Ministry of Health of Ukraine
Poltava State Medical University

Department of pathophysiology

SYLLABUS

PATHOPHYSIOLOGY

(the name of the academic discipline)

NORMATIVE DISCIPLINE

level of higher education	the second (master's) level of higher education
field of knowledge	22 Health care
specialty	221 Dentistry
educational qualification	Master of dentistry
professional qualification	Dentist
educational and professional program	"Dentistry"
form of education	full-time education
course(s) and semester(s) of study of the academic discipline	2nd year 4th semester and 3rd year 5th semester

Poltava – 2024

DATA ON TEACHERS WHO TEACH THE COURSE

Surname, first name, patronymic of the teacher (teachers), scientific degree, academic title		
	Kostenko Vitalii Oleksandrovich	Head of the department, D. Sci. Professor
	Akimov Oleh Yeugenovich	Associate professor, Ph.D.
Profile of the teacher(s)	https://ptphysiology.pdmu.edu.ua/team	
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The page of the department on the website of PSMU	https://ptphysiology.pdmu.edu.ua/	

MAIN CHARACTERISTICS OF THE EDUCATIONAL DISCIPLINE

Scope of the academic discipline
Number of credits - 6/180 hours of them:
Lectures - 18 hours
Practical – 84 hours
Independent work - 78 hours
Type of control - semester final attestation (SFA).

Policy of educational discipline

The policy of the academic discipline is determined by the system of requirements set out in the regulations of the Department of Pathophysiology:

1. At practical classes and lectures, students must wear gowns and caps. Gowns must be clean and ironed. It is strictly forbidden to enter the department in outerwear. Bringing food into classrooms and lecture halls is prohibited. During the practical session and the lecture, mobile phones must be switched to silent mode. It is forbidden to use mobile phones during school hours.
2. The head of the group or a responsible person appointed by him (on duty) must accept before the beginning of the practical class, and after its completion, hand over the property of the study room in proper condition to the senior laboratory technician of the department, or the appointed last auxiliary worker.
3. Students are not allowed to enter the classroom after the bell until the break. It is inadmissible to enter and leave the classroom during the educational process ("Rules of internal procedure for students of the Poltava State Medical University"

Link: https://www.pdmu.edu.ua/storage/department-npr/docs_links/OaN2nwysLPFAUDRvuDPvFSpzM1j9E9CwQQkgr93b.pdf

4. To work in a practical session, students must have a textbook, a summary of lectures, as well as the following mandatory educational and methodological aids, prepared in the form of workbooks:

Protocols on pathophysiology: educational and methodological manual. - Ukrainian, English languages;

5. Under the conditions of proper management " Protocols on pathophysiology " can be used during the SFA.

6. Students are obliged to maintain order in the classrooms and treat the equipment with care. Students are financially responsible for careless handling of the department's property and its damage.

7. Students of education are provided with daily advisory assistance according to the schedule of rotations and consultations at the department during the independent work of students of education, which are given in the general schedule.

8. Students who have passed the test control with a level of correct answers of at least 75% are allowed to take the practical part of the final class.

9. To receive additional points to the current assessment, the student has the opportunity to perform individual work. For this purpose, at the beginning of the semester, together with the teacher, the amount and type of individual work that will be performed during the semester is determined. The list of individual work for which additional points are awarded includes: a) publication of scientific works; b) participation in the work of the student scientific circle of the department; c) participation in the creation of manuals and illustrative material for lectures and practical classes.

10. Criteria for admission to the final module control and SFA:

- to be present at all practical classes and lectures, or completed the missed classes in the established order;

- have a positive grade for control classes;

- have a current success rate of 72 points and above;

- have notebooks with properly prepared protocols of practical classes in pathophysiology, tasks for independent work and situational and laboratory tasks in pathophysiology;

- prepared semester essays on the discipline or participated in the scientific work of the department;

- passed the test before the SFA with a result of at least 75% of correct answers.

When organizing the educational process at PSMU, teachers and students of education act in accordance with: Regulations on the organization of the educational process at Poltava State Medical University.

Regulations on the academic integrity of higher education applicants and employees at the Poltava State Medical University.

Rules of internal procedure for students of Poltava State Medical University.

These regulations can be read by referring to the section of the page of the department for scientific and pedagogical work and organization of the educational and scientific process NORMATIVE DOCUMENTS (https://www.pdmu.edu.ua/n-process/department-npr/normativni-dokumenti).

Description of the academic discipline

Pathophysiology is one of the fundamental disciplines in the system of higher medical education. The pathophysiology course consists of three parts: general nosology, typical pathological processes, pathophysiology of organs and systems. The first part contains the main provisions of the doctrine of disease, etiology and pathogenesis, reveals the essence of the disease-causing influence of environmental factors. The second part involves the study of the main patterns of functional and structural disorders and changes that occur under the influence of pathogenic factors. The third part introduces students to the general patterns of development of diseases of individual organs and systems that occur in clinical practice. In the process of studying pathophysiology, students acquire knowledge about the disease, etiology, pathogenesis, symptoms of typical pathological processes, disorders of the functions of individual organs and systems in the most common diseases, as well as about the etiological and pathogenetic bases of treatment and prevention of diseases. The types of educational activities of students of education are lectures, practical classes and independent work of students of education (IWS). The lecture course combines the most important topics of the discipline. Practical classes involve the work of students under the direct supervision of a teacher and include conducting experiments, solving situational problems, etc. The results of the work are analyzed and drawn up in the form of a protocol. Topics that are not covered by the educational process, but are foreseen by the program and are of significant importance for the preparation of a specialist, are planned for independent study outside the classroom. The subject of study of the academic discipline "Pathophysiology" is general nosology (the general doctrine of disease), typical pathological processes, typical metabolic disorders, and pathology of individual organs and systems. Pathophysiology studies the etiology and pathogenetic bases of diagnosis, treatment and prevention of diseases, which speaks of its applied importance. This is the theoretical basis of practical medicine. This science contributes to the formation of pathogenetic thinking in students.

Prerequisites and post-requisites of the academic discipline (interdisciplinary connections)

Prerequisites: before studying the discipline "Pathophysiology", the student must understand the basic principles and knowledge of human anatomy, histology, cytology and embryology, medical and biological physics, medical biology, biological and bioorganic chemistry, medical chemistry, physiology, microbiology, virology and immunology.

Post-requisites: knowledge, abilities and skills acquired by students after completing the study of the discipline "Pathophysiology" create theoretical foundations for mastering clinical disciplines (internal medicine, surgery, obstetrics, pediatrics, phthisiology, neurology, ophthalmology, infectious diseases, etc.), which involves the integration of teaching with the main clinical disciplines, as well as the acquisition of in-depth knowledge of pathophysiology, the ability to use this knowledge in the process of further education and in the professional activity of a doctor, forms the methodological foundations of clinical thinking and provides the possibility of conducting a pathophysiological analysis of clinical situations for the purpose of further diagnosis, treatment , disease prevention.

The purpose and tasks of the educational discipline:

- the purpose of studying the educational discipline "Pathophysiology" is the study of general laws and specific mechanisms of the emergence, development, course and consequences of pathological processes, individual diseases and pathological conditions;

- the main tasks of studying the discipline "Pathophysiology" are:

• creation of 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 the professional activity of a doctor;

• formation of methodological basic clinical thinking;

• ensuring the possibility of pathophysiological analysis of clinical situations for the purpose of further diagnosis, treatment, and prevention of diseases.

Competences and learning outcomes according to the educational and professional program, the formation of which contributes to the discipline (integral, general, special)

According to the requirements of the standard, the discipline ensures that students acquire the following **competencies**:

integral:

The ability to solve complex specialized tasks and practical problems in professional activities in the field of health care in the specialty "Medicine", or in the learning process, which involves conducting research and/or implementing innovations and is characterized by the complexity and uncertainty of conditions and requirements.

general:

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

- Ability to apply knowledge in practical situations.

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

- Ability to adapt and act in a new situation.

- Ability to make informed decisions; work in a team; interpersonal skills.

- Ability to communicate in the state language both orally and in writing; the ability to communicate in a foreign language. Ability to use international Greek-Latin terms, abbreviations and clichés in professional oral and written communication.

special:

- Ability to determine the necessary list of laboratory and instrumental studies and evaluate their results.

- Ability to establish a preliminary and clinical diagnosis of the disease.

- Ability to determine the principles and nature of treatment of diseases.

- Ability to plan and carry out preventive and anti-epidemic measures for infectious diseases

diseases

- Ability to conduct epidemiological and medical-statistical studies of the health of the population;

processing of state, social, economic and medical information.

Program learning outcomes, to the formation of which discipline contributes:

1. To know the structure and functions of individual organs and systems and the human body as a whole in normal conditions, during the development of pathological processes, diseases; to be able to use the acquired knowledge in further education and in the practical activities of a doctor.

2. Prescribe and analyze additional (mandatory and optional) examination methods (laboratory, X-ray, functional and/or instrumental). Evaluate information for the purpose of differential diagnosis of diseases (according to list 2), using knowledge about a person, his organs and systems, based on the results of laboratory and instrumental research (according to list 4).

3. Establish a preliminary and clinical diagnosis of the disease (according to list 2) on the basis of leading clinical symptoms or syndromes (according to list 1) by making a reasoned decision and logical analysis, using the most likely or syndromic diagnosis, data from laboratory and instrumental examination of the patient, conclusions of differential diagnosis.

4. Determine the nature of treatment of the disease (conservative, operative) and its principles (according to list 2) in the conditions of a health care facility, at the patient's home and at the stages of medical evacuation, including in field conditions on the basis of a preliminary clinical diagnosis, using knowledge about a person, his organs and systems, observing relevant ethical and legal norms, by making a reasoned decision according to existing algorithms and standard schemes., knowledge about a person, his organs and systems, observing the relevant ethical and legal norms.

5. Plan and carry out preventive and anti-epidemic measures to prevent the spread of infectious diseases (according to list 2) in the conditions of a health care facility based on the results of an epidemiological survey of infectious disease foci, epidemiological analysis, using existing preventive and anti-epidemic methods. Identify risk groups, risk areas, time of risk, risk factors and carry out an epidemiological analysis of infectious diseases of the population in the conditions of a health care institution, using statistical and laboratory methods. Diagnose infectious diseases in the early stages (according to list 2), carry out primary anti-epidemic measures in the center of the infectious disease.

6. To conduct epidemiological and medical-statistical studies of the health of the population; processing of state, social, economic and medical information under any circumstances using standard procedures, modern computer information technologies in particular.

7. To comply with the requirements of ethics, bioethics and deontology in their professional activities.

Learning outcomes for the discipline:

after completing the study of the academic discipline "Pathophysiology", students must:

KNOW:

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

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

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

• cause-and-effect relationships in the pathogenesis of the manifestations of environmental factors (to distinguish local and general, pathological and adaptive-compensatory, specific and non-specific changes; to determine the leading link;

• typical pathological processes (cell damage, local blood circulation and microcirculation disorders, inflammation, tumors, fever, hypoxia) according to the principles of their classification, stages of pathogenesis, general manifestations and termination options;

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

• cause-and-effect relationships in the pathogenesis of typical pathological processes (changes in local and general, pathological and adaptive-compensatory, specific and non-specific; leading and auxiliary links);

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

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

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

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

• pathological conditions and disorders in the blood circulation system: lack of blood circulation; heart failure, cardiac arrhythmias; arterial hypertension, arterial hypotension; arteriosclerosis, atherosclerosis;

• changes in the main parameters of cardio- and hemodynamics in heart failure (frequency and force of heart contractions, minute and systolic blood volumes, systolic, diastolic, average and pulse arterial blood pressures, venous blood pressure);

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

• the causes of external respiratory failure, the role of alveolar ventilation disorders, gas diffusion through the alveolar-capillary membrane, perfusion in the small circle of blood circulation in the development of respiratory failure; causes and mechanisms of shortness of breath;

• typical pathological conditions in the digestive system: insufficiency of digestion (for example, maldigestion) and malabsorption (for example, malabsorption), peptic ulcer disease of the stomach and/or duodenum as a multifactorial disease;

• etiology, pathogenesis, clinical manifestations of liver failure, hepatic coma, jaundice, portal hypertension. Principles of prevention and treatment;

• causes and mechanisms of violations of processes of glomerular filtration, tubular reabsorption and secretion in acute and chronic renal failure, glomerulonephritis, nephrotic syndrome, urinary syndrome, uremic coma;

• causes and general mechanisms of development of disorders of endocrine gland functions, primary and secondary endocrinopathies, consequences of disorders of secretion of hormones of the adenohypophysis, neurohypophysis, adrenal glands, thyroid gland, gonads;

• general principles of diagnosis and treatment of disorders of the endocrine system;

• the general biological role of stress, its causes and mechanisms of development, to have an idea of the general adaptation syndrome and "adaptation diseases";

• typical disorders of the nervous system: sensory functions, motor function, vegetative function, trophic function, and integrative function;

• the role of acute and chronic disorders of cerebral blood circulation in disorders of the brain and the body as a whole.

HAVE ABILITY:

• to solve situational problems with the determination of causal factors, risk factors, the main link of pathogenesis, stages of development, mechanisms of development of clinical manifestations, options for completion, principles of providing medical care for typical pathological processes and the most common diseases;

• to schematically display mechanisms of pathogenesis and clinical manifestations of diseases;

• to analyze and interpret the results of blood, urine, lipidogram, electrocardiogram, spirogram,

immunogram, hormonal background;

• to identify regenerative, degenerative, and forms of pathological regeneration of "red" and "white" blood cells in peripheral blood smears; interpret their presence or absence in the blood;

• to evaluate the state of functioning of organs and systems of the body in case of diseases on the basis of the results of laboratory and instrumental studies;

• to analyze various options for the development of cause-and-effect relationships in the pathogenesis of diseases;

• to identify and record the leading typical pathological process, its main link and clinical signs;

• to make a reasoned decision to appoint a laboratory and/or instrumental examination;

• to determine the principles of treatment of diseases.

Thematic plan of the lectures with an indication of the main issues considered at the lecture

№	TOPIC NAME	HOURS
1.	Topic: "Subject, problems, methods of pathophysiology, main stages of development. The doctrine of disease, etiology, pathogenesis". Pathophysiology as a science and educational discipline, its constituent parts. Methods of pathophysiology. Moral and ethical problems of using animals as experimental objects. General doctrine about the disease. Concept of pathological process, pathological condition, pathological reaction. Illness as a biological, medical and social problem.	**2**
2.	Topic: "General pathophysiology of the cell." Programmed cell death. Apoptosis, stages, mechanisms of regulation and course of the process. Concept of primary and secondary alteration. Peroxide oxidation of lipids. Systems of antioxidant protection.	**2**
3.	Topic: "Allergy." Allergy and immunity. Principles of classification of allergic reactions. General characteristics of allergic reactions of immediate and delayed types. Classification of hypersensitivity reactions according to Coombs and Jell. Stages of pathogenesis of allergic reactions. Pseudoallergic reactions, mechanisms. Basic principles of prevention and treatment of allergic reactions. Desensitization.	**2**
4.	Topic: "Inflammation". Classification of inflammation. Primary and secondary alteration. Mediators and anti-mediators of inflammation, their classifications. Types of exudates. Proliferation. The importance of inflammation for the body. Principles of anti-inflammatory therapy.	**2**
5.	Topic “Fever”. Origin of fever in phylogenesis. Etiology of fever. Concept of primary and secondary pyrogens. The role of interleukins 1 and 6, tumor necrosis factor in the pathogenesis of fever. Stages of fever. Types of febrile reactions. Protective value and negative features of fever. The concept of pyrotherapy.	**2**
6.	Topic: "Pathophysiology of tumor growth". The concept of malignant and benign tumors. Classification, etiology and pathogenesis. Chemical, physical and biological carcinogenesis. Stages of tumor pathogenesis. Mechanisms of tumor transformation. Cancer cachexia.	**2**
7.	Topic: "Disorders of lipid metabolism." Atherosclerosis. Types of fat metabolism disorders. Violation of digestion and absorption of lipids. Primary and secondary obesity. The main links of the pathogenesis of atherosclerosis. Mechanisms of development of proliferative changes in the arterial wall in atherosclerosis. Mechanisms of dystrophic and sclerotic changes in arterial vessels in atherosclerosis.	**2**
8.	Topic: "Hemoblastosis". Principles of leukemia classification. Causes of leukemia. Evidence of the tumor nature of leukemias. Viral leukogenesis, types of leukogenic viruses. Acute and chronic leukemias, features of their pathogenesis and blood patterns. Pathogenesis of leukemias, stages. Classification of oncogenes in leukemia.	**2**

9.	Topic: "Indigestion." Concept of digestive insufficiency, principles of classification. Etiology of digestive disorders. Functional connections of different departments of digestion under the conditions of pathology. Salivation disorders: hypo- and hypersalivation, their consequences. Gastric dyskinesias, hyper- and hypotonic variants. Etiology and pathogenesis of gastric and duodenal ulcers	**2**

There are no seminar classes.

Thematic plan of practical classes with an indication of the main issues considered at the practical class

№	TOPIC NAME	HOURS
MODULE 1 "GENERAL PATHOPHYSIOLOGY"		
General nosology is a general study of disease, etiology and pathogenesis. Pathogenic effect of environmental factors. The role of internal factors in pathology.		
1.	Modeling and experimental therapy of pathological processes. Methods of statistical processing of research material. The value of the experimental method in pathophysiology. Modeling of pathological processes. Pathophysiology as a science and educational discipline, its constituent parts. Methods of pathophysiology. Moral and ethical problems of using animals as experimental objects. Modern methods and techniques of conducting experiments. General doctrine about the disease. Concept of pathological process, pathological condition, pathological reaction. Illness as a biological, medical and social problem.	**2**
2	The value of the experimental method in pathophysiology. Modeling of pathological processes. Pathophysiology as a science and educational discipline, its constituent parts. Methods of pathophysiology. Moral and ethical problems of using animals as experimental objects. Modern methods and techniques of conducting experiments. General doctrine about the disease. Concept of pathological process, pathological condition, pathological reaction.	**2**
3	General etiology and pathogenesis. The role of causes and conditions in the occurrence of altitude sickness. Effect of low atmospheric pressure on the body. Etiology and pathogenesis of altitude sickness. Decompression sickness, pathogenesis. Explosive decompression.	**2**
4	Extreme and terminal conditions. Pathogenic effect of electric current. The concept of extreme states and their connection with terminal states. Collapse. Concept of crash syndrome. Coma. Terminal states: preagony, agony, clinical death. Biological death. Violation of the functions of organs and systems (brain, cardiovascular and respiratory systems) under the action of electric current.	**2**
5.	Informational aspects of cell dysfunction. Genetic and hereditary pathology. Programmed cell death. Apoptosis, stages, mechanisms of regulation and course of the process. Hereditary and congenital diseases. Mutations. Chromosomal diseases.	**2**
6.	Damage to cell membranes. Pathogenic effect of ionizing radiation. Concept of primary and secondary alteration. Peroxide oxidation of lipids. Systems of antioxidant protection. Radiosensitivity of tissue. Mechanisms of direct and indirect radiation damage to biological structures. Radiolysis of water. Radiotoxins. Near and distant consequences of large and small doses of ionizing radiation. Stochastic and non-stochastic effects of radiation.	**2**
7.	Damage to the executive apparatus of the cell. Pathogenic effect on the body of high and low temperatures of the external environment. Mechanisms of the cell's response to damage to the nucleus, cytoskeleton, endoplasmic reticulum, Golgi complex and lysosomes, mitochondria. Expression of emergency genetic programs. Hyperthermia: pathogenetic variants and clinical forms. Hypothermia.	**2**
8	The role of altered body reactivity and constitution in the development of pathological processes. Types of reactivity. Theories of aging. Progeria. Passive and active resistance. The connection of resistance with reactivity. Biological barriers. Diatheses. Adaptation, definitions, types, mechanisms. Stress.	**2**
9.	Immunological reactivity and its disorders. Immunodeficiencies. Violation of immunological tolerance. Violation of phagocytosis. Complement system and its disorders. Mechanisms of humoral and cellular immune response, their disorders. Immunological deficiency: primary and secondary immunodeficiencies. Pathophysiological characteristics of acquired immunodeficiency syndrome (AIDS). Immunological tolerance.	**2**

10.	Hypersensitivity. Allergy. Allergy and immunity. Principles of classification of allergic reactions. General characteristics of allergic reactions of immediate and delayed types. Classification of hypersensitivity reactions according to Coombs and Jell. Stages of pathogenesis of allergic reactions. Pseudoallergic reactions, mechanisms. The Schwartzman phenomenon. Histaminoliberators. Pathogenesis of pseudoallergy, involvement of the complement system. Basic principles of prevention and treatment of allergic reactions. Desensitization.	**2**
11.	Practical skills. Content module. "General nosology". Covers questions from previous classes.*	**2**
	Typical pathological processes	
12.	Pathophysiology of peripheral blood circulation. Arterial and venous hyperemia, ischemia and stasis. Sludge phenomenon. Typical disorders of lymphodynamics.	**2**
13.	Thrombosis, embolism, typical microcirculation disorders. Violation of peripheral blood circulation. Reperfusion syndrome, its pathogenesis, experimental models. Stages and mechanisms of embolism.	**2**
14	Inflammation. Stages of inflammation. Cardinal signs of the inflammatory process. Classification of inflammation. Primary and secondary alteration. Mediators and anti-mediators of inflammation, their classification. Types of exudates. Proliferation. The importance of inflammation for the body. Principles of anti-inflammatory therapy.	**2**
15	Fever. Etiology of fever. Concept of primary and secondary pyrogens. The role of interleukins 1 and 6, tumor necrosis factor in the pathogenesis of fever. Stages of fever. Types of febrile reactions. Protective value and negative features of fever. The concept of pyrotherapy.	**2**
16	Pathophysiology of tumor growth. The main types of tissue growth disorders. Concept of hypo- and hyperbiotic processes. The concept of malignant and benign tumors. Classification of carcinogens. Chemical carcinogenesis. Viral carcinogenesis. Stages of tumor pathogenesis. Mechanisms of tumor transformation.	**2**
17	Practical skills. Content module. "Typical pathological processes". Covers questions from previous classes.*	**2**
	Typical metabolic disorders.	
18	Violation of energy exchange. Starvation. Violation of the metabolism of proteins, nucleic acids, vitamins. Typical forms of energy metabolism disorders. Hypoergoses, definition, classification. Positive and negative nitrogen balance. Hereditary disorders of amino acid metabolism. Violation of the final stages of protein metabolism, urea synthesis. Gout: the role of exo- and endogenous factors, mechanisms. Hyper- and hypouricemia. Hereditary orotataciduria. Protein-calorie deficiency, its forms: alimentary marasmus, kwashiorkor. Alimentary dystrophy.	**2**
19	Violation of water-salt exchange and acid-base balance. Positive and negative water balance. Hyper- and hyponatremia. Hyper- and hypokalemia. Hyper- and hypophosphatemia. Classification of the main forms of acid-base balance disorders. Gas and non-gas acidosis. Gaseous and non-gaseous alkalosis. The relationship between acid-base balance disorders and water-electrolyte metabolism disorders.	**2**
20	Violation of carbohydrate and lipid metabolism. Atherosclerosis. Diabetes mellitus, classification of WHO experts. Types of carbohydrate metabolism disorders. Hypoglycemic coma Pathogenesis of the main clinical manifestations of diabetes. Types of coma in diabetes. Pathogenesis of the main complications of diabetes: macro- and microangiopathy, neuropathy. Pathogenetic principles of diabetes treatment. Types of fat metabolism disorders. Violation of digestion and absorption of lipids. Primary and secondary obesity. The main links of the pathogenesis of atherosclerosis. Mechanisms of development of proliferative changes in the arterial wall in atherosclerosis. Mechanisms of dystrophic and sclerotic changes in arterial vessels in atherosclerosis.	**2**
21	Practical skills. Content module. “Typical metabolic disorders”*	**2**
TOTAL HOURS FOR MODULE 1		**42**
MODULE 2 "PATHOPHYSIOLOGY OF ORGANS AND SYSTEMS"		

	Pathophysiology of blood	
1.	Violation of the volume of circulating blood. Qualitative and quantitative changes in red blood cells. Hypovolemia, normovolemia, hypervolemia, their types, causes and mechanisms of development, significance for the body. Scheme of normal erythropoiesis. Anemia. Basic principles of anemia classification. Anisocytosis, poikilocytosis. Causes and mechanisms of the shift of the Price-Jones curve to the right and to the left. Blood loss: etiology, pathogenesis. Hemorrhagic shock. Principles of blood loss therapy.	**2**
2.	Quantitative changes in red blood cells. Anemia. General hematological and clinical manifestations of anemia. Regenerative and degenerative forms of erythrocytes, cells of pathological regeneration. Hereditary hemolytic anemias. Megaloblastic anemias. Causes of vitamin B_{12} and folic acid deficiency. Addison-Birmer anemia, symptomatic B_{12}-deficient anemia. B_{12}-refractory megaloblastic anemias. Mineral deficiency anemia. Iron deficiency anemia. Iron-refractory anemias. Pathogenesis, blood picture, mechanisms of development of the main clinical manifestations.	**2**
3.	Leukocytosis, leukopenia. Types of quantitative and qualitative changes of leukocytes in the blood. Degenerative changes of leukocytes. Leukocytosis, classification, causes, mechanisms of development. The concept of a shift in the leukocyte formula, types of nuclear shift. Leukopenia, primary and secondary, causes, mechanisms of development. Food-toxic and hemorrhagic aleukia. Agranulocytosis, types, causes, mechanisms of development.	**2**
4.	Hemoblastosis. Principles of leukemia classification. Causes of leukemia. Evidence of the tumor nature of leukemias. Viral leukogenesis, types of leukogenic viruses. Acute and chronic leukemias, features of their pathogenesis and blood patterns. Pathogenesis of leukemias, stages. Classification of oncogenes in leukemia. Criteria of tumor progression in hemoblastosis. Principles of diagnosis and treatment of leukemias. Leukemoid reactions, causes and mechanisms of development. Common and distinctive features of leukemic reactions and leukemias.	**2**
5.	Violation of hemostasis. Violation of the physical and chemical properties of blood. Classification of hemostasis disorders. Hypercoagulation. Thrombotic syndrome, causes, mechanisms of development, changes in laboratory indicators, clinical manifestations. Vasopathies. Thrombocytopenia: etiology, pathogenesis, mechanisms of hemostasis disorders. Thrombocytopathies. Mechanisms of adhesion disorders, aggregation of platelets, release of platelet granules. Hemophilia A, B, C. Disseminated intravascular coagulation syndrome (DIC-syndrome). Causes and pathogenesis. The concept of "protease explosion". The role of DIC syndrome in the pathogenesis of extreme conditions. Changes in the physical and chemical properties of blood: osmotic and oncotic pressure, viscosity, ESR.	**2**
6.	*Final control "Pathophysiology of the blood system". Covers questions from previous classes.	**2**
	Pathophysiology of systemic circulation and external respiration, hypoxia.	
7.	Violation of heart rhythm and systemic level of blood pressure. The main properties of the myocardium. Mechanisms of automatism, drivers of the rhythm of heart contractions. Mechanisms of cardiac excitability, the concept of the resting potential and action of the ventricles of the heart, features of the action potential of pacemakers. Mechanisms of conduction, structure of the conduction system of the heart. Cardiac arrhythmias: definition, classification. Violations of automatism, excitability, conduction, contractility of the heart: types, causes, mechanisms of development, manifestations on the ECG. Pathogenetic principles of therapy. The concept of arterial hypertension and hypotension, their hemodynamic variants. Classifications of arterial hypertension.	**2**
8	Heart failure. Mechanisms of compensation and decompensation. Violation of coronary blood circulation. The concept of circulatory failure and heart failure, principles of classification. Heart failure from overload. Types of cardiac overload and immediate compensation mechanisms. Mechanisms of long-term adaptation of the heart to loads. Stages of compensatory hyperfunction of the heart. Physiological and pathological hypertrophy of the myocardium. Features of hypertrophied heart, mechanisms of its decompensation. Heart defects, their main types. Indicators of cardio and hemodynamics in heart failure. Pathogenesis of common manifestations of heart failure. Principles of treatment. Consequences of coronary blood circulation disorders for the heart. Reperfusion syndrome. Concept of "oxygen" and "calcium" paradoxes, their mechanisms. Ischemic heart disease, etiology and pathogenesis. Myocardial infarction, pathogenesis of the main clinical manifestations.	**2**
9	Violation of external breathing. The essence of the concept of respiratory insufficiency: the main signs, forms, indicators of respiratory insufficiency. Obstructive, restrictive, dysregulatory variants of impaired alveolar ventilation: etiology, pathogenesis, diagnostic indicators. Asphyxia: causes, mechanisms of development, main stages. Shortness of breath, its causes and forms; mechanisms of inspiratory and expiratory shortness of breath. Pathological forms of breathing: types, causes,	**2**

	mechanism of development.	
10	Hypoxia. Principles of classification of hypoxic conditions, 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. Mechanisms and stages of hypoxic cell damage. Resistance of individual organs and tissues to hypoxia. Immediate and long-term adaptive reactions of the body during hypoxia. Normobaric and hypobaric hypoxic therapy. Oxygen therapy and the toxic effect of oxygen. Normo- and hyperbaric oxygenation. Hyperoxia as a cause of hypoxia.	**2**
11	*Final control "Pathophysiology of blood circulation and breathing". Covers questions from previous classes.	**2**
	Pathophysiology of digestion, liver, kidneys.	
12	Indigestion in the mouth, stomach and intestines. Concept of digestive insufficiency, principles of classification. Etiology of digestive disorders. Functional connections of different departments of digestion under the conditions of pathology. Appetite disorders, types, causes, pathogenesis. Indigestion in the oral cavity. Causes of chewing and swallowing disorders. Caries, etiology, pathogenesis, experimental models. Periodontitis, etiology, pathogenesis, experimental models. Salivation disorders: hypo- and hypersalivation, their consequences. Gastric dyskinesias, hyper- and hypotonic variants. Etiology and pathogenesis of peptic ulcer disease of the stomach and duodenum. Violation of the secretory function of the pancreas. Acute pancreatitis, its pathogenetic variants. Pathogenesis of pancreatic shock. Maldigestion syndrome, causes, pathogenesis, main manifestations. Malabsorption syndrome. Intestinal enzyme diseases. Causes, pathogenesis, main manifestations. Intestinal dyskinesias.	**2**
13	Liver failure. Causes and mechanisms of development of jaundice. Concept of liver failure, principles of classification. Functional tests of the liver. Hepatocellular, cholestatic, hepatovascular variants of liver failure, causes of development, pathogenesis, experimental modeling. Pathogenesis of hepatic coma. Jaundice, their types. Causes and mechanisms of development, features of pigment metabolism disorders. Enzymopathic variants of jaundice (pathogenesis of Gilbert, Crigler-Nayar, Dabin-Johnson, Rotor syndromes). Cholemic and aholic syndromes. Gallstone disease. Portal hypertension syndrome, causes, mechanisms of development.	**2**
14	Etiology and pathogenesis of urinary disorders in the kidneys. Concept of kidney functions and main 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. Diffuse glomerulonephritis: etiology, pathogenesis, experimental models. Nephrotic syndrome, causes, pathogenesis, diagnostic criteria. Syndromes of acute and chronic renal failure, definition, classification, stages of the course, clinical signs. Pathogenesis of uremic coma. Urinary stone disease.	**2**
15	*Final control "Pathophysiology of digestion, liver, kidneys". Covers questions from previous classes.	**2**
	Pathophysiology of regulatory systems (endocrine, nervous).	
16	Pathophysiology of the endocrine system. Hypothalamic-pituitary system. Adrenal glands The main types of endocrine function disorders: hyper-, hypo- and dysfunction. 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. Glandular disorders of endocrine function. Pathology of systems of intracellular mediators of hormone action: adenylate and guanylate cyclase systems, calcium-calmodulin mechanisms, phospholipid messengers. Hyperfunction of the anterior lobe of the pituitary gland: eosinophilic and basophilic adenomas. Disorders of the hypothalamoneurohypophyseal system. Syndrome of excessive secretion of antidiuretic hormone. Diabetes insipidus. Adrenal gland pathology. Acute and chronic insufficiency of the cortex of the adrenal glands. Hyperfunction of the adrenal cortex. Primary and secondary hyperaldosteronism. Itsenko-Cushing syndrome. Adrenogenital syndrome, its pathogenetic variants.	**2**

	Hypo- and hyperfunction of the medulla of the adrenal glands.	
17	Pathophysiology of the thyroid gland, parathyroid glands, pineal gland and thymus. Hypofunction and hyperfunction of the thyroid gland: etiology, pathogenesis, manifestations, principles of therapy. Pathology of gonads. Male hypo- and hypergonadism, etiology and pathogenesis. Eunuchism and eunuchoidism. Female hypo- and hypergonadism. Pathology of the thymus gland. Hypo- and hyperthymia: causes, mechanisms of development, main manifestations. Pathology of the pineal gland: hypo- and hyperfunction.	**2**
18	Pathophysiology of the nervous system. Violation of motor and sensory function. General patterns of occurrence and development of pathological processes in the nervous system. Principles of classification of disorders of the nervous system. Pathological determinant, pathological dominant, their pathogenetic significance. Mechanisms of elimination of the pathological system. Peripheral and central paralysis and paresis: causes, mechanisms of development, main manifestations. Violation of sensory functions of the nervous system. Disorders of mechano-, thermo-, proprio- and nociception. Braun-Secard syndrome. Pain. Classification principles, causes and mechanisms of pain. Forms of pathological pain. Peripheral, peripheral-central and central mechanisms of development of pathological pain. Pathogenesis of pain shock. Principles and methods of pain management.	**2**
19	Pathophysiology of the nervous system. Violation of CNS. Typical pathological processes in the nervous system (according to H.M. Kryzhanovskyi). Spinal shock, mechanisms, manifestations, biological significance. Violation of the trophic function of the nervous system. Neurodystrophic process. Violations of integrative functions of the central nervous system. Violation of vegetative functions of the nervous system, methods of experimental modeling. Syndrome of vegetative-vascular dystonia, its pathogenetic variants. Acute and chronic disorders of cerebral circulation. Strokes. Cerebral edema, causes and mechanisms of development. Intracranial hypertension. Neurodegenerative diseases of the central nervous system. Causes and pathogenesis of human transmissible spongioform encephalopathies of prion etiology. Violations of higher nervous activity. Violent forms of behavior, psychopathy. Neuroses, etiology, views on pathogenesis, experimental modeling.	**2**
20	*Final control "Pathophysiology of endocrine and nervous systems".	**2**
21	Testing before SFA. Covers questions from previous classes.	**1**
TOTAL HOURS FOR MODULE 1		**42**
TOTAL HOURS FOR MODULE 1&2		**84**

Note: * marked topics from which there must have a positive assessment.

Independent work

№	TOPIC	HOURS
1	Preparation for practical classes: theoretical preparation and development of practical skills	42
2	Preparation for semester final attestation (SFA)	16
3	Inflammation. Stages of inflammation. Primary and secondary alteration. Exudation. Mechanisms of exudation. Emigration. Stages of emigration of leukocytes. Biochemical and physicochemical disorders in the focus of inflammation.	3
4	Immunological reactivity and its disorders Characteristics of phagocytosis and mononuclear phagocyte system. Obligatory and facultative phagocytes. Antigens of the major histocompatibility complex of classes I and II, role and functions in immunogenesis and pathology.	3

5	Pathophysiology of tumor growth. The main signs of physicochemical, biochemical, antigenic, functional atypism (anaplasia). Chemical carcinogenesis. Viral carcinogenesis. Stages of tumor pathogenesis.	3
6	Disorders of the erythrocyte system. Violation of the quantitative and qualitative composition of erythrocytes. General hematological and clinical manifestations of anemia. Hereditary hemolytic anemias. Acquired hemolytic anemia. Anemias associated with disorders of erythropoiesis. Megaloblastic anemias. Mineral deficiency anemia.	3
7	Pathophysiological interpretation of laboratory research methods in leukemia. Principles of leukemia classification. Acute leukemias, features of their pathogenesis and blood patterns. Chronic leukemias, features of their pathogenesis and blood patterns.	4
8	Pathophysiological interpretation of laboratory methods for heart rhythm disorders. Violation of the automaticity of the heart: types, causes, mechanism of development, manifestations on the ECG. Violation of heart excitability; extrasystole: types, causes, mechanism of development, manifestations on the ECG. Paroxysmal tachycardia: types, causes, mechanism of development, manifestations on the ECG. Atrial and ventricular atrial fibrillation, causes, mechanism of development, manifestations on the ECG. Cardiac conduction disorders: types, causes, mechanism of development, manifestations on the ECG. Violation of contractility of the heart: types, causes, mechanism of development. The role of additional conduction pathways of the heart in the development of arrhythmias, manifestations on the ECG.	4
TOTAL HOURS		78

Individual tasks

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

Experimental research on the subject of scientific research work of the department with publication of results in scientific publications.

The list of theoretical questions for the preparation of students for the final modular control (FMC) and semester final attestation (SFA).

Questions for FMC preparation:

1. Concept of pathological process, pathological condition, pathological reaction. Definition of a typical pathological process. Illness as a biological, medical and social problem. Abstract and concrete in the concept of "disease". The unity of the destructive and the protective in disease. Principles of disease classification, WHO classification. The main regularities of the course of diseases. Periods of disease development. Remission, relapse, complications. Options for ending the disease: complete and incomplete recovery.
2. General etiology. Definition of the term "etiology". The problem of causality in pathology. The role of causes and conditions in the occurrence of diseases. 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. The main directions of teaching about etiology: monocausalism, conditionalism, constitutionalism, holism. Concepts of psychosomatic medicine. Concept of "behavioral risk factors".
3. Basic provisions of the modern synthetic theory of general etiology. The concept of polyetiological diseases. Relative and absolute polyetiologizm. Concept of risk factors. "Diseases of civilization". Definition of the concept of pathogenesis. Relationship between destructive and adaptive phenomena in pathogenesis.
4. Adaptation, compensation. Mechanisms of immediate and long-term adaptation. Cause and effect relationships in pathogenesis. Variants of direct causal relationships. "Vicious circle". Main links of pathogenesis. Pathogenetic principles of disease treatment. The role of local and general in pathogenesis. The concept of localization and generalization. Assessment of local trends in the science of general pathogenesis. Specific and non-specific mechanisms of pathogenesis. The main components of universal pathogenesis.
5. Effect of low atmospheric pressure on the body. Etiology and pathogenesis of altitude sickness. Decompression sickness, pathogenesis. Explosive decompression. The concept of extreme states and their connection with terminal states. Extreme living conditions. Shock. Types of shock. Mechanisms of disorders of general hemodynamics and microcirculation in shock.
6. 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 prevention and therapy of shock. Collapse. Common and distinctive features of shock and collapse. Etiology and pathogenesis of colaptoid conditions. The role of neurogenic and humoral mechanisms in the development of collapse.
7. Concept of crash syndrome. Its causes and main pathogenetic mechanisms. Coma. Endogenous and exogenous commas. Mechanisms of development of comatose states. The role of brain energy supply disorders and general

disorders in the pathogenesis of coma. Principles of therapy. Terminal states: preagony, agony, clinical death.
8. Biological death. Patterns of the body's death. Pathophysiological foundations of resuscitation. Post-resuscitation disease, stages, pathogenesis. Pathogenic effect of electric energy. Factors determining the nature of electric shocks. Violation of the functioning of cellular structures under the action of electrical energy. Violations of the functions of organs and systems (brain, cardiovascular and respiratory systems) under the action of electric current.
9. Concept of technical and technological errors of cell regulatory systems (genetic programs and their selection). Violation of the selection of the genetic program at the level of controlling agents (hormones, mediators, antibodies, substrates, ions). The phenomenon of molecular mimicry. 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.
10. Programmed cell death. Apoptosis, stages, mechanisms of regulation and course of the process. Consequences of inhibiting and increasing apoptosis. Types and mechanisms of mitosis pathology.
11. 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. Causes of mutations. Mutagenic factors of physical, chemical and biological origin. The phenomenon of mosaicism. 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.
12. 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. Types of inheritance of genetic defects. Mechanism of development of autosomal dominant, autosomal recessive and sex-linked hereditary diseases.
13. Polygenic hereditary diseases. Hereditary predisposition to diseases. Antigen-associated diseases. 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. Unconventional inheritance. Mosaicism, genomic imprinting, triplet repeats, anticipation. Methods of study, prevention and treatment of hereditary diseases. Ways of correction of genetic defects. Perspectives of genetic engineering.
14. Mechanisms of the cell's response to damage to the nucleus. Expression of emergency genetic programs. Mechanisms and manifestations of damage to the cytoskeleton. Mechanisms and manifestations of damage to the endoplasmic reticulum, Golgi complex and lysosomes. Pathogenesis of thesaurisms. Mechanisms and manifestations of mitochondrial damage. Mechanisms of uncoupling of oxidation and phosphorylation in mitochondria. Causes of the development of intracellular acidosis. The role of acidotic mechanisms in cell damage.
15. Participation of protein mechanisms in alteration processes. Inactivation of enzymes, denaturation of proteins, activation of proteolysis. Types and mechanisms of development of cellular dystrophies. Consequences and stages of cell damage. Mechanisms of necrobiosis. Comparative characteristics of necrosis and apoptosis. 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.
16. Active and passive resistance of cells to damage. Principles of prevention and pathogenetic therapy of cell damage. Hyperthermia: pathogenetic variants and clinical forms. Defensive compensatory reactions and actual pathological changes in hyperthermia. Burns, burn disease. Pathogenesis of heat spasms, heat exhaustion, heat and sunstroke, role of cytokines.
17. Hypothermia. Defensive compensatory reactions and actual pathological changes. Mechanisms of adaptation to cold. Artificial hypothermia, its use in medicine. Characteristics of phagocytosis and the system of mononuclear phagocytes. Obligatory and facultative phagocytes.
18. Mechanisms and stages of phagocytosis. Mechanisms of leukocyte production of reactive oxygen species ("respiratory burst"). Disorders of phagocytosis: forms, causes, mechanisms, consequences. Chediak-Higashi syndrome. Humoral factors of the body's non-specific resistance to infectious agents (lysozyme, C-reactive protein, interferons, fibronectin, etc.). Complement system and its disorders. Significance for the pathology of classical and alternative pathways of complement activation.
19. Antigens of the main histocompatibility complex of classes I and II, role and functions in immunogenesis and pathology. Mechanisms of humoral and cellular immune response, their disorders. Immunological deficiency: primary and secondary immunodeficiencies. Causes, mechanism and types of primary immunodeficiencies. The role of physical, chemical and biological factors in the development of secondary immunodeficiencies. Pathophysiological characteristics of acquired immunodeficiency syndrome (AIDS).
20. 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. 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. Allergic reactions of type 1 (anaphylactic). Immunological mechanisms of anaphylactic reactions, the role of tissue basophilic granulocytes in their development.
21. Allergic reactions of type 1 (anaphylactic): characteristics of stages, mediators (primary and secondary), experimental models, main clinical forms. Mechanisms of self-limitation of anaphylactic reactions. Active and passive

anaphylaxis, pathogenesis of anaphylactic shock. 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.
22. 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. Allergic reactions of type IV (delayed type hypersensitivity): characteristics of stages, mediators, experimental models, main clinical forms. Features of immunological mechanisms. Classification, mechanisms of formation and action of lymphokines. Cytokinetic allergic reactions of suppressive and activating action: classification, characteristics of stages, mechanisms, experimental models, main clinical forms.
23. Definition of the concept of "local blood circulation disorders". The main forms of local blood circulation disorders. Nature, mechanisms of formation and role of endothelial factors: endothelial relaxation factor, endothelins in the pathogenesis of local blood circulation disorders. Arterial hyperemia: classification, causes and mechanisms of development, main manifestations, experimental models. Venous hyperemia: classification, causes and mechanisms of development, main manifestations, experimental models. 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.
24. Reperfusion syndrome, its pathogenesis, experimental models. Stasis: classification, causes and mechanisms of development, main manifestations, experimental models.
25. Definition of the concept of inflammation. Etiology of inflammation. Classification of phlogogenic agents. Methods of studying the inflammatory process in an experiment. Stages of inflammation. Cardinal signs of the inflammatory process. Classification of inflammation. Primary and secondary alteration. Causes and mechanisms of secondary alteration. Mediators and anti-mediators of inflammation, their classifications.
26. 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. Exudation Mechanisms of exudation. Causes and mechanisms of increased vascular wall permeability. Early and late stages of increased permeability. Emigration. Stages of emigration of leukocytes. The final state of leukocytes, its mechanisms. The role of cell adhesion molecules. Exogenous and endogenous chemotaxins, mechanisms of microbial neutralization by leukocytes.
27. Biochemical and physicochemical disorders in the focus of inflammation. Causes of changes in oncotic and osmotic pressure in tissue inflammation. Causes of acidosis in the focus of inflammation. The essence of the physicochemical (biochemical) theory of inflammation of Schade and Menkin. 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. Types of exudates. Differences between serous exudate and transudate. Morphological and biochemical composition of purulent exudate.
28. Proliferation. Mechanisms of proliferation. Molecular mechanisms of transfer and implementation of the mitogenic signal. Mechanisms of sclerosis. 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. The importance of inflammation for the body. Principles of anti-inflammatory therapy.
29. Definition of the concept and general characteristics of fever. Formation of febrile reaction in phylo- and ontogenesis. Etiology of fever. Principles of classification of pyrogens. Chemical nature of pyrogenic substances. 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. Stages of fever. Types of febrile reactions. Involvement of the nervous, endocrine and immune systems in the development of fever. Changes in metabolism and physiological functions during fever. Protective value and negative features of fever.
30. Pathophysiological principles of antipyretic therapy. The concept of pyrotherapy. The main differences between fever, exogenous overheating and other types of hyperthermia. Febrile states, their classification. Pathogenesis of stress-salt fever.
31. The main types of tissue growth disorders. Concept of hypo- and hyperbiotic processes. Definition of the concepts "tumor" and "neoplastic process". Biological features of tumor growth. Types of atypism of growth and differentiation. The main signs of physicochemical, biochemical, antigenic, functional atypism (anaplasia). The concept of malignant and benign tumors. Infiltrative and expansive growth. Molecular mechanisms of tumor growth, features of mitogenic signal implementation. Experimental study of the etiology and pathogenesis of tumors: methods of induction, transplantation, explantation.
32. Etiology of tumors. Risk factors for their development. Classification of carcinogens. Physical carcinogenesis. 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. Viral carcinogenesis. Experimental evidence of the viral origin of tumors. Classification of oncogenic viruses.
33. Stages of tumor pathogenesis. Mechanisms of tumor transformation. Mechanisms of promotion. The role of disruption of apoptosis in the pathogenesis of tumors. Mechanisms of tumor progression. Metastasis, its stages and mechanism. Mechanisms of cachexia. The interaction of the organism and the tumor. Mechanisms of natural antitumor protection, their classification.

34. Typical forms of energy metabolism disorders. Hypoergoses, definition, classification (according to S.N. Yefuni). Dissimilatory hypoergosis, pathogenetic options, causes, mechanisms of development. Accumulation and utilization g hypoergosis. pathogenetic variants, causes, mechanisms of development. The importance of energy metabolism disorders for the vital activity of cells, organs and the organism as a whole. Causes and mechanisms of purine and pyrimidine base exchange disorders. Positive and negative nitrogen balance. Disturbance of assimilation of food proteins.
35. Hereditary disorders of amino acid metabolism. Violation of the final stages of protein metabolism, urea synthesis. Production and retention hyperazotemia. Disorders of the protein composition of blood plasma: hyper-, hypo- and dysproteinemia. paraproteinemia. Gout: the role of exo- and endogenous factors, mechanisms. Hyper- and hypouricemia. Hereditary orotataciduria.
36. Hypo- and vitamin deficiency. their types Violation of absorption, transport, storage, utilization and metabolism of vitamins. Antivitamins. Hypervitaminoses. Mechanisms of metabolic disorders and physiological functions in the most important forms of hypo- and hypervitaminosis. Causes and mechanisms of the basic metabolism disorder.
37. Starvation, definition, classification, causes. Pathophysiological characteristics of periods of complete starvation. Protein-calorie deficiency, its forms: alimentary marasmus, kwashiorkor. Alimentary dystrophy. Mechanisms of the body's resistance to starvation. Therapeutic fasting.
38. Positive and negative water balance. Dehydration: extracellular and intracellular. Hypo-, iso- and hyperosmolar dehydration. Causes and mechanisms of development. Protective - compensatory mechanisms. Anhydremia syndrome. 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. Edema, etiological and pathophysiological classification. Hydrostatic and oncotic mechanisms of edema development. The role of vascular wall permeability disorders and lymph outflow in the pathogenesis of edema. Swelling caused by retention of sodium salts in the body. "Myxedematous" swellings. Principles of edema treatment.
39. 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. Violations of hormonal regulation of phosphorus-calcium exchange: Viper and hypoparathyroidism, hypo- and hypervitaminosis D, disorders of calcitonin secretion.
40. 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. Hypercalcemic state, causes and mechanisms of development. Calcification of soft tissues: metastatic, dystrophic and metabolic mechanisms. Mechanisms of ectopic formation of oxyapatite crystals. The concept of calcification. Hyper- and hypophosphatemia. Causes and mechanisms of development.
41. Buffer systems of the body, mechanisms of their functioning. The role of lungs, kidneys, stomach, salivary glands in the regulation of acid-alkaline balance. Classification of the main forms of acid-base balance disorders. Gas acidosis, diagnostic criteria (according to the Siggaard - Andersen nomogram), causes of development, protective compensatory reactions, principles of correction. Non-gaseous acidosis, types, diagnostic criteria (according to Siggaard-Andersen nomogram), causes of development, mechanisms of compensation, principles of correction. Acidosis with increased and normal anion difference. Causes of intracellular acidosis.
42. Gas alkalosis, diagnostic criteria (according to Siggaard - Andersen nomogram), causes of development, protective compensatory reactions, principles of correction. Non-gaseous alkalosis: hypochloremic, hypokalemic, hypernatremic. Diagnostic criteria. 43. Types of carbohydrate metabolism disorders. Violation of absorption of food carbohydrates, processes of synthesis, deposition and splitting of glycogen, transport of carbohydrates into cells. Hypoglycemia, causes and mechanisms. Hypoglycemic coma.
44. Diabetes mellitus, classification of WHO experts. Causes and mechanisms of development. Causes of extrapancreatic insulin insufficiency. Experimental models of diabetes. Violation of carbohydrate and other types of metabolism in diabetes. Pathogenesis of the main clinical manifestations of diabetes. Types of coma in diabetes. Pathogenesis of the main complications of diabetes: macro- and microangiopathy, neuropathy. Pathogenetic principles of diabetes treatment.
45. Types of fat metabolism disorders. Violation of digestion and absorption of lipids. Disorders of lipid transport in the blood. Hyper-, hypo- and dyslipoproteinemia. WHO classification of hyperlipoprotedemia. "Modified" lipoproteins. Hereditary and acquired disorders of blood plasma lipoprotein composition. Primary and secondary obesity. Experimental models and pathogenesis of obesity. Hyperketonemia: causes, mechanisms, consequences. Violation of intermediate lipid metabolism in cells. Mechanisms of fatty dystrophy.

Questions for SFA (questions for FMC are part of questions for SFA):

1. Classification of changes in total blood volume. Hypovolemia, their types, causes and mechanisms of development, significance for the body. Normovolemia, their types, causes and mechanisms of development, significance for the body. Hypervolemia, their types, causes and mechanisms of development, significance for the body.
2. Types of quantitative pathological changes of erythrocytes. Erythremia and erythrocytosis (absolute and relative), etiology, pathogenesis, diagnostic methods. 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. Anisocytosis, quantity. Causes and mechanisms of the shift of the Price-Jones curve to the right and to the left.
3. Blood loss: etiology, pathogenesis. Protective and adaptive reactions of the body during blood loss. Disorders of physiological functions caused by blood loss. Acute and chronic posthemorrhagic anemias, characteristics of the blood picture. Hemorrhagic shock, mechanisms of development, manifestations. Mechanisms of action of hyperbaric oxygenation in acute massive blood loss. General hematological and clinical manifestations of anemia. Regenerative and degenerative forms of erythrocytes, cells of pathological regeneration.
4. Hemolytic anemias, principles of classification. Hereditary hemolytic anemias: membrane-, enzyme-, and hemoglobinopathies, their causes and pathogenesis. Types, causes and pathogenesis of acquired hemolytic anemias. Mechanisms of intravascular and intracellular hemolysis of erythrocytes.
5. Anemias associated with disorders of erythropoiesis, classification. Myelotoxic anemia, causes, pathogenesis, blood picture. Acquired and hereditary forms of hypoplastic anemia, pathogenesis of clinical manifestations. The concept of myelophthisis. Metaplastic anemias. Megaloblastic anemias. Causes of vitamin B12 and folic acid deficiency. Addison-Birmer anemia, symptomatic B12-deficient anemia. B12-refractory megaloblastic anemias. Pathogenesis, blood picture, mechanisms of development of the main clinical manifestations of megaloblastic anemia.
6. Mineral deficiency anemias. Iron deficiency anemia: causes, pathogenesis, blood picture, mechanisms of development of the main clinical manifestations. Iron-refractory anemias. Dysregulatory anemias.
7. Leukocytosis, classification, causes, mechanisms of development. Neutrophilic, eosinophilic, lymphocytic and monocytic leukocytosis (absolute and relative). The concept of a shift in the leukocyte formula, types of nuclear shift.
8. Leukopenia, primary and secondary, causes, mechanisms of development. Food-toxic and hemorrhagic aleukia. Pathogenesis of the main clinical manifestations of leukopenia. Agranulocytosis, types, causes, mechanisms of development.
9. Hemoblastoses, their types. Leukemia as a type of hemoblastosis. Principles of leukemia classification. Causes of leukemia. Evidence of the tumor nature of leukemias. Viral leukogenesis, types of leukogenic viruses. The importance of the genetic and hereditary factor in the etiology of leukemia.
10. Acute leukemias, features of their pathogenesis and blood patterns. Chronic leukemias, features of their pathogenesis and blood patterns. Pathogenesis of leukemias, stages. Classification of oncogenes in leukemia. Criteria of tumor progression in hemoblastosis.
11. Features of leukemia cells, their morphological, cytogenetic, cytochemical characteristics. The main disorders in the body in leukemia, their mechanisms. Principles of diagnosis and treatment of leukemias. Leukemoid reactions, causes and mechanisms of development. Common and distinctive features of leukemic reactions and leukemias.
12. Hemorrhagic disorders of hemostasis, classification. Types of disorders of vascular and platelet mechanisms of hemostasis. Vasopathies, 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.
13. Causes, mechanisms and main manifestations of violation of the I phase of blood coagulation. Hemophilia A, B, C. Causes, mechanisms and main manifestations of violation of the II phase of blood coagulation: hereditary deficiency of V and VII factors, hypoprothrombinemia. Causes, mechanisms, and main manifestations of impaired blood coagulation phase III: increased fibrinolysis, hypo- and afibrinogenemia. Principles of correction of blood coagulation disorders.
14. Disseminated intravascular coagulation syndrome (DVZ syndrome). Causes and pathogenesis. The concept of "protease explosion". The role of DVZ syndrome in the pathogenesis of extreme conditions. Peculiarities of the course of DVZ in children. Changes in physical and chemical properties of blood: osmotic and oncotic pressure, viscosity, ESR.
15. Cardiac arrhythmias: definition, classification. Electrophysiological mechanisms of the development of arrhythmias. Violation of the automaticity of the heart: types, causes, mechanism of development, manifestations on the ECG. Paroxysmal tachycardia: types, causes, mechanism of development, manifestations on the ECG. Atrial and ventricular atrial fibrillation, causes and mechanism of development, manifestations on the ECG.
16. Cardiac conduction disorders: types, causes and mechanisms of development; manifestations on the ECG. Violation of heart contraction: types, causes, pathogenesis, clinical manifestations. The role of additional conducting pathways of the heart (Kent, James) in the development of arrhythmias, manifestations on the ECG. Pathogenetic principles of therapy, heart defibrillation; artificial rhythm drivers.
17. The concept of arterial hypertension, their hemodynamic variants. Principles of classification of arterial hypertension, theories of pathogenesis (dysregulatory and membrane theories of pathogenesis of primary arterial hypertension. Nephrogenic, endocrine and neurogenic secondary arterial hypertension: causes, pathogenesis, experimental modeling.
18. The concept of circulatory failure and heart failure, principles of classification. Heart failure from overload. Types of cardiac overload and immediate compensation mechanisms. Mechanisms of long-term adaptation of the heart to loads. Stages of compensatory hyperfunction of the heart. Physiological and pathological hypertrophy of the myocardium. Features of hypertrophied heart, mechanisms of its decompensation. Heart defects, their main types.
19. 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. Extramyocardial heart failure, causes,

mechanisms of development. Damage to the pericardium. Acute cardiac tamponade. Indicators of cardio and hemodynamics in heart failure. Pathogenesis of common manifestations of heart failure. Principles of treatment.
20. Insufficiency of coronary blood circulation, pathogenetic variants. Causes and mechanisms of myocardial ischemia. The concept of the value of "critical stenosis". Experimental modeling of myocardial ischemia. Mechanisms of development of pathological changes in the myocardium caused by insufficiency of coronary blood circulation. Consequences of coronary blood circulation disorders for the heart. Reperfusion syndrome. Concept of "oxygen" and "calcium" paradoxes, their mechanisms.
21. Ischemic heart disease, etiology and pathogenesis. Myocardial infarction, pathogenesis of the main clinical manifestations. Diagnostic value of increased activity of enzymes in myocardial infarction. Mechanisms of development of cardiogenic shock. Principles of prevention and treatment of ischemic heart lesions. Non-coronary necrosis of the heart, causes and mechanisms of their occurrence.
22. The essence of the concept of respiratory insufficiency: the main signs, forms, indicators of respiratory insufficiency. Pathogenetic variants of ventilation disorders. Alveolar hyperventilation. Obstructive variant of impaired alveolar ventilation: etiology, pathogenesis, diagnostic indicators. Restrictive variant of impaired alveolar ventilation: etiology, pathogenesis, diagnostic indicators. Dysregulatory variant of impaired alveolar ventilation: etiology, pathogenesis, diagnostic indicators.
23. Asphyxia: causes, mechanisms of development, main stages. 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. Pathological forms of breathing: types, causes, mechanism of development; experimental modeling of periodic breathing.
24. Violation of pulmonary blood circulation. Violations of general and regional ventilation-perfusion relations in the lungs. Causes and mechanisms of gas diffusion disorders in the lungs. Compensation mechanisms for external breathing disorders (pulmonary, extrapulmonary compensation factors). Violation of metabolic functions of the lungs. Violation of the surfactant system.
25. Definition of the concept of hypoxia. Principles of classification of hypoxic conditions. Types, etiology and pathogenesis of arterial-hypoxemic hypoxia, hemic hypoxia, hemodynamic hypoxia, peripheral shunting hypoxia and pathogenesis of primary and secondary tissue hypoxia (according to the classification of S.N. Yefuni), indicators of gas composition of arterial and venous blood.
26. Mechanisms and stages of hypoxic cell damage. Resistance of individual organs and tissues to hypoxia. Immediate and long-term adaptive reactions of the body during hypoxia. Normobaric and hypobaric hypoxic therapy. Oxygen therapy and the toxic effect of oxygen. Normo- and hyperbaric oxygenation. Hyperoxia as a cause of hypoxia.
27. The concept of insufficiency of digestion, principles of classification. Etiology of digestive disorders. Principles of experimental modeling of digestive disorders. Functional connections of different departments of digestion under the conditions of pathology. Connection of digestive disorders with metabolic disorders. General manifestations of indigestion. Appetite disorders, types, causes, pathogenesis.
28. Indigestion in the oral cavity. Causes of chewing and swallowing disorders. Caries, etiology, pathogenesis, experimental models. Periodontitis, etiology, pathogenesis, experimental models. Salivation disorders: hypo- and hypersalivation, their consequences.
29. Gastric dyskinesias, hyper- and hypotonic variants. Mechanisms of development of belching, heartburn, nausea, vomiting. Types of gastric secretion disorders. Causes and mechanisms of development of hypo- and hypersecretory states. Pathogenetic variants and experimental models of gastric ulcers. Etiology and pathogenesis of peptic ulcer disease of the stomach and duodenum.
30. Violations of the secretory function of the pancreas. Causes of pancreatic hyposecretion. Digestive disorders associated with secretory insufficiency of the pancreas. Causes of pancreatic hypersecretion. Acute pancreatitis, its pathogenetic variants. Pathogenesis of pancreatic shock.
31. Maldigestion syndrome, causes, pathogenesis, main manifestations. Malabsorption syndrome. Intestinal enzyme diseases. Causes, pathogenesis, main manifestations. Intestinal dyskinesias: hyper- and hypokinetic variants. Constipation and diarrhea. Intestinal obstruction: etiology and pathogenesis. Violation of the barrier function of the intestines: intestinal autointoxication, coli sepsis, dysbacteriosis.
32. Concept of liver failure, principles of classification. Functional tests of the liver. Hepato-cellular variant of liver failure, causes of development, pathogenesis, experimental modeling. Cholestatic variant of liver failure, causes of development, pathogenesis, experimental modeling. Hepatovascular variant of liver failure, causes of development, pathogenesis, experimental modeling.
33. Violation of carbohydrate and protein metabolism under conditions of liver failure. Violation of lipid, water-electrolyte exchanges, exchange of vitamins and hormones under conditions of liver failure. Violation of the antitoxic function of the liver. Syndrome of hepatocerebral insufficiency. Pathogenesis of hepatic coma, the role of cerebrotoxic substances.
34. Violations of the excretory function of the liver. Jaundice, their types. Causes and mechanisms of the development of hemolytic jaundice, features of pigment metabolism disorders. Causes, mechanisms of development of parenchymal jaundice, features of pigment metabolism disorders. Causes and mechanisms of mechanical jaundice, features of pigment metabolism disorders. Enzymopathic variants of jaundice (pathogenesis of Gilbert, Crigler-Nayar, Dabin-Johnson, Rotor syndromes). Cholemic and aholic syndromes. Gallstone disease.
35. Portal hypertension syndrome, causes, mechanisms of development. Pathogenesis of ascites, hepatolienal and

hepatorenal syndromes. Budd-Chiari syndrome, etiology, pathogenesis.
36. 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.
37. Basic indicators of kidney activity and variants of their disorders. Use of functional tests to find out the essence of kidney function disorders. Quantitative and qualitative changes in urine composition. Oligo -, an - and polyuria. Aqueous, osmotic and hypertensive diuresis. Nocturia. Hypo - and isosthenuria. Pathological components of urine: protein, cylinder and leukocyturia.
38. Proteinuria, selective and non-selective, glomerular and tubular. Pathogenesis of renal edema. Renal disturbances of acid-base balance: 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.
39. Diffuse glomerulonephritis: etiology, pathogenesis, experimental models. Nephrotic syndrome, causes, pathogenesis, diagnostic criteria. Syndrome of acute renal failure, definition, classification, stages of the course, clinical signs.
40. Syndrome of chronic renal failure, definition, classification, stages of the course, clinical signs. Pathogenesis of uremic coma. Concept of extracorporeal and peritoneal hemodialysis, lymphodialysis and lymphosorption. Causes and mechanisms of formation of kidney stones, urolithiasis. Theories of lithogenesis.
41. General patterns 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. 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.
42. Glandular disorders of endocrine function. Causes and mechanisms of disorders of biosynthesis, deposition and secretion of hormones. Peripheral endocrine function disorders. Disruption of transport and metabolic inactivation of hormones. Pathology of hormone reception. Violation of hormonal signal implementation in target cells. Pathology of the systems of intracellular mediators in the action of hormones: adenylate and guanylate cyclase systems, calcium-calmodulin mechanisms, phospholipid messengers.
43. Causes and mechanisms of hypothalamus neuroendocrine function disorders. Psychogenic endocrinopathies. Panhypopituitarism, types, causes, mechanisms of development, main manifestations. Hyperfunction of the anterior lobe of the pituitary gland: eosinophilic and basophilic adenomas. Disorders of the hypothalamic-neuro-pituitary system. Syndrome of excessive secretion of antidiuretic hormone. Diabetes insipidus.
44. Pathology of the adrenal glands. Acute and chronic adrenal insufficiency: etiology and pathogenesis
manifestations with loss of mineralo-glucocorticoid function. Hyperfunction of the adrenal glands. Primary and secondary hyperaldosteronism. Itsenko-Cushing syndrome. Adrenogenital syndrome: its pathogenetic variants. Hypo- and hyperfunction of the medulla of the adrenal glands. Familial dysautonomia, pheochromocytoma, causes, pathogenesis, main manifestations.
45. Hypofunction of the thyroid gland: etiology, pathogenesis, manifestations, principles of therapy. The main diseases caused by hypofunction of the thyroid gland, their brief characteristics. Radiation lesions of the thyroid gland, endemic goiter, Hashimoto's autoimmune thyroiditis. Hyperfunction of the thyroid gland: etiology, pathogenesis, manifestations, principles of therapy. The main diseases with hyperfunction of the thyroid gland, their brief characteristics. Diffuse toxic goiter, the role of immune mechanisms in its development. Consequences of violations of calcitonin secretion.
46. General patterns of occurrence and development of pathological processes in the nervous system. Principles of classification of disorders of the nervous system. Damage to neurons as one of the causes of disturbances in the integrative functions of the central nervous system. Causes and mechanisms of disorders of neurochemical processes. Disruption of the exchange of neurotransmitters, neuromodulators and neurohormones.
47. Disorders of the motor function of the nervous system. Violation of neuromuscular transmission. Peripheral and central paralysis and paresis: causes, mechanisms of development, manifestations. Movement disorders of subcortical origin. Disorders associated with damage to the cerebellum.
48. Causes and mechanisms of disturbances of electrophysiological processes. Causes and pathogenesis of epilepsy. Antiepileptic system. Seizures, their types.
49. Violation of sensory functions of the nervous system. Disorders of mechano-, thermo-, proprio- and nociception. Violation of the conduction of sensory information. Braun-Secard syndrome. Manifestations of damage to thalamic centers and sensory structures of the cerebral cortex.
50. Pain. Peculiarities of pain as a type of sensitivity. Principles of pain classification. Causes, Newtonian and neurochemical mechanisms of pain. The theory of impulse distribution ("gate control"), the theory of a pathologically enhanced excitation generator, the theory of specificity.
51. Forms of pathological pain. Peripheral, peripheral-central and central mechanisms of development of pathological pain. 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 final control and semester final attestation

"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. Experimental reproduction of a febrile reaction using pyrogenic substances.

"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.

Forms of control:

During training sessions:

a) individual inspection; b) frontal inspection.

Form of final control of study success - Semester final attestation (SFA).

System of current and final control

Evaluation of the current educational activity is carried out during practical classes. The main purpose of

current control is to provide feedback between a scientific and pedagogical worker and a student of higher education in the process of learning and formation of educational motivation of students of higher education. The information obtained during the current control is used both by a scientific and pedagogical worker - to adjust technologies, methods and teaching aids, and by students of higher education - to plan independent work.

Current control is carried out in the form of an oral survey, solving situational tasks, written control, written or software computer testing in practical classes. At the same time, standardized generalized criteria for evaluating the knowledge of higher education students are used (Tab. 1).

Table 1. Standardized generalized criteria for evaluating the knowledge of students of higher education at PSMU

According to 4-point scale	According to ECTS	Evaluation criteria
5 (excellent)	A	The student shows special creative abilities, knows how to acquire knowledge independently, finds and processes the necessary information without the help of a teacher, knows how to use the acquired knowledge and skills to make decisions in non-standard situations, convincingly argues answers, independently reveals his own gifts and inclinations, possesses at least 90 % of knowledge on the topic both during the survey and all types of control.
4 (good)	B	The student is fluent in the studied amount of material, applies it in practice, freely solves exercises and problems in standardized situations, independently corrects errors, the number of which is insignificant, possesses at least 85% knowledge of the topic as during the survey, and all types of control.
	C	The student knows how to compare, generalize, systematize information under the guidance of a scientific and pedagogical worker, in general, independently apply it in practice, control his own activity; correct mistakes, including significant ones, choose arguments to support opinions, possess at least 75% of knowledge on the topic both during the survey and all types of control.
3 (sufficient)	D	The learner reproduces a significant part of the theoretical material, demonstrates knowledge and understanding of the main provisions with the help of a scientific and pedagogical worker, can analyze the educational material, correct errors, among which there are a significant number of significant ones, possesses at least 65% knowledge of the topic as during the survey, and all types of control.
	E	The learner owns educational material at a level higher than the initial one, reproduces a significant part of it at the reproductive level. has at least 60% knowledge on the topic both during the survey and all types of control.
2 (insufficient)	FX	The learner owns the material at the level of individual fragments that make up an insignificant part of the material, has less than 60% knowledge of the topic both during the survey and all types of control.
	F	The learner possesses the material at the level of basic recognition and reproduction of individual facts, elements, possesses less than 60% of knowledge on the topic during the survey, and all types of control.

Unified Table No. 2 of the correspondence of points for current success to points for the exam and the traditional four-point evaluation

Average mark for semester (A)	Points for current control (A*24)	Points for FMS/SFA (A*16)	Points for FMC and /or SFA (A*24 + A*16)	ECTS grade	According to 4-point scale
1	2	3	4	5	6
2	48	**32**	**80**	F FX	2 insufficient
2,1	50	**34**	**84**		

2,15	52	**34**	**86**		
2,2	53	**35**	**88**		
2,25	54	**36**	**90**		
2,3	55	**37**	**92**		
2,35	56	**38**	**94**		
2,4	58	**38**	**96**		
2,45	59	**39**	**98**		
2,5	60	**40**	**100**		
2,55	61	**41**	**102**		
2,6	62	**42**	**104**		
2,65	64	**42**	**106**		
2,7	65	**43**	**108**		
2,75	66	**44**	**110**		
2,8	67	**45**	**112**		
2,85	68	**46**	**114**		
2,9	70	**46**	**116**		
2,95	71	**47**	**118**		
3	72	**50**	**122**	E	3 sufficient
3,05	73	**50**	**123**		
3,1	74	**50**	**124**		
3,15	76	**50**	**126**		
3,2	77	**51**	**128**		
3,25	78	**52**	**130**	D	
3,3	79	**53**	**132**		
3,35	80	**54**	**134**		
3,4	82	**54**	**136**		
3,45	83	**55**	**138**		
3,5	84	**56**	**140**	C	4 good
3,55	85	**57**	**142**		
3,6	86	**58**	**144**		
3,65	88	**58**	**146**		
3,7	89	**59**	**148**		
3,75	90	**60**	**150**		
3,8	91	**61**	**152**		
3,85	92	**62**	**154**		
3,9	94	**62**	**156**		
3,95	95	**63**	**158**		
4	96	**64**	**160**	B	
4,05	97	**65**	**162**		
4,1	98	**66**	**164**		
4,15	100	**66**	**166**		
4,2	101	**67**	**168**		
4,25	102	**68**	**170**		
4,3	103	**69**	**172**		
4,35	104	**70**	**174**		
4,4	106	**70**	**176**		
4,45	107	**71**	**178**		
4,5	108	**72**	**180**	A	5 excellent
4,55	109	**73**	**182**		

4,6	110	**74**	**184**		
4,65	112	**74**	**186**		
4,7	113	**75**	**188**		
4,75	114	**76**	**190**		
4,8	115	**77**	**192**		
4,85	116	**78**	**194**		
4,9	118	**78**	**196**		
4,95	119	**79**	**198**		
5	120	**80**	**200**		

The intended form of final control is the semester final attestation (SFA).

After completing the course, students take the SPA. The SPA is evaluated according to the following methodology: a grade of "3" is given to the student who, during the preparation of the SFA, correctly answered at least 15-16 (75%-80%) of the 20 test tasks, answered the theoretical questions, reproducing at least 60% theoretical material, and correctly solved 2 situational problems. A grade of "4" is given to a student who, when completing the SFA, correctly answered at least 17-18 (85%-90%) of the 20 test tasks, answered theoretical questions, reproducing at least 75% of the theoretical material, and correctly solved I did 2 situational problems. A grade of "5" is given to a student who, when completing the SFA, correctly answered at least 19-20 (95%-100%) of 20 test tasks, answered a theoretical question, reproducing at least 90% of the theoretical material, and correctly solved 2 situational problems.

Compilation of FMC testing and semester final attestation (SFA) testing is conducted in the computer classroom.

Information about students who have not been enrolled in FMC, with a precise indication of the reason for non-enrollment, is also entered in the "Report of Final Modular Control" and individual study plans of students. The reasons for non-enrollment may be the following:

a) the student of higher education has missed classes and (or) lectures. Mark "n/c" (did not complete) in the column "points for FMC";

b) the student of higher education has attended all classes (practical, lecture), but has not scored the minimum number of points for the current educational activity and is not admitted to PC. Mark "n/a" (not allowed) in the "points for FMC" column;

c) the student of higher education attended all classes and scored the number of points for the current educational activity and was admitted to take the FMC, but did not appear. Mark "n/ap" (did not appear) in the "FMC points" column.

A student of higher education has the right to take and two retakes of FMC, before completing the study of the discipline. In exceptional cases, an additional rewriting of the FMC can be carried out with the personal permission of the rector or the first vice-rector for scientific and pedagogical work.

If the student of higher education does not retake at least one final test before the start of the new semester, he receives a traditional grade of "2" and an ECTS grade of "F" for the discipline. Permission to retake the FMC is issued by the dean of the faculty in the form of "Personal information of retaking final control" which the student receives in the dean's office under a personal signature upon presentation of an individual study plan and (if necessary) information from the department on liquidation of debt (absence of "nb", average mark of 3.0 or more). In the case of an organized redeployment of the FMC by a group of higher education applicants, a general list is used. The personal record of the final inspection (general record) is filled out by the head of the department or a person authorized by him in two copies, one of which remains at the department, the second is returned to the dean's office on the day of completion by the head of the educational part of the department (responsible teacher). A student of higher education has the right to retake the FMC before completing the study of the discipline. If a student of higher education has not passed the FMC, he cannot be admitted to pass the semester control in pathophysiology. Uncompleted final control in one discipline is not a reason for denying a student of higher education to take a FMC in another discipline, with the exception of admission to the final attestation.

Applicants take the semester exam during the exam session provided by the curriculum. It is held according to a separate schedule, which is approved by the first vice-rector for scientific and pedagogical work.

Self-preparation time for higher education applicants for the exam is at least 2 days (3 days for the first stage of the EDKI, 5 days for each component of the second stage of the EDKI and the final certification).

Before each exam, the department necessarily organizes consultations. The department informs applicants of higher education about the schedule of pre-examination consultations, the time and place of the examination no later than 2

weeks before the beginning of the examination session.

Students who have no outstanding missed classroom classes, have scored a minimum number of points of at least 72 (corresponding to an average score of 3.0 for the current academic performance), have passed the FMC in pathophysiology, have fulfilled their financial obligations according to the concluded agreements are admitted to the exam (for study, living in a dormitory, etc.), about which they received a note in the individual study plan for admission to the session from the dean (deputy dean) of the faculty.

Semester exams at PSMU are accepted by a committee, in accordance with the "Regulations on the Examination Committee". Exams are conducted openly and publicly. The grades obtained during the examination by persons receiving certification are submitted to the "Information of the final semester control" and to the individual plans of the students of education.

The exam is held in one day in two stages: computer testing and theoretical component. At the first stage, on the day of the exam, in the cathedral's computer classroom, students of higher education are tested on 20 questions from the academic base of KTI-1 on pathophysiology. Time for execution - 20 minutes. Each correct answer for a test task when completing a computer control is counted as 1 point (maximum in the amount for the first stage, respectively 20 points). The result of a higher education student passing a computer test is not a reason to prevent him from taking the theoretical part of the exam. The exam ticket contains one specific basic theoretical question and two situational problems. The answer of a student of higher education to each task takes approximately 3-5 minutes.

Based on the results of the computer control and the theoretical part of the exam, the student is assigned a total score from 0 to 80 points, conversion of points into a traditional score is not carried out.

Students of higher education who, during the study of pathophysiology, had a current average score of 4.50 to 5.0 are exempted from taking the exam and automatically (upon consent) receive a final grade in accordance with table No. 2, while the student's presence at the exam is mandatory with a tie In case of disagreement with the assessment, the specified category of higher education applicants will take the exam according to general rules.

A student of higher education has the right to retake the exam no more than 2 times and only during the exam session. Permission to retake the exam is issued by the dean. When the exam is retaken in an organized manner by a group of higher education applicants, the general list is used.

The result of retaking the exam is certified by the signatures of all members of the commission in the credit and examination report.

The assessment of pathophysiology is given on a traditional (national) 4-point scale based on the average number of points for two controls provided by the discipline program.

The scale for converting the average number of points for all controls into a traditional assessment on a 4-point scale for all departments is the same (table No. 3).

The grade from the discipline is not converted (is not converted) into ECTS grades.

The grade is given to the student no later than on the next working day after the last final inspection, only if the student of higher education has all passed inspections.

Table No. 3. Conversion of the average number of points for all controls provided by the discipline program into a traditional assessment on a 4-point scale

The average number of points for all discipline controls	Traditional assessment on a 4-point scale
122,0 – 139,99	3
140,0 – 169,99	4
170,0 – 200,0	5

If the student does not retake at least one final test before the beginning of the new semester, he receives a traditional grade of "2" and an ECTS grade of "F" for the discipline.

Teaching methods

- Verbal: lectures, explanations, narration, conversation, instruction.
- Visual: observation, illustration, demonstration.
- Practical: experimental modeling of pathological conditions.
- Thematic discussions.
- Brain storm.
- Round Table.

- Analysis of specific situations (case method).
- Design method.
- Problem statement.
- Research methods.
- Presentations.
- Business games.

Control methods
• Oral control
• Written control
• Test control.
• Programmable control
• Practical examination
• Self-control
• Self-evaluation

Types of control:
• Previous (outgoing)
• Current
• Final control
• Final semester certification

Methodical support

1. Syllabus.
2. Lectures, their multimedia presentations.
3. Test tasks (STEP-1 type) for each lesson.

Recommended list of Study-books

Basic (available in the PDMU library)

1. Crash course in Pathophysiology: Questions and Answers. підруч. для студ. вищ. мед. навч. закл. /Ataman O.V. - Вінниця: Нова книга, анг. – 2019. – 520 с.
2. Pathophysiology. – [textbook] / edited by N.V. Krishtal, V.A. Mikhnev. -Kyiv : Meditsyna, 2019. – 656 p.
3. General and Clinical Pathophysiology : підручник для мед. ВНЗ III—IV р.а. — Затверджено МОЗ / Eds. Kubyshkin A.V., Gozhenko A.I. - Vinnytsia : Nova kniha, 2016. – 656 p.

Supplementary

1. Pathophysiology : підручник для мед. ВНЗ III—IV р.а. — 3-тє вид., випр. Затверджено МОН / Сімеонова Н.К.; за ред. В.А. Міхньова. — К. : Медицина, 2017.
2. Manual for Practical Studies on Pathophysiology. Part 1 Pathophysiology of organs and systems/ V.O. Kostenko, O.Y. Akimov, N.V. Solovyova, V.H. Kostenko. Poltava, 2022. 164p.
3. Manual for Practical Studies on Pathophysiology. Part 2. General pathophysiology / V.O. Kostenko, O.Y. Akimov, N.V. Solovyova, V.H. Kostenko. Poltava, 2022. 154 p.
4. Essentials of Pathophysiology : Concepts of Altered Health States. – [4th ed.] / C. Porth, K.J. Gaspard. - Philadelphia : Wolters Kluwer, 2015. – 1222 p.
5. Ganong W.F. Review of Medical Physiology, 21st ed. – N.Y., etc.: McGraw-Hill, 2003.
6. Leukemia Diagnosis / B.J.Bain ed. - Oxford, UK: Blackwell Science, 1999, 2nd ed.
7. Molecular biology of the cell / Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter - Sixth edition, 2015.
8. Molecular Cell Biology. 4th ed. / H.Lodish, A.Berk, S.Zipursky et al. - New York: W.H. Freeman & Co, 2000.
9. Molecular Haematology / D. Provan, J.Gribben ed. - Oxford, UK: Blackwell Science, 2000.
10. *Mechanisms in Hematology / L.G.Israels, E.D.Israels. ed. - Core Health Sciences Inc., 2002, 3rd ed.*
11. Pathophysiology / I.Hulín et al. - Bratislava, 1997.
12. Porth C.M. Pathophysiology: Concepts of Altered Health States, 7th ed. -Lippincott Williams & Wilkins, 2004.
13. Robbins and Cotran Pathologic Basis of Disease. – [10th ed.] / eds. V. Kumar, A.K. Abbas, J.C. Aster. – Philadelphia : Elsevier/Saunders, 2020.

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

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