

**MINISTRY OF HEALTH PROTECTION OF UKRAINE**

**ODESSA NATIONAL MEDICAL UNIVERSITY**

Department of general and clinical pathological physiology

*Agreement*

**I APPROVE**

Vice-rector for scientific and pedagogical work

Eduard BURYACHKIVSKY

September 1, 2023

**WORK PROGRAM ON THE DISCIPLINE  
PATHOPHYSIOLOGY**

**Level of higher education** : second (master's )

**Field of knowledge:** 22 "Health care"

**Specialty:** 222 "Medicine"

**Educational and professional program:** Medicine

The work program is compiled on the basis of the educational and professional program "Medicine" for the training of specialists of the second (master's) level of higher education in the specialty 222 "Medicine" of the field of knowledge 22 "Health care", approved by the Scientific Council of ONMedU (protocol No. 8 of June 29, 2023 ).

Developers:

Head of the department, Doctor of Medicine, prof. Vastyanov R.S.

Assistant Sarakhan V.M., assistant Ostapenko I.O.

The work program was approved at the meeting of the Department of General and Clinical Pathological Physiology

Protocol No. 1 from "29". August 2023


Head of the department  Ruslan VASTYANOV

Agreed with the guarantor of the OPP  Valery MARICHEREDA

Approved by the subject cycle methodical commission for medical and biological disciplines of ONMedU

Protocol No. \_\_\_ from "\_\_\_". \_\_\_\_\_ 2023

Head of the subject cycle methodical commission for medical and biological disciplines of ONMedU

 Leonid GODLEVSKY

Reviewed and approved at a meeting of the department

\_\_\_\_\_

Protocol No. \_\_\_ of "\_\_\_" \_\_\_\_\_ 20\_\_

Head of Department \_\_\_\_\_  
(signature) (First Name Surname)

Reviewed and approved at a meeting of the department

\_\_\_\_\_

Protocol No. \_\_\_ of "\_\_\_" \_\_\_\_\_ 20\_\_

Head of Department \_\_\_\_\_  
(signature) (First Name Surname)

### 1. Description of the academic discipline :

Name of indicators	Field of knowledge, specialty, specialization, level of higher education	Characteristics of the academic discipline
The total number of: Credits: 7 Hours: 210 Content modules: 7	Branch of knowledge 22 "Health care"	<i>Full-time education</i>
		<i>Mandatory discipline</i>
	Specialty 222 "Medicine"	<i>Year of training: 3</i>
		<i>Semester: V-VI</i>
	Level of higher education second (master's )	<i>Lectures (30 hours)</i>
		<i>Seminars (0 hours)</i>
		<i>Practical (96 hours)</i>
		<i>Laboratory (0 hours)</i>
		<i>Independent work (84 hours) including individual tasks (0 hours)</i>
	<i>Final control form - exam</i>	

### 2. The purpose and tasks of the educational discipline, competences, program learning outcomes.

**Purpose :** Formation of systemic knowledge about the disease and the general patterns of occurrence and development of various diseases, formation in the students of the concept of complexity and dialectics of the relationship between harmful and protective-adaptive components of pathological processes; providing a theoretical base for further study of other medical and biological disciplines.

**Task:**

1. Formation of a certain amount of knowledge on the emergence and development of typical pathological processes and their modeling, understanding of the ways of pharmacocorrection of the main human diseases and creating a base that determines the professional competence and general erudition of the doctor.
2. Apply theoretical knowledge of nosology, cell pathophysiology, typical metabolic disorders, typical pathological processes in the research of issues of etiology and pathogenesis, manifestations and consequences of functional system (organ) disorders and the most common human diseases.

**The process of studying the discipline is aimed at forming elements of the following competencies:**

**- General (ZK):**

ZK1 – Ability to abstract thinking, analysis and synthesis .

ZK4 – Knowledge and understanding of the subject area and understanding of professional activity

ZK10. Ability to use information and communication technologies

ZK11. Ability to search, process and analyze information from various sources

**- Special (SK):**

SK6. Ability to determine the principles and nature of treatment and prevention of diseases

SK11. Ability to solve medical problems in new or unfamiliar environments in the presence of incomplete or limited information, taking into account aspects of social and ethical responsibility

SK28. Ability to apply fundamental biomedical knowledge at a level sufficient to perform professional tasks in the field of health care

**Program learning outcomes (PRL):**

PRN1. Have thorough knowledge of the structure of professional activity. To be able to carry out professional activities that require updating and integration of knowledge. To be responsible for professional development, the ability for further professional training with a high level of autonomy.

PRN2. Understanding and knowledge of fundamental and clinical biomedical sciences, at a level sufficient for solving professional tasks in the field of health care.

PRN3. Specialized conceptual knowledge, which includes scientific achievements in the field of health care and is the basis for conducting research, critical understanding of problems in the field of medicine and related interdisciplinary problems.

**As a result of studying the academic discipline, the student of higher education must:**

**Know:**

1) Studies by students of higher education of the state of functions and changes in relevant parameters under pathological conditions in experiments on animals, isolated organs, cells, models or based on experiments recorded in video films, motion pictures, presented in computer programs and other educational technologies.

2) Assessment of age, gender and individual characteristics of the course of diseases.

3) Solving situational problems (analysis and interpretation of parameters of homeostasis, indicators of activity of organs and systems, mechanisms of their regulation, etc.), which has a clinical-diagnostic and prognostic direction.

**Be able:**

- distinguish destructive (destructive) phenomena from compensatory and protective ones;
- apply understanding of the causes and mechanisms of the pathological process when making a diagnosis, when prescribing treatment and organizing preventive measures;
- evaluate and analyze the role of environmental factors in the occurrence of diseases, especially the pathogenic effect of ionizing radiation and chemical factors on the human body;
- independently carry out experimental research within the framework of one's specialty;
- independently assess and provide assistance within the limits of one's competence in extreme situations.

### **3. Content of the academic discipline**

#### **Chapter 1. General pathology, typical pathological processes:**

##### **Content module 1. General nosology. Pathophysiology of the cell.**

**Topic 1. Subject, methods and tasks of pathophysiology. The history of its development. General etiology and pathogenesis.**

Classification of etiological factors, concept of risk factors. Definition of the concept of "pathogenesis". Pathological and adaptive-compensatory (protective) phenomena in pathogenesis. Causal relationships, the role of *the circulus vitiosus* in pathogenesis. The concept of the main and secondary links of pathogenesis. Specific and non-specific mechanisms of disease development.

**Topic 2. Typical cell responses to damage: types, mechanisms of development. Apoptosis and necrosis .**

Cell damage, principles of classification. Cell death (necrosis, apoptosis), their signs. Universal mechanisms of cell damage. Mechanisms of free-radical and hypoxic damage. Mechanisms of cell protection and cell adaptation to the action of damaging factors.

**Topic 3. Typical disorders of peripheral blood circulation and microcirculation: classification, etiology and pathogenesis.**

Arterial and venous hyperemia: definition, manifestations, types, causes and

mechanisms of development, termination options and consequences. Ischemia: definition, manifestations, types, causes and mechanisms of development, termination options and consequences. Ischemia-reperfusion syndrome. Embolism: definition, manifestations, types of embolus. Peculiarities of the pathogenesis of embolism of the large and small circles of blood circulation, portal vein system. Stasis: definition, types, causes, pathogenesis, consequences. Microcirculation disorders, classification. Sludge syndrome: definition, causes and mechanisms of development. Disorders of local lymph flow, types, causes and mechanisms of development.

**Topic 4. Inflammation: etiology, pathogenesis. Mediators. Local signs.**

Inflammation: definition, principles of classification. Characteristics of general and local signs of inflammation. Etiology. Pathogenesis of inflammation, stages. Pathological and adaptive-compensatory changes in the dynamics of inflammation. Alteration: causes and mechanisms.

**Topic 5. Exudation and proliferation. General disorders of microcirculation in the focus of inflammation.**

Exudation, its causes and mechanisms. Types of exudates. Emigration of leukocytes to the focus of inflammation. Sequence, causes and mechanisms of emigration of leukocytes. The role of leukocytes in the development of local and general signs of inflammation. Violation of phagocytosis: causes, mechanisms, consequences. Metabolic disorders in the focus of inflammation. Mediators of inflammation, their classification. Formation mechanisms and biological action of humoral mediators of inflammation. Mediators of inflammation of cellular origin: their biological effects. Proliferation of cells in the focus of inflammation. Mechanisms of mitogenic action of growth factors and cytokines. Regeneration and fibroplasia as ways of healing.

**Topic 6. Disorders of thermoregulation: hypo- and hyperthermia. Fever: etiology, pathogenesis.**

Fever: definition, principles of classification. The connection between fever and inflammation. Types of pyrogens. Chemical nature and origin of secondary pyrogens, mechanism of their action. Fever: stages of development, changes in thermoregulation, metabolism and physiological functions. Protective value and pathological manifestations of fever. Principles of antipyretic therapy. Concept of pyrotherapy. The main differences between fever, exogenous overheating and other types of hyperthermia.

**Content module 2. Typical pathological processes .**

**Topic 7. Pathophysiology of the immune system. Immunodeficiency and immunodepressive conditions.**

General characteristics of immune system disorders: abnormal immune response and loss of tolerance to autoantigens. Mechanisms of tolerance to autoantigens. Mechanisms of tolerance of the immune system. Causes and consequences of its loss. Types of immune deficiency. Etiology, pathogenesis of primary and secondary immunodeficiencies. Typical manifestations of immune deficiency. Etiology and pathogenesis of AIDS. Pathophysiological characteristics of HIV infection. Typical cellular manifestations. Principles of prevention and therapy of HIV infection.

**Topic 8. Allergy: classification, etiology, pathogenesis.** Allergy: definition, principles of classification of allergic reactions. Classification and characteristics of allergens.

**Topic 9. Allergy: Allergic reactions of types I - IV. Pseudoallergic reactions. Autoimmune reactions.**

Allergic reactions of type I (anaphylactic): etiology, pathogenesis, clinical manifestations of local and systemic anaphylactic reactions. Mediators of anaphylaxis. "Pseudoanaphylactic" reaction. Allergic reactions of type II (cytotoxic): etiology, pathogenesis, clinical manifestations. Allergic reactions of type III (immunocomplex): etiology,

pathogenesis, clinical manifestations. Serum sickness. Allergic reactions of type IV (cellular): etiology, pathogenesis, clinical manifestations. Allergic reactions of type V (cellular dysfunctions mediated by antibodies): etiology, pathogenesis, clinical manifestations. Autoimmune disease reactions: general characteristics, principles of classification, modern ideas about etiology and pathogenesis.

**Topic 10. Pathophysiology of tissue growth. Tumors: etiology, pathogenesis.**

Tumors: definition, principles of classification. General patterns of tumor growth. Molecular genetic basis of unlimited growth and potential immortality of tumor cells. Typical features of benign and malignant tumors. Types of anaplasia. Ways and mechanisms of metastasis. Etiology of tumors. General characteristics of carcinogens (chemical, physical, biological). Risk factors (genetic, chromosomal defects, constitutional abnormalities) and conditions for the occurrence and development of tumors. Pathogenesis of tumor growth. The role of violations of molecular (genetic) mechanisms of cell division regulation in the process of tumor transformation. Ways of transforming pro-oncogenes into oncogenes. Features of oncoproteins. Tumor progression: definition, causes and mechanisms, typical signs. Mechanisms of invasive growth and metastasis. Acquisition of resistance to chemopreparations.

**Content module 3. Typical metabolic disorders.**

**Topic 11. Violation of water-salt exchange: etiology, pathogenesis. Dyshydrria, edema.**

Violation of water-electrolyte exchange. Hyper- and hypohydrria, their etiology, pathogenesis, consequences. Disorders of sodium and potassium metabolism: causes, mechanisms, clinical manifestations. Edema: definition, types, causes and mechanisms of development.

**Topic 12. Pathophysiology of acid-base metabolism: acidosis, alkalosis .**

Acidosis: definition, classification, causes of development. Compensatory and pathological reactions. Indicators of acid-base balance in various types of acidosis. Principles of correction. Alkalosis: definition, classification, causes of development. Compensatory and pathological reactions. Indicators of acid-base balance in various types of alkalosis. Principles of correction.

**Topic 13. Pathophysiology of energy and protein metabolism. Etiology and pathogenesis. Starvation.**

Violation of energy metabolism: etiology, pathogenesis, consequences. The concept of energy needs of the body, positive and negative energy balance. Changes in the basic metabolism in pathology. Characteristics of carbohydrate metabolism disorders. Criteria of hypoglycemia, hyperglycemia, impaired glucose tolerance. The role of changes in neurohumoral regulation of carbohydrate metabolism in the pathogenesis of hypo- and hyperglycemic states. Causes and mechanisms of hypoglycemic conditions. Pathogenesis of hypoglycemic coma. Starvation: definition, classification. External and internal causes of starvation. Characteristics of disorders of the main metabolism and metabolism in different periods of complete starvation.

Pathophysiology of incomplete and partial (quality) starvation. Types, causes and mechanisms of manifestations. The concept of medical fasting.

**Topic 14. Pathophysiology of carbohydrate metabolism: etiology and pathogenesis.**

Disorders of carbohydrate metabolism: causes, mechanisms, manifestations. Dependence of the development of diabetes on environmental factors, heredity, concomitant diseases. Reasons for classification.

**Topic 15. Pathophysiology of fat metabolism: etiology and pathogenesis. Atherosclerosis.**

Etiology and pathogenesis of primary (hereditary) and secondary hyperlipoproteinemia.

Obesity: definition, classification, etiology and pathogenesis of individual forms. Medical problems associated with obesity. Atherosclerosis. Etiology of atherosclerosis: risk factors, causative factors. Modern theories of atherogenesis are "inflammatory" and "receptor". The role of hereditary and acquired disorders of receptor-mediated transport, lipoproteins in atherogenesis.

**Topic 16. Pathophysiology of extreme conditions. Etiology and pathogenesis of shock and colaptoid states.**

Extreme and terminal states: classification, manifestations and mechanisms. Shock and colaptoid conditions: classification.

## **Section of discipline II. . Pathophysiology of organs and systems.**

### **Content module 4. Pathophysiology of the blood system.**

**Topic 17. Pathophysiology of the blood system. Changes in total volume.**

Disorders of the total volume of blood: classification, causes and mechanisms of development.

**Topic 18. Pathophysiology of the blood system. Blood loss. Erythrocytosis.** Etiology, pathogenesis of blood loss. Pathogenesis of posthemorrhagic shock. Erythrocytosis: definition, types, etiology, pathogenesis.

**Topic 19. Anemias: Etiology and pathogenesis. Classification of anemias. Posthemorrhagic anemia, etiology, pathogenesis . .**

Anemia: definition of the concept, principles of classification. Regenerative, degenerative, pathological forms of erythrocytes. Posthemorrhagic anemia, types, causes, pathogenesis, blood picture.

**Topic 20. Hemolytic anemias, etiology, pathogenesis**

Hemolytic anemias, classification; causes and mechanisms of erythrocyte hemolysis. Clinical and hematological characteristics of various types of hemolytic anemias.

**Topic 21. B12 - folic acid deficiency, iron deficiency anemia, etiology, pathogenesis.**

Iron deficiency anemia: causes and mechanisms of development, typical changes in peripheral blood, pathogenesis of the main clinical manifestations. Iron-refractory anemias. Causes and mechanisms of vitamin B12 and folic acid deficiency. Characteristics of general disorders in the body with deficiency of vitamin B12 and/or folic acid. Hematological characteristics of vitamin B12 and folate deficiency anemias.

**Topic 22. Leukocytosis and leukopenia: etiology, pathogenesis. A picture of blood. Leukemoid reactions..**

Leukocytosis: types, causes and mechanisms of development. Accompanying nuclear shifts of neutrophil granulocytes. Leukemoid reactions. Leukopenia: types, causes and mechanisms of development. Agranulocytosis. Neutropenia. Accompanying nuclear shifts of neutrophil granulocytes.

**Topic 23. Leukosis: etiology, classification, pathogenesis. A picture of blood**

Leukosis: definition of the concept, principles of classification. Etiology of leukemias. Anomalies of the genotype and constitution as risk factors for the occurrence and development of leukemias. Violations of the cellular composition of bone marrow and peripheral blood in acute and chronic leukemias. Pathogenesis of leukemias: progression, metastasis, systemic disorders. Principles of diagnosis and therapy of leukemias.

**Topic 24. Pathophysiology of the hemostasis system: hemorrhagic syndrome, thrombosis and DVZ-syndrome.**

Violation of vascular and platelet hemostasis. Etiology and pathogenesis of vasopathies, thrombocytopenia, thrombocytopenia. Insufficiency of coagulation hemostasis. Causes and mechanisms of disorders of individual stages of blood coagulation. Disseminated intravascular coagulation syndrome, principles of classification, etiology, pathogenesis, clinical

manifestations. Role in pathology. Insufficiency of blood circulation: definition of the concept, principles of classification, causes and mechanisms of development of its various types. Pathogenesis of the main clinical manifestations of chronic circulatory failure.

### **Content module 5. Pathophysiology of blood circulation and breathing.**

#### **Topic 25. Pathophysiology of systemic circulation. Heart failure: classification, overload mechanisms.**

Heart failure: definition of the concept, principles of classification. Causes of cardiac volume and resistance overload. The mechanism of immediate and long-term adaptation of the heart to excessive load. Hypertrophy of the heart, its pathogenesis (according to F. Meyerson). Features of hypertrophied myocardium. Etiology, pathogenesis of non-coronary myocardial damage. Experimental modeling.

**Topic 26. Ischemic heart disease. Coronary insufficiency. Myocardial necrosis.** Mechanisms of ischemic and reperfusion damage to cardiomyocytes. Ischemic heart disease: types, etiology, pathogenesis, clinical manifestations and complications of myocardial infarction. Arterial hypertension: definition of the concept, principles of classification. Primary arterial hypertension. Hemodynamic options. Causes and mechanisms of development of secondary arterial hypertension. Experimental modeling.

#### **Topic 27. Violation of blood circulation is caused by a violation of vascular functions. General characteristics of the occurrence of hypertension. Pathogenesis of atherosclerosis.**

Primary arterial hypertension as a multifactorial disease; modern ideas about the etiology and pathogenesis of hypertension. Arterial hypotension. Etiology and pathogenesis of acute and chronic arterial hypotension. Arteriosclerosis: definition, classification. Characteristics of the main forms: atherosclerosis (Marchand), medial calcinosis (Menkeberg), arteriosclerosis. Etiology of atherosclerosis: risk factors, causative factors. Modern theories of atherogenesis are "inflammatory" and "receptor". The role of hereditary and acquired disorders of receptor-mediated transport, lipoproteins in atherogenesis.

#### **Topic 28. General characteristics of arrhythmias: etiology, classification, pathogenesis.**

Arrhythmias of the heart. Causes, mechanisms of violations of automaticity, excitability, conduction, typical electrocardiographic manifestations.

#### **Topic 29. Pathophysiology of external breathing. Respiratory failure.**

Insufficiency of external breathing: definition of the concept, principles of classification. Pathogenesis of the main clinical manifestations. Shortness of breath: types, causes, mechanisms of development. Dysregulatory disorders of alveolar ventilation. Causes and mechanisms of pathological breathing (violation of frequency, depth, rhythm). Pathogenesis of periodic breathing. Violation of alveolar ventilation. Obstructive and restrictive mechanisms of development. Causes and mechanisms of gas diffusion disorders in the lungs. Violations of general and regional ventilation-perfusion relationships in the lungs. Asphyxia: definition of the concept, causes, pathogenesis. Terminal breathing.

#### **Topic 30. Hypoxia: classification, etiology, pathogenesis.**

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

### **Content module 6. Pathophysiology of digestion, liver, kidneys.**

#### **Topic 31. Indigestion in the gastrointestinal tract. Ulcer disease.**

Causes and mechanisms of indigestion in the oral cavity. Etiology, pathogenesis, experimental models of caries and periodontitis. Causes, mechanisms of salivation disorders. General characteristics of disorders of the motor and secretory functions of the stomach.



Pathological gastric secretion, its types. The role of nervous and humoral mechanisms in the violation of secretion. Etiology, pathogenesis of gastric and/or duodenal ulcer. Etiology, pathogenesis of symptomatic gastric and/or duodenal ulcers.

**Topic 32. Pathophysiology of the intestine. Pancreatitis.**

Violation of cavity digestion in the intestines; causes, mechanisms, manifestations. Disorders associated with secretory insufficiency of the pancreas. Pancreatitis: types, causes; pathogenesis of acute pancreatitis. Pancreatic shock. Violation of absorption. Causes and mechanisms of malabsorption, pathogenesis of the main clinical manifestations. Intestinal dyskinesias. Causes and mechanisms of constipation and diarrhea. Intestinal obstruction: types, etiology, pathogenesis.

**Topic 33. Pathophysiology of the liver. Liver failure.** Liver failure: definition of the concept, principles of classification, causes of occurrence, experimental modeling. Causes, mechanisms, clinical manifestations of insufficiency of the antitoxic function of the liver.

**Topic 34. Pathophysiology of the liver. Komi, Zhovtyanitsy.**

Theories of the pathogenesis of hepatic coma. Insufficiency of the excretory function of the liver: causes, mechanisms, clinical manifestations. Violation of the exchange of bile pigments in various types of jaundice. Cholemic and aholic syndromes. Violation of the hemodynamic function of the liver. Portal hypertension syndrome: etiology, pathogenesis, clinical manifestations.

**Topic 35. Pathophysiology of kidneys. Violations of the main functions of the kidneys.** Causes and mechanisms of disturbances in the processes of filtration, reabsorption and secretion in the kidneys. Functional tests to find out disorders of kidney functions. Causes and mechanisms of the development of quantitative and qualitative changes in the composition of urine: oliguria, anuria, polyuria; hyposthenuria, isosthenuria; proteinuria, hematuria, cylinduria, leukocyturia.

**Topic 36. Kidney failure. Nephrotic syndrome.**

Acute renal failure syndrome: definition of the concept, causes and mechanisms of development, clinical manifestations. Nephrotic syndrome. Syndrome of chronic renal failure: definition of the concept, causes and mechanisms of development, clinical manifestations. Pathogenesis of uremic coma. General manifestations of renal insufficiency. Pathogenesis of edema, arterial hypertension, anemia, hemostasis disorders, acid-base status, osteodystrophy. Glomerulonephritis: definition of the concept, principles of classification, experimental models. Etiology, pathogenesis of diffuse glomerulonephritis.

**Content module 7. Pathophysiology of regulatory systems (endocrine, nervous).**

**Topic 37. General etiology and pathogenesis of endocrine disorders. Pathophysiology of the pituitary gland and adrenal glands. Pathophysiology of the thyroid and parathyroid glands.**

Typical endocrine gland disorders, their causes and mechanisms of development. Violations of direct and reverse regulatory relationships in the pathogenesis of dysregulatory endocrinopathies. Glandular endocrinopathy and peripheral disorders of endocrine function. Disorders of transport and inactivation of hormones. Violation of hormone reception. Mechanisms of hormonal resistance. Pathology of the neuroendocrine system. The causes and mechanisms of the development of syndromes of excess and lack of pituitary hormones, their general characteristics. Insufficiency of the adrenal cortex, acute and chronic: causes and mechanisms of development, pathogenesis of the main clinical manifestations. Hyperfunction of the adrenal cortex. Itsenko-Cushing syndrome. Primary and secondary hyperaldosteronism. Syndrome of congenital hyperplasia of the adrenal glands (adrenogenital syndrome). Causes, mechanisms, clinical manifestations. Pathophysiology of the thyroid and parathyroid glands. Disruption of the endocrine function of the pancreas. Hypothyroidism and hyperthyroidism: causes, mechanisms of development, pathogenesis of the main clinical manifestations. Hypo-

and hyperfunction of the parathyroid glands: etiology, pathogenesis, typical disorders in the body.

**Topic 38. Disorders of the endocrine function of the pancreas. Diabetes mellitus: etiology, pathogenesis, types.**

Etiology of type 1 diabetes (importance of hereditary and environmental factors in the development of absolute insulin deficiency). Pathogenesis of type 1 diabetes mellitus: disturbance of protein, carbohydrate, fat, water-electrolyte exchanges and acid-base state. Clinical manifestations. Etiology, pathogenesis of type 2 diabetes. The role of hereditary factors. Causes of relative insulin deficiency. Disorders of metabolism and physiological functions. Clinical manifestations. Disorders of the function of the gonads: primary and secondary states of hyper- and hypogonadism. Etiology, pathogenesis, typical clinical manifestations.

**Topic 39. Pathophysiology of the nervous system. General signs and pathogenesis of disorders. Pathophysiology of higher nervous activity.**

Stress. Definition of concepts, causes and mechanisms of development, stages. The concept of "adaptation diseases". General characteristics of the pathology of the nervous system, principles of classification of disorders of its activity. Features of the development of typical pathological processes in the nervous system. The role of changes in the blood-brain barrier in the pathogenesis of disorders of the central nervous system. Disorders of the sensory function of the nervous system.

**Topic 40. Pathophysiology of motor disorders. Etiology, pathogenesis. Pathophysiology of sensitivity.**

Violation of the motor function of the nervous system. Experimental modeling of movement disorders. Peripheral and central paralysis and paresis: causes, mechanisms, manifestations. Disorders associated with lesions of subcortical origin. Disorders associated with damage to the cerebellum. Convulsions Myasthenia. Violation of the trophic function of the nervous system. Pathogenesis of the neurodystrophic process, changes in denervated organs and tissues.

**Topic 41. Pain. Etiology and pathogenesis.**

Pain. Types of pain. Modern ideas about the causes and mechanisms of pain development. Natural antinociceptive mechanisms.

#### 4. The structure of the academic discipline

Topic	Number of hours			
	In total	Including		
		L.	Pr. gen	SRS
<b>Chapter 1. General pathology</b>				
<b>Content module 1. General nosology. Pathophysiology of the cell.</b>				
Topic 1. Subject, methods and tasks of pathophysiology. The history of its development. General etiology and pathogenesis. Initial level of knowledge.	13	1	2	8
Topic 2. Typical cell responses to damage: types, mechanisms of development. Apoptosis and necrosis.	3	1	2	
Topic 3. Typical disorders of peripheral blood circulation and microcirculation: classification, etiology and pathogenesis.	7	1	2	4
Topic 4. Inflammation: etiology, pathogenesis. Mediators. Local signs.	8	1	2	5
Topic 5. Exudation and proliferation. General disorders of microcirculation in the focus of inflammation.	2		2	
Topic 6. Disorders of thermoregulation: hypo- and hyperthermia.	3	1	2	—

Fever: etiology, pathogenesis.				
<i>Together according to content module 1</i>	34	5	12	17
<b>Content module 2. Typical pathological processes.</b>				
Topic 7. Pathophysiology of the immune system. Immunodeficiency and immunodepressive conditions.	8	1	2	5
Topic 8. Allergy: classification, etiology, pathogenesis.	2		2	
Topic 9. Allergy: Allergic reactions of types I - IV. Pseudoallergic reactions. Autoimmune reactions.	8	1	2	5
Topic 10. Pathophysiology of tissue growth. Tumors: etiology, pathogenesis.	3	1	2	-
General nosology. Typical pathological processes. Current control of knowledge	2		2	-
<i>Together according to content module 2</i>	23	3	10	10
<b>Content module 3. Typical metabolic disorders.</b>				
Topic 11. Violation of water-salt metabolism: etiology, pathogenesis. Dyshydria, edema.	8	1	2	5
Topic 12. Pathophysiology of acid-base metabolism: acidosis, alkalosis.	8	1	2	5
Topic 13. Pathophysiology of energy and protein metabolism. Etiology and pathogenesis. Starvation.	7	1	2	4
Topic 14. Pathophysiology of carbohydrate metabolism: etiology and pathogenesis.	8	1	2	
Topic 15. Pathophysiology of fat and carbohydrate metabolism: etiology and pathogenesis. Atherosclerosis.	2	1	2	4
Topic 16. Pathophysiology of extreme conditions. Etiology and pathogenesis of shock and colaptoid states.	3	1	2	-
General metabolic disorders. Current control of knowledge	2	-	2	-
<i>Together according to content module 3</i>	38	6	14	18
<b>Chapter 2. Pathophysiology of organs and systems</b>				
<b>Content module 4. Pathophysiology of the blood system.</b>				
Topic 17. Pathophysiology of the blood system. Changes in the total volume	3	1	2	-
Topic 18. Pathophysiology of the blood system. Blood loss. Erythrocytosis .	2		2	
Topic 19. Anemias: Etiology and pathogenesis. Classification of anemias. Posthemorrhagic anemia, etiology, pathogenesis.	3	1	2	
Topic 20. Hemolytic anemias, etiology, pathogenesis	2		2	-
Topic 21. B12 - folate-deficient, iron-deficient anemias, etiology, pathogenesis	2		2	
Topic 22. Leukocytosis and leukopenia: etiology, pathogenesis. A picture of blood. Leukemoid reactions.	2	-	2	-
Topic 23. Leukosis: etiology, classification, pathogenesis. A picture of blood.	2		2	
Topic 24. Pathophysiology of the hemostasis system: hemorrhagic syndrome, thrombosis and DVZ-syndrome.	2	-	2	-
Pathophysiology of the blood system. Current control of knowledge	2		2	
<i>Together according to content module 4</i>	20	2	18	
<b>Content module 5. Pathophysiology of blood circulation and breathing.</b>				

Topic 25. Pathophysiology of systemic circulation. Heart failure: classification, overload mechanisms.	11	1	2	3
Topic 26. Ischemic heart disease . Coronary insufficiency. Myocardial necrosis.	2	1	2	
Topic 27. .Disruption of blood circulation is caused by a violation of vascular functions. General characteristics of the occurrence of hypertension. Pathogenesis of atherosclerosis.	2	1	2	3
Topic 28. General characteristics of arrhythmias: etiology, classification, pathogenesis.	8	1	2	5
Topic 29. Pathophysiology of external breathing. Respiratory failure.	8	1	2	5
Topic 30. Hypoxia: classification, etiology, pathogenesis.	3	1	2	
Pathophysiology of the blood, cardiovascular and respiratory systems. Current control of knowledge.	2	-	2	-
<i>Together according to content module 5</i>	36	6	14	16
<b>Content module 6. Pathophysiology of digestion, liver, kidneys.</b>				
Topic 31. Digestive disorders in the gastrointestinal tract. Ulcer disease.	8	1	2	5
Topic 32. Pathophysiology of the intestine. Pancreatitis.	2		2	
Topic 33. Pathophysiology of the liver. Liver failure.	3	1	2	–
Topic 34. Liver failure. Commies. Jaundice	2		2	
Topic 35. Kidney pathophysiology. Violations of the main functions of the kidneys.	8	1	2	5
Topic 36. Kidney failure. Nephrotic syndrome.	3	1	2	
Pathophysiology of digestion. Current control of knowledge.			2	
<i>Together according to content module 6</i>	28	4	14	10
<b>Content module 7. Pathophysiology of regulatory systems (endocrine, nervous).</b>				
Topic 37. General etiology and pathogenesis of endocrine disorders. Pathophysiology of the pituitary gland and adrenal glands. Pathophysiology of the thyroid and parathyroid glands.	11	1	2	8
Topic 38. Disruption of the endocrine function of the pancreas. Diabetes mellitus: etiology, pathogenesis, types.	3	1	2	
Topic 39. Pathophysiology of the nervous system. General signs and pathogenesis of disorders. Pathophysiology of higher nervous activity.	8	1	2	5
Topic 40. Pathophysiology of motor disorders. Etiology, pathogenesis.	3	1	2	
Topic 41. Pain. Etiology and pathogenesis.	2		2	
<i>Together according to content module 7</i>	27	4	10	13
Pathophysiology of digestion, liver, kidneys. Pathological physiology of neurohumoral regulation. Current control of knowledge.	2	-	2	–
Final test control.	2	-	2	-
<b>In total</b>	<b>210</b>	<b>30</b>	<b>96</b>	<b>84</b>

## 5. Topics of lectures / seminars / practical / laboratory classes

### 5.1 Topics of lectures

No	Topic	How many hours
1	Introductory lecture. Pathological physiology as a fundamental and educational discipline. The place of pathological physiology in the system of medical knowledge. Concept of etiology and pathogenesis. Typical responses of cells to damage. Causes of cell damage, their general mechanisms. Typical disorders of peripheral blood circulation and microcirculation: classification, etiology and pathogenesis.	2
2	Inflammation. Stages of inflammation, primary and secondary alteration. Mediators of inflammation, their classification. Changes in blood circulation in the focus of inflammation, the importance of inflammation for the body.	2
3	Pathophysiology of heat exchange. Hypo- and hyperthermia. Fever: etiology and pathogenesis, stages. Pathophysiology of tissue growth. General patterns of tumor growth. Carcinogens. Pathogenesis of tumor growth.	2
4	Allergy and immunity. Etiology of allergies, classification of allergic reactions. Mechanisms of development.	2
5	Pathophysiology of metabolism. Pathophysiology of water-salt exchange: dyshydria, edema. Pathophysiology of metabolism. Peculiarities of disturbance of acid-alkaline balance: acidosis, alkalosis	2
6	. Peculiarities of protein, fat, and carbohydrate metabolism disorders: etiology, pathogenesis.	2
7	Pathophysiology of shock. Types, clinical manifestations, causes and mechanisms of development. Violations of general hemodynamics and microcirculation in the pathogenesis of shock states.	2
8	Pathophysiology of red blood. Erythrocytosis. Anemias: classification, etiology, pathogenesis. Pathophysiology of white blood. Leukocytosis, leukopenia: etiology, pathogenesis. Leukemias: classification, etiology, pathogenesis. Leukemoid reactions.	2
9	Pathophysiology of systemic circulation. Heart failure with damage to the myocardium. Myocardial necrosis. Arrhythmias: etiology, pathogenesis. Blood circulation is caused	2
10	vascular dysfunction. Etiology and pathogenesis of hypo- and hypertension. Atherosclerosis.	2
11	Pathological physiology of the respiratory system. Respiratory failure.	2
12	Pathophysiology of the gastrointestinal tract. Ulcer disease of the stomach and duodenum. Pancreatitis. Liver failure. Commies. Jaundice Etiology and pathogenesis.	2
13	Kidney pathophysiology. Violations of the main functions of the kidneys. Kidney failure. Kidney syndromes and diseases.	2
14	General characteristics of disorders of the endocrine system. Neuroendocrine disorders. Peripheral disorders.	2
15	Pathophysiology of the nervous system. Causes and features of the development of pathological processes in the nervous system. Pain. Classification, etiology and pathogenesis	2
	<b>In total</b>	<b>30</b>

## 5.2. Topics of seminar classes

Seminar classes are not provided.

### 5.3. Topics of practical classes

No	Topic	How many hours
1	Practical lesson 1. Subject, methods and tasks of pathophysiology. The history of its development. General etiology and pathogenesis.	2
2	Practical exercise 2. Typical reactions of cells to damage: types, mechanisms of development. Apoptosis and necrosis.	2
3	Practical lesson 3. Typical disorders of peripheral blood circulation and microcirculation: classification, etiology and pathogenesis.	2
4	Practical lesson 4. Inflammation: etiology, pathogenesis. Mediators. Local signs.	2
5	Practical lesson 5. Exudation and proliferation. General disorders of microcirculation in the focus of inflammation.	2
6	Practical session 6. Disorders of thermoregulation: hypo- and hyperthermia. Fever: etiology, pathogenesis.	2
7	Practical session 7. Pathophysiology of the immune system. Immunodeficiency and immunodepressive conditions.	2
8	Practical lesson 8. Allergy: classification, etiology, pathogenesis.	2
9	Practical lesson 9. Allergy: Allergic reactions of types I - IV. Pseudoallergic reactions. Autoimmune reactions.	2
10	Practical session 10. Pathophysiology of tissue growth. Tumors: etiology, pathogenesis.	2
11	Practical session 11. General nosology. Typical pathological processes. Current control of knowledge	2
12	Practical lesson 12. Violation of water-salt metabolism: etiology, pathogenesis. Dyshydria, edema.	2
13	Practical session 13. Pathophysiology of acid-base metabolism: acidosis, alkalosis.	2
14	Practical lesson 14. Pathophysiology of energy and protein metabolism. Etiology and pathogenesis. Starvation.	2
15	Practical lesson 15. Pathophysiology of carbohydrate metabolism: etiology and pathogenesis.	2
16	Practical lesson 16. Pathophysiology of fat metabolism: etiology and pathogenesis. Atherosclerosis.	2
17	Practical lesson 17. Pathophysiology of extreme conditions. Etiology and pathogenesis of shock and colaptoid states.	2
18	Practical session 18. General disorders of metabolism. Current control of knowledge	2
19	Practical lesson 19. Pathophysiology of the blood system. Changes in total volume.	2
20	Practical lesson 20. Pathophysiology of the blood system. Blood loss. Erythrocytosis	2
21	Practical session 21. Anemia: Etiology and pathogenesis. Classification of anemias. Posthemorrhagic anemia, etiology, pathogenesis.	2
22	Practical lesson 22. Hemolytic anemias, etiology, pathogenesis	2
23	Practical lesson 23. In <sub>12</sub> - foliodeficiency, iron deficiency anemia,	2

	etiology, pathogenesis	
24	Practical lesson 24. Leukocytosis and leukopenia: etiology, pathogenesis. A picture of blood. Leukemoid reactions.	2
25	Practical lesson 25. Leukosis: etiology, classification, pathogenesis. A picture of blood.	2
26	Practical lesson 26. Pathophysiology of the hemostasis system: hemorrhagic syndrome, thrombosis and DVZ-syndrome.	2
27	Practical lesson 27. Pathophysiology of the blood system. Current control of knowledge	2
28	Practical session 28. Pathophysiology of systemic blood circulation. Heart failure: classification, overload mechanisms	2
29	Practical lesson 29. Ischemic heart disease. Coronary insufficiency. Myocardial necrosis.	2
30	Practical exercise 30. Violation of blood circulation is caused by a violation of the functions of blood vessels. General characteristics of the occurrence of hypertension. Atherosclerosis: etiology, pathogenesis.	2
31	Practical lesson 31. General characteristics of arrhythmias: etiology, classification, pathogenesis.	2
32	Practical lesson 32. Pathophysiology of external breathing. Respiratory failure.	2
33	Practical session 33. Hypoxia: classification, etiology, pathogenesis.	2
34	Practical lesson 34. Pathophysiology of the heart. Current control of knowledge.	2
35	Practical lesson 35. Digestive disorders in the gastrointestinal tract. Ulcer disease.	2
36	Practical lesson 36. Pathophysiology of the intestine. Pancreatitis.	2
37	Practical class 37. Pathophysiology of the liver. Liver failure.	2
38	Practical lesson 38. Pathophysiology of the liver. Komi, Zhovtyanitsy.	2
39	Practical class 39. Pathophysiology of kidneys. Violations of the main functions of the kidneys.	2
40	Practical lesson 40. Kidney failure . Nephrotic syndrome.	2
41	Practical lesson 41. Pathophysiology of digestion. Current control of knowledge.	2
42	Practical lesson 42. General etiology and pathogenesis of endocrine disorders. Pathophysiology of the pituitary gland and adrenal glands. Pathophysiology of the thyroid and parathyroid glands.	2
43	Practical lesson 43. Disorders of the endocrine function of the pancreas. Diabetes mellitus: etiology, pathogenesis, types.	2
44	Practical lesson 44. Pathophysiology of the nervous system. General signs and pathogenesis of disorders. Pathophysiology of higher nervous activity. Current control of knowledge.	2
45	Practical lesson 45. Pathophysiology of motor disorders. Etiology, pathogenesis. Pathophysiology of sensitivity.	2
46	Practical lesson 46. Pain. Etiology and pathogenesis.	2
47	Practical lesson 47. Pathophysiology of the endocrine and nervous systems. Current control of knowledge.	2

48	Practical lesson 48. Final test control	2
	In total	<b>96</b>

#### 5.4. Laboratory topics classes

Laboratory classes are not provided .

### 6. Independent work of a student of higher education

No	Title of the topic / types of tasks	Number of hours
1	The doctrine of disease. General doctrine of etiology and pathogenesis.	2
2	Pathogenic effect of physical factors.	2
3	The role of heredity, constitution, age-related changes in pathology.	4
4	Typical disorders of peripheral blood circulation and microcirculation.	4
5	Inflammation.	5
6	Pathology of reactivity. Violation of immunological reactivity.	5
7	Allergy.	5
8	Violation of water-electrolyte exchange.	5
9	Violation of acid-base balance.	4
10	Starvation.	4
11	Violation of protein and fat metabolism.	4
12	Insufficiency of blood circulation. Pathophysiology of the heart.	4
13	Coronary insufficiency. Arrhythmias.	4
14	Pathophysiology of blood vessels.	4
15	Pathophysiology of external breathing.	5
16	Pathophysiology of the digestive system. Insufficiency of digestion.	5
17	Kidney pathophysiology. Kidney failure.	5
18	Pathophysiology of the endocrine system. General violations.	4
19	Dysfunction of the thyroid, parathyroid, adrenal and gonad glands.	4
20	Pathophysiology of the nervous system.	5
	<b>In total</b>	<b>84</b>

### 7. Teaching methods

**Lectures:** story, explanation, conversation.

**Practical classes:** conversation, role-playing, solving clinical situational problems, oral control through individual and frontal interview.

**Independent work:** independent work with recommended basic and additional literature, with electronic information resources, independent work with a bank of test tasks Step-1.

### 8. Forms of control and evaluation methods (including criteria for evaluating learning outcomes)

**Current control:** oral survey, testing, solution of situational clinical tasks, assessment of



activity in class.

**Final control** : oral exam.

**Evaluation of the current educational activity in a practical session**

1. Evaluation of theoretical knowledge on the subject of the lesson:

-methods: survey, solving a situational clinical problem

- maximum score – 5, minimum score – 3, unsatisfactory score – 2 .

The grade for one practical session is the arithmetic average of all components and can only have a whole value (5, 4, 3, 2), which is rounded according to the statistical method.

**Current evaluation criteria in practical training**

<b>Rating</b>	<b>Evaluation criteria</b>
Perfectly "5"	It is presented in the case when the applicant knows the program in its entirety, illustrating the answers with various examples; gives exhaustively accurate and clear answers without any leading questions; teaches the material without errors and inaccuracies; performs practical tasks of varying degrees of complexity;
Fine "4"	It is issued on the condition that the applicant knows the entire program and understands it well, answers the questions correctly, consistently and systematically, but they are not exhaustive, although the applicant answers additional questions without errors; performs practical tasks, experiencing difficulties only in the most difficult cases;
Satisfactorily "3"	It is given to the applicant on the basis of his knowledge of the entire scope of the program on the subject and a satisfactory level of understanding of it. The applicant is able to solve simplified tasks with the help of leading questions; performs practical skills, experiencing difficulties in simple cases; is not able to give a systematic answer on his own, but answers directly to directly asked questions correctly
Unsatisfactorily "2"	It is issued in cases where the applicant's knowledge and skills do not meet the requirements of a "satisfactory" assessment (does not know any of the above questions, or knows less than 50% of the questions).

Only those applicants who have fulfilled the requirements of the training program in the discipline, have no academic debt, their average score for the current educational activity in the discipline is at least 3.00, and they have passed the test control according to the tests "STEP - 1" are admitted to the final control in the form of an exam. » at least 90% (50 tasks). The test control of the "STEP-1" tests is conducted in the Educational and Production Complex of Innovative Technologies of Learning, Informatization and Internal Monitoring of the Quality of Education of the University in the last class before the exam.

**Evaluation of the results of the students' training during the final control - exam.**

**The method of final control in the form of an exam is unified and involves the use of standardized forms.** The number of questions submitted to the exam corresponds to the amount of credits assigned to the study of the academic discipline.

The form of the ticket is standardized and consists of structural elements (components): theoretical questions and practical tasks (situational tasks, case tasks, descriptions, etc.). Theoretical questions are short, simple, understandable, clear and transparent, a complete answer to one theoretical question lasts no more than 5 minutes. Practical tasks are clearly and clearly formulated, a complete answer to one practical question lasts no more than 5 minutes. The timing of the exam is standard - no more than 30 minutes.

For each ticket, a check list (answer standard) is drawn up, which provides full correlation with the ticket, contains a similar number of structural elements (components), has answer standards, which are mandatory for providing complete answers to the questions.

During the exam, the applicant receives a ticket, and the examiners use a checklist for the corresponding ticket with standard answers and determine which mandatory components of the answer were named or not named by the applicant.

The overall grade for the exam is calculated as the arithmetic average of all grades obtained for answers to theoretical questions and practical tasks on a traditional four-point scale, rounded to two decimal places .

The exam is held in the educational and production complex of innovative technologies of learning, informatization and internal monitoring of the quality of education of the University during the examination sessions at the end of the semester (autumn and spring) according to the schedule.

### **9. Distribution of points received by students of higher education**

The obtained average score for the academic discipline for applicants who have successfully mastered the work program of the academic discipline is converted from a traditional four-point scale to points on a 200-point scale, as shown in the table:

**Conversion table of a traditional assessment into a multi-point scale**

<b>Traditional four-point scale</b>	<b>Multipoint 200-point scale</b>
Excellent ("5")	185 - 200
Good ("4")	151 - 184
Satisfactory ("3")	120-150
Unsatisfactory ("2")	Below 120

Multi-point scale (200-point scale) characterizes the actual success of each applicant in mastering the educational component. The conversion of the traditional grade (average score for the academic discipline) into a 200-point grade is performed by the information and technical department of the University.

According to the obtained points on a 200-point scale, the achievements of the applicants are evaluated according to the ECTS rating scale. Further ranking according to the ECTS rating scale allows you to evaluate the achievements of students from the educational component who are studying in the same course of the same specialty, according to the points they received.

The ECTS scale is a relative-comparative rating, which establishes the applicant's belonging to the group of better or worse among the reference group of fellow students (faculty, specialty). An "A" grade on the ECTS scale cannot be equal to an "excellent" grade, a "B" grade to a "good" grade, etc. When converting from a multi-point scale, the limits of grades "A", "B", "C", "D", "E" according to the ECTS scale do not coincide with the limits of grades "5", "4", "3" according to the traditional scale. Acquirers who have received grades of "FX" and "F" ("2") are not included in the list of ranked acquirers. The grade "FX" is awarded to students who have obtained the minimum number of points for the current learning activity, but who have not passed the final examination. A grade of "F" is given to students who have attended all classes in the discipline, but have not achieved a grade point average (3.00) for the current academic activity and are not admitted to the final examination.

Applicants who study in one course (one specialty), based on the number of points scored in the discipline, are ranked on the ECTS scale as follows:

### **Conversion of the traditional grade from the discipline and the sum of points on the ECTS scale**

<b>Evaluation on the ECTS scale</b>	<b>Statistical indicator</b>
-------------------------------------	------------------------------

AND	Top 10% achievers
IN	The next 25% of earners
WITH	The next 30% of earners
D	The next 25% of earners
IS	The next 10% of earners

## 10. Methodological support

- Working program of the academic discipline
- Syllabus of the academic discipline
- Multimedia presentations
- Situational clinical tasks
- Methodical developments for practical classes
- Electronic bank of test tasks by subdivisions of the discipline

## 11. Questions for preparing for the final inspection

### I. Typical pathological processes

1. Classification of etiological factors, concepts of risk factors. "Diseases of civilization".
2. Definition of the concept of "pathogenesis". Pathological and adaptive-compensatory (protective) phenomena in pathogenesis.
3. Causal relationships, the role of the circulus vitiosus in pathogenesis. The concept of the main and secondary links of pathogenesis. Specific and non-specific mechanisms of disease development.
4. Hereditary and congenital diseases. Mutations as a cause of hereditary diseases (types, causes, consequences). Mutational influences. Violation of DNA repair and elimination of mutated cells as a risk factor for the accumulation of mutations and the occurrence of diseases.
5. Characteristics of monogenic diseases by type of inheritance. Molecular and biochemical bases of the pathogenesis of monogenic diseases with a classical type of inheritance: defects in enzymes, receptors, transport structures of proteins and proteins that regulate cell division.
6. Chromosomal diseases, their etiology and pathogenesis. General characteristics of Down's, Klinefelter's, Shershevsky-Turner's syndromes. The role of chromosomal aberrations in the etiology and pathogenesis of tumors.
7. Principles of diagnosis of hereditary diseases (cytological, DNA diagnostic methods). Principles of prevention and treatment of hereditary diseases.
8. Abnormalities of the constitution as a risk factor for the occurrence and development of diseases. Classification of constitutional types according to Hippocrates, Sigo, I.P. Pavlov, O.O. Bogomolets
9. Aging. Structural, functional and biochemical manifestations of aging. Progeria. Modern theories of aging.
10. Cell damage, principles of classification. Cell death (necrosis, apoptosis), their signs.
11. Universal mechanisms of cell damage. Mechanisms of free-radical and hypoxic damage.
12. Mechanisms of cell protection and cell adaptation to the action of damaging factors.
13. Arterial and venous hyperemia: definition, manifestations, types, causes and mechanisms of development, termination options and consequences.
14. Ischemia: definition, manifestations, types, causes and mechanisms of development, termination options and consequences. Ischemia-reperfusion syndrome.
15. Embolism: definition, manifestations, types of emboli. Peculiarities of the pathogenesis of embolism of the large and small circles of blood circulation, portal vein system.

16. Stasis: definition, types, causes, pathogenesis, consequences.
17. Violations of microcirculation, classification. Sludge syndrome: definition, causes and mechanisms of development. Disorders of local lymph flow, types, causes and mechanisms of development.
18. Inflammation: definition, principles of classification. Characteristics of general and local signs of inflammation. Etiology.
19. Pathogenesis of inflammation, stages. Pathological and adaptive-compensatory changes in the dynamics of inflammation. Alteration: causes and mechanisms.
20. Exudation, its causes and mechanisms. Types of exudates.
21. Emigration of leukocytes to the focus of inflammation. Sequence, causes and mechanisms of emigration of leukocytes. The role of leukocytes in the development of local and general signs of inflammation.
22. Violation of phagocytosis: causes, mechanisms, consequences.
23. Metabolic disorders in the focus of inflammation.
24. Mediators of inflammation, their classification. Formation mechanisms and biological action of humoral mediators of inflammation.
25. Mediators of inflammation of cellular origin: their biological effects.
26. Proliferation of cells in the focus of inflammation. Mechanisms of mitogenic action of growth factors and cytokines. Regeneration and fibroplasia as ways of healing.
27. Fever: definition, principles of classification. The connection between fever and inflammation. Types of pyrogens. Chemical nature and origin of secondary pyrogens, mechanism of their action.
28. Fever: stages of development, changes in thermoregulation, metabolism and physiological functions. Protective value and pathological manifestations of fever. Principles of antipyretic therapy. Concept of pyrotherapy.
29. The main differences between fever, exogenous overheating and other types of hyperthermia.
30. General characteristics of immune system disorders: abnormal immune response and loss of tolerance to autoantigens. Mechanisms of tolerance to autoantigens. Mechanisms of tolerance of the immune system. Causes and consequences of its loss.
31. Types of immune deficiency. Etiology, pathogenesis of primary and secondary immunodeficiencies. Typical manifestations of immune deficiency.
32. Etiology and pathogenesis of AIDS. Pathophysiological characteristics of HIV infection. Typical cellular manifestations. Principles of prevention and therapy of HIV infection.
33. Allergy: definition, principles of classification of allergic reactions. Classification and characteristics of allergens.
34. Type I allergic reactions (anaphylactic): etiology, pathogenesis, clinical manifestations of local and systemic anaphylactic reactions. Mediators of anaphylaxis. "Pseudoanaphylactic" reaction.
35. Type II allergic reactions (cytotoxic): etiology, pathogenesis, clinical manifestations.
36. Allergic reactions of type III (Immunocomplex): etiology, pathogenesis, clinical manifestations. Serum sickness.
37. Allergic reactions of type IV (cellular): etiology, pathogenesis, clinical manifestations.
38. Allergic reactions of type V (cell dysfunctions mediated by antibodies): etiology, pathogenesis, clinical manifestations.
39. Autoimmune disease reactions: general characteristics, principles of classification, modern ideas about etiology and pathogenesis.
40. Fundamentals of organ and tissue transplantation. Causes and mechanisms of transplant rejection, methods of prevention. Graft-versus-host reactions.
41. Tumors: definition, principles of classification. General patterns of tumor growth. Molecular genetic basis of unlimited growth and potential immortality of tumor cells.

42. Typical features of benign and malignant tumors. Types of anaplasia. Ways and mechanisms of metastasis.
43. Etiology of tumors. General characteristics of carcinogens (chemical, physical, biological). Risk factors (genetic, chromosomal defects, constitutional abnormalities) and conditions for the occurrence and development of tumors.
44. Pathogenesis of tumor growth. The role of violations of molecular (genetic) mechanisms of cell division regulation in the process of tumor transformation. Ways of transforming proto-oncogenes into oncogenes. Features of oncoproteins.
45. Tumor progression: definitions, causes and mechanisms, typical signs. Mechanisms of invasive growth and metastasis. Acquisition of resistance to chemopreparations.
46. Mechanisms of natural antitumor protection: immune and non-immune.
47. Pathophysiological basis of tumor prevention and treatment.
48. Violation of water-electrolyte exchange. Hyper- and hypohydria, their etiology, pathogenesis, consequences. Disorders of sodium and potassium metabolism: causes, mechanisms, clinical manifestations.
49. Swelling: definitions, types, causes and mechanisms of development.
50. Acidosis: definition, classification, causes of development. Compensatory and pathological reactions. Indicators of acid-base balance in various types of acidosis. Principles of correction.
51. Alkalosis: definition, classification, causes of development. Compensatory and pathological reactions. Indicators of acid-base balance in various types of alkalosis. Principles of correction.
52. Violation of energy metabolism: etiology, pathogenesis, consequences. The concept of energy needs of the body, positive and negative energy balance. Changes in the basic metabolism in pathology.
53. Characteristics of carbohydrate metabolism disorders. Criteria of hypoglycemia, hyperglycemia, impaired glucose tolerance. The role of changes in neurohumoral regulation of carbohydrate metabolism in the pathogenesis of hypo- and hyperglycemic states.
54. Causes and mechanisms of the development of hypoglycemic states. Pathogenesis of hypoglycemic coma.
55. Disorders of lipid metabolism: causes, mechanisms, manifestations. Dependence of the development of dyslipoproteinemia on environmental factors, heredity, concomitant diseases. Reasons for classification. Etiology and pathogenesis of primary (hereditary) and secondary hyperlipoproteinemia.
56. Obesity: definition, classification, etiology and pathogenesis of individual forms. Medical problems associated with obesity.
57. Positive and negative nitrogen balance. Types of hyperazotemia. Changes in the protein composition of blood. Hereditary disorders of amino acid metabolism.
58. Violation of purine and pyrimidine metabolism. Etiology and pathogenesis of gout.
59. Hypo- and hypervitaminosis: types, causes and mechanisms of development. Pathogenesis of the main clinical manifestations. Principles of vitamin deficiency correction.
60. Starvation: definition, classification. External and internal causes of starvation. Characteristics of disorders of the main metabolism and metabolism in different periods of complete starvation.
61. Pathophysiology of incomplete and partial (qualitative) starvation. Types, causes and mechanisms of manifestations. The concept of medical fasting.
62. Protein-calorie deficiency, forms. Pathogenesis of the main clinical manifestations.
63. Hypoxia: definition, classification, etiology, pathogenesis. Pathological changes and adaptive-compensatory reactions in hypoxia. Principles of therapy.
64. Disorders of the total volume of blood: classification, causes and mechanisms of development. Etiology, pathogenesis of blood loss. Pathogenesis of posthemorrhagic shock.

## **II. Pathological physiology of organs and systems**

1. Erythrocytosis: definition of the concept, types, their etiology, pathogenesis.
2. Anemia: definition of the concept, principles of classification. Regenerative, degenerative, pathological forms of erythrocytes. Posthemorrhagic anemia, types, causes, pathogenesis, blood picture.
3. Hemolytic anemias, classification; causes and mechanisms of erythrocyte hemolysis. Clinical and hematological characteristics of various types of hemolytic anemias.
4. Iron deficiency anemia: causes and mechanisms of development, typical changes in peripheral blood, pathogenesis of the main clinical manifestations. Iron-refractory anemias.
5. Causes and mechanisms of vitamin B12 and folic acid deficiency. Characteristics of general disorders in the body with deficiency of vitamin B12 and/or folic acid. Hematological characteristics of vitamin B12 and folate deficiency anemias.
6. Leukocytosis: types, causes and mechanisms of development. Accompanying nuclear shifts of neutrophil granulocytes. Leukemoid reactions.
7. Leukopenia: types, causes and mechanisms of development. Agranulocytosis. Neutropenia. Accompanying nuclear shifts of neutrophil granulocytes.
8. Leukosis: definition of the concept, principles of classification. Etiology of leukemias. Anomalies of the genotype and constitution as risk factors for the occurrence and development of leukemias.
9. Violation of the cellular composition of the bone marrow and peripheral blood in acute and chronic leukemias. Pathogenesis of leukemias: progression, metastasis, systemic disorders. Principles of diagnosis and therapy of leukemias.
10. Violation of vascular and platelet hemostasis. Etiology and pathogenesis of vasopathies, thrombocytopenia, thrombocytopenia.
11. Insufficiency of coagulation hemostasis. Causes and mechanisms of disorders of individual stages of blood coagulation.
12. Disseminated intravascular coagulation syndrome, principles of classification, etiology, pathogenesis, clinical manifestations. Role in pathology.
13. Insufficiency of blood circulation: definition of the concept, principles of classification, causes and mechanisms of development of its various types. Pathogenesis of the main clinical manifestations of chronic circulatory failure.
14. Heart failure: definition of the concept, principles of classification. Causes of cardiac volume and resistance overload. The mechanism of immediate and long-term adaptation of the heart to excessive load. Hypertrophy of the heart, its pathogenesis (according to F. Meyerson). Features of hypertrophied myocardium.
15. Etiology, pathogenesis of non-coronary myocardial damage. Experimental modeling.
16. Mechanisms of ischemic and reperfusion damage to cardiomyocytes.
17. Ischemic heart disease: types, etiology, pathogenesis, clinical manifestations and complications of myocardial infarction.
18. Heart arrhythmias. Causes, mechanisms of violations of automaticity, excitability, conduction, typical electrocardiographic manifestations.
19. Arterial hypertension: definition of the concept, principles of classification. Primary arterial hypertension. Hemodynamic options.
20. Causes and mechanisms of the development of secondary arterial hypertension. Experimental modeling.
21. Primary arterial hypertension as a multifactorial disease; modern ideas about the etiology and pathogenesis of hypertension.
22. Arterial hypotension. Etiology and pathogenesis of acute and chronic arterial hypotension.
23. Arteriosclerosis: definition of the concept, classification. Characteristics of the main forms: atherosclerosis (Marchand), mediocalcinosis (Menkeberg), arteriosclerosis.
24. Atherosclerosis. Etiology of atherosclerosis: risk factors, causative factors. Modern

theories of atherogenesis are "inflammatory" and "receptor". The role of hereditary and acquired disorders of receptor-mediated transport, lipoproteins in atherogenesis.

25. Insufficiency of external breathing: definition of the concept, principles of classification. Pathogenesis of the main clinical manifestations. Shortness of breath: types, causes, mechanisms of development.

26. Dysregulatory disorders of alveolar ventilation. Causes and mechanisms of pathological breathing (violation of frequency, depth, rhythm). Pathogenesis of periodic breathing.

27. Violation of alveolar ventilation. Obstructive and restrictive mechanisms of development.

28. Causes and mechanisms of gas diffusion disorders in the lungs. Violations of general and regional ventilation-perfusion relationships in the lungs.

29. Asphyxia: definition of the concept, causes, pathogenesis. Terminal breathing.

30. Causes and mechanisms of indigestion in the oral cavity. Etiology, pathogenesis, experimental models of caries and periodontitis. Causes, mechanisms of salivation disorders.

31. General characteristics of disorders of the motor and secretory functions of the stomach. Pathological gastric secretion, its types. The role of nervous and humoral mechanisms in the violation of secretion.

32. Etiology, pathogenesis of gastric and/or duodenal ulcer. Etiology, pathogenesis of symptomatic gastric and/or duodenal ulcers.

33. Violation of cavity digestion in the intestines; causes, mechanisms, manifestations. Disorders associated with secretory insufficiency of the pancreas. Pancreatitis: types, causes; pathogenesis of acute pancreatitis. Pancreatic shock.

34. Violation of absorption. Causes and mechanisms of malabsorption, pathogenesis of the main clinical manifestations.

35. Intestinal dyskinesias. Causes and mechanisms of constipation and diarrhea. Intestinal obstruction: types, etiology, pathogenesis.

36. Liver failure: definition of the concept, principles of classification, causes of occurrence, experimental modeling.

37. Causes, mechanisms, clinical manifestations of insufficiency of the antitoxic function of the liver. Theories of the pathogenesis of hepatic coma.

38. Insufficiency of the excretory function of the liver: causes, mechanisms, clinical manifestations. Violation of the exchange of bile pigments in various types of jaundice. Cholemic and aholic syndromes.

39. Violation of the hemodynamic function of the liver. Portal hypertension syndrome: etiology, pathogenesis, clinical manifestations.

40. Causes and mechanisms of disturbances in the processes of filtration, reabsorption and secretion in the kidneys. Functional tests to find out disorders of kidney functions.

41. Causes and mechanisms of the development of quantitative and qualitative changes in the composition of urine: oliguria, anuria, polyuria; hyposthenuria, isosthenuria; proteinuria, hematuria, cylinduria, leukocyturia.

42. Acute renal failure syndrome: definition of the concept, causes and mechanisms of development, clinical manifestations. Nephrotic syndrome.

43. Syndrome of chronic renal failure: definition of the concept, causes and mechanisms of development, clinical manifestations. Pathogenesis of uremic coma.

44. General manifestations of insufficiency of renal functions. Pathogenesis of edema, arterial hypertension, anemia, hemostasis disorders, acid-base status, osteodystrophy.

45. Glomerulonephritis: definition of the concept, principles of classification, experimental models. Etiology, pathogenesis of diffuse glomerulonephritis.

46. Typical disorders of endocrine glands, their causes and mechanisms of development. Violations of direct and reverse regulatory relationships in the pathogenesis of dysregulatory endocrinopathies.

47. Glandular endocrinopathy and peripheral endocrine function disorders. Disorders of

transport and inactivation of hormones. Violation of hormone reception. Mechanisms of hormonal resistance.

48. Pathology of the neuroendocrine system. The causes and mechanisms of the development of syndromes of excess and lack of pituitary hormones, their general characteristics.

49. Insufficiency of the adrenal cortex, acute and chronic: causes and mechanisms of development, pathogenesis of the main clinical manifestations.

50. Hyperfunction of the adrenal cortex. Itsenko-Cushing syndrome. Primary and secondary hyperaldosteronism. Syndrome of congenital hyperplasia of the adrenal glands (adrenogenital syndrome). Causes, mechanisms, clinical manifestations.

51. Hypothyroidism and hyperthyroidism: causes, mechanisms of development, pathogenesis of the main clinical manifestations.

52. Hypo- and hyperfunction of the parathyroid glands: etiology, pathogenesis, typical disorders in the body.

53. Etiology of type 1 diabetes (importance of hereditary and environmental factors in the development of absolute insulin deficiency). Pathogenesis of type 1 diabetes mellitus: disturbance of protein, carbohydrate, fat, water-electrolyte exchanges and acid-base state. Clinical manifestations.

54. Etiology, pathogenesis of type 2 diabetes. The role of hereditary factors. Causes of relative insulin deficiency. Disorders of metabolism and physiological functions. Clinical manifestations.

55. Disorders of the function of the gonads: primary and secondary states of hyper- and hypogonadism. Etiology, pathogenesis, typical clinical manifestations.

56. Stress. Definition of concepts, causes and mechanisms of development, stages. The concept of "adaptation diseases".

57. General characteristics of the pathology of the nervous system, principles of classification of disorders of its activity. Features of the development of typical pathological processes in the nervous system. The role of changes in the blood-brain barrier in the pathogenesis of disorders of the central nervous system.

58. Disorders of the sensory function of the nervous system. Pain. Types of pain. Modern ideas about the causes and mechanisms of pain development. Natural antinociceptive mechanisms.

59. Disorders of the motor function of the nervous system. Experimental modeling of movement disorders. Peripheral and central paralysis and paresis: causes, mechanisms, manifestations. Disorders associated with lesions of subcortical origin. Disorders associated with damage to the cerebellum. Convulsions Myasthenia.

60. Violations of the trophic function of the nervous system. Pathogenesis of the neurodystrophic process, changes in denervated organs and tissues.

## **12. Recommended literature**

### **Main:**

1. 1. Ataman O.V. Pathophysiology: General pathology. – Vinnytsia: New book, 2018. – Volume 1. - 584 p.
2. 2. Ataman O.V. Pathophysiology: Pathophysiology of organs and systems. – Vinnytsia: Nova kniga, 2019. – Vol. 2. – 448 p.
3. 3. Yu.V. Byts, G.M. Butenko, A.I. Gozhenko. Pathophysiology: a textbook / edited by M.N. Zayka, Yu.V. Bytsia, M.V. crystal - Kyiv: VSV "Medicine", 2015. - 752 p.
4. 4. Zaiko M.N., Byts Y.V., Kryshstal M.V. etc. Pathophysiology: a textbook / edited by M.N. Zayka, Yu.V. Bytsia, M.V. crystal – Kyiv: Medicine, 2017. - 736 c.

### **Additional:**



1. 1. Ataman O.V. Pathological physiology in questions and answers. – Vinnytsia: New book - 2007. – 512 p.
2. 2. Zaiko M.N., Byts Yu.V., Butenko H.M. and others. Pathophysiology: a textbook / edited by M.N. Zaika, Yu.V. Bytsia. - K.: Medicine, 2008. - 704 p.
3. 3. Krishtal NV, Mikhnev VA, Zayko NN et al. Pathophysiology: Textbook / Ed. by NV Krishtal, VA Mikhnev : Textbook, the 3rd Edition. — Kyiv: AUS Medicine Publishing, 2019. - 656 p.
4. 4. Robbins and Cotran pathological basis of disease / Ed. by Vinay Kumar, Abul K. Abbas, Jon C. Aster : Textbook, the 9<sup>th</sup> Edition. - Philadelphia: Elsevier Saunders, 2015. - 1392 p. 952

### **13. Electronic information resources**

1. 2- information resource of the Department of General and Clinical Pathological Physiology
2. <http://moz.gov.ua> – Ministry of Health of Ukraine
3. [www.who.int](http://www.who.int) - World Health Organization
4. [www.dec.gov.ua/mtd/home/](http://www.dec.gov.ua/mtd/home/) - State Expert Center of the Ministry of Health of Ukraine
5. <http://bma.org.uk> - British Medical Association