Mutagenic factors of physical, chemical and biological origin. Antimutation protection systems. Mechanisms of DNA repair. The role of disorders of reparative systems and "immune surveillance" in the occurrence of hereditary pathology.

Monogenic hereditary diseases. Characteristics of monogenic diseases by type of inheritance of pathological gene: 1) inherited classically, according to Mendel (autosomal dominant and -recessive, codominant, sex-linked), 2) inherited non-classically (caused by triplet-repeats, mitochondrial). Manifestations of harmful gene mutations at the molecular, cellular, organ levels and at the level of the organism as a whole. Polygenic (multifactorial) diseases. Hereditary predisposition to disease.

Chromosomal diseases. Mechanisms of chromosomal aberrations. Polyploidy, aneuploidy, deletion, duplication, translocation, inversion. Syndromes associated with changes in the number of chromosomes. The main phenotypic manifestations of chromosomal aberrations.

Methods of diagnosis, principles of prevention and treatment of hereditary diseases. Ways to correct genetic defects. Prospects for genetic engineering.

Constitution, its role in pathology. Classification of constitutional types according to Hippocrates, Sigo, Kretschmer, IP Павлович, O.O. Bogomolets, MV

Chornorutsky. Anomalies of the constitution as a risk factor for the occurrence and development of diseases.

The concept of antenatal pathology. Gameto-, blasto-, embryo- and fetopathy. Teratogenic factors. Critical periods in antenatal ontogenesis. Intrauterine hypo- and hypertrophy. Intrauterine infection and hypoxia. Pathology of placental circulation.

Diseases and bad habits of the mother as causal factors or risk factors for the occurrence and development of fetal pathology.

Aging. Factors that determine the species, individual and average life expectancy. General features and patterns of aging.

Structural, functional and biochemical manifestations of aging at the molecular, cellular, tissue, organ, systemic levels and at the level of the organism as a whole. Theories of aging. Aging and disease. Progeria. Theoretical foundations of life expectancy. Methods of geroprotection.

Topic 7. Pathology of reactivity. Violation of immunological reactivity.

Reactivity as a condition for disease development. Manifestations of reactivity at the molecular, cellular, tissue, organ, systemic levels and at the level of the organism as a whole. Types of reactivity. Dependence of reactivity on sex, age, heredity, state of immune, nervous and endocrine systems. Influence of environmental factors on the reactivity of the organism.

The concept of resistance. Passive and active resistance. Relationship between resistance and reactivity. Mechanisms of nonspecific resistance. Biological barriers, their classification, importance in the body's resistance. The role of the system of mononuclear phagocytes in the body's resistance to pathogenic agents (the work of OO Bogomolets). Phagocytosis. Disorders of phagocytosis: causes, mechanisms, consequences. Humoral factors of nonspecific resistance of the organism to infectious agents. The complement system and its violation.

Mechanisms of immune response of humoral and cellular type, mechanisms of immunological tolerance, its types and reproduction in experiment. General patterns of immune system disorders, hyper-, hypo- and dysfunction of the immune system. Experimental modeling of pathology of the immune system. Immune deficiency, definition, classification (WHO). Causes, mechanisms of development, types of primary immunodeficiencies. The role of physical, chemical and biological factors in the development of secondary immunodeficiency (immunosuppressive) states. Pathogenesis of clinical manifestations of immune deficiency. Etiology, pathogenesis of acquired immunodeficiency syndrome (AIDS).

Pathophysiological bases of organ and tissue transplantation. Graft rejection reaction, its causes and mechanisms. Graft-versus-host disease.

Immunological relationships in the "mother-fetus" system.

Basic principles of immunostimulation and immunosuppression.

Disorders of the systems functionally related to the immune system: disorders of the complement system, disorders of phagocytosis and systems of biologically active substances.

Topic 8. Allergies.

Definition and general characteristics of allergies. Etiology of allergies, types of exogenous and endogenous allergens. Formation of allergic reactions depending

on the state of the organism. The importance of hereditary and acquired factors in the development of allergies.

Principles of classification of allergic reactions. General characteristics of allergic reactions of immediate and delayed types. Classification of allergic reactions by Coombs and Jell. Stages of pathogenesis of allergic reactions.

Anaphylactic reactions: experimental models, basic clinical forms. Immunological mechanisms of anaphylactic reactions, the role of tissue basophils in their development. Active and passive anaphylaxis, pathogenesis of anaphylactic shock.

Cytotoxic reactions: experimental modeling, main clinical forms. Mechanisms of cytolysis: complement-dependent cytolysis, antibody-dependent phagocytosis, antibody-dependent cellular cytotoxicity. The role of complement and its activation products in the development of cytotoxic reactions.

Immunocomplex reactions: reproduction in the experiment, the main clinical forms. Factors determining the pathogenicity of immune complexes. Immunocomplex lesions, their local and general manifestations.

Cell-mediated reactions: experimental reproduction, basic clinical forms. Features of immunological mechanisms. The role of lymphokines.

Allergic reactions of stimulating and inhibitory type, clinical forms. Pseudoallergic reactions.

Autoallergic (autoimmune) reactions. Causes and mechanisms of their development. The role of the autoallergic component in the pathogenesis of diseases.

Basic principles of prevention and treatment of allergic reactions. Hyposensitization. The relationship between allergies, immunity and inflammation.

Topic 9. Practical skills on the topic "General nosology. Pathogenic action of environmental factors. The role of internal factors in pathology.

Section 2.

Typical pathological processes

Topic 10. Pathophysiology of the cell.

Characteristics of the concept of "cell damage". Principles of classification of cell damage. Violent and disregulatory cell damage. Structural, functional, physicochemical, biochemical and thermodynamic signs of cell damage. Exo- and endogenous causes of cell damage: hypoxia, exposure to physical, chemical, infectious agents, immune reactions, genetic defects.

Information mechanisms of cell damage. Alarm pathology, signal reception. The phenomenon of molecular mimicry. Disorders of signal transduction mechanisms, violation of secondary messengers. Defects of cellular programs as a basis for the development of pathological processes.

Characteristics of universal mechanisms of cell damage (hypoxic, free radical, calcium-dependent).

Mechanisms and manifestations of damage to subcellular structures. Consequences of cell damage. Necrosis and apoptosis, their characteristic features. Exo- and endogenous inducers of apoptosis. Mechanisms of apoptosis. Consequences of suppression and increased apoptosis.

Mechanisms of protection and adaptation of cells to the action of harmful agents. Cellular stress - proteins.

Topic 11. Typical disorders of peripheral blood circulation and microcirculation.

The main forms of peripheral circulatory disorders: arterial and venous hyperemia, ischemia, stasis. Their types, causes and mechanisms of development, external manifestations. The role of endothelial factors in the pathogenesis of local circulatory disorders. Tissue changes caused by local circulatory disorders, their significance and possible consequences. The concept of reperfusion syndrome, ischemic toxicosis.

Thrombosis and embolism as causes of local circulatory disorders. Causes and conditions of thrombosis. Types of emboli, mechanisms of embolism. The role of reflex mechanisms in the development of general disorders caused by embolism. Features of the course of embolism of the great and small circles of blood circulation, portal vein.

Typical microcirculation disorders. Intravascular disorders. Sludge syndrome. Stasis: types and mechanisms of development. Violation of the tone, mechanical integrity and permeability of microvessels. Extravascular disorders of microcirculation. Capillarotrophic insufficiency.

Typical lymphatic disorders. Mechanical, dynamic and resorption insufficiency of lymphatic circulation.

Topic 12. Inflammation.

Definition of inflammation. Classifications of inflammation (immune, non-immune; infectious, non-infectious; acute, chronic; normal, hypo-, hyperergic, etc.). Etiology of inflammation: classification and characterization of phlogogenic factors. General and local manifestations of inflammation.

Pathogenesis of acute inflammation. Stages of inflammation. Alteration (primary and secondary), causes and mechanisms of secondary alteration.

Biochemical and physicochemical disorders in the inflammatory focus.

Inflammation mediators, their classification. Plasma mediators (acute phase proteins, proteins of complement systems, blood coagulation, fibrinolysis, kinins).

Mediators of cellular origin, specific and nonspecific. Cytokines - types, characteristics of action. Mediators from tissue basophils. Eicosanoids.

Disturbances of local blood circulation in the center of acute inflammation. The experiment of J. Congheim. Pathogenesis of ischemia and arterial hyperemia. The reasons for the transition of arterial hyperemia to venous. Changes in the rheological properties of blood in the center of acute inflammation.

Exudation at the site of acute inflammation, causes and mechanisms. Characteristics of exudates.

Emigration of leukocytes in the inflammatory focus. Stages, causes and mechanisms of leukocyte emigration. Adhesive molecules of leukocytes and endotheliocytes. Causes and mechanisms of leukocyte chemotaxis. Mechanisms of microbial neutralization by leukocytes. Phagocytosis: stages, mechanisms of destruction of phagocytosis objects.

Proliferation at the site of inflammation - regeneration and / or fibroplasia. Causes and mechanisms of proliferation. Mitogenic signals (growth factors, cytokines, hormones, lack of contact inhibition of proliferation). Transmission of mitogenic signal by intracellular signaling pathways. The role of mitogen-activated protein kinases in stimulating cell division. Mechanisms of sclerosis, scar organization.

Chronic inflammation. General characteristics, features of systemic and local manifestations (in comparison with acute inflammation). Features of pathogenesis (mononuclear infiltration, repair / fibrosis, granuloma formation).

The role of the body's reactivity, pathological immune response in the development of inflammation (normal, hypo-, hyperergic inflammation). Systemic response to the action of phlogogenic factors. The role of cytokines. Acute phase proteins.

Principles of anti-inflammatory therapy.

Topic 13. Fever.

Definition of the concept. General characteristics of fever, its formation in onto- and phylogeny.

Etiology of fever. Characteristics of pyrogens. Primary and secondary pyrogens. Pyrogen formation during infection, aseptic injury and immune reactions. Chemical nature and origin of secondary pyrogens. Mechanisms of influence on the center of thermoregulation. Stages of fever. Changes in heat production and heat transfer processes at different stages of fever. Involvement of nervous, endocrine and immune systems in the development of fever. Changes in metabolism and physiological processes (reactions of the cardiovascular, respiratory, digestive, excretory systems) with fever. Protective value and pathological manifestations of fever. Principles of classification, types of fever.

Pathophysiological principles of antipyretic therapy. The concept of pyrotherapy. The main differences between fever, exogenous overheating and other types of hyperthermia.

Topic 14. Tumors.

General characteristics of the main types of tissue growth disorders (hypoplasia, hyperplasia).

Definition of "tumor" and "tumor process". General patterns of tumor growth. Molecular-genetic bases of infinite growth and potential immortality of tumor cells. Anaplasia: manifestations of structural, functional, physicochemical, biochemical, antigenic anaplasia. Characteristics of expansive and infiltrative (invasive) tumor growth. Principles of tumor classification.

Experimental study of etiology and pathogenesis of tumors: methods of induction, transplantation, explantation.

Etiology of tumors. Physical, chemical and biological carcinogenic factors. Properties of carcinogenic factors that determine their carcinogenic effect.

Risk factors (genetic / chromosomal defects and constitution abnormalities), conditions of occurrence and development of tumors.

Physical carcinogenic factors. Basic regularities of blastomogenic action of ionizing radiation and ultraviolet rays.

Chemical carcinogens, their classification. Exogenous and endogenous carcinogens. Chemical carcinogens of direct and indirect action. Features of the chemical structure of compounds that determine their carcinogenicity. Cocarcinogenesis and syncarcinogenesis.

Biological carcinogenic factors: plant (cicadine), fungal (aflatoxin), viruses. Classification of oncogenic viruses. Viral carcinogenesis. Experimental evidence of viral origin of tumors.

Pathogenesis of tumor growth. Stages of pathogenesis: initiation, promotion and progression.

Stage of transformation (initiation). Mutational and epigenomic mechanisms of tumor transformation. Disorders of the system of genes that provide cell division. The concept of proto-oncogenes, oncogenes (cellular, viral), genes-suppressors of cell division. Methods of conversion of protooncogene to oncogene. Types of cancer proteins. The role of apoptosis in the pathogenesis of tumor growth. The concept of inducers and suppressors of apoptosis. Mechanisms of evasion of transformed cells from apoptosis.

Promotion stage. Promotion mechanisms. Characteristics of tumor growth promoters (hormonal effects, chemicals, chronic irritation, etc.).

Stage of progression. Mechanisms of tumor progression.

Interaction of tumor and organism. The effect of the tumor on the body. Mechanisms of cancerous cachexia. Mechanisms of natural antitumor protection (anticancer, antitransformation and anti-cellular). Immune and non-immune mechanisms of antitumor resistance. Mechanisms of tumor evasion from immune surveillance. Pathophysiological bases of tumor prevention and treatment.

Topic 15. Hypoxia.

Definition, principles of classification of hypoxia. Mechanisms of hypoxia development: reduction of supply and disturbance of oxygen utilization by cells. Etiology of the main types of hypoxia: hypoxic, respiratory, circulatory, hemic, tissue, substrate, overload, mixed. Changes in the gas composition of arterial and venous blood in different types of hypoxia. Immediate and long-term mechanisms of adaptation and adaptation to hypoxia. Resistance to hypoxia. Factors that provide it. Mechanisms of therapeutic and prophylactic action of dosed hypoxic training.

Modern principles of oxygen therapy. Iso- and hyperbaric oxygenation. Toxic effect of oxygen. Hyperoxia and free radical reactions. Hyperoxia as a cause of hypoxia.

Topic 16. Pathophysiology of extreme conditions.

The concept of extreme conditions. Shock: types, clinical manifestations, causes and mechanisms of development. Stages of shock: compensated, progressive and irreversible. Involvement of nervous and endocrine mechanisms in the development of shock. Disorders of general hemodynamics and microcirculation in the pathogenesis of shock. The mechanism of centralization of blood circulation. The role of hormones and physiologically active substances and products of tissue damage in the pathogenesis of shock. The concept of "shock organs". Pathophysiological bases of shock prevention and therapy.

The concept of crash syndrome. Causes, mechanisms of development, manifestations.

Collapse. Common and distinctive signs of shock and collapse. Causes and mechanisms of colaptoid states.

Coma. Principles of classification. Causes and mechanisms of comatose states. The role of disorders of brain energy supply, osmotic disorders, ionic and acid - basic homeostasis in the pathogenesis of coma. Principles of coma therapy.

Topic 17. Practical skills on the topic "Typical pathological processes".

Section 3.

Typical metabolic disorders.

Topic 18. Disorders of energy metabolism.

Energy needs of the body. Energy balance, negative and positive, causes and mechanisms of origin and development. Basic metabolism as a factor influencing the energy balance. Pathological changes of the basic metabolism: etiology, pathogenesis.

Disruption of cell energy supply. Disorders of nutrient transport across cell membranes, disorders of intracellular catabolic pathways. Disorders of cellular respiration, the effect of separation of oxidation and phosphorylation, its mechanisms. Significance of disorders of energy metabolism in the life of cells, organs, organism. The role of energy supply disorders in cells in the development of their damage.

Topic 19. Disorders of carbohydrate metabolism.

Disorders of carbohydrate absorption, processes of synthesis, deposition and breakdown of glycogen, transport of carbohydrates into cells. Disorders of nervous and hormonal regulation of carbohydrate metabolism.

Diabetes. Definition, classification (by WHO). Experimental modeling of diabetes mellitus.

Etiology, pathogenesis of type 1 diabetes. The role of hereditary and environmental factors in its origin and development. Pathogenesis of absolute insulin insufficiency, its manifestations and consequences: violation of energy, protein, carbohydrate, fat, water-electrolyte metabolism, acid-base state.

Etiology, pathogenesis of type 2 diabetes mellitus. The role of hereditary and environmental factors in its origin and development. Variants of relative insulin insufficiency in type 2 diabetes (secretory disorders of B cells, resistance of tissues - targets to insulin). Manifestations and consequences of relative insulin insufficiency. The concept of metabolic syndrome.

Complications of diabetes. Hypo- and hyperglycemia syndrome: types, causes and mechanisms of development. Coma: varieties, causes and mechanisms of development, manifestations, principles of therapy. Long-term complications (macro-, microangiopathy, neuropathy, fetopathy, etc.), their general characteristics.

Prevention of the occurrence and development of diabetes. Principles of diabetes therapy. Prevention of complications.

Topic 20. Disorders of fat metabolism.

Disorders of digestion and absorption of lipids. Disorders of lipid transport in the blood.

Hyper-, hypo-, dyslipoproteinemia. Dependence of dyslipoproteinemia on environmental factors (diet, nutrition), heredity and comorbidities. Modern classifications of dyslipoproteinemias (primary and secondary; by lipoprotein phenotype; with high or low risk of atherosclerosis), criteria for hypercholesterolemia, hypertriglyceridemia, low levels of high-density lipoprotein (HDL).

Etiology, pathogenesis of primary (hereditary, familial) and secondary (in eating disorders, obesity, diabetes, kidney disease, hypothyroidism, liver cirrhosis, AIDS, under the influence of drugs) dyslipoproteinemia. Consequences / complications of dyslipoproteinemias. Principles and goals of restoring the normal lipid composition of the blood.

Definition of obesity. Types of obesity. Experimental models. Etiology and pathogenesis of obesity. Mechanisms of fatty degeneration.

Characteristics of medical problems associated with obesity.

Topic 21. Disorders of protein metabolism. Disorders of metabolism of purine and pyrimidine bases.

Representation of positive and negative nitrogen balance. Violation of the main stages of protein metabolism. Azotemia, productive and retention. Disorders of blood protein composition: hyper-, hypo-, dysproteinemia. Impaired transport function of blood plasma proteins. Conformational changes of protein molecules, disorders of protein degradation in lysosomes and proteosomes, their role in pathology.

Hereditary disorders of amino acid metabolism: phenylketonuria, tyrosine, alkaptonuria, albinism, hypothyroidism, orotaciduria.

Pathology of purine metabolism. Hyper- and hypouricemia. Gout: etiology, pathogenesis.

Topic 22. Disorders of water-salt metabolism.

Positive and negative water balance. Dehydration: extracellular and intracellular; hypo-, iso-, hyperosmolar. Causes and mechanisms of development. Protective and compensatory mechanisms.

Excessive accumulation of water in the body. Hypo-, iso- and hyperosmolar hyperhydria, causes and mechanisms of development, protective, compensatory reactions. Extra- and intracellular hyperhydria.

Definition of "edema", types of edema. Causes and mechanisms of edema. Edema is caused by an increase in intravascular hydrodynamic pressure (theory of the pathogenesis of Starling's edema). Edema caused by changes in oncotic pressure of blood and tissue fluid. The role of vascular permeability disorders and lymph outflow in the pathogenesis of edema. Swelling caused by the retention of sodium salts and / or water in the body. Myxedematous edema. Principles of treatment of edema.

Hyper- and hyponatremia. Causes and mechanisms of development. Disturbances caused by changes in the concentration of sodium ions in the extracellular fluid.

Hyper- and hypokalemia. Causes and mechanisms of development. The main manifestations of disorders of potassium ion metabolism.

Disorders of phosphorus-calcium metabolism. Disorders of hormonal regulation of phosphorus-calcium metabolism: hyper- and hypoparathyroidism, hypo-

and hypervitaminosis D, disorders of calcitonin secretion. Hypocalcemic conditions: causes, mechanisms of development, main manifestations. Rickets: causes and mechanisms of development, the main clinical manifestations. Principles of prevention and treatment of rickets. The concept of osteodystrophy (osteopenia and osteoporosis).

Hypercalcemic conditions, causes and mechanisms of development. Soft tissue calcification: metastatic, dystrophic and metabolic mechanisms. Hyper- and hypophosphatemia. Causes and mechanisms of development.

Disorders of micronutrient metabolism. Etiology, pathogenesis.

Topic 23. Violation of the acid-base state.

General characteristics of acid-base disorders (ACS). Acidosis, definition, classification, basic laboratory criteria. Gas acidosis: causes and mechanisms of development, clinical manifestations. Non-gaseous acidosis (metabolic, excretory, exogenous): causes and mechanisms of development, the relationship between CBS and electrolyte disturbances. Acidosis with increased and normal anionic difference.

Alkalosis, definition, classification, basic laboratory criteria. Gas alkalosis: causes and mechanisms of development, clinical manifestations. Non-gaseous alkalosis (excretory, exogenous): causes and mechanisms of development. The role of buffer systems of blood, ion exchange, respiratory system and kidneys in the mechanisms of compensation and correction of CBS disorders.

Pathological changes in the body in disorders of acid-base status. Principles of pathogenetic therapy of acidosis and alkalosis.

Topic 24. Starvation.

Definition, types of starvation: complete, absolute, incomplete, partial. External and internal causes of starvation. Characteristics of disorders of basic metabolism and metabolism in certain periods of complete starvation without water restriction. Pathophysiological features of incomplete starvation. Types, etiology, pathogenesis of partial (qualitative) starvation.

Protein-calorie deficiency, its forms: alimentary insanity, kwashiorkor. Alimentary dystrophy.

Factors affecting the body's resistance to starvation.

The concept of medical fasting.

Topic 25. Practical skills on the topic: "Typical metabolic disorders».

BLOCK 2. PATHOPHYSIOLOGY OF ORGANS AND SYSTEMS

Section 4.

Pathophysiology of the blood system.

Topic 26. Pathophysiology of the blood system. Anemia caused by blood loss. Erythrocytosis.

Changes in total blood volume. Characteristics of types of hypo-normo- and hypervolemia, causes and mechanisms of development.

Violation of physicochemical properties of blood. Erythrocyte sedimentation rate and osmotic resistance of erythrocytes: concepts, causes and mechanisms of their changes in pathology.

Blood loss: etiology, pathogenesis. Emergency (urgent) and non-emergency (non-urgent) mechanisms of adaptation and compensation of blood loss.

Compensatory reactions aimed at increasing the volume of circulating blood in case of blood loss, elimination of hypoproteinemia and restoration of peripheral blood composition in case of blood loss. Disorders of physiological processes caused by blood loss (disorders of systemic and regional hemodynamics, hematological disorders, hypoxic syndrome, non-gaseous acidosis, dysfunction of internal organs). Hemorrhagic shock.

Principles and methods of blood loss therapy aimed at eliminating the causes of blood loss (etiologic treatment), ensuring adequate transport and oxygen consumption (pathogenetic therapy), elimination of disorders of the body that result from blood loss (symptomatic therapy).

Erythrocytosis: definition, types (absolute, relative; primary, secondary), etiology, pathogenesis.

Anemia: definition, clinical and hematological manifestations, principles of classification (by etiology, pathogenesis, nature of the course, type of erythropoiesis, bone marrow regenerative capacity, color index, changes in erythrocyte size). Degenerative, regenerative forms of erythrocytes and cells of pathological regeneration. Etiology, pathogenesis, stages, hematological characteristics of posthemorrhagic anemia (acute and chronic).

Topic 27. Hemolytic anemias and anemias caused by erythropoiesis disorders.

Etiological classification (hereditary, acquired) of hemolytic anemias. Characteristics of causal factors of acquired hemolytic anemias. Ways of realization of genetic defects in the pathogenesis of hereditary hemolytic anemias (membrane, enzyme, hemoglobinopathies).

Hemolysis of erythrocytes, intravascular and intracellular, as mechanisms of hemolytic anemia. Typical clinical manifestations of hemolysis of erythrocytes (jaundice, hemoglobinuria, ICE, dyscholia, cholelithiasis, splenomegaly), their possible association with the type of hemolysis. Pathological forms of erythrocytes specific for hereditary hemolytic anemias.

Classification of dyserythropoietic anemias (deficient, dysregulatory, hypoplastic, metaplastic, aplastic), general characteristics of the causes and mechanisms of development.

Etiology, pathogenesis, typical changes of peripheral blood in iron deficiency anemia. The concept of iron-refractory anemia.

Anemia caused by vitamin B12 and / or folic acid deficiency. Causes and mechanisms of absolute and relative deficiency of vitamin B12 and folic acid. Addison-Birmer malignant anemia. Characteristics of general disorders in the body with a deficiency of vitamin B12 and / or folic acid. Hematological characteristics of vitamin B12-, folate deficiency anemia.

Topic 28. Leukocytosis, leukopenia.

Leukocytosis, principles of classification. Causes and mechanisms of reactive and redistributive leukocytosis. Neutrophilic, eosinophilic, basophilic, lymphocytic and monocytic leukocytosis. The concept of nuclear shift of neutrophilic granulocytes, its varieties. Leukemoid reactions.

Leukopenia, principles of classification. Causes, mechanisms of leukopenia, agranulocytosis. Pathogenesis of the main clinical manifestations.

Acquired and hereditary disorders of the structure and function of leukocytes.

Topic 29. Leukemia.

Representation of hemoblastosis, general characteristics of their main groups. Leukemia as a tumor. Principles of classification of leukemias (by cell phenotype, degree of differentiation, total number of leukocytes).

Etiology of leukemia: characteristics of leukogenic factors of physical, chemical, biological nature. Mechanisms of their transforming action on hematopoietic cells of the bone marrow. Anomalies of genotype and constitution as risk factors for the occurrence and development of leukemia.

Typical patterns and features of the pathogenesis of acute and chronic leukemias: disorders of the cellular composition of bone marrow and peripheral blood; morphological, cytogenetic, cytochemical immunophenotypic characteristics; systemic disorders in the body. Tumor progression of leukemia, the concept of "blast crisis". Leukemia metastasis. Principles of diagnosis and treatment of leukemia.

Topic 30. Disorders of the hemostasis system.

General characteristics of typical disorders in the hemostasis system.

Hemorrhagic disorders of hemostasis. Insufficiency of vascular and platelet hemostasis. Vasopathies: types, causes, mechanisms of development, pathogenesis of the main clinical manifestations. Thrombocytopenia: etiology, pathogenesis, mechanisms of hemostasis disorders. Thrombocytopathy. Mechanisms of adhesion disorders, platelet aggregation, platelet granule release.

Violation of coagulation hemostasis. Reasons for decreased activity of the blood coagulation system and increased activity of anticoagulant and fibrinolytic systems. The main manifestations of disorders of certain stages of blood clotting, their etiology and pathogenesis.

Thrombophilic conditions: thrombosis, disseminated intravascular coagulation (DIC), localized intravascular coagulation. Principles of classification of DIC syndrome (according to the course - acute, subacute, chronic; by the trigger mechanism of coagulation), etiology, pathogenesis. Role in pathology.

Principles of correction of disorders in the hemostasis system.

Topic 31. Practical skills on the topic "Pathophysiology of the blood system».

Section 5.

Pathophysiology of systemic circulation and external respiration.

Topic 32. Pathophysiology of systemic circulation. Circulatory failure.

Definition of the concept of circulatory insufficiency, principles of its classification, characteristics of cardio- and hemodynamic disorders. The concept of acute and chronic ("stagnant") circulatory failure. Etiology, pathogenesis, stages of chronic circulatory failure. Mechanisms of development of the main clinical manifestations of chronic circulatory failure (shortness of breath, cyanosis, edema).

Acute circulatory failure: etiology, pathogenesis, pathological and adaptive-compensatory changes. Collapse, shock as variants of acute circulatory failure; criteria, causes and mechanisms of development.

Topic 33. Pathophysiology of the heart. Heart failure. Coronary insufficiency.

Definition of heart failure, principles of classification.

Heart failure due to overload. Causes of heart overload with volume and resistance. Pathophysiological characteristics of hemodynamic disorders in various heart defects. Mechanisms of immediate and long-term adaptation of the heart to overload: tachycardia, hyperfunction (hetero-, homeometric), myocardial hypertrophy. Cardiac hypertrophy: types, causes, mechanisms of development, stages (according to FZ Meerson). Features of hypertrophied myocardium, causes and mechanisms of its decompensation.

Myocardial form of heart failure. Coronary myocardial damage. Coronary insufficiency (relative and absolute; acute and chronic), mechanisms of development. The concept of "critical stenosis". Consequences of myocardial ischemia: depression of contractile activity, electrical instability, damage / necrosis of cardiomyocytes, additional damage during reperfusion. Ischemic heart disease as a manifestation of coronary insufficiency, its varieties. Clinical and laboratory criteria, manifestations and complications of myocardial infarction. Pathogenesis of cardiogenic shock. Principles of prevention and treatment of coronary heart disease.

Etiology and pathogenesis of non-coronary myocardial damage. Cardiomyopathy. Classification. Characteristics of causes and mechanisms of occurrence, clinical manifestations.

Cardiac arrhythmias: classification, causes, mechanisms, typical electrocardiographic manifestations. The role of additional conduction pathways of the heart in the development of arrhythmias. Causes and mechanisms of ectopic foci of excitation in the myocardium, mechanisms of re-entry and recirculation of excitation. Fibrillation and defibrillation of the heart.

Extramyocardial heart failure. Pericardial lesions. Acute cardiac tamponade.

Principles of cardioprotection and treatment of heart / circulatory failure.

Topic 34. Pathophysiology of blood vessels.

The concept of vascular insufficiency. Types, causes and mechanisms of its development.

Arteriosclerosis: definition, classification. Risk factors for atherosclerosis. Experimental models. Modern and historical theories of atherogenesis. The role of endothelial damage, inflammation, hereditary and acquired disorders of receptor-mediated transport of lipoproteins (LP) (disorders of LP receptors, defects of LP molecules, modification of LP) in atherogenesis.

Arterial hypertension (AH), definition, principles of classification. Hemodynamic variants of hypertension. The role of disorders of pressor and depressor systems in the development of hypertension.

Primary and secondary arterial hypertension. Etiology, pathogenesis. Experimental models.

Primary hypertension as a multifactorial disease: the role of hereditary factors and external factors in the development of primary hypertension. Theories of pathogenesis of primary hypertension (dysregulatory, membrane, etc.).

Mechanisms of development of primary and secondary hypertension of the small circle of blood circulation.

Arterial hypotension: definition, criteria. Etiology and pathogenesis of acute and chronic hypotension. Collapse. Causes and mechanisms of development, manifestations.

Topic 35. Pathophysiology of external respiration. Respiratory failure.

Definition of the concept of respiratory failure, criteria, principles of classification. Extrapulmonary and pulmonary disorders of alveolar ventilation: central, neuromuscular, thoracodiaphragmatic, decreased airway patency, elastic properties of lung tissue, the number of functioning alveoli. Mechanisms of alveolar ventilation disorders: dysregulatory, restrictive, obstructive.

Causes and mechanisms of gas diffusion disorders in the lungs.

Disorders of pulmonary circulation. Violation of general and regional ventilation-perfusion relations in the lungs.

Changes in blood gas composition and acid-base status in various types of respiratory failure, their importance for the body.

Pathogenesis of the main clinical manifestations of respiratory failure. Shortness of breath: types, causes, mechanisms of origin and development. Asphyxia, causes and mechanisms of development. Pathological breathing. Types of periodic and terminal respiration.

Violation of non-respiratory functions of the lungs, their impact on systemic hemodynamics and hemostasis.

Topic 36. Practical skills on "Pathophysiology of systemic circulation and external respiration».

Section 6.

Pathophysiology of digestion, liver, kidneys.

Topic 37. Pathophysiology of the digestive system. Insufficiency of digestion.

General ideas about indigestion, principles of classification. Causes of indigestion (maldigestion). The role of alimentary and infectious agents, disorders of nervous and humoral regulation of the digestive system. Association of digestive disorders with metabolic and energy disorders in the body. Appetite disorders. Anorexia.

Causes and mechanisms of digestive disorders in the oral cavity. Etiology, pathogenesis, experimental models of caries and periodontitis. Causes, mechanisms and consequences of salivation disorders. Impaired motor function of the esophagus. Etiology, pathogenesis of heartburn.

Indigestion in the stomach. General characteristics of disorders of motor and secretory functions of the stomach. Pathological gastric secretion, types; causes and mechanisms of development.

Etiology, pathogenesis of gastric and / or duodenal ulcers. The role of helicobacter pylory. Understanding the etiology and pathogenesis of symptomatic gastric and / or duodenal ulcers.

Indigestion in the intestines, etiology, pathogenesis. Digestive disorders associated with insufficient secretion of pancreatic juice. Etiology, pathogenesis,

complications of acute and chronic pancreatitis. Pathogenesis of pancreatic shock. Intestinal dyskinesias. Causes, mechanisms and manifestations of constipation and diarrhea. Intestinal obstruction: types, etiology, pathogenesis. Intestinal barrier dysfunction: intestinal autointoxication, coli-sepsis, dysbacteriosis. Disorders of cavity and parietal digestion in the intestines. Malabsorption syndrome: definition, manifestations (diarrhea, weight loss, protein deficiency, hypovitaminosis), causes and mechanisms of development. Intestinal enzymopathy.

Topic 38. Pathophysiology of the liver. Hepatic failure.

Liver failure: definition, principles of classification. Etiology, pathogenesis, experimental models of liver failure. Typical disorders of carbohydrate, protein, lipid, water-electrolyte metabolism, metabolism of trace elements, vitamins and hormones, dysfunction of functional systems of the body in liver failure.

Insufficiency of antitoxic function of the liver, the mechanism of the main manifestations. Types, causes, pathogenesis of hepatic coma. The role of cerebrotoxic substances.

Insufficient excretory function of the liver, the main manifestations. Definitions, criteria, types of jaundice, their causes and mechanisms. Comparative characteristics of pigment metabolism disorders in hemolytic, hepatic and mechanical jaundice; syndromes of cholemia and hypo-, acholia. Gallstone disease.

Portal hypertension syndrome: etiology, pathogenesis, manifestations. Mechanisms of ascites, hepatolienal and hepatorenal syndromes.

Topic 39. Pathophysiology of the kidneys. Renal failure.

The concept of renal failure, the principles of classification. Prerenal, actually renal and postrenal mechanisms of renal disorders. Causes and mechanisms of circulatory disorders in the kidneys. Functional and physicochemical bases of glomerular filtration disorders. Causes and mechanisms of tubular reabsorption and secretion disorders. Hereditary tubulopathies. The main indicators of kidney function. Use of functional tests to determine the type of renal dysfunction.

Quantitative and qualitative changes in the composition of urine. Oliguria, anuria and polyuria. Water, osmotic and hypertensive diuresis. Hypo- and isostenuria. Pathological components of urine: proteinuria, cylindruria, glucosuria, aminoaciduria, hematuria, leukocyturia. The concept of selective and non-selective proteinuria. Pathogenesis of proteinuria.

General manifestations of renal insufficiency. Causes, manifestations and mechanisms of retention azotemia. Pathogenesis of renal edema. Acid-base disorders: renal azotemic acidosis, proximal and distal tubular acidosis. Pathogenesis and manifestations of renal osteodystrophy. Mechanisms of development of arterial hypertension, anemia, hemostasis disorders in renal lesions.

Glomerulonephritis: definitions, classifications, experimental models, modern ideas about the etiology and pathogenesis. Nephrotic syndrome, primary and secondary. Causes and mechanisms of kidney stones, urolithiasis.

Syndromes of acute and chronic renal failure: criteria, causes and mechanisms of development, clinical manifestations. Pathogenesis of uremic coma. Principles of treatment of renal failure. The concept of extracorporeal and peritoneal hemodialysis, lymphodialysis, lymphosorption.

**Topic 40. Practical skills on "Pathophysiology of digestion, liver, kidneys."
Section 7.**

Pathophysiology of regulatory systems (endocrine, nervous)

Topic 41. Pathophysiology of the endocrine system.

General characteristics of disorders of the endocrine system: hypofunction, hyperfunction, gland dysfunction; primary, secondary endocrinopathies. Causes and mechanisms of endocrinopathies. Dysregulatory endocrinopathies: disorders of nervous, neuroendocrine, endocrine and metabolic regulation of endocrine glands. Violation of direct and indirect regulatory links. Glandular endocrinopathies: causes and mechanisms of disorders of synthesis, deposition and secretion of hormones.

Peripheral disorders of endocrine function. Disorders of transport and metabolic inactivation of hormones. Disorders of hormone reception, mechanisms of desensitization and hormonal resistance (prereceptor, receptor, postreceptor).

Pathology of the hypothalamic-pituitary system. Causes and mechanisms of development of syndromes of excess and deficiency of pituitary hormones. General characteristics of disorders of the hypothalamic-pituitary-thyroid, hypothalamic-pituitary-adrenal, hypothalamic-pituitary-gonadal systems. Etiology, pathogenesis, clinical manifestations of panhypopituitarism. Causes, mechanisms, clinical manifestations of partial insufficiency of adenohypophysis hormones (STG, TSH, ACTH, gonadotropins). Etiology, pathogenesis, clinical manifestations of partial hyperfunction of the adenohypophysis (STG, TSH, ACTH, gonadotropins, prolactin).

Pathophysiology of the neurohypophysis. Diabetes mellitus: causes and mechanisms of development, clinical manifestations.

Pathology of the adrenal glands. Insufficiency of the adrenal cortex: types (primary, secondary; acute, chronic), etiology, pathogenesis, clinical manifestations. Hyperfunction of the adrenal cortex: types (primary, secondary), etiology, pathogenesis, clinical manifestations. Itsenko-Cushing's syndrome, Conn's syndrome, congenital hyperplasia of the adrenal cortex (adrenogenital syndrome). Types, causes, mechanisms of development, clinical manifestations of disorders of the cerebral substance of the adrenal glands.

Pathology of the thyroid gland. Hypothyroidism: causes and mechanisms of development, pathogenesis of major disorders in the body. Hyperthyroidism: causes and mechanisms of development, pathogenesis of major disorders in the body. Goiter: species (endemic, sporadic, nodular and diffuse toxic), their etiology and pathogenesis; characteristics of disorders of the functional state of the gland.

Dysfunction of the parathyroid glands: types, causes, mechanisms of development, clinical and pathophysiological manifestations.

Gonadal dysfunction: primary and secondary states of hyper- and hypogonadism. Causes and mechanisms of development, extragenital manifestations of gonadal dysfunction.

Disorders of endocrine function of the pancreas (see section "Pathology of carbohydrate metabolism").

Pathology of the pineal gland: hypo- and hyperfunction, main manifestations.

Principles of diagnosis and methods of treatment of pathology of endocrine glands.

The concept of stress as a non-specific, stereotyped adaptive response of the body to the action of extraordinary stimuli. Stages of development of the general adaptation syndrome. Mechanisms of long-term adaptation. The concept of stressors and "adaptation diseases". Principles of prevention of stressors.

Topic 42. Pathophysiology of the nervous system.

General characteristics of the pathology of the nervous system, the principles of classification of disorders of its activity. Features of development of typical pathological processes in the nervous system.

Disorders of sensory functions of the nervous system. Disorders of mechano-, thermo-, proprio- and nociception. Violation of sensory information. Brown-Sekara syndrome. Manifestations of damage to the thalamic centers and sensory structures of the cerebral cortex.

Pain. Features of pain as a type of sensitivity. Principles of pain classification. Somatic pain. Visceral pain. Modern ideas about the causes and pathogenesis of pain: the theory of impulse distribution ("gate theory"), the theory of specificity. Pathological pain: neuralgia, causalgia, phantom, thalamic. Peripheral, peripheral - central and central mechanisms of pathological pain. Emotional, autonomic, motor reactions of the body to pain. Emotional and painful stress, painful shock. Natural antinociceptive mechanisms. Principles and methods of pain therapy.

Impaired motor function of the nervous system. Experimental modeling of motor disorders. Peripheral and central paralysis and paresis: causes, mechanisms of development, main manifestations. Spinal shock. Motor disorders of subcortical origin. Disorders associated with cerebellar lesions. Cramps, their types. Disorders of neuromuscular transmission. Myasthenia.

Disorders of autonomic nervous system, methods of experimental modeling. Syndrome of vascular dystonia.

Disorders of trophic function of the nervous system. Neurogenic dystrophies. Etiology, pathogenesis.

Disorders of integrative functions of the central nervous system (CNS). Causes and mechanisms of disorders of electrical activity of neurons. Disruption of ion channels. Causes and mechanisms of disorders of neurochemical processes. Metabolic disorders of neurotransmitters, neuromodulators, neurohormones. Pathological excitation and pathological inhibition of nerve centers.

Neuronal damage as one of the causes of CNS integrative dysfunction.

Acute and chronic disorders of cerebral circulation. Stroke. Swelling and swelling of the brain, causes and mechanisms of development. Intracranial hypertension. The role of neuroglia damage in the development of pathological processes in the CNS. Damage to the blood-brain barrier and autoimmune brain damage.

Topic 43. Practical skills on "Pathophysiology of regulatory systems (endocrine, nervous)».

The structure of the discipline

Topic	Lect.	Pr. cl.	Ind. work
BLOCK 1. GENERAL PATHOPHYSIOLOGY			
Section 1. General nosology - a general study of the disease, etiology and pathogenesis. Pathogenic action of environmental factors. The role of internal factors in pathology.			
1. Subject and tasks of pathophysiology. Methods of pathophysiological research. The main stages of development of pathophysiology.	1	0.5	1
2. General doctrine of disease, etiology and pathogenesis.	1	0.5	1
3. Pathogenic action of physical factors.	-	1	2
4. Pathogenic action of chemical factors.	-	-	2
5. Pathogenic action of biological factors.	-	-	2
6. The role of heredity, constitution, age-related changes in pathology.	-	-	2
7. Reactivity pathology. Violation of immunological reactivity.	2	2	2
8. Allergy.	2	2	2
9. Practical skills and testing under section 1	-	2	2
Section 2. Typical pathological processes.			
10. Cell pathophysiology. Cell damage.	-	1	1
11. Typical disorders of peripheral circulation and microcirculation.	-	1	1
12. Inflammation.	2	2	2
13. Fever.	-	2	2
14. Tumors.	2	2	2
15. Hypoxia.	-	2	2
16. Pathophysiology of extreme states.	-	2	2
17. Practical skills and testing under section 2.	-	2	2
Section 3. Typical metabolic disorders.			
18. Disorders of energy metabolism.	-	-	2
19. Disorders of carbohydrate metabolism.	2	2	2
20. Disorders of fat metabolism.	-	-	2

Individual work - a review of the scientific literature or experimental research

21. Disorders of protein metabolism. Disorders of metabolism of purine and pyrimidine bases.	-	-	2	
22. Disorders of water-salt metabolism.	2	2	1	
23. Violation of the acid-base state.	1	1	1	
24. Starvation.	-	1	1	
25. Practical skills and testing under section 3.	1	1	1	
FINAL CONTROL WORK ON THE BLOCK 1	-	-	2	
Total hours - 90. ECTS credits - 3.0	15	30	45	
BLOCK 2. PATHOPHYSIOLOGY OF ORGANS AND SYSTEMS				
Section 4. Pathophysiology of blood system				Individual work - a review of the scientific literature or experimental research
26. Pathophysiology of the blood system. Anemia caused by blood loss. Erythrocytosis.	1	1	2	
27. Hemolytic anemias and anemias caused by erythropoiesis disorders.	1	1	2	
28. Leukocytosis, leukopenia.	1	1	2	
29. Leukemia.	1	0.5	2	
30. Disorders of the hemostasis system.	-	0.5	2	
31. Practical skills and testing under section 4.	-	2	2	
Section 5. Pathophysiology of systemic circulation and external respiration.				
32. Pathophysiology of systemic circulation. Circulatory failure.	2	0.5	2	
33. Pathophysiology of the heart. Heart failure. Coronary insufficiency.	2	1	2	
34. Pathophysiology of blood vessels.	2	0.5	2	
35. Pathophysiology of external respiration. Respiratory failure.	2	2	2	
36. Practical skills and testing under section 5.	-	2	1	
Section 6. Pathophysiology of digestion, liver, kidneys.				
37. Pathophysiology of the digestive system. Insufficiency of digestion.	1	0.5	2	
38. Pathophysiology of the liver. Hepatic failure.	1	0.5	2	
39. Pathophysiology of the kidneys. Renal failure.	2	1	2	
40. Practical skills and testing under section 6.	-	2	1	

Section 7. Pathophysiology of regulatory systems (endocrine, nervous).				
41. Pathophysiology of the endocrine system.	2	1	2	
42. Pathophysiology of the nervous system.	2	1	2	
43. Practical skills and testing under section 7.	-	-	1	
FINAL CONTROL WORK ON THE BLOCK 2	-	2	2	-
Total hours - 75. ECTS credits - 2.5	20	20	35	4

4. Content of the academic discipline

4.1. Plan of the lectures

№	Topic of class / plan	Number of hours
BLOCK 1. GENERAL NOSOLOGY		
1	Topic 1. Subject and tasks of pathophysiology. Methods of pathophysiological research. The doctrine of disease, etiology and pathogenesis. 1) The subject and tasks of pathophysiology. 2) Methods of pathophysiological research. 3) The doctrine of disease, etiology and pathogenesis.	2
2	Topic 2. Reactivity pathology. Immune system disorders. Lack of immunity. 1) Pathology of reactivity. 2) Disorders of the immune system. 3) Insufficient immunity.	2
3	Topic 3. Allergy. Etiology, pathogenesis, clinical manifestations. Autoimmune diseases. 1) The concept of allergy, classification of allergic reactions. 2) Etiology, pathogenesis, clinical manifestations of allergy. 3) Autoimmune diseases.	2
4	Topic 4. Inflammation: types, manifestations. Etiology, pathogenesis of acute and chronic inflammation. 1) The concept of inflammation. Types, manifestations of inflammation. 2) Etiology and pathogenesis of acute inflammation. 3) Etiology and pathogenesis of chronic inflammation.	2

5	<p>Topic 5. Tumors. Features of tumor growth. Etiology and pathogenesis of tumor growth.</p> <p>1) The concept of tumor growth. Types of tumor growth.</p> <p>2) Features of tumor growth.</p> <p>3) Etiology and pathogenesis of tumor growth.</p>	2
6	<p>Topic 6. Disorders of carbohydrate metabolism. Diabetes mellitus: definition, classification, clinical manifestations and complications. Etiology, pathogenesis of the main forms of diabetes mellitus (types 1 and 2).</p> <p>1) Hyper- and hypoglycemia.</p> <p>2) Diabetes mellitus: definition, classification, clinical manifestations and complications.</p> <p>3) Etiology, pathogenesis of the main forms of diabetes mellitus (1st and 2nd types).</p>	2
7	<p>Topic 7. Pathology of water-salt metabolism. Conditions of hyper- and hypohydria. Edema: types, etiology, pathogenesis.</p> <p>1) The concept of VSO and its violation.</p> <p>2) Conditions of hyper- and hypohydria.</p> <p>3) Edema: types, etiology, pathogenesis.</p>	2
8	<p>Topic 8. Violation of the acid-base state. Acidosis, alkalosis: classification, etiology, pathogenesis. Compensation and correction mechanisms.</p> <p>1) The concept of acid-base state and its violation.</p> <p>2) Acidosis, alkalosis: classification, etiology, pathogenesis.</p> <p>3) Mechanisms of compensation and correction for violations of acid-base state.</p>	1
<i>Total hours</i>		<i>15</i>
BLOCK 2. PATHOPHYSIOLOGY OF ORGANS AND SYSTEMS		
9	<p>Topic 9. Pathophysiology of the blood system. Anemia: principles of classification, types, etiology, pathogenesis; clinical and hematological manifestations of anemia.</p> <p>1) The concept of the blood system and its pathology.</p> <p>2) Anemia: principles of classification, types, etiology, pathogenesis.</p> <p>3) Clinical and hematological manifestations of anemia.</p>	2

10	<p>Topic 10. Leukocytosis, leukopenia. Leukemia. Etiology, pathogenesis of leukocytosis and leukopenia. Leukemia: principles of classification, main types, typical manifestations. Etiology of leukemia. Features of the pathogenesis of acute and chronic leukemias.</p> <ol style="list-style-type: none"> 1) The concept of leukocytosis and leukopenia. Etiology and pathogenesis. 2) Leukemia: principles of classification, main types, typical manifestations. 3) Etiology of leukemia. Features of the pathogenesis of acute and chronic leukemias. 	2
11	<p>Topic 11. Pathophysiology of the circulatory system. Circulatory failure.</p> <ol style="list-style-type: none"> 1) The concept of circulatory failure. 2) Chronic circulatory failure. Types, causes, mechanisms, manifestations. 3) Acute circulatory failure. Types, causes, mechanisms, manifestations. 	2
12	<p>Topic 12. Heart failure. Coronary insufficiency: etiology, pathogenesis, consequences, clinical manifestations. Myocardial infarction.</p> <ol style="list-style-type: none"> 1) The concept of heart failure. Classification, causes, mechanisms, manifestations. 2) Coronary insufficiency: etiology, pathogenesis, consequences, clinical manifestations. 3) Myocardial infarction. 	2
13	<p>Topic 13. Pathophysiology of blood vessels. Arterial hypertension: types, etiology, pathogenesis. Atherosclerosis: etiology, pathogenesis.</p> <ol style="list-style-type: none"> 1) The concept of vascular insufficiency. Causes mechanisms, types. 2) Arterial hypertension: types, etiology, pathogenesis. Hypotension. 3) Atherosclerosis: etiology, pathogenesis. 	2
14	<p>Topic 14. Pathophysiology of external respiration. Respiratory failure. Causes and mechanisms of alveolar ventilation disorders, diffusion of gases through the respiratory membrane, perfusion of the systemic circulation.</p> <ol style="list-style-type: none"> 1) The concept of respiratory failure. Classification. 2) Causes and mechanisms of alveolar ventilation disorders. 3) Causes and mechanisms of disorders of gas diffusion through the respiratory membrane, perfusion of the small circulation. 	2

15	<p>Topic 15. Pathophysiology of the digestive system and liver. Disorders of secretory and motor function of the digestive tract. Gastric or peptic ulcer: Digestive disorders associated with secretory insufficiency of the pancreas. Insufficiency of digestion. Hepatic failure.</p> <p>1) The concept of indigestion. Indigestion in the mouth and swallowing.</p> <p>2) Indigestion in the stomach. Gastric or peptic ulcer:</p> <p>3) Indigestion in the intestine. Hepatic failure.</p>	2
16	<p>Topic 16. Pathophysiology of the kidneys. Renal failure. Causes and mechanisms of glomerular filtration disorders, tubular reabsorption and secretion. Acute and chronic renal failure: criteria, causes, mechanisms, general manifestations. Glomerulonephritis. Nephrotic syndrome.</p> <p>1) Causes and mechanisms of disorders of glomerular filtration, tubular reabsorption and secretion.</p> <p>2) Acute and chronic renal failure: criteria, causes, mechanisms, general manifestations.</p> <p>3) Glomerulonephritis. Nephrotic syndrome.</p>	2
17	<p>Topic 17. Pathophysiology of the endocrine system. General mechanisms of endocrine system disorders. Neuroendocrine disorders. Syndromes of excess or deficiency of pituitary hormones. Pathology of the adrenal glands. Pathology of the thyroid gland.</p> <p>1) General mechanisms of disorders of the endocrine system.</p> <p>2) Neuroendocrine disorders. Syndromes of excess or deficiency of pituitary hormones.</p> <p>3) Pathology of the adrenal glands. Pathology of the thyroid gland.</p>	2
18	<p>Topic 18. Pathophysiology of the nervous system. Principles of classification of violations. Features of development of typical pathological processes in the nervous system. Disorders of sensory, motor and trophic functions of the nervous system. Pathogenesis of neurogenic dystrophies.</p> <p>1) Principles of classification of disorders of the nervous system.</p> <p>2) Features of the development of typical pathological processes in the nervous system.</p> <p>3) Disorders of sensory, motor and trophic functions of the nervous system. Pathogenesis of neurogenic dystrophies.</p>	2
Total hours		20

4.2. Plan of the practical classes

№	Topic of class	Number of hours
BLOCK 1. GENERAL PATHOPHYSIOLOGY		
1	Topic 1-2. Subject, tasks and methods of pathophysiology. General doctrine of disease, etiology and pathogenesis. Pathogenic effect of ionizing radiation on the body.	1
	Topic 3. Pathogenic effect of ionizing radiation on the body.	1
2	Topic 4. Reactivity pathology. Violation of immunological reactivity.	2
3	Topic 5. Allergy.	2
4	Topic 6. Practical skills on the topic "General nosology".	2
5	Topic 7. Cell pathophysiology. Disorders of peripheral blood circulation and microcirculation.	1
	Topic 8. Disorders of peripheral blood circulation and microcirculation.	1
6	Topic 6. Inflammation.	2
7	Topic 7. Disorders of heat exchange. Fever.	2
8	Topic 8. Tumors.	2
9	Topic 9. Hypoxia.	2
10	Topic 10. Pathophysiology of extreme states.	2
11	Topic 11. Practical skills on the topic "Typical pathological processes".	2
12	Topic 12. Disorders of carbohydrate metabolism. Diabetes mellitus.	2
13	Topic 13. Disorders of water-salt metabolism and micronutrient metabolism.	2
14	Topic 14. Violation of the acid-base state. Starvation.	1
	Topic 15. Starvation.	1
15	FINAL CONTROL WORK ON THE BLOCK 1	2
<i>Total hours</i>		30
BLOCK 2. PATHOPHYSIOLOGY OF ORGANS AND SYSTEMS		

1	Topic 1. Post-hemorrhagic, hemolytic anemias and anemias caused by erythropoiesis disorders.	2
2	Topic 2. Leukocytosis, leukopenia.	1
	Topic 3. Leukemia.	0.5
	Topic 4. Disorders of the hemostasis system.	0.5
3	Topic 5. Practical skills on the topic "Blood Pathology".	2
4	Topic 6. Pathophysiology of systemic circulation. Circulatory failure.	0.5
	Topic 7. Pathophysiology of the heart. Heart failure. Coronary heart disease. Arrhythmias.	1
	Topic 8. Pathophysiology of blood vessels.	0.5
5	Topic 9. Pathophysiology of external respiration. Respiratory failure.	2
6	Topic 10. Practical skills on "Pathophysiology of systemic circulation and external respiration".	2
7	Topic 11. Pathophysiology of the digestive system. Pathophysiology of the liver.	1
	Topic 12. Pathophysiology of the kidneys. Renal failure.	1
8	Topic 13. Practical skills on "Pathophysiology of digestion, liver, kidneys."	2
9	Topic 14. Pathophysiology of the endocrine system. Pathology of the pituitary gland and thyroid gland. Pathology of the adrenal glands. Stress.	1
	Topic 15. Pathophysiology of the nervous system.	1
10	FINAL CONTROL WORK ON THE BLOCK 2	2
Total hours		20

Note. * - Plan of each practical lesson:

- 1) Written solution of test problems "KROK-1" on the topic.
- 2) Group work on mistakes, at the same time oral questioning on all material of the topic.
- 3) Assessment of knowledge.

4.3. Tasks for independent work

№	TOPIC	Number of hours
Block 1. General pathophysiology		
1	Preparation for practical classes (theoretical training, development of practical skills)	15
2	Online courses and online testing	10
3	Independent elaboration of topics that are not included in the classroom plan Block 1 (list attached)	15
4	Individual work	3
5	Preparation for the final test	2
	Together	45
Block 2. Pathophysiology of organs and systems		
1	Preparation for practical classes (theoretical training, development of practical skills)	10
2	Online courses and online testing	10
3	Independent elaboration of topics that are not included in the classroom plan Block 2 (list attached)	10
4	Individual work	3
5	Preparation for the final test	2
	Together	35

BLOCK 1

1. History of pathophysiology development. National School of Pathophysiologists (N.A. Hrzhonshevsky, V.V. Pidvysotsky, V.K. Lindeman, O.O. Bogomolets, N.N. Syrotinin, A.V. Repryov, D.O. Alpern, V.V. Voronin, N.N. Zaiko). Modern schools of pathophysiologists, the main directions of their activity.
2. The main directions of the doctrine of the disease: humoral (Hippocrates), solidarity (Democritus), cellular (R. Virkhov). The development of these areas at the present stage. Causation and relationships, their variants and "circulus vitiosus". The concept of the main link of pathogenesis.
3. Influence on an organism of factors of space flight, acceleration, weightlessness.
4. Pathogenic action of thermal factors. Heat and sunstroke. Artificial hypothermia, its use in medicine. Local manifestations - burns, frostbite.
5. Aging. General signs and patterns of aging. Structural, functional and biochemical manifestations of aging at the molecular, cellular, tissue, organ levels and at the level of the whole organism. Theories of aging. Progeria. Methods of geroprotection.
6. Pathophysiological bases of organ and tissue transplantation. Graft rejection reaction: causes, mechanisms. Graft versus host reaction. Immunological relationships in the "mother-fetus" system.

7. Information mechanisms of cell damage. Alarm pathology, signal reception. The phenomenon of molecular mimicry. Disorders of signal transduction mechanisms, disorders of secondary messengers. Defects of cellular programs as a basis for the development of pathological processes.
8. Typical lymphatic disorders. Mechanical, dynamic and resorption insufficiency of lymph circulation.
9. Modern principles of oxygen therapy. Iso - and hyperbaric oxygenation. Toxic effect of oxygen. Hyperoxia and free radical reactions.
10. The concept of "crash syndrome". Causes, mechanisms of development, manifestations.
11. Disorders of carbohydrate absorption, processes of synthesis, deposition and breakdown of glycogen, transport of carbohydrates into cells. Violation of nervous, hormonal regulation of carbohydrate metabolism.
12. Disruption of cell energy supply. Disorders of nutrient transport across cell membranes, disorders of intracellular catabolic pathways. Disorders of cellular respiration, the effect of separation of oxidation and phosphorylation, its mechanisms. Significance of disorders of energy metabolism in the life of cells, organs, organism. The role of disorders of energy supply of cells in the development of their damage.
13. Disorders of digestion and absorption of lipids. Disorders of lipid transport in the blood. Hyper-, hypo-, dyslipoproteinemia. Dependence of dyslipoproteinemia on environmental factors (diet, nutrition, heredity, comorbidities).
14. Hereditary disorders of amino acid metabolism: phenylketonuria, tyrosinosis, alkaptonuria, albinism, hypothyroidism, orotaciduria. Pathology of purine metabolism. Hyper- and hypouricemia.
15. Hypercalcemic conditions: causes and mechanisms of development. Soft tissue calcification: metastatic, dystrophic and metabolic mechanisms. Hyper- and hypophosphatemia. Causes and mechanisms of development.

BLOCK 2

1. Hemorrhagic shock. Blood transfusion and posthemotransfusion reactions: mechanisms of development and means of prevention.
2. Myocarditis: definition, etiology, pathogenesis, principles of classification, clinical manifestations.
3. Cardiomyopathy: classification, characteristics of causes and mechanisms of occurrence and clinical manifestations.
4. Circulatory disorders in arrhythmias.
5. Metabolic X-syndrome: clinical signs, causes and mechanisms, stages of development, clinical significance.
6. Experimental models of arterial hypertension.
7. Causes and mechanisms of digestive disorders in the oral cavity. Etiology, pathogenesis, experimental models of caries and periodontitis. Causes, mechanisms and consequences of salivation disorders.
8. Impaired motor function of the esophagus. Etiology and pathogenesis of heartburn.
9. Intestinal barrier dysfunction. Intestinal autointoxication, coli-sepsis, dysbacteriosis.

10. Gallstone disease. Definition, etiology, pathogenesis, clinical manifestations. Mechanisms of stone formation.
11. Kidney stone disease. Definition, etiology, pathogenesis, clinical manifestations. Mechanisms of stone formation.
12. Principles of treatment of renal failure. The concept of extracorporeal and peritoneal hemodialysis, lyfodialysis and hemosorption.
13. Dysfunction of the gonads. Primary and secondary states of hypogonadism: causes and mechanisms of development. Adrenogenital syndrome: etiology, pathogenesis, clinical manifestations.
14. Modern ideas about the causes and pathogenesis of pain: the theory of impulse distribution ("gate theory"), the theory of specificity. Principles of pain classification.
15. Pathological pain: neuralgia, causalgia, phantom, thalamic pain. Emotional and painful stress, painful shock. Natural antinociceptive mechanisms. Principles and methods of anesthesia.

Individual tasks

Selection and review of scientific literature on the subject of the program in pathophysiology of the student's choice with the writing of an abstract and its public defense.

Selection and review of scientific literature on the subject of research work of the department with the preparation of a scientific report at a meeting of the student scientific society or at student conferences.

Experimental research on the topic of research work of the department with the publication of results in scientific journals.

The assessment of an individual task is carried out according to the criteria and points of a separate practical lesson (see section 6 below), ie the maximum score is 7 points for the autumn semester (5 points for the spring semester).

Typical test problems to be solved in practical classes

1. The patient has atrophy of the alveolar processes of the jaw after tooth extraction. This is an example:
 - A. pathological reaction
 - B. pathological process
 - C. structural trace of adaptation
 - D. diseases
 - E. pathological condition
2. In 1910, Raus experimentally obtained chicken sarcoma by injecting them with the cell-free filtrate obtained from chicken sarcoma. What method of experimentation did the author use?
 - A. Explantation
 - B. Isotransplantation
 - C. Homotransplantation
 - D. Heterotransplantation
 - E. Induction
3. At X-ray inspection at the patient with a peptic ulcer the stenosis of the goalkeeper is revealed. This violation is:

- A. Disease
- B. Pathological process
- C. Pathological condition
- D. Pathological reaction

4. A 50-year-old man who was treated for peptic ulcer disease, normalized digestion, pain disappeared, improved mood. But after a few weeks, epigastric pain, heartburn, and sour belching reappeared. How can we characterize this course of the disease?

- A. Terminal state.
- B. Period of remission.
- C. Recurrence of the disease.
- D. Prodromal period.
- E. Latent period.

5. At the end of winter, a student who had recently experienced mental overload became ill with an acute respiratory illness after hypothermia. What is the reason for this?

- A. Mental overload.
- B. Pathogenic pathogen.
- C. Hypothermia.
- D. Irrational nutrition.
- E. Hypovitaminosis.

4.4. Ensuring the educational process

1. Multimedia projectors, computers, screens for multimedia presentations, lecture presentations.
2. Demonstration screens, laptops, files in Power Point and Word with tasks "KROK-1" for practical and final classes.
3. Examination tickets.

5. Final control

List of final control (exam) questions

1. Subject, tasks and methods of pathophysiology, connection with other sciences, significance for the clinic. Pathophysiology as an academic discipline.
2. History of the development of pathophysiology in Ukraine (NA Khrzhonshchevsky, VV Pidvysotsky, OO Bogomolets, OV Reprev, DO Alpern).
3. Basic concepts of nosology: health, disease, pathological condition, pathological process, typical pathological process, pathological reaction.
4. Universal periods in the development of the disease. Options for ending the disease. The concept of terminal states: agony, clinical death, biological death. Principles of resuscitation.
5. Classification of etiological factors, the concept of risk factors. "Diseases of civilization."
6. Definition of "pathogenesis". Pathological (destructive) and adaptive-compensatory (protective) phenomena in the pathogenesis (on the examples of acute radiation sickness, inflammation, blood loss). Causal relationships, the role of circulus vitiosus in pathogenesis; the concept of the main and secondary links of pathogenesis.

7. Patterns of development of mechanical trauma. Traumatic shock. Prolonged crushing syndrome.
8. Mechanisms of pathogenic action of ionizing radiation on the body. Tissue radiosensitivity. General characteristics of forms of radiation damage. Local and general effect on the body of ionizing radiation. Acute radiation sickness, its forms.
9. Chemical pathogens as a problem of ecology and medicine. Toxicity, carcinogenicity, teratogenicity of chemical compounds. Exointoxication. Pathophysiological aspects of smoking, alcoholism and drug addiction.
10. Hereditary and congenital diseases. Mutations as a cause of hereditary diseases (types, causes, consequences of mutations). Pathogenesis of monogenic diseases with non-classical inheritance. Polygenic (multifactorial) diseases. Chromosomal diseases, their etiology, pathogenesis. General characteristics of Down, Klinefelter, Shereshevsky-Turner syndromes.
11. The role of reactivity in pathology. Reactivity and resistance: definitions, types, mechanisms. Dependence of reactivity on age, sex, heredity, condition of the nervous and endocrine systems.
12. General characteristics of immune system disorders: abnormal immune response to exoantigens and loss of tolerance to autoantigens. Mechanisms of tolerance of the immune system to autoantigens. Causes and consequences of its abolition.
13. Types of immune deficiency. Etiology, pathogenesis of primary and secondary immunodeficiencies. Typical manifestations of immune deficiency.
14. Etiology, pathogenesis of AIDS. Pathophysiological characteristics of periods of HIV infection. Typical clinical manifestations. Principles of prevention and treatment of HIV infection.
15. Definition of "allergy", the principles of classification of allergic reactions. Multifactorial nature of allergic diseases.
16. Allergic reactions of type 1 (anaphylactic), according to Coombs and Jell. Etiology, pathogenesis, clinical manifestations of local and systemic anaphylactic reactions. Mediators of anaphylaxis. "Pseudoanaphylactic" reactions.
17. Allergic reactions type 2 (cytotoxic, antibody-mediated), according to Coombs and Jell. Etiology, pathogenesis, clinical manifestations.
18. Allergic reactions of type 3 (mediated by immune complexes), according to Coombs and Jell. Etiology, pathogenesis, clinical manifestations of local and systemic reactions. Serum sickness.
19. Allergic reactions of type 4 (mediated by cells), according to Coombs and Jell. Etiology, pathogenesis, clinical manifestations.
20. Type 5 allergic reactions (antibody-mediated cellular dysfunctions). Etiology, pathogenesis, clinical manifestations.
21. Cell damage, principles of classification. Cell death (necrosis, apoptosis), their symptoms. Universal mechanisms of cell damage. Mechanisms of cellular protection and adaptation of cells to the action of damaging factors.
22. Arterial and venous hyperemia: definition, manifestations, types, causes and mechanisms of development, completion options and consequences.

23. Ischemia: definition, manifestations, types, causes, mechanisms of development, consequences. Mechanisms of ischemic cell damage. Ischemia-reperfusion syndrome.
24. Thrombosis: definition, types of blood clots. Causes, mechanisms, consequences of thrombosis.
25. Embolism: definition, types of emboli. Features of the pathogenesis of embolism of the great and small circulatory system, the portal vein system.
26. Stasis: definition, types, causes, pathogenesis, consequences.
27. Disorders of microcirculation, classification. Sludge syndrome: definition, causes and mechanisms of development. Disorders of local lymph circulation, types, causes and mechanisms of development.
28. Inflammation: definition, principles of classification. Characteristics of acute and chronic inflammation. General manifestations and local signs of inflammation. Etiology of inflammation.
29. Pathogenesis of acute inflammation, stages. Combination of pathological and adaptive-compensatory changes in the dynamics of acute inflammation. Alteration, types, causes, mechanisms.
30. Changes in local blood circulation in inflammation (according to J. Congheim). Pathogenesis of separate stages of vascular reaction in the center of acute inflammation.
31. Exudation in the inflammatory focus, its causes and mechanisms. Phases of increasing the permeability of the vascular wall. Types of exudates.
32. Emigration of leukocytes in the inflammatory focus. Sequence, causes and mechanisms of leukocyte emigration. The role of leukocytes in the development of local and general manifestations of inflammation. Mechanisms of microbial neutralization by leukocytes.
33. Mediators of inflammation, their classification. Mechanisms of formation and biological action.
34. Cell proliferation in the inflammatory focus, its mechanisms.
35. The role of the body's reactivity in the development of inflammation. The link between a pathological immune response and inflammation. Influence of hormonal factors on inflammation.
36. Fever: definition, principles of classification. The link between fever and inflammation. Types of pyrogens.
37. Fever: stages of development, changes in thermoregulation, metabolism and physiological functions. Protective value and pathological manifestations of fever. Principles of antipyretic therapy. The concept of pyrotherapy.
38. Tumors: definition, principles of tumor classification. General patterns of tumor growth. Typical properties of benign and malignant tumors. Types of anaplasia. Ways and mechanisms of metastasis.
39. Etiology of tumors. General characteristics of carcinogens. Risk factors (genetic / chromosomal defects, constitutional abnormalities) and conditions of occurrence and development of tumors.
40. Pathogenesis of tumor growth. The role of disorders of molecular (genetic) mechanisms of regulation of cell division in the process of tumor transformation.

Methods of conversion of protooncogenes into oncogenes. Properties of oncoproteins.

42. Hypoxia: definition, classification, etiology, pathogenesis. Pathological changes and adaptive-compensatory reactions in hypoxia.

42. The idea of extreme conditions. General characteristics.

43. Causes and mechanisms of shock, clinical and pathophysiological manifestations.

44. Coma: definition, variety; causes and mechanisms of comatose states.

45. Characteristics of disorders of carbohydrate metabolism; criteria for euglycemia, hypoglycemia, hyperglycemia, impaired glucose tolerance. The role of changes in neuro-humoral regulation of carbohydrate metabolism in the pathogenesis of hypo- and hyperglycemic states.

46. Definition, classification of diabetes mellitus (WHO). General characteristics of the main types of diabetes mellitus (type of insulin deficiency, its origin, features of the course, typical manifestations, complications and principles of treatment).

47. Conclusion of diabetes mellitus. Causes and mechanisms of different types of coma in diabetes. Remote replenishment of diabetes.

48. Experimental modeling of diabetes mellitus. Principles of prevention and therapy of its main types. Prevention of comparison of diabetes mellitus.

49. Disorders of lipid metabolism: causes, mechanisms, manifestations. Dependence of dyslipoproteinemia development on environmental factors, heredity, concomitant problems. Principles of classification of dyslipoproteinemias. Etiology and pathogenesis of primary (hereditary) and secondary hyperlipoproteinemias.

50. Obesity: definition, classification; etiology and pathogenesis of some forms. Experimental modeling of obesity. Medical problems associated with obesity.

51. Positive and negative nitrogen balance. Types of hyperazotemia. Changes in the protein composition of the blood. Hereditary disorders of amino acid metabolism.

52. Disorders of purine and pyrimidine metabolism. Etiology, pathogenesis of gout.

53. Hypothesis of hypervitaminosis: sees the causes and mechanisms of development. Pathogenesis of the main clinical manifestations. Principles of correction of vital insufficiency.

54. Violation of water-salt metabolism. Forms of hyper- and hypohydria, their etiology, pathogenesis, consequences. Sodium and potassium metabolism: causes, mechanisms, clinical manifestations.

55. Edema: definition, sees, causes and mechanisms of edema (according to Starling).

56. Violation of the acid-base state. Acidosis, alkalosis: definition, classification, causes of development. Compensatory and pathological reactions.

57. Fasting: definition, classification. Causes of starvation. Pathophysiology of incomplete and partial (what) starvation. Types, through and mechanisms that affect the features of manifestations. The concept of treatment of voting.

58. Disorders of general blood participation: classification, causes and mechanisms of development. Etiology, pathogenesis of blood loss. Pathogenesis of post-hemorrhagic shock.

59. Anemia: definition, principles of classification. Regenerative, degenerative, pathological forms of erythrocytes. Post-hemorrhagic anemia: see, cause, pathogenesis, blood picture.

60. Hemolytic anemia, classification; causes and mechanisms hemolyze erythrocytes. Clinical and hematological characteristics of different types of hemolytic anemias.
61. Iron deficiency anemia: causes and mechanisms of development, typical changes in peripheral blood, pathogenesis of major clinical manifestations. Iron refractory anemia.
62. Causes and mechanisms of deficiencies of vitamin B12 and folic acid. Characteristics of general reports in particular vitamin B12 and / or folic acid deficiency. Hematological characteristics of vitamin B12 and folate deficiency anemias.
63. Leukocytosis: sees, causes and mechanisms of development. Concomitant nuclear facilities of neutrophilic granulocytes. Leukemoid reactions.
64. Leukopenia: sees the causes and mechanisms of development. Agranulocytosis. Neutropenia. Concomitant nuclear facilities of neutrophilic granulocytes.
65. Leukemia: definition, principles of classification. Etiology of leukemia. Anomalies of genotype and constitution as risk factors for the occurrence and development of leukemia.
66. Violation of the cellular composition of bone marrow and peripheral blood in acute and chronic leukemia. Pathogenesis of leukemia: progression, metastasis, systemic disorders. Principles of diagnosis and treatment of leukemia.
67. Violation of vascular-platelet hemostasis. Etiology and pathogenesis of vasopathy, thrombocytopenia, thrombocytopathy.
68. Insufficiency of coagulation hemostasis. Causes and mechanisms of violations of certain stages of blood clotting.
69. Disseminated intravascular coagulation syndrome, principles of classification, etiology, pathogenesis, clinical manifestations. Role in pathology.
70. Circulatory failure: definition, principles of classification, causes and mechanisms of its various types. Pathogenesis of the main clinical manifestations of chronic circulatory failure.
71. Heart failure: definition, principles of classification. Causes of heart overload with volume and resistance. Mechanisms of immediate and long-term adaptation of the heart to overload. Cardiac hypertrophy, its pathogenesis (according to FZ Meerson). Features of hypertrophied myocardium.
72. Myocardial heart failure. Etiology, pathogenesis of non-coronary myocardial damage. Experimental modeling.
73. Cardiomyopathy: definition, principles of classification; etiology, pathogenesis.
74. Insufficiency of coronary circulation: definition, causes and mechanisms of development, clinical manifestations. Mechanisms of ischemic and reperfusion damage of cardiomyocytes.
75. Ischemic heart disease: types, etiology, pathogenesis, clinical manifestations. Pathogenesis of manifestations and complications of myocardial infarction.
76. Cardiac arrhythmias. Experimental modeling. Causes, mechanisms of disorders of automatism, excitability, conductivity, typical electrocardiographic manifestations.
77. Extramyocardial heart failure. Pericardial lesions. Acute cardiac tamponade, manifestations and consequences.

78. Arterial hypertension: definition, principles of classification. Primary and secondary arterial hypertension. Hemodynamic options.
79. Causes and mechanisms of secondary arterial hypertension, experimental modeling.
80. Primary arterial hypertension as a multifactorial disease; modern ideas about the etiology and pathogenesis of hypertension. The role of the kidneys in the pathogenesis of primary hypertension.
81. Hypertension of the small circle of blood circulation (primary, secondary). Causes and mechanisms of development. Clinical and hemodynamic manifestations.
82. Arterial hypotension. Etiology and pathogenesis of acute and chronic hypotension.
83. Arteriosclerosis: definition, classification. Characteristics of the main forms: atherosclerosis (Marshana), mediocalcinosis (Menkeberg), arteriosclerosis.
84. Atherosclerosis. Etiology of atherosclerosis: risk factors, causal factors. Modern theories of atherogenesis - "inflammatory" and "receptor". The role of hereditary and acquired disorders of receptor-mediated transport of lipoproteins in atherogenesis.
85. Insufficiency of external respiration: definition, principles of classification. Pathogenesis of the main clinical manifestations. Shortness of breath: types, causes, mechanisms of development.
86. Dysregulatory disorders of alveolar ventilation. Causes and mechanisms of pathological respiration (frequency, depth, rhythm disorders). Pathogenesis of periodic respiration.
87. Violation of alveolar ventilation. Obstructive and restrictive mechanisms of development.
88. Causes and mechanisms of gas diffusion disorders in the lungs. Disorders of pulmonary circulation. Violation of general and regional ventilation-perfusion relationships in the lungs.
89. Asphyxia: definition, causes, pathogenesis. Terminal respiration.
90. Causes and mechanisms of digestive disorders in the oral cavity. Etiology, pathogenesis, experimental models of caries and periodontitis. Causes, mechanisms of salivation disorders.
91. General characteristics of disorders of motor and secretory functions of the stomach. Pathological gastric secretion, its types. The role of nervous and humoral mechanisms in secretion disorders.
92. Etiology, pathogenesis of peptic ulcer of the stomach and / or duodenum. Etiology, pathogenesis of symptomatic gastric and / or duodenal ulcers.
93. Disorders of cavity digestion in the intestines; causes, mechanisms, manifestations. Disorders associated with secretory insufficiency of the pancreas. Pancreatitis: types, causes; pathogenesis of acute pancreatitis. Pancreatic shock.
94. Absorption disorders. Causes and mechanisms of malabsorption, pathogenesis of the main clinical manifestations.
95. Intestinal dyskinesias. Causes and mechanisms of constipation and diarrhea. Intestinal obstruction: types, etiology, pathogenesis.
96. Liver failure: definition, principles of classification, causes, experimental modeling.

97. Typical disorders of carbohydrate, protein, lipid, water-electrolyte metabolism, metabolism of vitamins and hormones, systemic disorders in the body with liver failure.
98. Causes, mechanisms, clinical manifestations of liver antitoxic insufficiency. Theories of the pathogenesis of hepatic coma.
99. Insufficient excretory function of the liver: causes, mechanisms, clinical manifestations. Disorders of bile pigment metabolism in different types of jaundice. Cholemic and acholic syndromes.
100. Hemodynamic dysfunction of the liver. Portal hypertension syndrome: etiology, pathogenesis, clinical manifestations.
101. Causes and mechanisms of disorders of filtration, reabsorption and secretion in the kidneys. Functional tests to determine renal impairment.
102. Causes and mechanisms of development of quantitative and qualitative changes in the composition of urine: oliguria, anuria, polyuria; hypostenuria, isostenuria; proteinuria, hematuria, cylindruria, leukocyturia.
103. Syndrome of acute renal failure: definition, causes and mechanisms of development, clinical manifestations. Nephrotic syndrome.
104. Syndrome of chronic renal failure: definition, causes and mechanisms of development, clinical manifestations. Pathogenesis of uremic coma.
105. General manifestations of renal failure. Pathogenesis of edema, hypertension, anemia, hemostasis disorders, acid-base status, osteodystrophy.
106. Glomerulonephritis: definition, principles of classification, experimental models. Etiology, pathogenesis of diffuse glomerulonephritis.
107. Typical disorders of the endocrine glands, their causes and mechanisms of development. Disorders of direct and inverse regulatory links in the pathogenesis of dysregulatory endocrinopathies.
108. Glandular endocrinopathies. Causes and mechanisms of disorders of biosynthesis, deposition and secretion of hormones.
109. Peripheral disorders of endocrine function. Disorders of transport and inactivation of hormones. Disorders of hormone reception. Mechanisms of hormonal resistance.
110. Pathology of the neuroendocrine system. Causes and mechanisms of development of syndromes of excess and deficiency of pituitary hormones, their general characteristics.
111. Insufficiency of the adrenal cortex, acute and chronic: causes and mechanisms of development, pathogenesis of major clinical manifestations.
112. Hyperfunction of the adrenal cortex. Itsenko-Cushing's syndrome. Primary and secondary hyperaldosteronism. Congenital hyperplasia of the adrenal glands (adrenogenital syndrome). Causes, mechanisms, clinical manifestations.
113. Hypothyroidism: causes and mechanisms of development, pathogenesis of the main clinical manifestations.
114. Hyperthyroidism: causes and mechanisms of development, pathogenesis of the main clinical manifestations.
115. Goiter: types, etiology, pathogenesis; dysfunction of the thyroid gland.

116. Hypo- and hyperfunction of the parathyroid glands: etiology, pathogenesis, typical disorders in the body.
117. Dysfunction of the gonads: primary and secondary states of hyper- and hypogonadism. Etiology, pathogenesis, typical clinical manifestations.
118. Stress. Definition of the concept, causes and mechanisms of development, stages. The concept of "disease of adaptation".
119. Pain. Principles of classification. Somatic pain. Modern ideas about the causes and mechanisms of pain: the theory of impulse distribution, the theory of specificity. Pathological pain. The body's response to pain. Natural antinociceptive mechanisms.
120. Impaired motor function of the nervous system. Experimental modeling of motor disorders. Peripheral and central paralysis and paresis: causes, mechanisms, manifestations. Spinal shock. Motor disorders of subcortical origin. Disorders associated with cerebellar lesions. Cramps. Myasthenia.
121. Disorders of autonomic nervous system, methods of experimental modeling. Syndrome of vascular dystonia.
122. Disorders of trophic function of the nervous system. Neurogenic dystrophies. Structural, functional and biochemical changes in denervated organs and tissues.
123. Acute and chronic disorders of cerebral circulation. Stroke. Swelling and swelling of the brain. Intracranial hypertension.

"0" variant of the exam ticket

Petro Mohyla Black Sea National University

Level of higher education - master

Area of knowledge: 22 Health

Specialty 222 Medicine

Educational discipline - **PATHOPHYSIOLOGY**

Variant № 0

1. History of pathophysiology development in Ukraine (NA Khrzhonshchevsky, VV Pidvysotsky, OO Bogomolets, OV Reprev, DO Alpern) - **maximum number of points - 20.**
2. Pathogenesis of acute inflammation, stages. Combination of pathological and adaptive-compensatory changes in the dynamics of acute inflammation. Alteration, types, causes, mechanisms - **maximum number of points - 20.**
3. Anemia: definition, principles of classification. Regenerative, degenerative, pathological forms of erythrocytes. Posthemorrhagic anemia: types, causes, pathogenesis, blood picture - **maximum number of points - 20.**
4. General characteristics of disorders of motor and secretory functions of the stomach. Pathological gastric secretion, its types. The role of nervous and humoral mechanisms in the violation of secretion - **maximum number of points - 20.**

Approved at the meeting of the Department of "Medical Biology and Chemistry, Biochemistry, Microbiology, Physiology, Pathophysiology and Pharmacology", the protocol № ____ from " __ " _____ 2021.

The head of the department
Examiner

Associate professor Korolyova O.V.
Professor Klimenko M.O.

An example of the final control work on block 1

Solving problems KROK-1

1. The patient complains of periodic weakening of bowel movements, which is associated with the consumption of fatty foods. At the same time he notes a decrease in the intensity of the color of feces. During the laboratory examination, the normal content of lipids in the serum was established. Violation of which of the stages of lipid metabolism occurs in this patient?

- A. Blood transport
- B. Intermediate exchange
- C. Absorption
- D. Deposition in adipose tissue
- E. Mobilization of adipose tissue

2. During fasting (in the second period) the patient may increase the amount of lipids in the blood and there is hypoproteinemia. What form of hyperlipemia occurs in this case?

- A. Retention
- B. Alimentary
- C. Food
- D. Redistributive
- E. Transport

3. A 16-year-old patient suffering from Itsenko-Cushing's disease was consulted about being overweight. The survey found that the energy value of food is 1700-1900 kcal / day. What is the main cause of obesity in this case?

- A. Insulin deficiency
- B. Lack of glucocorticoids
- C. Hypodynamia
- D. Excess glucocorticoids
- E. Excess insulin

4. Examination of a 45-year-old man who had been on a plant-based diet for a long time revealed a negative nitrogen balance. What feature of the diet was the cause of this phenomenon?

- A. Excessive carbohydrates
- B. Insufficient amount of protein
- C. Excessive amount of water
- D. Insufficient fat
- E. Insufficient fats and proteins

5. In dogs 1-2 days after removal of the parathyroid glands there was lethargy, thirst, a sharp increase in neuromuscular excitability with the development of tetany. What is the violation of electrolyte metabolism?

- A. Hypocalcemia
- B. Hypercalcemia
- C. Hypomagnesemia
- D. Hyponatremia
- E. Hypermagnesemia

And so 26 problems with the subsequent analysis of typical errors.

An example of the final control work on block 2

Solving problems KROK-1

1. Patient K., 35 years old, complains of constant thirst, decreased appetite. The amount of fluid consumed per day - 9 liters. Daily diuresis is increased, urine is discolored, relative density is 1005. The most probable reason for the development of this pathology in a patient is an injury:

- A. pineal gland
- B. epithelium of the renal tubules
- C. adenohipophysis
- D. hypothalamic nuclei
- E. the basement membrane of the glomerular capillaries

2. 1-2 days after removal of the thyroid glands in dogs were observed: lethargy, thirst, a sharp increase in neuromuscular excitability with the development of tetany. What is the violation of electrolyte metabolism?

- A. Hypermagnesemia
- B. Hypercalcemia
- C. Hypomagnesemia
- D. Hypocalcemia
- E. Hyponatremia

3. A 45-year-old patient was accidentally removed thyroid glands during surgery on the thyroid gland. This led to

- A. Tetany
- B. Increased levels of calcium in the blood and bone resorption
- C. Increased levels of calcium, sodium and potassium in the blood
- D. Lowering blood pressure
- E. Increased blood pressure

4. A 17-year-old man was admitted to the hospital with complaints of growth retardation, graying, alopecia, decreased visual and hearing acuity, hyperkeratosis. Blood hyperglycemia, hypercholesterolemia. What pathology is characterized by these phenomena?

- A. Hutchinson-Guilford syndrome.
- B. Werner's syndrome.
- C. Shereshevsky-Turner syndrome.
- D. Familial hypercholesterolemia.
- E. Klinefelter's syndrome.

5. In women with primary hyperparathyroidism, recurrent attacks of renal colic. Ultrasound examination showed the presence of small kidney stones, the most likely cause of which is:

- A. Hyperuricemia
- B. Hyperphosphatemia
- C. Hypercholesterolemia
- D. Hypercalcemia
- E. Hyperkalemia

And so 40 problems with the subsequent analysis of typical errors.

6. Evaluation criteria and tools for diagnosing learning outcomes

Control methods

- Survey (testing of theoretical knowledge and practical skills).
- Test control.
- Writing a review of scientific literature (abstracts), performing individual tasks, their defense.

Current control. Testing in practical classes of theoretical knowledge and the acquisition of practical skills, as well as the results of independent work of students. Supervised by teachers according to the specific purpose of the curriculum. Assessment of the level of student training is carried out by: interviewing students, solving and analyzing situational tasks and test tasks, interpreting the results of experimental and clinical and laboratory research, monitoring the acquisition of practical skills.

Intermediate control. Checking the possibility of using students for clinical and diagnostic analysis of theoretical knowledge and practical skills on all topics studied, as well as the results of independent work of students. Carried out in the last lesson by section (final lessons) by passing practical skills, solving situational problems and testing.

The final test is carried out upon completion of the study of all topics of the block at the last test session of the semester.

Students who have attended all lectures, classroom classes, completed full-time independent work and scored at least 70 points in the fall semester in the autumn semester and 40 points in the spring semester are admitted to the final test.

In order to assess the results of training in pathophysiology in general, the final control in the form of an exam, which is recommended for academic disciplines, which is part of the integrated test exams EDKI and "KROK-2". Only students who have passed both final tests (according to blocks 1 and 2) in the discipline are admitted to the exam.

Distribution of points received by students

Students are evaluated on a 200-point scale.

In the autumn semester for the current educational activity the student can receive from 70 to 120 points. In the autumn semester 15 practical classes. Accordingly, the minimum grade for the class is: $70:15 = 4.7$ points, rounded to 5, but for the semester a total of no more than 70 points. A score below 5 points means "unsatisfactory", the lesson is not credited and is subject to practice in the prescribed manner. The maximum score for the lesson is $120:15 = 8$ points. At the final test for block 1, a student can get from 50 to 80 points. The final test is considered credited if the student scored at least 50 points.

In the spring semester for current educational activity, a student can get from 40 to 80 points. In the spring semester 10 practical classes. Accordingly, the minimum score for the lesson is: $40:10 = 4$ points. A score below 4 points means "unsatisfactory", the lesson is not credited and is subject to practice in the prescribed manner. The maximum score for the lesson - $80:10 = 8$ points. On the final test on block 2 the student can receive from 30 to 40 points. The final test is considered

credited if the student scored at least 30 points. At the exam the student can get from 50 to 80 points. A score below 50 points means "unsatisfactory", the exam is not passed and must be retaken in the prescribed manner.

Assessment of student performance

Type of activity (task)	Minimum number of points	Maximum number of points
Block 1		
Practical classes from 1 to 15	5	8
Together	70	120
Final control test for the block 1	50	80
Together for the block 1	120	200
Block 2		
Practical classes from 1 to 10	4	8
Together	40	80
Final control test for the block 2	30	40
Together for the block 2	70	120
Exam	50	80
Together for the block 2 and exam	120	200

Criteria for assessing knowledge

Score 8 points in the fall and spring semesters, 71-80 points on the final test in the fall semester (38-40 points in the spring semester) and 71-80 points on the exam (A on the ECTS scale and 5 on the national scale) the student's response is assessed if it demonstrates a deep knowledge of all theoretical principles and the ability to apply theoretical material for practical analysis and has no inaccuracies.

Scoring 6-7 points in the autumn and spring semesters, 61-70 points on the final test in the autumn semester (35-37 points on the final test in the spring semester) and 61-70 points on the exam (B and C on the ECTS scale and 4 on the national scale) the answer is evaluated if it shows knowledge of all theoretical provisions, the ability to apply them in practice, but some fundamental inaccuracies are allowed.

A score of 5 points in the fall semester (4-5 points in the spring semester), 50-60 points on the final test in the fall semester (30-34 points on the final test in the spring semester) and 50-60 points on the exam (D and E on the ECTS scale) and 3 on a national scale) the student's response is assessed provided that he knows the main theoretical principles and can use them in practice.

7. Recommended sources of information

7.1. Basic

1. Patofiziologiya : pidruch. dlya stud. vyshch. med. navch. zakl. / Yu. V. Byts, G. M. Butenko [ta in.] ; za red.: M. N. Zayka, Yu. V. Bytsya, M. V. Kryshchalya. - 6-e vyd., pererob. i dopov. - Kyyiv : Medytsyna, 2017. - 737 s.
2. Posibnyk do praktychnykh zanyat z patologichnoyi fiziologiyi : navch. posib. dlya stud. vyshch. med. navch. zakl. III-IV rivniv akredytatsiyi / za red. Yu.V. Bytsya, L.Ya. Danylovoyi . - Kyyiv : Zdorov'ya, 2001. - 400 s.
3. General and clinical pathophysiology : textbook for students of higher educational institutions, of IV th level of accreditation / A. V. Kubyshkin [et al.] ; ed. by.: A. V. Kubyshkin, A. I. Gozhenko ; rets.: N. V. Krishtal, N. K. Kazimirko. - 2nd ed. - Vinnytsya : Nova Knyha Publishers, 2016. - 656 p.
4. Pathophysiology=Patofiziologiya : pidruchnyk dlya med. VNZ IV r. a. Zatverdzheno MON / za red. M.V. Kryshchalya, V.A. Mikhnova. - Kyyiv : Medytsyna, 2017. - 656 s.
5. Simeonova N. K. Pathophysiology=Patofiziologiya : textbook for students of higher medical educational institutions of the III-IV accreditation levels / N. K. Simeonova ; ed. by V. A. Mikhnev. – 3rd ed. - Kyiv : AUS Medicine Publishing, 2017. - 544 p.
6. Ataman O. B. Patofiziologiya : pidruch. dlya stud. vyshch. med. navch. zakl. U 2-kh t. T. 1 : Zagalna patologiya / O. B. Ataman. - - 2-ge vyd. - Vinnytsya : Nova knyga, 2016. - 580 s.
7. Ataman O. B. Patofiziologiya : pidruch. dlya stud. vyshch. med. navch. zakl. U 2-kh t. T. 2 : Patofiziologiya organiv i system / O. B. Ataman. - 2-ge vyd. - Vinnytsya : Nova knyga, 2016. - 448 s.

7.2. Auxiliary

1. Ataman O. V. Patologichna fiziologiya v zapytannyakh i vidpovidyakh : navchalnyy posibnyk / O. V. Ataman. - 5-te vyd. - Vinnytsya : Nova knyga, 2017. - 512 s.
2. Bodnar Ya. Ya. Patologichna anatomiya i patologichna fiziologiya lyudyny : pidruchnyk / Ya. Ya. Bodnar, V. V. Fayfura. – Ternopil : Ukrmedknyga, 2000. – 493 s. – ISBN 966–7364–43-7.
3. Vybrani pytannya patologichnoyi fiziologiyi : kn. v 3-kh ch. Ch. 2. Typovi patologichni protsesy / [M. S. Regeda, L. Lyubinets, M. Bidyuk ta in.]; za red. M. S. Regedy. – Lviv : Spolom, 2008.- 276 s.
4. Ganong V.F. Fiziologiya lyudyny : pidruchnyk : per. z angl.. / V. F. Ganong. – Lviv: BaK, 2002. – 784 s.
5. Greyda B. P. Patologichna anatomiya i fiziologiya pry khvorobakh organiv ta system : [navch. posib.] / B. P. Greyda, A. M. Voynarovskyy, Yu. M. Valetskyy. – Lutsk : Volynska oblasna drukarnya, 2004. – 328 s. – ISBN 966-8468-81-3.
6. Zagalna alergologiya : dovidnyk / M.S. Regeda, F.Y. Shchepanskyy, I.V. Poliyants, O.A. Kovalyshyn. – Lviv : Spolom, 2006. – 70 s.

7. Kazmirchuk V. Ye. Klinichna imunologiya i alergologiya: pidruch. dlya stud. vyshch. navch. zakl. IVrivnya akredytatsiyi / V.Ye. Kazmirchuk, L.Ye. Kovalchuk. - Vinnytsya: Nova knyga, 2006. - 528 s.
8. Patologichna fiziologiya : kn. v 3-kh ch. Ch. 1. Nozologiya / [M.S. Regeda, L. Lyubinets, M. Bidyuk ta in.] ; za red. M.S.Regedy. – Lviv : Spolom, 2009. - 290 s.
9. Patologichna fiziologiya : pidruchnyk / za red. prof. M. S. Regedy, prof. A. I. Berezhnyakovoyi. – vyd. 2 -ge, dopov. ta pererobl. – Lviv: Magnoliya 2006, 2011. – 489 s. – ISBN 978-966-2025-95-8.
10. Rozvytok patofiziologiyi v Ukraini : / za red. O.O. Moybenka; uklad. S.B. Frantsuzova. - Kyyiv : b. v., 2009. - 305 s.
11. Skrypnyk I.M. Klinichna gematologiya / I.M. Skrypnyk, T.V. Melnyk, Potyazhenko M.M.: navch. posib. – Poltava : Dyvosvit, 2007. – 424 s.
12. Alberts B. Molecular biology of the cell / B. Alberts. - 6th ed. - Garland Science, 2015. – 1464 p.
13. Damjanov, Ivan. Pathophysiology : textbook / I. Damjanov. - 1st ed. - Philadelphia : Elsevier, 2009. - 464 p.
14. Kumar V. Robbins and Cotran Pathologic Basis of Disease. Vol. I / V. Kumar, A. K. Abbas, J. C. Aster. - India : Elsevier, 2014. - 1391 p.
15. Kumar V. Robbins and Cotran Pathologic Basis of Disease. Vol. I / V. Kumar, A. K. Abbas, J. C. Aster. - India : Elsevier, 2015. - 1391 p.
16. Mohan Harsh. Textbook of pathology. - - 6 th ed. - New Delhi : Jaypee Brothers Medical Publishers Ltd., 2010. - 933 p.
17. Pathophysiology : The Biologic Basis of Disease in Adults and Children / ed. by K. L. McCance, S.E. Huether. - 7th ed. - Mosby, 2014. - 1840 p.
18. Porth C. M. Pathophysiology : Concepts of Altered Health States. - Lippincott Williams & Wilkins; Seventh Edition USA. - 2004. - 1616 p.

7.3. Information resources on the Internet

1. <http://www.testcentr.org.ua>
2. ExamPrep. - URL : <https://www.elsevierexamprep.co.uk/>
3. Silbernagl St. Color Atlas of Pathophysiology / St. Silbernagl, F. Lang. - Thieme Stuttgart New York, 2000. – 416 p. - URL : <http://lmpbg.org/new/downloads/pathophysiology.pdf>
4. Pathophysiology : The Official Journal of the International Society for Pathophysiology – URL : <https://www.journals.elsevier.com/pathophysiology>
5. Journal of basic and clinical pathophysiology. – URL : <http://jbcp.shahed.ac.ir/>
6. Bloodline // Carden Jennings Publishing Co., Ltd. - URL : <http://www.bloodline.net/>
7. Atlases - Pathology Images : Collection of high resolution histological images. - URL : <http://atlases.muni.cz/en/index.html>
8. Pathophysiology for Medical Assistants : Get the best resources for pathophysiology for medical assistants // COM Library. – URL : <https://libguides.com.edu/c.php?g=649895&p=4556866>