

**INTERNATIONAL EUROPEAN UNIVERSITY
EDUCATIONAL AND SCIENTIFIC INSTITUTE
"EUROPEAN MEDICAL SCHOOL"**

APPROVED

Director of ESI"EMS"

Ph.D. Associate Professor

Alexandrina



2022

**COURSE TRAINING PROGRAM
on
PATHOPHYSIOLOGY**

Degree level	Master
Field of study	22 "Health care"
Specialty	222 "Medicine"

Kyiv - 2022

DEVELOPED AND SUBMITTED: Educational and Scientific Institute "European Medical School", Department of Fundamental and Medical and Preventive Disciplines.

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Discussed and approved by the Department of Fundamental and Medical Preventive Disciplines №.1 from " 25 " 08 2022

Head of the department Kostynskyi G.B.



Approved at the meeting of the Scientific Council of the ESI"EMS"

№ 1 of " 29 " 08 of 2022

INTRODUCTION

Working study program in the discipline "Pathophysiology" for students of the 3rd year of the Faculty of Medicine, specialty 222 "Medicine". The purpose of the Regulation is to standardize the content, scope, sequence and organizational forms of studying the discipline by students, as well as forms and means of current and final control of knowledge.

The working curriculum of the discipline is a regulatory document of the university, which is developed by the staff of the department for each academic discipline on the basis of the industry standard of higher education in accordance with the curriculum.

The working curriculum must ensure: conformity of the content of the industry standards of higher education through the direct connection of the content of the discipline with the goals of higher education (skills and abilities of the specialist, defined in the OKH); compliance with licensing and accreditation conditions and requirements; compliance with "Standards and recommendations for quality assurance in the European area of higher education"; the possibility of using disciplinary competencies as an information base for the formation of diagnostic tools; unambiguity of the criteria for evaluating educational achievements.

The working curriculum of the discipline in its content is a document that determines the amount of knowledge that the student must master in accordance with the requirements of the educational and qualification characteristics of the future specialist, the algorithm for studying the educational material of the discipline taking into account interdisciplinary connections, which excludes the duplication of educational material when studying common for different courses of problems, necessary methodical support, components and technology of assessing students' knowledge.

The working curriculum as a regulatory document that lays down the ideology of the content of education and the organization of the educational process, determines the educational and methodological principles of the department's activity; on its basis, all educational and methodical materials are developed to ensure the educational process, including for independent work of students.

1. Description of the academic discipline

Name of indicators	Field of knowledge, direction of training	Characteristics of the academic discipline	
		full-time education	
The number of credits is 6.0	Field of knowledge 22 Health care	Full term of study	
		A year of training	
	3rd		
	Semester		
The total number of hours is 180	Specialty: 222 "Medicine"	V th	VI
		Lectures	
		8 hours	4 p.m
		Practical training	
		40 hours	48 hours
		Individual work	
		42 hours	26 hours
		Type of control:	
Test	Exam		

PATHOPHYSIOLOGY as an educational discipline:

a) is based on the basic principles and knowledge previously studied by students in anatomy, histology, medical and biological physics, bioinorganic , bioorganic and biological chemistry, biology (general, molecular and medical), normal physiology, microbiology, integrates with these disciplines, as well as with pathomorphology and pharmacology;

b) develops professional abilities for clinical thinking; provides the possibility of diagnosis, treatment, prevention of the occurrence and development of diseases ; c) creates theoretical foundations 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 the main clinical disciplines and the acquisition of deep knowledge of pathophysiology, skills use this knowledge in the process of further education and in professional activities to solve clinical problems.

The term "pathophysiology" is studied by students in the 3rd year, in the 5th and 6th semesters.

1. THE PURPOSE OF STUDYING THE EDUCATIONAL DISCIPLINE

PURPOSE of the educational discipline "**Pathophysiology**" stems from the goals of the educational and professional training program for graduates of a higher medical educational institution and is determined by the content of those systemic knowledge and skills that a specialist doctor should master. The knowledge that students receive from the academic discipline is basic for the block of disciplines that provide natural-scientific (PN block) and professional- practical (PP block) training.

The study of pathological physiology forms in students the ability to interpret the main concepts of general nosology, to interpret the causes, mechanisms of development and manifestations of typical pathological processes and the most common diseases, to analyze and draw conclusions about the causes and mechanisms of functional, metabolic, and structural disorders of organs and systems of the body in diseases; provides fundamental training and acquisition of practical skills for the next professional activity of a doctor.

Competencies and learning outcomes, the formation of which is facilitated by the discipline "Pathophysiology" (interrelationship with the normative content of the training of higher education applicants, formulated in terms of learning outcomes in the Higher Education Standard). According to the requirements of the Higher Education Standard, the discipline ensures that students acquire the following competencies :

General competences (CG)	
ZK-1	Ability to abstract thinking, analysis and synthesis
ZK-2	Ability to learn and master modern knowledge.
ZK-3	Ability to apply knowledge in practical situations.
ZK-4	Knowledge and understanding of the subject area and understanding of professional activity.
ZK-5	Ability to adapt and act in a new situation.
ZK-6	Ability to make informed decisions.
ZK-7	Ability to work in a team.
ZK-8	Ability to interpersonal interaction.
ZK-10	Ability to use information and communication technologies.
ZK-11	Ability to search, process and analyze information from various sources.
ZK-12	Determination and persistence in relation to assigned tasks and assumed responsibilities.
Professional competences (FC)	
FC-1	Ability to collect medical information about the patient and analyze clinical data.
FC-2	Ability to determine the necessary list of laboratory and instrumental studies and evaluate their results.
FC-3	Ability to establish a preliminary and clinical diagnosis of the disease.
FC-7	Ability to diagnose emergency conditions.
FC-8	Ability to determine tactics and provide emergency medical care.

FC 21	It is clear and unambiguous to convey one's own knowledge, conclusions and arguments on health care problems and related issues to specialists and non-specialists, in particular to people who are studying.
FC 24.	Adherence to ethical principles when working with patients and laboratory animals.
FC 25.	Adherence to professional and academic integrity, to be responsible for the reliability of the obtained scientific results.
Program learning outcomes (PRN)	
PRN 1.	Have thorough knowledge of the structure of professional activity. To be able to carry out professional activities that require updating and integration of knowledge. To be responsible for professional development, the ability for further professional training with a high level of autonomy.
PRN 2.	Understanding and knowledge of fundamental and clinical biomedical sciences, at a level sufficient for solving professional tasks in the field of health care.
PRN 3.	Specialized conceptual knowledge, which includes scientific achievements in the field of health care and is the basis for conducting research, critical understanding of problems in the field of medicine and related interdisciplinary problems.
PRN 21.	Search for the necessary information in the professional literature and databases of other sources, analyze, evaluate and apply this information.
PRN 25.	It is clear and unambiguous to convey one's own knowledge, conclusions and arguments on health care problems and related issues to specialists and non-specialists.

As a result of studying the discipline "Pathophysiology", the student should master the following skills:

- differentiation of temperature curves;
- analysis of quantitative indicators of blood in anemia;
- assessment of changes in the number of leukocytes in pathological processes;
- differentiation of types of acid-base imbalance.

PROGRAM OF EDUCATIONAL DISCIPLINE

The discipline program is structured into two sections.

Section I. General pathology

Section II. Pathophysiology of organs and systems

The types of training sessions according to the curriculum are: A) lectures;

B) practical classes;

C) independent work of students;

The lectures cover the main theoretical material of a single or several topics of the academic discipline, reveal the main problematic issues of the relevant sections of the discipline.

Practical classes involve a detailed examination by students of individual theoretical provisions of the academic discipline with the teacher and the formation of the skills and abilities of their practical application through the student's individual performance of formulated tasks and solving situational problems.

The independent work of students involves the student's mastery of the educational material, namely, the independent study of individual topics of the academic discipline in the time free from mandatory educational classes, and also involves preparation for all types of control. The educational material of the discipline provided by the working curriculum for assimilation by the student in the process of independent work is submitted to the final control along with the educational material that was worked out during classroom classes.

1. CONTENTS OF THE PROGRAM CHAPTER I. General pathology

Specific goals:

- Explain the basic concepts of general nosology: health, disease, pathological process, typical pathological process, pathological reaction, pathological condition, etiology, pathogenesis.
- To explain the basic concepts of etiology: causal factors, risk factors, conditions for the occurrence and development of the disease, to analyze various options for the development of cause-and-effect relationships in pathogenesis.
- To analyze pathological and adaptive phenomena in pathogenesis - compensatory, local and general, specific and non-specific, to identify the leading link of pathogenesis.
- Evaluate the value of modern research methods (experimental and clinical) for pathophysiology.
- To analyze the role of environmental factors in the occurrence of diseases .
- To analyze the general regularities of the mechanisms of the pathogenic effect of environmental factors on the body.
- Explain the mechanisms of pathogenic action of physical, chemical and biological factors of the external environment.
- Explain cause-and-effect relationships, while separating local and general, pathological and adaptive -compensatory changes in the pathogenesis of manifestations of environmental factors (overheating, cooling, burns, frostbite, radiation sickness, decompression and compression diseases).
- To determine and analyze the role of abnormalities of the constitution, intrauterine development and heredity, the importance of age changes and reactivity disorders in the development of diseases.
- To characterize the etiological factors of the occurrence and development of hereditary diseases and disorders of intrauterine development.

Topic. General doctrine of disease, etiology and pathogenesis. Effect of changed atmospheric pressure on the body.

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

Pathophysiology as an educational discipline, its constituent parts: general pathology, pathophysiology of organs and systems. The place of pathophysiology in the system of training a doctor.

Methods of pathophysiology. Experimental modeling of pathological processes (diseases) - the main method of pathophysiology - its possibilities and limitations. Modern methods of conducting experiments, rules for working with experimental animals. Experimental therapy. Methods of clinical pathophysiology.

The history of the development of pathophysiology. The value of the scientific works of K. Bernard , R. Virkhov , Yu. Kongheim , I. Mechnikov, V.V. Pashutin , H. Selye and other outstanding researchers.

Domestic school of pathophysiologists (V.V. Pidvysotskyi, V.K. Lindeman , O.O. Bogomolets, M.M. Syrotynin , O.V. Repryov , D.O. Alpern , V.V. Voronin, M.N. Bunny). Scientific schools of pathophysiologists, the main areas of their activity.

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

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

Principles of disease classification, WHO classification. The main regularities and periods in the development of the disease. Options for ending diseases .

The concept of terminal states (agony, clinical death) and biological death. Pathophysiological foundations of resuscitation.

Basic directions of teaching about the disease: humoral (Hippocrates), solidarity (Democritus),

cellular (R. Vikhrov). The current state of development of these directions. Definition of the concept of "etiology". The problem of causality in pathology, the current state of its solution. Modern ideas about causative factors, risk factors, conditions for the occurrence and development of diseases.

The main directions of the development of the theory of etiology: monocausality, conditionalism, constitutionalism, the psycho-somatic concept, etc. Modern concepts of causality in pathology.

Classification of etiological factors. External and internal etiological factors. Ecological, genetic, accumulation and ontogenetic concept of the occurrence of human diseases. Etiotropic principle of treatment and prevention of diseases.

Definition of the concept of "pathogenesis". Pathological (destructive) and adaptively-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.

Cause-and-effect relationships, their variants. The concept of the "main link" of pathogenesis. Local and general phenomena, specific and non-specific in pathogenesis. Unity of structural changes and functional manifestations of the disease. Pathogenetic principle of classification and treatment of diseases.

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

Topic. Pathogenic effect of ionizing radiation on the body.

Pathogenic effect of radiant energy. Types of ionizing radiation. Radiosensitivity of tissues. Mechanisms of direct and indirect radiation damage to 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. Nearest and remote consequences of large and small doses of ionizing radiation. Its stochastic and non-stochastic effects. Natural mechanisms of radiation protection. Pathophysiological bases of radioprotection.

Pathogenic effect of infrared and ultraviolet rays. Photosensitization. Danger of insufficient insolation. Damage caused by electromagnetic radio waves in the ultra-high frequency range.

Topic. The role of heredity in pathology.

Heredity as a cause and condition for the development of diseases. The ratio of hereditary and acquired in 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. Anti-mutation protection systems. Mechanisms of DNA repair. The role of violations of reparative systems and "immune surveillance" in the occurrence of hereditary pathology.

Monogenic hereditary diseases. Characteristics of monogenic diseases according to the type of inheritance of the pathological gene: 1) are inherited classically, according to Mendel (autosomal-dominant and -recessive, codominant, sex-linked);

2) are not classically inherited (caused by triplet repeats, mitochondrial, in case of disruption of the genomic imprinting). Manifestations of harmful gene mutations at the molecular, cellular, organ levels and at the level of the organism as a whole. Molecular and biochemical bases of the pathogenesis of classic monogenic diseases: defects of enzymes, receptors and transport systems; defects in the structure, function or quantity of non-enzymatic (structural) proteins, as well as defects in proteins that regulate cell division (familial cancer). General ideas about the pathogenesis of monogenic diseases with non-classical inheritance (caused by amplification of genes — fragile X chromosome syndrome, mutations of mitochondrial genes or disruption of the genomic imprinting).

Polygenic (multifactorial) diseases. Hereditary predisposition to diseases. Chromosomal diseases. Mechanisms of genomic and chromosomal mutations. Polyploidy, aneuploidy, deletion, duplication, translocation, inversion. Syndromes caused by a change in the number of chromosomes. The main phenotypic manifestations of chromosomal aberrations.

Diagnostic methods, principles of prevention and treatment of hereditary diseases .

Ways of correction of genetic defects. Perspectives of genetic engineering.

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 determining species, individual and average life expectancy. General features and regularities of aging. Structural, functional and biochemical manifestations of aging at the molecular, cellular, tissue, organ, system levels and at the level of the organism as a whole. Theories of aging. Aging and diseases. Progeria . Theoretical foundations of life extension. Methods of geroprotection .

Topic . Pathology of reactivity.

Reactivity as a condition for the development of diseases . 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 gender, age, heredity, state of the immune, nervous and endocrine systems. The influence of environmental factors on the body's reactivity.

The concept of resistance. Passive and active resistance. The connection of resistance with reactivity. Mechanisms of non-specific resistance. Biological barriers, their classification, significance in the body's resistance. The role of the physiological system of connective tissue in the body's resistance to the action of pathogenic agents (O.O. Bogomolets).

Constitution, its role in pathology. Classification of constitutional types according to Hippocrates, Seago , Sheldon , Kretchmer , I.P. Pavlov, O.O. Bogomolets Abnormalities of the constitution as a risk factor for the occurrence and development of diseases .

Topic. Protective mechanisms of reactivity. The role of SMF in pathology. Violation of phagocytosis

Phagocytosis. Humoral factors of non-specific resistance of the body to infectious agents. Complement system and its disorders. Disorders of phagocytosis: complete and incomplete phagocytosis, hereditary defects of phagocytosis, acquired disorders of phagocytosis. General characteristics of the system of mononuclear phagocytes (SMF): definition of the concept of SMF, cell composition of SMF, functions of SMF cells. The main methods of studying the system of mononuclear phagocytes: operative method, blocking method with colloids, inhibition by large doses of glucocorticoids , inhibition by ionizing rays. The role of the mononuclear phagocyte system in immunity: implementation of immune phagocytosis, the importance of macrophages in the interaction of T- and B-lymphocytes.

Topic. Allergy.

Definition of the concept and general characteristics of allergy. Etiology of allergy, types of exogenous and endogenous allergens. The formation of allergic reactions depending on the state of the body. 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 according to Coombs and Gell . Stages of pathogenesis of allergic reactions.

Anaphylactic reactions: experimental models, main 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. Immune complex injuries, their local and general manifestations.

Cellular reactions (delayed hypersensitivity reactions): experimental reproduction, main clinical forms. Peculiarities of immunological mechanisms. The role of lymphokines .

Allergic reactions of stimulating and inhibitory type, clinical forms.

Pseudoallergic reactions.

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

Basic principles of prevention and treatment of allergic reactions.

Hyposensitization. The relationship between allergy, immunity and inflammation.

Topic . Pathology of the immune system. Immunodeficiency states. Immunopathogenesis of HIV infections

Reactivity as a condition for the development of diseases . 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 gender, age, heredity, state of the immune, nervous and endocrine systems. The influence of environmental factors on the body's reactivity.

The concept of resistance. Passive and active resistance. The connection of resistance with reactivity. Mechanisms of non-specific resistance. Biological barriers, their classification, significance in the body's resistance. The role of the physiological system of connective tissue in the body's resistance to the action of pathogenic agents (O.O. Bogomolets). Phagocytosis. Violation of phagocytosis: causes, mechanisms, consequences. Humoral factors of non-specific resistance of the body to infectious agents. Complement system and its disorders.

Mechanisms of immune response of humoral and cellular type, mechanisms of immunological tolerance, its types and reproduction in the experiment. General patterns of disorders of the immune system, 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 (immunodepressive) conditions. Pathogenesis of clinical manifestations of immune deficiency. Etiology, pathogenesis of acquired immunodeficiency syndrome (AIDS).

Pathophysiological basis of transplantation of organs and tissues. Transplant rejection reaction, its causes and mechanisms. Graft-versus-host reaction. Immunological relationships in the "mother-fetus" system. Basic principles of immunostimulation and immunosuppression .

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

Topic. Pathophysiology of the cell. Cell damage.

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

Characteristics of universal mechanisms of cell damage:

- O₂ -dependent (action of oxygen and its derivatives - free radicals that cause peroxidation of molecules, primarily lipids with activation of membrane phospholipases, detergent action of lysophospholipids and free fatty acids);
- calcium-dependent (increase in free calcium in cells, activation of phospholipases, proteases, endonucleases);
- caused by a deficiency of ATP or primary violations of membrane permeability and, as a result, an electrolyte -osmotic mechanism of damage;
- due to the development of intracellular acidosis;
- caused by activation of proteolysis, denaturation of proteins;
- due to violations of the genetic apparatus of the cell.

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

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

proteins.

Topic. Typical disorders of peripheral blood circulation and microcirculation.

The main forms of peripheral blood circulation 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 blood circulation disorders. Changes in tissues caused by disorders of local blood circulation, their significance and possible consequences. Concept of reperfusion syndrome, ischemic toxicosis.

Thrombosis and embolism as causes of local blood circulation 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. Peculiarities of the course of embolism of the large and small circulation , portal vein.

Typical microcirculation disorders. Intravascular disorders. Sludge is a syndrome. Disseminated syndrome intravascular blood coagulation. Capillary (true) stasis. Violation of tone, mechanical integrity and permeability of microvessels . Extravascular disorders of microcirculation. Capillarotrophic insufficiency.

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

Topic. Inflammation.

Definition of inflammation. Classifications of inflammation (immune, non-immune; infectious, non-infectious; acute, chronic; norm-, hypo- , hyperergic , etc.). Etiology of inflammation: classification and characteristics 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 focus of inflammation.

Mediators of inflammation, their classification. Plasma mediators (acute phase proteins, complement system proteins, coagulation / anti-coagulation, fibrinolysis, kinins).

Mediators of cellular origin, specific and non-specific.

Cytokines: types, characteristics of action. Mediators from tissue basophils.

Eicosanoids .

Violation of local blood circulation in the focus of acute inflammation. The experiment of Y. Kongheim . Pathogenesis of ischemia and arterial hyperemia. Reasons for the transition of arterial hyperemia to venous. Changes in the rheological properties of blood in the focus of acute inflammation.

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

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

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 the mitogenic signal by intracellular signaling pathways. The role of mitogen-activated protein kinases in the stimulation of cell division. Mechanisms of sclerosing, 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 body reactivity, pathological immune response in the development of inflammation (norm-, hypo- , hyperergic inflammation).

Principles of anti-inflammatory therapy.

Topic. Fever.

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

Etiology of fever. Characteristics of pyrogens. Primary and secondary pyrogens. Formation of

pyrogens during infection, aseptic injury and immune reactions. Chemical nature and origin of secondary ("true") pyrogens. Mechanisms of influence on the center of thermoregulation. Stages of fever.

Principles of classification, types of fever. Involvement of the nervous, endocrine and immune systems in the development of fever. Changes in metabolism and physiological functions during fever. Protective value and pathological manifestations of fever.

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

Topic. Tumors

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

Definition of the concepts "tumor" and "neoplastic process". General patterns of tumor growth. Molecular genetic basis of unlimited 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 constitutional abnormalities) and conditions for the occurrence and development of tumors. Physical carcinogenic factors.

Basic regularities of the blastomogenic effect of ionizing radiation and ultraviolet rays.

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

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

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

Stage of transformation (initiation). Immortalization and damage to cellular mechanisms of division regulation as the main events of tumor transformation. Mutational and epigenomic mechanisms of malignant transformation. Violation of the system of genes that ensure cell division. The concept of proto-oncogenes, oncogenes (cellular, viral), genes suppressors of cell division. Methods of transforming a proto-oncogene into an oncogene. Types of oncoproteins. The role of apoptosis in the pathogenesis of tumor growth. The concept of inductors and suppressors apoptosis. Mechanisms of evasion of transformed cells from apoptosis. Promotion stage. Mechanisms of promotion. Characteristics of promoters of tumor growth (hormonal effects, chemical substances, chronic irritation, etc.).

Stage of progression. Mechanisms of tumor progression.

The interaction between the tumor and the body. The effect of the tumor on the body. Mechanisms of cancer cachexia. Mechanisms of natural antitumor protection, immune and non-immune mechanisms of resistance. Mechanisms of tumor evasion from immune surveillance. Pathophysiological basis of tumor prevention and treatment.

Topic. Starvation.

Definition of the concept of "starvation". Types of starvation. Stages of starvation. Changes in body weight and individual organs during complete starvation. Peculiarities of metabolism in various forms of starvation. Factors affecting the duration of fasting. Features of quantitative fasting. Protein-calorie deficiency.

Topic. Violation of water-electrolyte exchange.

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 the concept of "swelling", types of swelling. Causes and mechanisms of edema development. The theory of Starling's edema pathogenesis. Swelling caused by a change in the oncotic

pressure of blood and tissue fluid. The role of vascular wall permeability disorders and lymph outflow in the pathogenesis of edema. Edema caused by retention of sodium salts and/or water in the body. Myxedematous edema. Principles of edema treatment.

Hyper- and hyponatremia . Causes and mechanisms of development. Disorders 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 disturbances in the exchange of potassium ions.

Violation of phosphorus -calcium metabolism. Violation of hormonal regulation of phosphorus - calcium metabolism: hyper- and hypoparathyroidism , hypo- and hypervitaminosis D, violation of calcitonin secretion . Hypocalcemic conditions: causes, mechanisms of development, main manifestations. Rickets: causes and mechanisms of development, main clinical manifestations. Principles of prevention and treatment of rickets. Forms of rickets resistant to vitamin D. Concept of osteodystrophy.

Hypercalcemic conditions, causes and mechanisms of development. Calcification (calcification) of soft tissues: metastatic, dystrophic and metabolic mechanisms. Hyper- and hypophosphatemia . Causes and mechanisms of development. Violation of the metabolism of microelements. Etiology, pathogenesis.

Section II. PATHOPHYSIOLOGY OF ORGANS AND SYSTEMS.

Topic. Pathophysiology of the blood system. Anemias caused by blood loss.

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

Blood loss: etiology, pathogenesis. Changes are pathological and adaptive - compensatory in the pathogenesis of blood loss. Manifestations and consequences of blood loss (hypovolemia , anemia, circulatory failure/shock). Principles of blood loss therapy. Concept of posthemotransfusion reactions and complications, mechanisms of their development and means of prevention.

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

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

Topic. Hemolytic anemias and anemias caused by impaired erythropoiesis .

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

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

Classification of anemias associated with disorders of erythropoiesis (deficient, dysregulatory , hypo- , aplastic , etc.), general characteristics of causes and mechanisms of development.

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

Anemias caused by vitamin B₁₂ and/or folic acid deficiency. Causes and mechanisms of absolute and relative deficiency of vitamin B₁₂ and folic acid. Malignant anemia of Addison-Birmer . Characterization of general disorders in the body with deficiency of vitamin B₁₂ and/or folic acid. Hematological characteristics of vitamin B₁₂ , foliodeficiency anemias.

Topic. Violation 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. Thrombocytopathies . Mechanisms of adhesion

disorders, aggregation of platelets, release of platelet granules.

Violation of coagulation hemostasis. Reasons for decreasing the activity of the blood coagulation system and increasing the activity of the anticoagulation and fibrinolytic systems. The main manifestations of disorders of individual stages of blood coagulation, their etiology and pathogenesis.

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

Principles of correction of disorders in the hemostasis system.

Topic . Leukocytosis , leukopenia.

Leukocytosis, principles of classification. Causes and mechanisms of development of reactive and redistributive leukocytosis. Neutrophilic, eosinophilic, basophilic, lymphocytic and monocytic leukocytosis. The concept of nuclear displacement of neutrophil granulocytes, its varieties.

Leukopenia, principles of classification. Causes, mechanisms of development of leukopenia, agranulocytosis (neutropenia). Pathogenesis of the main clinical manifestations.

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

Topic. Leukosis.

Concept of hemoblastoses, general characteristics of their main groups. Leukemias as tumors. Principles of classification of leukemias (acute, chronic; myelo-, lympho-, biphenotypic; primary, secondary).

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

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

Topic. Pathophysiology of systemic circulation. Insufficiency of blood circulation.

Definition of the concept of blood circulation insufficiency, principles of its classification, characteristics of cardio- and hemodynamic disorders. The concept of acute and chronic ("congestive") circulatory failure. Etiology, pathogenesis, stages of chronic circulatory failure. Development mechanisms of the main clinical manifestations of chronic circulatory failure (dyspnea, cyanosis, edema).

Acute circulatory failure: etiology, pathogenesis, pathological and adaptively compensatory changes. Collapse, shock as variants of acute circulatory failure.

Topic. Pathophysiology of blood vessels. Atherosclerosis

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

Arteriosclerosis: definition, classification. The main forms of arteriosclerosis: atherosclerosis (Marchan), mediocalcinosis (Menkeberga), arteriosclerosis, their general characteristics (typical localization, manifestations, complications). Experimental modeling.

Atherosclerosis. Risk factors for atherosclerosis. Experimental models. Modern and historical theories of atherogenesis. The role of endothelium damage, inflammation, hereditary and acquired disorders of receptor-mediated transport of lipoproteins (LP) (disruption of receptors of LP, defects of LP molecules, modification of LP) in atherogenesis. Disorders of lipid transport in the blood. Hyper-, hypo-, dyslipoproteinemia. Dependence of the development of dyslipoproteinemias on environmental factors (diet, diet), heredity and concomitant diseases. Modern classifications of dyslipoproteinemias (primary and secondary; according to the phenotype of LP; with high or low risk of atherosclerosis), criteria for hypercholesterolemia, hypertriglyceridemia, low HDL level.

Etiology, pathogenesis of primary (hereditary, familial) and secondary (in case of malnutrition, obesity, diabetes, kidney diseases, hypothyroidism, liver cirrhosis, under the influence of drugs)

dyslipoproteinemia . Consequences/complications of dyslipoproteinemia . Principles and goals of restoring the normal lipid composition of the blood.

Arterial hypertension (AH), definition of the concept, principles of classification. Hemodynamic variants of AG. The role of disorders of the 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 the pathogenesis of primary hypertension (dysregulatory , membrane, etc.).

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

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

Topic. Pathophysiology of the heart. Coronary heart disease

Coronary damage of the myocardium. 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 noncoronary myocardial damage. Cardiomyopathies. Classification. Characteristics of causes and mechanisms of occurrence, clinical manifestations.

Topic. Pathophysiology of the heart. Heart failure. Arrhythmias

Definition of the concept of heart failure, principles of classification.

Heart failure due to overload. Causes of cardiac volume and resistance overload. Mechanisms of immediate and long-term adaptation of the heart to excessive load: tachycardia, hyperfunction (hetero-, homeometric), myocardial hypertrophy. Hypertrophy of the heart: types, causes, mechanisms of development, stages (according to F.Z. Meyerson). Features of hypertrophied myocardium, causes and mechanisms of its decompensation. Myocardial form of heart failure.

Cardiac arrhythmias: classification, causes, mechanisms, typical electrocardiographic manifestations. The role of additional conducting 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. Damage to the pericardium. Acute cardiac tamponade.

Principles of cardioprotection and treatment of heart/circulatory failure.

Topic. Pathophysiology of external breathing. Respiratory failure.

Definition of the concept of insufficiency of external respiration, criteria, principles of classification. Extrapulmonary and pulmonary disorders of alveolar ventilation: central, neuromuscular, thoracodiaphragmatic , reduction of airway patency , elastic properties of lung tissue, number of functioning alveoli. Mechanisms of violation of alveolar ventilation: dysregulatory , restrictive , obstructive. Causes and mechanisms of gas diffusion disorders in the lungs.

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

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

Pathogenesis of the main clinical manifestations of external respiratory failure.

Shortness of breath: types, causes, mechanisms of occurrence and development. Asphyxia, causes and mechanisms of development.

Violations of non-respiratory functions of the lungs, their influence on systemic hemodynamics and the system of hemostasis.

Pathological breathing. Types of periodic and terminal breathing.

Topic. Hypoxia.

Definition of the concept, principles of classification of hypoxia. Mechanisms of development of hypoxia: decrease in supply and violation of utilization of oxygen by cells. Etiology of the main types of hypoxia: hypoxic, respiratory, circulatory, blood, tissue, mixed. Changes in the gas composition of arterial and venous blood in different types of hypoxia. Immediate and long-term mechanisms of adjustment and adaptation to hypoxia. Resistance to hypoxia. Factors that ensure it. Mechanisms of hypoxic cell damage.

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. Pathophysiology of the digestive system. Insufficiency of digestion.

General ideas about digestive insufficiency, principles of classification. Causes of indigestion (maldigestion). The role of alimentary and infectious agents, disorders of nervous and humoral regulation of the functioning of the digestive system. Connection of digestive disorders with disorders of metabolism of substances and energy in the body.

Appetite disorders. Anorexia Types of starvation: physiological, pathological; complete, absolute, incomplete, partial. External and internal causes of starvation. Characterization of disturbances of basic metabolism and metabolism in separate periods of complete fasting with water. Pathophysiological features of incomplete fasting. Types, etiology, pathogenesis of partial (qualitative) starvation. Protein-calorie deficiency, its forms: alimentary marasmus, kwashiorkor. Alimentary dystrophy. Factors affecting the body's resistance to starvation. The concept of medical starvation.

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

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

Etiology, pathogenesis of gastric and/or duodenal ulcer. The role of *Helicobacter pylori* _ Insights into the etiology and pathogenesis of symptomatic gastric and/or duodenal ulcers.

Digestive disorders 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.

Violation of the barrier function of the intestines: intestinal autointoxication, coli-sepsis, dysbiosis.

Disturbance of cavity and parietal digestion in the intestines. Malabsorption syndrome: definition of the concept, manifestations (diarrhea, weight loss, protein

deficiency, hypovitaminosis), causes and mechanisms of development. Intestinal Enzymopathies.

Violation of fat metabolism. Violation of digestion and absorption of lipids. Definition of obesity. Types of obesity. Experimental models. Etiology and pathogenesis of obesity. Mechanisms of fatty dystrophy. Characteristics of obesity-related medical problems.

Topic. Pathophysiology of the liver. Liver failure.

Liver failure: definition of the concept, principles of classification. Etiology, pathogenesis, experimental models of liver failure. Typical violations of carbohydrate, protein, lipid, water-electrolyte exchanges, exchange of trace elements, vitamins and hormones, violations of the functional systems of the body in case of liver failure.

Insufficiency of the antitoxic function of the liver, the mechanism of the main manifestations.

Types, causes, pathogenesis of hepatic coma. The role of cerebrototoxic substances.

Insufficiency of the excretory function of the liver, the main manifestations. Definition of concepts, 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

development of ascites, hepato -renal and hepato-renal syndromes.

Violation of protein metabolism. Violation of the exchange of purine and pyrimidine bases. Concept of positive and negative nitrogen balance. Violation of the main stages of protein metabolism. Azotemia, production and retention . Violations of the protein composition of the blood: hyper -, hypo -, dysproteinemia . Violation of the 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. Gout: etiology, pathogenesis. Hyper- and hypouricemia . Hereditary orotaciduria .

Violation of vitamin metabolism. Types of hypo- and hypervitaminosis , their etiology and pathogenesis. Mechanisms of development of the main clinical manifestations. Principles of vitamin deficiency correction.

Topic. Kidney pathophysiology. Kidney failure.

The concept of kidney failure, principles of classification. Pre -renal , actually real and post -renal mechanisms of disorders of renal processes. Causes and mechanisms of blood circulation 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 activity. Use of functional tests to find out the type of kidney function disorders.

Quantitative and qualitative changes in urine composition. Oliguria , anuria and polyuria. Aqueous, osmotic and hypertensive diuresis. Hypo and isosthenuria . Pathological components of urine: proteinuria, cylinduria, glycosuria, aminoaciduria , hematuria, leukocyturia . Concept of selective and non-selective proteinuria and its mechanisms.

General manifestations of renal insufficiency. Causes, manifestations and mechanisms of development of retention azotemia. Pathogenesis of renal edema.

Violation of the acid-base state: renal azotemic acidosis, proximal and distal tubular acidosis. Pathogenesis and manifestations of renal osteodystrophy. Mechanisms of development of arterial hypertension, anemia, hemostasis disorders in kidney damage.

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

Glomerulonephritis : definition of the concept, principles of classification. Experimental models, modern ideas about the etiology and pathogenesis of diffuse glomerulonephritis . Nephrotic syndrome, primary and secondary. Causes and mechanisms of kidney stone formation, urolithiasis.

Topic. Violation of acid-base balance.

General characteristics of acid-base disorders (ABS). 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 KOS and disorders of electrolyte metabolism. Acidosis with increased and normal anion difference .

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

Pathological changes in the body with acid-base disturbances.

Principles of pathogenetic therapy of acidosis and alkalosis .

Topic. Pathophysiology of the endocrine system. Pathology of the pituitary gland and thyroid gland.

General characteristics of disorders of the endocrine system: hypofunction, hyperfunction, gland dysfunction; primary, secondary endocrinopathy. Causes and mechanisms of development of endocrinopathies. Dysregulatory endocrinopathies: disorders of nervous, neuroendocrine, endocrine and metabolic regulation of endocrine gland activity. Violation of direct and reverse regulatory relations .

Glandular endocrinopathy: causes and mechanisms of disorders of synthesis, deposition and secretion of hormones.

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

Pathology of the hypothalamic-pituitary system. The causes and mechanisms of the development of syndromes of excess and lack of pituitary hormones. General characteristics of hypothalamic-pituitary - thyroid , hypothalamic-pituitary-adrenal , hypothalamic-pituitary - gonadal system disorders. Etiology, pathogenesis, clinical manifestations of panhypopituitarism . Causes, mechanisms, clinical manifestations of partial hormone deficiency

adenohypophysis (STH, TSH, ACTH, gonadotropins). Etiology, pathogenesis, clinical manifestations of partial hyperfunction of the adenohypophysis (STH, TSH, ACTH, gonadotropins , prolactin).

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

Pathology of the thyroid gland. Hypothyroidism: causes and mechanisms of development, pathogenesis of the main disorders in the body. Hyperthyroidism: causes and mechanisms of development, pathogenesis of the main disorders in the body. Goitre: types (endemic, sporadic, nodular and diffuse toxic), their etiology and pathogenesis; characteristic of disorders of the functional state of the gland.

Violation of energy exchange. Energy needs of the body. Energy balance, negative and positive, causes and mechanisms of occurrence and development. The main exchange as a factor influencing the energy balance.

Pathological changes in basic metabolism: etiology, pathogenesis. Violation of energy supply of cells. Disruption of transport of nutrients through cell membranes, disorders of intracellular catabolic pathways. Violation of cellular respiration, the effect of dissociation of oxidation and phosphorylation, its mechanisms. Significance of energy metabolism disorders in the vital activity of cells, organs, and the body. The role of cell energy supply disorders in the development of cell damage.

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

Pathology of carbohydrate metabolism. Diabetes.

Pathophysiology of disorders of the endocrine function of the pancreas. Violation of carbohydrate metabolism. Violation of absorption of carbohydrates, processes of synthesis, deposition and splitting of glycogen, transport of carbohydrates into cells. Violation of nervous and hormonal regulation of carbohydrate metabolism.

Hypoglycemia syndrome: types, causes, mechanisms. Pathogenesis of hypoglycemic coma. Hyperglycemia syndrome: types, causes and mechanisms of development. Diabetes. Definition of the concept, classification (according to WHO). Experimental modeling of diabetes. Etiology, pathogenesis of type 1 diabetes. The role of hereditary and environmental factors in its occurrence and development. Pathogenesis of absolute insulin deficiency, its manifestations and consequences: disturbance of energy, protein, carbohydrate, fat, water-electrolyte exchanges, acid-base state. Etiology, pathogenesis of type 2 diabetes. The role of hereditary and environmental factors in its occurrence and development. Variants of relative insulin deficiency in type 2 diabetes (secretory disorders of B cells, resistance of target tissues to insulin). Manifestations and consequences of relative insulin deficiency.

Concept of metabolic syndrome. Complications of diabetes. Coma: varieties, causes and mechanisms of development, manifestations, principles of therapy. Remote 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. Pathophysiology of the endocrine system. Adrenal gland pathology . Stress

Adrenal gland pathology. 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. Syndromes of Itsenko-Cushing , Conn , congenital hyperplasia of the adrenal cortex (adrenogenital syndrome). Types, causes,

mechanisms of development, clinical manifestations of disorders of the medulla of the adrenal glands.

The concept of stress as a non-specific, stereotyped adaptive reaction 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 stress injuries and "adaptation diseases". Principles of stress injury prevention.

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

Topic. Pathophysiology of the nervous system.

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

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

Pain. Peculiarities 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 development of pathological pain. Emotional, vegetative, motor reactions of the body to pain. Emotional - painful stress, painful shock. Natural antinociceptive mechanisms. Principles and methods of pain therapy.

Violation of the motor function of the nervous system. Experimental modeling of movement disorders. Peripheral and central paralysis and paresis: causes, mechanisms of development, main manifestations. Spinal shock. Movement disorders of subcortical origin. Disorders associated with damage to the cerebellum. Seizures, their types. Violation of neuromuscular transmission. Myasthenia.

Violation of vegetative functions of the nervous system, methods of experimental modeling. Syndrome of vegetative-vascular dystonia.

Violation of the trophic function of the nervous system. Neurogenic dystrophies.

Etiology, pathogenesis.

Violations of integrative functions of the central nervous system (CNS). Causes and mechanisms of disturbances of electrophysiological processes in neurons. Violation of ion channel activity. Causes and mechanisms of disorders of neurochemical processes. Violation of the exchange of neurotransmitters, neuromodulators, neurohormones. Pathological excitation and pathological inhibition of nerve centers. Neuroses.

Damage to neurons as one of the causes of disorders of the integrative functions of the central nervous system.

Acute and chronic disorders of cerebral circulation. A 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 central nervous system. Damage to the blood-brain barrier and autoimmune lesions of the brain.

2. STRUCTURE OF THE EDUCATIONAL DISCIPLINE

No. z/p	Topic No practical no occupation	Names of topics	Lectures	Practice . occupation	Himself. work
1.	1.	Subject, tasks and methods of pathophysiology. General doctrine of disease, etiology and pathogenesis. Effect of changed atmospheric pressure on the body.	2	2.5	-
2.	2.	Pathogenic effect of ionizing radiation on the body.	-	2.5	-
3.	3.	The role of heredity and constitution in pathology.	-	2.5	-

4.	4.	Reactivity and its role in pathology	-	2.5	-
5.	5.	Protective mechanisms of reactivity. The role of the mononuclear phagocyte system (MSF) in pathology. Violation of phagocytosis.	-	2.5	-
6.	6.	Pathology of the immune system. Immunodeficiency states.	-	2.5	-
	7.	Immunopathogenesis of HIV infections		2.5	
7.	8.	Allergy.	2	2.5	-
8.	9.	Pathophysiology of the cell		2.5	-
9.	10.	Violation of peripheral blood circulation and microcirculation.	-	2.5	-
10.	11.	Violation of heat exchange.	-	2.5	-
	12.	Fever.		2.5	
11.	thirteen.	Inflammation.	-	2.5	-
12.	14.	Tumors	-	2.5	-
thirteen.	15.	Starvation.	-	2.5	-
14.		Violation of carbohydrate metabolism. Diabetes mellitus: definition, classification, clinical manifestations and complications.	-	-	1
15.		Pathology of water-salt metabolism. Conditions of hyper- and hypohydria . Edema: types, etiology, pathogenesis.	2	-	-
16.		Violation of the acid-base state. Acidosis , alkalosis : classification, etiology, pathogenesis. Compensation and correction mechanisms.	2	-	-
17		Pathogenic effect of the thermal factor on the body			3
18.		Pathogenic effect of electric current	-	-	3
19.		Pathogenic effect of chemical factors	-	-	3
20.		Pathogenic action of biological factors	-	-	3
21.		Mechanisms of non-specific resistance of the body	-	-	4
22.		Immunological basis of transplantation	-	-	4
23.		Cytotoxic allergic reactions	-	-	4
24.		Immunocomplex allergic reactions	-	-	3
25.		Autoallergic reactions	-	-	3
26.		Aging and pathology	-	-	4
27.		Violation of mineral metabolism	-	-	3
28.		Violation of vitamin metabolism	-	-	3
29.		Typical disorders of lymphodynamics	-	-	3
30.	16.	Credit class	-	2.5	-
Total (Section I):			8	40	42
Section 2. Pathophysiology of organs and systems.					
31.	17.	Violation of water-electrolyte exchange.	-	3	-

32.	18.	Pathophysiology of the blood system. Anemias caused by blood loss.	2	3	2
33.	19.	Hemolytic anemias and anemias caused by disorders of erythropoiesis .	-	3	2
34.	20.	Violation of the hemostasis system.	-	3	2
35.	21.	Leukocytosis , leukopenia. Leukosis.	-	3	2
36.	22.	Pathophysiology of systemic circulation. Insufficiency of blood circulation.	2	3	3
37.	23.	Pathophysiology of blood vessels. Atherosclerosis.	2	3	2
38.	24.	Pathophysiology of the heart. Coronary heart disease. Heart failure. Arrhythmias		3	3
39.	25.	Pathophysiology of external breathing. Respiratory failure. Hypoxia.	2	3	-
40.	26.	Pathophysiology of the digestive system. Insufficiency of digestion.	1	3	-
41.	27.	Pathophysiology of the liver. Liver failure.	1	3	-
42.	28.	Kidney pathophysiology. Kidney failure. Violation of acid-base balance.	2	3	-
43.	29.	Pathophysiology of the endocrine system. Pathology of the pituitary gland and thyroid gland.	1	4	-
44.	30.	Pathology of carbohydrate metabolism. Diabetes. Adrenal gland pathology. Stress	1	4	-
45.	31.	Pathophysiology of the nervous system.	2	4	-
46.		Arterial hypotension	-	-	2
47.		Extrapulmonary disorders of alveolar ventilation. Violation of non-respiratory functions of the lungs	-	-	2
48.		Violation of the secretory function of the pancreas	-	-	2
49.		Intestinal dysfunction	-	-	2
50.		Portal hypertension syndrome	-	-	2
51.		General disorders of hormonal regulation	-	-	2
52.		Pathology of the hypothalamic-pituitary system	-	-	2
53.		Stress. Stress damage to organs and adaptation diseases	-	-	2
54.		Pathology of gonads	-	-	2
55.		General patterns of violations of hormonal regulation of functions and metabolism	-	-	2
56.		Violations of the autonomic nervous system systems	-	-	2
57.		Violation of the nociceptive function of the nervous system. Pain	-	-	2
58.		Violation of the trophic function of the nervous system	-	-	2
59.	32.	Exam			
Total (section II):			16	48	26

3. TOPICS OF LECTURES

No. z.p. –	TOPIC OF THE LECTURE	Number of hours
Section I. General pathology		
1.	The subject and tasks of pathophysiology. Pathophysiological research methods. The doctrine of disease, etiology and pathogenesis. Pathology of reactivity. The role of heredity, constitution, age changes in the development of diseases .	2
2.	Allergy. Etiology, pathogenesis, clinical manifestations. Autoimmune diseases.	2
3.	Pathology of water-salt metabolism. Conditions of hyper- and hypohydria . Edema: types, etiology, pathogenesis.	2
4.	Violation of the acid-base state. Acidosis , alkalosis : classification, etiology, pathogenesis. Compensation and correction mechanisms.	2
TOGETHER		8
Section II. Pathophysiology of organs and systems		
1.	Pathophysiology of the blood system. Anemias: principles of classification, types, etiology, pathogenesis; clinical and hematological manifestations of anemia.	2
2.	Pathophysiology of the circulatory system. Insufficiency of blood circulation. Heart failure. Coronary insufficiency: etiology, pathogenesis, consequences, clinical manifestations. Myocardial infarction.	2
3.	Vascular pathophysiology. Arterial hypertension: types, etiology, pathogenesis. Atherosclerosis: etiology, pathogenesis.	2
4.	Pathophysiology of external breathing. Respiratory failure. Causes and mechanisms of disorders of alveolar ventilation, diffusion of gases through the respiratory membrane, perfusion of the small circle of blood circulation. Hypoxia	2
5.	Pathophysiology of the digestive system and liver. Violation of the secretory and motor function of the alimentary canal. Ulcers of the alimentary canal. Disorders digestion associated with secretory insufficiency of the pancreas. Insufficiency of digestion. Liver failure.	2
6.	Kidney pathophysiology. Kidney failure. Causes and mechanisms violations of glomerular filtration, tubular reabsorption and secretion. Acute and chronic renal failure: criteria, causes, mechanisms, general manifestations. Glomerulonephritis . Nephrotic syndrome.	2
7.	Pathophysiology of the endocrine system. General mechanisms of disorders of the endocrine system. Neuroendocrine disorders. Syndromes of excess or lack of pituitary hormones. Adrenal gland pathology. Pathology of the thyroid gland.	2
8.	Pathophysiology of the nervous system. Principles of classification of violations. Features of the development of typical pathological processes in the nervous system. Violation of sensitive, motor and trophic functions of the nervous system. Pathogenesis of neurogenic dystrophies .	2
TOGETHER		16

**4. TOPICS OF PRACTICAL LESSONS
SEMESTER 1**

No z.p	Topic of practical lesson	Number of hours
1.	Subject, tasks and methods of pathophysiology. General doctrine of disease, etiology and pathogenesis. Effect of changed atmospheric pressure on the body.	2.5
2.	Pathogenic effect of ionizing radiation on the body.	2.5
3.	The role of heredity and constitution in pathology.	2.5
4.	Reactivity and its role in pathology	2.5
5.	Protective mechanisms of reactivity. The role of the mononuclear phagocyte system (MSF) in pathology. Violation of phagocytosis.	2.5
6.	Pathology of the immune system. Immunodeficiency states.	2.5
7.	Immunopathogenesis of HIV infections.	2.5
8.	Allergy.	2.5
9.	Pathophysiology of the cell	2.5
10.	Violation of peripheral blood circulation and microcirculation.	2.5
11.	Violation of heat exchange.	2.5
12.	Fever.	2.5
thirteen.	Inflammation.	2.5
14.	Tumors	2.5
15.	Starvation.	2.5
16.	Credit class	2.5
TOGETHER		40
SEMESTER 2		
17.	Violation of water-electrolyte exchange.	3
18.	Pathophysiology of the blood system. Anemias caused by blood loss.	3
19.	Hemolytic anemias and anemias caused by disorders of erythropoiesis .	3
20.	Violation of the hemostasis system.	3
21.	Leukocytosis , leukopenia. Leukosis.	3
22.	Pathophysiology of systemic circulation. Insufficiency of blood circulation.	3
23.	Pathophysiology of blood vessels. Atherosclerosis.	3
24.	Pathophysiology of the heart. . Coronary heart disease. Heart failure. Arrhythmias	3
25.	Pathophysiology of external breathing. Respiratory failure. Hypoxia.	3
26.	Pathophysiology of the digestive system. Insufficiency of digestion.	3
27.	Pathophysiology of the liver. Liver failure.	3
28.	Kidney pathophysiology. Kidney failure. Violation of acid-base balance.	3
29.	Pathophysiology of the endocrine system. Pathology of the pituitary gland and thyroid gland.	4
30.	Pathology of carbohydrate metabolism. Diabetes. Adrenal gland pathology. Stress	4
31.	Pathophysiology of the nervous system.	4
32.	Exam	

TOGETHER	48

5. INDIVIDUAL WORK

No z.p. –	Topics	Number of hours
Semester 1 General pathology		42
1	Pathogenic effect of the thermal factor on the body	3
2	Pathogenic effect of electric current	3
3	Pathogenic effect of chemical factors	3
4	Pathogenic action of biological factors	3
5	Mechanisms of non-specific resistance of the body	4
6	Immunological basis of transplantation	3
7	Cytotoxic allergic reactions	4
8	Immunocomplex allergic reactions	3
9	Autoallergic reactions	3
10	Aging and pathology	4
11	Violation of mineral metabolism	3
12	Violation of vitamin metabolism	3
thirteen	Typical disorders of lymphodynamics	3
Semester 2 Pathophysiology of organs and systems		26
14	Arterial hypotension	2
15	Extrapulmonary disorders of alveolar ventilation.	2
	Violation of non-respiratory functions of the lungs	
16	Violation of the secretory function of the pancreas	2
17	Intestinal dysfunction	2
18	Portal hypertension syndrome	2
19	General disorders of hormonal regulation	2
20	Pathology of the hypothalamic-pituitary system	2
21	Stress. Stress damage to organs and adaptation diseases	2
22	Pathology of gonads	2
23	General patterns of violations of hormonal regulation of functions and metabolism	2
24	Violations of the autonomic nervous system	2
25	Violation of the nociceptive function of the nervous system. Pain	2
26	Violation of the trophic function of the nervous system	2
In total		68

6. Individual tasks.

Individual tasks are one of the forms of organization of education at the university, which aims to deepen, generalize and consolidate the knowledge that students receive in the process of learning, as well

as the application of this knowledge in practice. Individual tasks are performed by students independently under the guidance of the teacher.

Individual tasks include: writing abstracts and creating multimedia presentations with reports at the meetings of the scientific student circle of the department, participation in the production of macro and micro preparations, participation in the scientific and research work of the department, participation in writing theses and articles of reports at student scientific conferences.

List of tasks for individual student work: defense of an individual research project ; participation in the work of the student scientific circle and speeches at scientific forums; participation in the student Olympiad in discipline; selection of video and audio materials from sections of the academic discipline; selection of materials and creation of a presentation on a relevant topic or section of the discipline.

7. Teaching methods

According to the sources of knowledge, teaching methods are used: verbal - story, explanation, lecture, instruction; visual - demonstration, illustration; practical - practical work, problem solving. According to the nature of the logic of knowledge, methods are used: analytical, synthetic, analytical-synthetic, inductive, deductive. According to the level of independent mental activity, the following methods are used: problem-based, searching, research.

1. Verbal methods: lecture, interactive lecture, conversation;
2. Visual methods: illustration, demonstration.
3. Practical methods: performing practical work and solving situational tasks to develop skills and abilities;
4. Students' independent work on understanding and assimilation of new material
5. Use of control and educational computer programs
6. Innovative teaching methods: Case-based learning (Learning through the analysis of a clinical case, situation); brainstorming; educational discussion; educational debate; role play; team-based learning; think-pair-share.

The types of training according to the curriculum are: lectures; practical training; independent work of students.

8. Control methods

Current control is carried out on the basis of control theoretical knowledge, practical skills and abilities.

Forms of current control are: *in the dream* survey (frontal, individual, combined), interview; **practical verification of formed professional skills** (carried out based on the results of solving clinical cases, working with medical documentation, performing practical skills); **test control** ("open" and "closed" test tasks).

Current control is mandatory. During the evaluation of mastering of each topic from all disciplines of the curriculum for the current educational activity, the student is given grades on a 4-point (traditional scale) taking into account the approved evaluation criteria for the discipline. All types of work provided by the curriculum are taken into account. The student must receive a grade in each topic. The teacher conducts a survey of each student in the group at each lesson and assigns a grade in the journal of attendance and student performance according to the traditional scale ("5", "4", "3", "2").

When evaluating the student's current educational activity, 20% of the grade is the student's independent work, which takes into account the knowledge of the topic of independent study and the performance of work in the notebook.

The final (summary) control is carried out :

- in the form of a written test, which includes test tasks, theoretical questions
- control of practical skills (solving clinical cases, assessment of macro and micro drugs, assessment of the correctness of practical skills - practical-oriented exam.

According to the specifics of professional training, preference is given to test and practically oriented control.

9. Form of final control of study success .

The final control of the discipline is carried out on the basis of theoretical control knowledge, practical skills and abilities.

Assessment is a form of final control, which consists in assessing the student's learning of the learning material based solely on the results of his performance of certain types of work in practical, seminar or laboratory classes. Semester assessment of subjects is carried out after the end of its study, before the beginning of the examination session.

An exam (differential assessment) is a form of final control of a student's assimilation of theoretical and practical material from an educational discipline.

10. Scheme of accrual and distribution of points received by students.

The maximum number of points for a discipline is 200 points. The ratio between the results of the evaluation of the current educational activity and the final control of knowledge is 60% and 40%.

The first semester of studying the discipline ends with a test.

The maximum number of points that a student can score for the current educational activity while studying the discipline is 200 points, *the minimum number of points* - the minimum number of points - is 120 points.

The calculation of the number of points is carried out on the basis of the grades received by the student on a 4-point (national) scale during the study of the discipline, by calculating the arithmetic mean, rounded to two decimal places.

The student receives a credit in the last lesson of the discipline based on the results of the current assessment.

Only those students who do not have academic debt and whose average score for the current academic activity in the academic discipline is at least 3.00 are admitted to the credit.

The average grade for the current activity is converted into points on a 200-point scale, according to the conversion table (Table 1).

Table 1.

Recalculation of the average grade for the current activity into a multi-point scale (for disciplines ending with credit)

4-point scale	200-point scale	4-point scale	200-point scale	4-point scale	200-point scale	4-point scale	200-point scale
5	200	4.47	179	3.94	158	3.42	137
4.97	199	4.44	178	3.92	157	3.39	136
4.94	198	4.42	177	3.89	156	3.37	135
4.92	197	4.39	176	3.87	155	3.34	134
4.89	196	4.37	175	3.84	154	3.32	133
4.87	195	4.34	174	3.82	153	3.29	132
4.84	194	4.32	173	3.79	152	3.27	131
4.82	193	4.29	172	3.77	151	3.24	130
4.79	192	4.27	171	3.74	150	3.22	129
4.77	191	4.24	170	3.72	149	3.19	128
4.74	190	4.22	169	3.69	148	3.17	127
4.72	189	4.19	168	3.67	147	3.14	126
4.69	188	4.17	167	3.64	146	3.12	125
4.67	187	4.14	166	3.62	145	3.09	124
4.64	186	4.12	165	3.59	144	3.07	123

4.62	185	4.09	164	3.57	143	3.04	122
4.59	184	4.07	163	3.54	142	3.02	121
4.57	183	4.04	162	3.52	141	3	120
4.54	182	4.02	161	3.49	140	< 3	70-119 (refolding)
4.52	181	4.00	160	3.47	139		
4.49	180	3.97	159	3.44	138		

The learning result is also evaluated on a two-point scale (passed/failed).

Table 2

The scale of transferring points to the national system

According to the national system	On a 200-point scale
counted	from 120 to 200 points
not counted	less than 119 points

Students' independent work, which is provided for by the topic of the lesson along with classroom work, is evaluated during the current control of the topic in the corresponding lesson.

The last semester of studying the discipline ends with a final control in the form of an exam.

Only those students who do not have academic debt (all missed classes have been completed) and whose average score for the current educational activity in the academic discipline is at least "3" are admitted to the exam.

The maximum number of points that a student can score for the current educational activity for admission to the exam is 120 points and is defined as the sum of the arithmetic average of all grades received in the semester.

The minimum number of points that a student must score for the current educational activity for admission to the exam is 72 points. Recalculation of the average grade for the current academic performance (on a 120-point scale) in the table. 3.

Table 3.

Recalculation of the average grade for the current academic performance in a multi-point scale for disciplines ending with an exam

4-point scale	200-point scale	4-point scale	200-point scale	4-point scale	200-point scale
5	120	4.29	103	3.58	86
4.96	119	4.25	102	3.54	85
4.92	118	4.21	101	3.50	84
4.87	117	4.17	100	3.46	83
4.83	116	4.12	99	3.42	82
4.79	115	4.08	98	3.37	81
4.75	114	4.04	97	3.33	80
4.71	113	4.00	96	3.29	79
4.67	112	3.96	95	3.25	78
4.62	111	3.92	94	3.21	77
4.58	110	3.87	93	3.17	76
4.54	109	3.83	92	3.12	75
4.50	108	3.79	91	3.08	74
4.46	107	3.75	90	3.04	73
4.42	106	3.71	89	3	72
4.37	105	3.67	88	Less than 3	Not enough
4.33	104	3.62	87		

The maximum number of points that a student can score when taking the exam is 80 (the minimum number is at least 50).

Discipline assessment is defined comprehensively as the sum of points for the current

educational activity and points for the exam.

From the allocated 120 points for the current educational activity, 4 to 12 additional points are allocated for the assessment of individual independent work of higher education applicants, according to the work curriculum. Encouragement points are added to the final grade for the discipline at the end of its study.

Points from the discipline for students who have successfully completed the program are converted to the national scale and the ECTS system (tables 4, 5).

Table 4.

Discipline points	Evaluation on a 4-point scale
From 180 to 200 points	5
From 150 to 179 points	4
From 149 points to the minimum number of points that the student must score	3
Below the minimum number of points that the student must score	2

Table 5.

Rating scale: national and ECTS

The sum of points for all types of educational activities	Evaluation of ECTS	Evaluation on a national scale	
		for an exam, a diploma	for credit
180-200	A	perfectly	counted
160-179	B	okay	
150-159	C		
130-149	D	satisfactorily	
120-129	E		
50-119	FX	unsatisfactory with the possibility of refolding	not included with the possibility of refolding
0-49	F	unsatisfactory with mandatory repeated study of the discipline	not enrolled with mandatory re-study disciplines

11. Methodological support

1. Working curriculum of the discipline;
2. Plans of lectures, practical classes and independent work of students;
3. Abstracts of lectures on the discipline;
4. Methodical instructions for practical classes for students;
5. Methodical materials that ensure independent work of students;
6. Test and control tasks for practical classes;
7. List of questions and practical skills for the exam

12. A list of theoretical questions for preparing students for the final examination

Questions for PC preparation 1

1. Pathophysiology as a science and educational discipline, its constituent parts. The subject and tasks of pathophysiology.
2. Modern methods and techniques of conducting experiments. General principles of experimental research planning, accounting, statistical processing and analysis of results. Experimental therapy.
3. Moral and ethical problems of using animals as experimental objects. Requirements of bioethics regarding work with laboratory animals. Types of experiment.
4. Methods of clinical pathophysiology. Methods of physical and mathematical modeling of

pathological processes.

5. General teaching about the disease. Basic concepts of general nosology. Norm. Health, definition of WHO. Disease.
6. Concept of pathological process, pathological condition, pathological reaction. Definition of a typical pathological process.
7. Illness as a biological, medical and social problem. Abstract and concrete in the concept of "disease". Unidestructive and protective in disease.
8. Principles of disease classification, WHO classification.
9. Basic regularities of the course of diseases. Periods of disease development. Remission, relapse, complications. Options for ending the disease: complete and incomplete recovery.
10. General etiology. Definition of the term "etiology". The problem of causality in pathology. The role of causes and conditions in the occurrence of diseases.
11. Classification of etiological factors according to the nature and strength of the active factor. External and internal etiological factors. The concept of an extraordinary irritant.
12. The main directions of teaching about etiology: monocausalism, conditionalism, constitutionalism, holism.
13. Concepts of psychosomatic medicine. Concept of "behavioral risk factors".
14. Basic provisions of the modern synthetic theory of general etiology.
15. The concept of polyetiological diseases. Relative and absolute polyetiologism.
16. Concept of risk factors. "Diseases of civilization".
17. Definition of the concept of pathogenesis. Relationship between destructive and adaptive phenomena in pathogenesis.
18. Adaptation, compensation. Mechanisms of immediate and long-term adaptation
19. Cause and effect relationships in pathogenesis. Variants of direct causal relationships. "Vicious circle". The main links of pathogenesis. Pathogenetic principles of disease treatment.
20. The role of local and general in pathogenesis. The concept of localization and generalization. Assessment of local trends in the science of general pathogenesis.
21. Specific and non-specific mechanisms of pathogenesis. The main components of universal pathogenesis.
22. Effect of low atmospheric pressure on the body. Etiology and pathogenesis of altitude sickness.
23. Decompression sickness, pathogenesis. Explosive decompression.
24. The concept of extreme states and their connection with terminal states. Extreme living conditions.
25. Shock. Types of shock. Mechanisms of disorders of general hemodynamics and microcirculation in shock.
26. Functional and structural disorders at different stages of shock. The role of physiologically active substances and tissue damage products in the pathogenesis of shock states. Involvement of nervous mechanisms in the development of shock. Pathophysiological basis of shock prevention and therapy.
27. Collapse. Common and distinctive features of shock and collapse. Etiology and pathogenesis of colaptoid conditions. The role of neurogenic humoral mechanisms in the development of collapse.
28. Concept of crash syndrome. Its causes and main pathogenetic mechanisms.
29. Coma. Endogenous and exogenous comas. Mechanisms of development of comatose states. The role of brain energy supply disorders and general disorders in the pathogenesis of coma. Principles of therapy.
30. Terminal states: preagony, agony, clinical death.
31. Biological death. Patterns of the body's death.
32. Pathophysiological foundations of resuscitation. Post-resuscitation disease, stages, pathogenesis.
33. Pathogenic effect of electric energy. Factors determining the nature of electric shocks.
34. Violation of the functioning of cellular structures under the action of electric energy.

35. Violation of the functions of organs and systems (brain, cardiovascular and respiratory systems) under the action of electric current.
36. Concept of technical and technological errors of regulatory systems of cells (genetic programs and their selection). Violation of selection of the genetic program at the level of control agents (hormones, mediators, antibodies, substrates, ions). The phenomenon of molecular mimicry.
37. Violation of the selection of the genetic program at the level of receptors (blockade and stimulation of receptors). Mechanisms of disruption of post-receptor signal transmission and selection of a program that does not correspond to the situation.
38. Programmed cell death. Apoptosis, stages, mechanisms of regulation and course of the process.
39. Consequences of suppressing and increasing apoptosis.
40. Types and mechanisms of mitosis pathology.
41. Heredity as a cause and condition for the development of diseases. The ratio of hereditary and acquired in pathogenesis. Hereditary and congenital diseases. Geno- and phenocopies. Classification of hereditary diseases.
42. Mutations. Principles of their classification. Causes of mutations. Mutagenic factors of physical, chemical and biological origin. The phenomenon of mosaicism.
43. Anti-mutation protection systems. Excision and recombination mechanisms of DNA repair. The role of violations of reparative systems and "immune surveillance" in the occurrence of hereditary pathology. Syndromes of chromosomal instability.
44. Monogenic hereditary diseases. Gene mutations, classification, mechanisms of development. Manifestations of harmful gene mutations at the molecular, cellular, organ levels and at the level of the organism as a whole. Violation of the structure and function of enzymatic and non-enzymatic proteins as a result of gene mutations.
45. Types of inheritance of genetic defects. Mechanism of development of autosomal dominant, autosomal recessive sex-linked hereditary diseases.
46. Polygenic hereditary diseases. Hereditary predisposition to diseases. Antigen-associated diseases.
47. Chromosomal diseases. Mechanisms of genomic and chromosomal mutations, their types. Syndromes caused by a change in the number of chromosomes. The main phenotypic manifestations of chromosomal aberrations.
48. Non-traditional inheritance. Mosaicism, genomic imprinting, triplet repeats, anticipation.
49. Methods of study, prevention and treatment of hereditary diseases. Ways of correction of genetic defects. Perspectives of genetic engineering.
50. Mechanisms of cell response to nuclear damage. Expression of emergency genetic programs.
51. Mechanisms and manifestations of damage to the cytoskeleton.
52. Mechanisms and manifestations of damage to the endoplasmic reticulum, Golgi complex and lysosomes. Pathogenesis of thesaurismoses.
53. Mechanisms and manifestations of mitochondrial damage. Mechanisms of uncoupling oxidation and phosphorylation in mitochondria.
54. Causes of the development of intracellular acidosis. The role of acidotic mechanisms in cell damage.
55. Participation of protein mechanisms in alteration processes. Inactivation of enzymes, denaturation of proteins, activation of proteolysis.
56. Types and mechanisms of the development of cellular dystrophies.
57. Consequences and stages of cell damage. Mechanisms of necrobiosis.
58. Comparative characteristics of necrosis and apoptosis.
59. Mechanisms of protection and adaptation of cells to the action of harmful agents. Protective compensatory reactions aimed at restoring the shifted intracellular homeostasis. Cellular and subcellular regeneration.
60. Active and passive resistance of cells to damage. Principles of prevention and pathogenetic therapy of cell damage.

61. Hyperthermia: pathogenetic options and clinical forms. Defensive compensatory reactions and actual pathological changes in hyperthermia. Burns, burn disease.
62. Pathogenesis of heat spasms, heat exhaustion, heat and sunstroke, the role of cytokines.
63. Hypothermia. Defensive compensatory reactions and actual pathological changes. Mechanisms of adaptation to cold.
64. Artificial hypothermia, its use in medicine.
65. Characteristics of phagocytosis and the system of mononuclear phagocytes. Obligatory and facultative phagocytes.
66. Mechanisms and stages of phagocytosis.
67. Mechanisms of leukocyte production of reactive oxygen species ("respiratory explosion").
68. Disorders of phagocytosis: forms, causes, mechanisms, consequences. Chediak-Higashi syndrome.
69. Humoral factors of the body's non-specific resistance to infectious agents (lysozyme, C-reactive protein, interferons, fibronectin, etc.).
70. Complement system and its disorders. Significance for the pathology of classical and alternative pathways of complement activation.
71. Antigens of the main histocompatibility complex of classes I and II, role and functions in immunogenesis and pathology.
72. Mechanisms of humoral and cellular immune response, their disorders. Immunological deficiency: primary and secondary immunodeficiencies.
73. Causes, mechanism and types of primary immunodeficiencies. The role of physical, chemical and biological factors in the development of secondary immunodeficiencies.
74. Pathophysiological characteristics of acquired immunodeficiency syndrome (AIDS).
75. Allergy. Definition of the concept and general characteristics of allergy. Allergy and immunity. Etiology of allergy, types of exo- and endogenous allergens. The importance of hereditary factors in the development of allergies.
76. Principles of classification of allergic reactions. General characteristics of allergic reactions of immediate and delayed types. Classification of allergic reactions according to Coombs and Gell. Stages of pathogenesis of allergic reactions.
77. Allergic reactions of type I (anaphylactic). Immunological mechanisms of anaphylactic reactions, the role of tissue basophilic granulocytes in their development.
78. Allergic reactions of type I (anaphylactic): characteristics of stages, mediators (primary and secondary), experimental models, main clinical forms. Mechanisms of self-limitation of anaphylactic reactions.
79. Active and passive anaphylaxis, pathogenesis of anaphylactic shock.
80. Allergic reactions of type II (cytotoxic): characteristics of stages, mediators, experimental models, main clinical forms. Mechanisms of cytolysis: complement-dependent cytolysis, antibody-dependent cytolysis, antibody-dependent cellular cytotoxicity.
81. Allergic reactions of type III (immunocomplex): characteristics of stages, mediators, experimental models, main clinical forms. Factors determining the pathogenicity of immune complexes, immune complex damage, their local and general manifestations.
82. Allergic reactions of type IV (delayed type hypersensitivity): characteristics of stages, mediators, experimental models, main clinical forms. Peculiarities of immunological mechanisms. Classification, mechanisms of formation and actions of lymphokines.
83. Cytokinetic allergic reactions of suppressive and activating action: classification, characteristics of stages, mechanisms, experimental models, main clinical forms.
84. Definition of the concept of "local blood circulation disorders". The main forms of local blood circulation disorders.
85. Nature, mechanisms of formation and role of endothelial factors: endothelial relaxation factor, endothelins in the pathogenesis of local blood circulation disorders.
86. Arterial hyperemia: classification, causes and mechanisms of development, main manifestations, experimental models.

87. Venous hyperemia: classification, causes and mechanisms of development, main manifestations, experimental models.
88. Ischemia: classification, causes and mechanisms of development, main manifestations, experimental models. Tissue changes caused by ischemia, their significance and possible consequences. Concept of ischemic toxicosis.
89. Reperfusion syndrome, its pathogenesis, experimental models.
90. Stasis: classification, causes and mechanisms of development, main manifestations, experimental models.
91. Definition of the concept of inflammation. Etiology of inflammation. Classification of phlogogenic agents.
92. Methods of studying the inflammatory process in an experiment.
93. Stages of inflammation. Cardinal signs of the inflammatory process. Classification of inflammation.
94. Primary and secondary alteration. Causes and mechanisms of secondary alteration.
95. Mediators and anti-mediators of inflammation, their classifications.
96. Changes in blood circulation in the focus of inflammation (Y. Kongheim). Mechanisms of short-term ischemia and arterial hyperemia during inflammation. Reasons for the transition of arterial hyperemia to venous.
97. Exudation. Mechanisms of exudation. Causes and mechanisms of increased vascular wall permeability. Early and late stages of increased permeability.
98. Emigration. Stages of emigration of leukocytes. The final state of leukocytes, its mechanisms. The role of cell adhesion molecules.
99. Exogenous and endogenous chemotaxins, mechanisms of neutralization of microbes by leukocytes.
100. Biochemical and physicochemical disorders in the focus of inflammation.
101. Causes of changes in oncotic and osmotic pressure in the focus of tissue inflammation.
102. Reasons for the development of acidosis in the focus of inflammation.
103. The essence of the physicochemical (biochemical) theory of inflammation of Schade and Menkin.
104. Pathogenesis of the main signs of inflammation (fever, leukocytosis, "proteins of the acute phase of inflammation", increased ESR). Syndrome of systemic action of inflammatory mediators. Connection of local and general disorders during inflammation.
105. Types of exudates. Differences between serous exudate and transudate. Morphological and biochemical composition of purulent exudate.
106. Proliferation. Mechanisms of proliferation. Molecular mechanisms of transfer and implementation of the mitogenic signal. Mechanisms of sclerosis.
107. The role of reactivity in the development of inflammation, the importance of immune reactions in the inflammatory process. Inflammation and allergy. Influence of nervous and hormonal factors on inflammation.
108. The importance of inflammation for the body. Principles of anti-inflammatory therapy.
109. Definition of the concept and general characteristics of fever. Formation of febrile reaction in phylo- and ontogenesis.
110. Etiology of fever. Principles of classification of pyrogens. Chemical nature of pyrogenic substances. The formation of pyrogens during the infectious process, aseptic tissue damage and immune reactions.
111. The concept of primary and secondary pyrogens. The role of interleukins 1 and 6, tumor necrosis factor in the pathogenesis of fever. Involvement of prostaglandins in the reconstruction of thermoregulation.
112. Stages of fever. Types of febrile reactions.
113. Involvement of the nervous, endocrine and immune systems in the development of fever.
114. Changes in metabolism and physiological functions during fever.
115. Protective value and negative features of fever.

116. Pathophysiological principles of antipyretic therapy.
117. Concept of pyrotherapy.
118. The main differences between fever, exogenous overheating and other types of hyperthermia. Febrile conditions, their classification.
119. Pathogenesis of stress-salt fever.
120. The main types of tissue growth disorders. Concept of hypo- and hyperbiotic processes.
121. Definition of the terms "tumor" and "neoplastic process". Biological features of tumor growth. Types of atypical growth and differentiation.
122. The main signs of physicochemical, biochemical, antigenic, functional atypism (anaplasia).
123. The concept of malignant and benign tumors. Infiltrative and expansive growth. Molecular mechanisms of tumor growth, features of mitogenic signal implementation.
124. Experimental study of the etiology and pathogenesis of tumors: methods of induction, transplantation, explantation.
125. Etiology of tumors. Risk factors for their development. Classification of carcinogens. Physical carcinogenesis.
126. Chemical carcinogenesis. Classification of chemical carcinogens. Endo- and exocarcinogens. Chemical carcinogens of direct and indirect action. Peculiarities of the chemical structure of compounds that determine their carcinogenicity. Cocarcinogenesis and syncarcinogenesis. The role of hormones in carcinogenesis.
127. Viral carcinogenesis. Experimental evidence of the viral origin of tumors. Classification of oncogenic viruses.
128. Stages of tumor pathogenesis. Mechanisms of tumor transformation.
129. Mechanisms of promotion. The role of disruption of apoptosis in the pathogenesis of tumors.
130. Mechanisms of tumor progression. Metastasis, its stages and mechanism. Mechanisms of cachexia.
131. Interaction of an organism and a tumor.
132. Mechanisms of natural antitumor protection, their classification.
133. Typical forms of energy metabolism disorders. Hypoergoses, definition, classification (according to S.N. Yefuni). Dissimilatory hypoergosis, pathogenetic variants, causes, mechanisms of development.
134. Accumulation and utilization of hypoergosis. pathogenetic variants, causes, mechanisms of development.
135. The importance of energy metabolism disorders for the vital activity of cells, organs and the organism as a whole,
136. Causes and mechanisms of disturbance of exchange of purine and pyrimidine bases.
137. Positive and negative nitrogen balance. Disturbance of assimilation of food proteins.
138. Hereditary disorders of amino acid metabolism.
139. Violation of the final stages of protein metabolism, urea synthesis.
140. Production and retention hyperazotemia. Disorders of the protein composition of blood plasma: hyper-, hypo-dysproteinemia. paraproteinemia.
141. Gout: the role of exo- and endogenous factors, mechanisms. Hyper- and hypouricemia. Hereditary orotaciduria.
142. Hypo- and vitamin deficiency. their types Violation of transport absorption, storage, utilization and metabolism of vitamins. Antivitamins.
143. Hypervitaminoses. Mechanisms of metabolic disorders and physiological functions in the most important forms of hypo- and hypervitaminosis.
144. Causes and mechanisms of metabolic disturbances.
145. Starvation, definition, classification, causes. Pathophysiological characteristics of periods of complete starvation.
146. Protein-calorie deficiency, its forms: alimentary marasmus, kwashiorkor. Alimentary dystrophy. Mechanisms of the body's resistance to starvation. Therapeutic fasting.
147. Positive and negative water balance. Dehydration: extracellular and intracellular. Hypo-, iso-

and hyperosmolar dehydration. Causes and mechanisms of development. Protective - compensatory mechanisms. Anhydremia syndrome.

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

149. Swellings, etiological and pathophysiological classification. Hydrostatic and oncotic mechanisms of edema development.

150. The role of vascular wall permeability disorders and lymph outflow in the pathogenesis of edema. Edema caused by retention of sodium salts in the body. "Myxedematous" swellings. Principles of edema treatment.

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

152. Hyper- and hypokalemia. Causes and mechanisms of development. The main manifestations of disturbances in the exchange of potassium ions.

153. Violations of hormonal regulation of phosphorus-calcium exchange: Viper and hypoparathyroidism, hypo- and hypervitaminosis D, disorders of calcitonin secretion.

154. Hypocalcemic conditions, causes and mechanisms of development. The main manifestations of hypocalcemia: tetany, rickets, calcium and phosphopenic variants of development. Resistance to the action of vitamin D. Principles of prevention and treatment of rickets. Osteodystrophy, its manifestations.

155. Hypercalcemic state, causes and mechanisms of development. Calcification of soft tissues: metastatic, dystrophic and metabolic mechanisms. Mechanisms of ectopic formation of oxyapatite crystals. Concept of procalcification.

156. Hyper and hypophosphatemia. Causes and mechanisms of development.

157. Violation of the metabolism of trace elements.

158. Buffer systems of the body, mechanisms of their functioning.

159. The role of the lungs, kidneys, stomach, and salivary glands in the regulation of acid-alkaline balance.

160. Classification of the main forms of acid-base balance disorders.

161. Gas acidosis, diagnostic criteria (according to Siggaard-Andersen nomogram), causes of development, protective compensatory reactions, principles of correction.

162. Non-gaseous acidosis, types, diagnostic criteria (according to Siggaard - Andersen nomogram), causes of development, mechanisms of compensation, principles of correction.

163. Acidosis with increased and normal anion difference. Causes of intracellular acidosis.

164. Gas alkalosis, diagnostic criteria (according to Siggaard - Andersen nomogram), causes of development, protective compensatory reactions, principles of correction.

165. Non-gaseous alkalosis: hypochloremic, hypokalemic, hypernatremic. Diagnostic criteria (according to Siggaard-Andersen nomogram indicators), development mechanisms and compensatory reactions, principles of correction. The relationship between acid-base balance disorders and water-electrolyte metabolism disorders.

166. Types of violations of carbohydrate metabolism. Violation of absorption of food carbohydrates, processes of synthesis, deposition and breakdown of glycogen, transport of carbohydrates into cells.

167. Hypoglycemia, causes and mechanisms. Hypoglycemic coma.

168. Diabetes mellitus, classification of WHO experts. Causes and mechanisms of development. Causes of extrapancreatic insulin insufficiency. Experimental models of diabetes.

169. Violations of carbohydrate and other types of metabolism in diabetes.

170. Pathogenesis of the main clinical manifestations of diabetes. Types of coma in diabetes. Pathogenesis of the main complications of diabetes: macro- and microangiopathy, neuropathy.

171. Pathogenetic principles of diabetes treatment.

172. Types of fat metabolism disorders. Violation of digestion and absorption of lipids.

173. Disorders of lipid transport in the blood. Hyper-, hypo- and dyslipoproteinemia. WHO

classification of hyperlipoproteinemia. "Modified" lipoproteins. Hereditary and acquired disorders of blood plasma lipoprotein composition.

174. Primary and secondary obesity. Experimental models and pathogenesis of obesity.

175. Hyperketonemia: causes, mechanisms, consequences.

176. Violation of intermediate lipid exchange in cells. Mechanisms of fatty dystrophy. Questions for SPA (questions for PMK 1 are part of questions for SPA)

177. Classification of changes in total blood volume. Hypovolemia, their types, causes and mechanisms of development, significance for the body.

178. Normovolemia, their types, causes and mechanisms of development, significance for the body.

179. Hypervolemia, their types, causes and mechanisms of development, significance for the body.

180. Scheme of normal erythropoiesis according to I. L. Chortkov and O. I. Vorobyov. Causes of dysregulation of erythropoiesis, effective and ineffective erythropoiesis.

181. Types of quantitative pathological changes of erythrocytes. Erythremia and erythrocytosis (absolute and relative), etiology, pathogenesis, diagnostic methods.

182. Anemia. Definition of the concept. General hematological and clinical manifestations of anemia. Regenerative and degenerative forms of erythrocytes, cells of pathological regeneration. Basic principles of anemia classification.

183. Anisocytosis, quantity. Causes and mechanisms of the shift of the Price-Jones curve to the right and to the left.

184. Blood loss: etiology, pathogenesis. Protective and adaptive reactions of the body during blood loss. Disorders of physiological functions caused by blood loss.

185. Acute and chronic posthemorrhagic anemias, characteristics of the blood picture.

186. Hemorrhagic shock, mechanisms of development, manifestations. Mechanisms of action of hyperbaric oxygenation in acute massive blood loss.

187. General hematological and clinical manifestations of anemia. Regenerative and degenerative forms of erythrocytes, cells of pathological regeneration.

188. Hemolytic anemias, principles of classification. Hereditary hemolytic anemias: membrane-, enzyme-taghemoglobinopathies, their causes and pathogenesis.

189. Types, causes and pathogenesis of acquired hemolytic anemias.

190. Mechanisms of intravascular and intracellular hemolysis of erythrocytes.

191. Anemias associated with disorders of erythropoiesis, classification. Myelotoxic anemia, causes, pathogenesis, blood picture.

192. Acquired and hereditary forms of hypoplastic anemia, pathogenesis of clinical manifestations. The concept of myelophthisis. Metaplastic anemia.

193. Megaloblastic anemias. Causes of vitamin B12 and folic acid deficiency. Addison-Birmer anemia, symptomatic B12-deficient anemia. B12-refractory megaloblastic anemias. Pathogenesis, blood picture, mechanism of development of the main clinical manifestations of megaloblastic anemia.

194. Mineral deficiency anemias. Iron deficiency anemia: causes, pathogenesis, blood picture, mechanisms of development of the main clinical manifestations. Iron-refractory anemias. Dysregulatory anemias.

195. Mechanisms of leukopoiesis in hematopoietic organs and its disorders.

196. Types of quantitative and qualitative changes of leukocytes in the blood. Degenerative changes of leukocytes.

197. Leukocytosis, classification, causes, mechanisms of development.

198. Neutrophilic, eosinophilic, lymphocytic and monocytic leukocytosis (absolute and relative).

199. The concept of a shift in the leukocyte formula, types of nuclear shift.

200. Leukopenia, primary and secondary, causes, mechanisms of development. Alimentary toxic and hemorrhagic aleukia.

201. Pathogenesis of the main clinical manifestations of leukopenia.

202. Agranulocytosis, types, causes, mechanisms of development.

203. Hemoblastosis, their types. Leukemia as a type of hemoblastosis.
204. Principles of classification of leukemias.
205. Causes of leukemia. Evidence of the tumor nature of leukemias. Viral leukogenesis, types of leukogenic viruses.
206. The importance of the genetic and hereditary factor in the etiology of leukemias.
207. Acute leukemias, features of their pathogenesis and blood patterns.
208. Chronic leukemias, features of their pathogenesis and blood patterns.
209. Pathogenesis of leukemias, stages. Classification of oncogenes in leukemia.
210. Criteria of tumor progression in hemoblastosis.
211. Features of leukemic cells, their morphological, cytogenetic, cytochemical characteristics.
212. Basic disorders in the body in leukemia, their mechanisms.
213. Principles of diagnosis and treatment of leukemias.
214. Leukemoid reactions, causes and mechanisms of development. Common and distinctive features of leukemic reactions and leukemias.
215. Hemorrhagic disorders of hemostasis, classification. Types of disorders of vascular and thrombocytic mechanisms of hemostasis.
216. Vasopathies, causes, mechanisms of development, pathogenesis of the main clinical manifestations.
217. Thrombocytopenia: etiology, pathogenesis, mechanisms of hemostasis disorders.
218. Thrombocytopathies. Mechanisms of adhesion disorders, aggregation of platelets, release of platelet granules.
219. Causes, mechanisms and main manifestations of violation of the 1st phase of blood coagulation. Hemophilia A, B, C.
220. Causes, mechanisms and main manifestations of violation of the II phase of blood coagulation: hereditary deficiency of V and VII factors, hypoprothrombinemia.
221. Causes, mechanisms and main manifestations of violation of the III phase of blood coagulation: increased fibrinolysis, hypo- and fibrinogenemia.
222. Principles of correction of blood coagulation disorders.
223. Disseminated intravascular coagulation syndrome (DVZ syndrome). Causes and pathogenesis. Concept of "protease explosion". The role of DVZ syndrome in the pathogenesis of extreme conditions. Peculiarities of the course of DVZ in children.
224. Changes in the physical and chemical properties of blood: osmotic and oncotic pressure, viscosity, ESR.
225. Basic properties of the myocardium. Mechanisms of automatism, drivers of heart contraction rhythm. Mechanisms of heart excitability, concept of resting potential and action of heart ventricles, Features of action potential of pacemakers.
226. Mechanisms of conduction, structure of the conduction system of the heart.
227. Cardiac arrhythmias: definition, classification. Electrophysiological mechanisms of the development of arrhythmias.
228. Violation of the automaticity of the heart: types, causes, mechanism of development, manifestations on the ECG.
229. Violation of heart excitability; extrasystole: types, causes, mechanism of development, manifestations on the ECG.
230. Paroxysmal tachycardia: types, causes, mechanism of development, manifestations on the ECG.
231. Atrial and ventricular atrial fibrillation, causes and mechanism of development, manifestations on the ECG.
232. Cardiac conduction disorders: types, causes and mechanisms of development; manifestations on the ECG.
233. Disorders of heart contraction: types, causes, pathogenesis, clinical manifestations.
234. The role of additional conducting pathways of the heart (Kent, James) in the development of arrhythmias, manifestations on the ECG.

235. Pathogenetic principles of therapy, heart defibrillation; artificial rhythm drivers.
236. The concept of circulatory failure and heart failure, principles of classification.
237. Heart failure from overload. Types of cardiac overload and immediate compensation mechanisms.
238. Mechanisms of long-term adaptation of the heart to loads. Stages of compensatory hyperfunction of the heart. Physiological and pathological hypertrophy of the myocardium.
239. Features of hypertrophied heart, mechanisms of its decompensation. Heart defects, their main types.
240. Myocardial form of heart failure. Hypo- and hypercalcic variants of disorders of the contractile function of the myocardium. Concept of cardioplegia, methods of its implementation.
241. Extramyocardial heart failure, causes, mechanisms of development. Damage to the pericardium. Acute cardiac tamponade.
242. Indicators of cardio and hemodynamics in heart failure. Pathogenesis of common manifestations of heart failure. Principles of treatment.
243. Insufficiency of coronary blood circulation, pathogenetic options. Causes and mechanisms of myocardial ischemia. The concept of the value of "critical stenosis".
244. Experimental modeling of myocardial ischemia. Mechanisms of the development of pathological changes in the myocardium caused by insufficiency of coronary blood circulation.
245. Consequences of coronary blood circulation disorders for the heart. Reperfusion syndrome. Concept of "oxygen" and "calcium" paradoxes, their mechanisms.
246. Ischemic heart disease, etiology and pathogenesis. Myocardial infarction, pathogenesis of the main clinical manifestations.
247. Diagnostic value of increased activity of enzymes in myocardial infarction.
248. Mechanisms of development of cardiogenic shock.
249. Principles of prevention and treatment of ischemic heart lesions.
250. Non-coronary necrosis of the heart, causes and mechanisms of their occurrence.
251. The essence of the concept of respiratory insufficiency: the main signs, forms, indicators of respiratory insufficiency.
252. Pathogenetic variants of ventilation disorders. Alveolar hyperventilation.
253. Obstructive variant of impaired alveolar ventilation: etiology, pathogenesis, diagnostic indicators.
254. Restrictive variant of impaired alveolar ventilation: etiology, pathogenesis, diagnostic indicators.
255. Dysregulatory variant of impaired alveolar ventilation: etiology, pathogenesis, diagnostic indicators.
256. Asphyxia: causes, mechanisms of development, main stages.
257. Pathogenesis of the main clinical manifestations of external respiratory failure. Shortness of breath, its causes and forms; mechanisms of inspiratory and expiratory shortness of breath.
258. Pathological forms of breathing: types, causes, mechanism of development; experimental modeling of periodic breathing.
259. Violation of pulmonary blood circulation. Violations of general and regional ventilation-perfusion relations in the lungs.
260. Causes and mechanisms of gas diffusion disorders in the lungs.
261. Mechanisms of compensation for external breathing disorders (pulmonary, extrapulmonary factors of compensation).
262. Violation of metabolic functions of the lungs. Violation of the surfactant system.
263. Definition of the concept of hypoxia. Principles of classification of hypoxic conditions.
264. Types, etiology and pathogenesis of arterial-hypoxemic hypoxia (according to the classification of S.N. Yefuni), indicators of gas composition of arterial and venous blood.
265. Types, etiology and pathogenesis of hemic hypoxia (according to the classification of S.N. Yefuni), indicators of gas composition of arterial and venous blood. Causes, mechanisms and consequences of the formation of carboxyhemoglobin, methemoglobin, sulfhemoglobin,

nitrosylhemoglobin. The concept of hereditary methemoglobinemia.

266. Types, etiology and pathogenesis of hemodynamic hypoxia (according to the classification of S.N. Yefuni), indicators of gas composition of arterial and venous blood.

267. Types, etiology and pathogenesis of hypoxia of peripheral shunting (according to the classification of S.N. Yefuni), indicators of gas composition of arterial and venous blood.

268. Causes and pathogenesis of primary and secondary tissue hypoxia. Mixed forms of hypoxia.

269. Mechanisms and stages of hypoxic cell damage. Resistance of individual organs and tissues to hypoxia.

270. Immediate and long-term adaptive reactions of the body during hypoxia.

271. Normobaric and hypobaric hypoxic therapy.

272. Oxygen therapy and the toxic effect of oxygen. Normo- and hyperbaric oxygenation.

Hyperoxia as a cause of hypoxia.

273. Concept of insufficiency of digestion, principles of classification. Etiology of digestive disorders. Principles of experimental modeling of digestive disorders.

274. Functional connections of different departments of digestion under the conditions of pathology. The connection between digestive disorders and metabolic disorders. General manifestations of indigestion.

275. Appetite disorders, types, causes, pathogenesis.

276. Indigestion in the oral cavity. Causes of chewing and swallowing disorders.

277. Caries, etiology, pathogenesis, experimental models.

278. Periodontitis, etiology, pathogenesis, experimental models.

279. Salivation disorders: hypo- and hypersalivation, their consequences.

280. Gastric dyskinesias, hyper- and hypotonic variants.

281. Mechanisms of development of belching, heartburn, nausea, vomiting.

282. Types of gastric secretion disorders. Causes and mechanisms of the development of hypo- and hypersecretory states. Pathogenetic variants and experimental models of gastric ulcers.

283. Etiology and pathogenesis of gastric and duodenal ulcers.

284. Violation of the secretory function of the pancreas. Causes of pancreatic hyposecretion. Digestive disorders associated with pancreatic insufficiency. Causes of pancreatic hypersecretion.

285. Acute pancreatitis, its pathogenetic variants. Pathogenesis of pancreatic shock.

286. Maldigestion syndrome, causes, pathogenesis, main manifestations.

287. Malabsorption syndrome. Intestinal enzyme diseases. Causes, pathogenesis, main manifestations.

288. Intestinal dyskinesias: hyper- and hypokinetic variants. Constipation and diarrhea. Intestinal obstruction: etiology and pathogenesis.

289. Violation of the barrier function of the intestines: intestinal autointoxication, coli sepsis, dysbacteriosis.

290. Concept of liver failure, principles of classification. Functional tests of the liver.

291. Hepatocellular variant of liver failure, causes of development, pathogenesis, experimental modeling.

292. Cholestatic variant of liver failure, causes of development, pathogenesis, experimental modeling.

293. Hepatovascular variant of liver failure, causes of development, pathogenesis, experimental modeling.

294. Violation of carbohydrate and protein metabolism under conditions of liver failure.

295. Violation of lipid, water-electrolyte exchanges, exchange of vitamins and hormones under conditions of liver failure.

296. Violation of the antitoxic function of the liver. Syndrome of hepatocerebral insufficiency. Pathogenesis of hepatic coma, the role of cerebrotoxic substances.

297. The formation and release of bile pigments is normal.

298. Violation of the excretory function of the liver. Jaundice, their types.

299. Causes and mechanisms of the development of hemolytic jaundice, features of pigment

metabolism disorders.

300. Causes, mechanisms of development of parenchymal jaundice, features of pigment metabolism disorders.

301. Causes and mechanisms of mechanical jaundice, features of pigment metabolism disorders.

302. Enzymopathic variants of jaundice (pathogenesis of Gilbert, Criglier Nayar, Dabin-Johnson, Rotor syndromes).

303. Cholemic and aholic syndromes. Gallstone disease.

304. Portal hypertension syndrome, causes, mechanisms of development. Pathogenesis of ascites, hepatolienal and hepatorenal syndromes.

305. Budd-Chiari syndrome, etiology, pathogenesis.

306. Concept of kidney functions and main renal processes.

307. Causes and mechanisms of blood circulation disorders in the kidneys, functional and physicochemical bases of glomerular filtration disorders.

308. Causes and mechanisms of tubular reabsorption and secretion disorders. Hereditary tubulopathies.

309. Basic indicators of kidney activity and variants of their disorders. Use of functional tests to clarify the essence of kidney function disorders.

310. Quantitative and qualitative changes in the composition of urine. Oligo -, an - and polyuria. Watery, osmotic and hypertensive diuresis. Nocturia. Hypo - and isosthenuria.

311. Pathological components of urine: protein, cylinder and leukocyturia.

312. Proteinuria, selective and non-selective, glomerular and tubular.

313. Pathogenesis of renal edema.

314. Renal disorders of acid-base balance: renal azotemic acidosis, proximal and distal tubular acidosis.

315. Pathogenesis and manifestations of renal osteodystrophy.

316. Mechanisms of development of arterial hypertension, anemia, hemostasis disorders in kidney damage.

317. Diffuse glomerulonephritis: etiology, pathogenesis, experimental models.

318. Nephrotic syndrome, causes, pathogenesis, diagnostic criteria.

319. Acute renal failure syndrome, definition, classification, stages of the course, clinical signs.

320. Syndrome of chronic renal failure, definition, classification, stages of the course, clinical signs.

321. Pathogenesis of uremic coma. Concept of extracorporeal and peritoneal hemodialysis, lymphodialysis and lymphosorption.

322. Causes and mechanisms of formation of kidney stones, urolithiasis. Theories of lithogenesis.

323. General regularities of violations of hormonal regulation of functions and metabolism. The role of tissue hormones in the development of pathological processes. The main types of endocrine function disorders: hyper-, hypo- and dysfunction.

324. Dysregulatory disorders of endocrine function. Disorders of nervous (pulse-mediated), neuroendocrine (hypothalamic), endocrine and non-endocrine regulation of endocrine glands. Violations of direct and reverse relations.

325. Glandular disorders of endocrine function. Causes and mechanisms of disorders of biosynthesis, deposition and secretion of hormones.

326. Peripheral endocrine function disorders. Disorders of transport and metabolic inactivation of hormones. Pathology of hormone reception. Violation of hormonal signal implementation in target cells.

327. Pathology of systems of intracellular mediators of hormone action: adenylate and guanylate cyclase systems, calcium-calmodulin mechanisms, phospholipid messengers.

328. Causes and mechanisms of disorders of the neuroendocrine function of the hypothalamus. Psychogenic endocrinopathies. Panhypopituitarism, types, causes, mechanisms of development, main manifestations.

329. Hyperfunction of the anterior lobe of the pituitary gland: eosinophilic and basophilic adenomas.

330. Disorders of the hypothalamic-neuro-pituitary system. Syndrome of excessive secretion of antidiuretic hormone. Diabetes insipidus.
331. Pathology of adrenal glands. Acute and chronic insufficiency of the adrenal cortex: etiology and pathogenesis; manifestations with loss of mineralo-glucocorticoid function.
332. Hyperfunction of the adrenal glands. Primary and secondary hyperaldosteronism. Itsenko-Cushing syndrome.
333. Adrenogenital syndrome: its pathogenetic variants.
334. Hypo- and hyperfunction of the medulla of the adrenal glands. Familial dysautonomia, pheochromocytoma, causes, pathogenesis, main manifestations.
335. Hypofunction of the thyroid gland: etiology, pathogenesis, manifestations, principles of therapy.
336. The main diseases caused by hypofunction of the thyroid gland, their brief characteristics.
337. Radiation lesions of the thyroid gland, endemic goiter, Hashimoto's autoimmune thyroiditis.
338. Hyperfunction of the thyroid gland: etiology, pathogenesis, manifestations, principles of therapy.
339. The main diseases with hyperfunction of the thyroid gland, their brief description.
340. Diffuse toxic goiter, the role of immune mechanisms in its development.
341. Consequences of calcitonin secretion disorders.
342. Pathology of gonads. Male hypo- and hypergonadism, etiology and pathogenesis. Eunuchism and eunuchoidism.
343. Female hypo- and hypergonadism. Violation of sexual differentiation and maturation.
344. Disorders of cyclic functions of the female body.
345. Hormone-induced disorders of pregnancy, childbirth and lactation.
346. Extragenital manifestations of gonad function disorders. Disorders of the endocrine function of the placenta.
347. Pathology of the thymus gland. Hypo- and hyperthymia: causes, mechanisms of development, main manifestations.
348. Pathology of the pineal gland: hypo- and hyperfunction.
349. General patterns of occurrence and development of pathological processes in the nervous system. Principles of classification of disorders of the nervous system.
350. Damage to neurons as one of the causes of disturbances in integrative functions of the central nervous system.
351. Causes and mechanisms of disorders of neurochemical processes. Disruption of the exchange of neurotransmitters, neuromodulators and neurohormones.
352. Mechanisms of pathological excitation and pathological inhibition of nerve centers. Ephaptic effects. Generators of pathologically enhanced excitement, examples, mechanisms of formation, pathogenetic significance.
353. Pathological determinant, pathological dominant, their pathogenetic significance.
354. Disorders of the motor function of the nervous system. Violation of neuromuscular transmission.
355. Peripheral and central paralysis and paresis: causes, mechanisms of development, manifestations.
356. Movement disorders of subcortical origin.
357. Disorders associated with damage to the cerebellum.
358. Causes and mechanisms of disturbances of electrophysiological processes. Causes and pathogenesis of epilepsy. Antiepileptic system. Seizures, their types.
359. Violation of sensory functions of the nervous system. Disorders of mechano-, thermo-, proprio- and nociception.
360. Violation of sensor information. Braun-Secard syndrome. Manifestations of damage to thalamic central sensory structures of the cerebral cortex.
361. Pain. Peculiarities of pain as a type of sensitivity. Principles of pain classification. Reasons, Newtonian and neurochemical mechanisms of pain.

362. Theory of impulse distribution ("gate control"), theory of pathologically enhanced excitation generator, theory of specificity.

363. Forms of pathological pain. Peripheral, peripheral-central and central mechanisms of development of pathological pain.

364. General reactions of the body to pain. Pathogenesis of pain shock. Natural antinociceptive mechanisms. Principles and methods of pain management.

List of practical skills for the final control and semester

Final lesson

Module 1. "General pathophysiology"

1. Experimental reproduction of kinetosis and consideration of the mechanism of its development.

2. Reproduction of hypoxic hypoxia in the Komovsky apparatus in mice against the background of changes in the functional state of the central nervous system.

3. Cooling of a warm-blooded animal.

4. Determination of sex chromatin in epithelial cells of the mucous membrane of the oral cavity.

5. Dependence of the electric current action on the direction.

6. Study of fat embolism of frog vessels.

7. Reproduction of hypoxic hypoxia in animals at different stages of phylo- and ontogenesis.

8. Vascular reaction during inflammation of the mesentery of a frog's intestine (Kongheim's experiment).

9. Reproduction in the experiment of a febrile reaction with the help of pyrogens substances

Module 2. "Pathophysiology of organs and systems"

10. Methodology for counting the number of erythrocytes.

11. Determination of the amount of hemoglobin.

12. Calculation of color index in experimental animals.

13. Leukocyte reaction in a rabbit to intraperitoneal injection of milk.

14. Reproduction of hypoglycemic coma in the experiment.

15. The method of determining the number of leukocytes.

16. Calculation of leukocyte formula.

17. Determination of nuclear shift index.

18. Determination of ESR in hemolytic anemia.

19. Congestive form of heart failure. The effect of increased blood flow to the heart, the development of tonogenic dilatation of the heart.

20. Reflex apnea when the mucous membrane of the upper respiratory tract is irritated by ammonia.

21. Reproduction of an experimental gastric ulcer.

22. Reproduction of experimental epilepsy under the action of camphor oil.

23. Trophic disorders in sciatic nerve transection.

24. Pathogenic effect of a rarefied atmosphere on the body of rats against the background of caffeine administration.

13. Recommended literature

Main:

1. " General and clinical pathophysiology "(I. Savytskyi ; A. Gozenko ; L. Szarpak ; A. Kubyshkin). New book, 2021.

2. Pathophysiology: tutorial . for studies _ higher _ honey. teach _ app . / Yu. V. Byts, H. M. Butenko [and others]; edited by: M. N. Zaika , Yu. V. Bytsia, M. V. Kryshchalya . - 6th type, revision. and added _ - Kyiv: Medicine, 2017. - 737 p.

3. Ataman O.V. Pathophysiology: [textbook]: in 2 volumes / O.V. Ataman . – Vinnytsia: New Book, 2012-2015. - T.1. : General pathology, 2012. – 579 p.; T. 2.: Pathophysiology of organs and

systems, 2015. – 528 p.

4. Ganong V.F. Human physiology: [textbook] / William F. Ganong ; trans. from English - Lviv: BaK , 2002. - 784 p.

5. Pathophysiology 7th edition By ^{Jaquelin L.} Banasik , 2019. – 688p.

6. Understanding Pathophysiology by Sue E. Huether, 2020, 2d edition&

Additional:

1. Ataman O. V. Pathological physiology in questions and answers: study guide / O. V. Ataman . - 5-tevid. - Vinnytsia: New Book, 2017. - 512 p.

2. Kostenko V.O., Akimov O.E., Yelinska A.M., Kovaleva I.O. Pathophysiology of the blood system // Lviv: Magnolia , 2020. - 164 p.

3. Robbins and Cotran Pathologic Basis of Disease . Vol . I / V. Kumar , AK Abbas , JC Aster . – Philadelphia: Elsevier , 2020, - 1392 p.

4. Collection of tests on pathological physiology. / Yu.I. Bondarenko, O.V. Denefil et al. (compilers). – Ternopil, 2012. – 282 p.

Information resources:

1. TO "Testing Center": [officer site]. - URL: testcentr.org.ua

2. Course of lectures on pathophysiology // www.molecula.club

3. ExamPrep . - URL : <https://www.elsevierexamprep.co.uk/>

4. 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>

5. Pathophysiology : The Official Journal of the International Society for Pathophysiology - URL : <https://www.journals.elsevier.com/pathophysiology>

6. Journal of basic and clinical pathophysiology . – URL: <http://jbcpc.shahed.ac.ir/>

7. Bloodline // Carden Jennings Publishing Co. , Ltd. _ - URL : <http://www.bloodline.net/>

8. Atlases - Pathology Images : Collection of high resolution histological images . – URL : <http://atlases.muni.cz/en/index.html> _

9. Pathophysiology for Medical Assistants : Get the best resources for pathophysiology for medical assistants // COMLibrary . – URL: <https://libguides.com.edu/c.php?g=649895&p=4556866>