MINISTRY OF HEALTH OF UKRAINE
NATIONAL UNIVERSITY OF PHARMACY
Department of Physiology and Pathological physiology

PATHOLOGICAL PHYSIOLOGY

WORK PROGRAM
of educational component

training for _____**Master**_____
(Higher Educational Level Name)
in specialty _____**226 Pharmacy, industrial pharmacy**_____
(Code and Specialty Name)
field of knowledge «___**22 Publik Health**_____
(Code and Knowledge Field Name)
of educational program ____**Pharmacy for foreign students**_____
(Educational Program Name)
in specialization(s)_____
(name of specialization, if available)

2022

The work program of educational component "Phatological Physiology", in specialty "226 Pharmacy, industrial pharmacy", educational program "Pharmacy for foreign students" for 2nd year and 3rd year students.

EDUCATIONAL COURSE TEAM:

KONONENKO Nadiia, head of the Department of Physiology and Pathological physiology, MD, Professor

CHIKITKINA Valentyna, associate professor of the Department of Physiology and Pathological physiology, MD, associate professor

Work program has been considered and approved at the Department meeting of the department of Physiology and Pathological physiology
Record from «02» September 2022 № 2

Head of the Department of Physiology and Pathological Physiology  Prof. Nadiia KONONENKO

Work program has been approved at the meeting Methodical Commission of biomedical sciences
Record from «12» September 2022 № 1

Head of Specialized Committee  Prof. Nadiia KONONENKO

1. Description of the educational component

Language of study: English

Status of the educational component: mandatory

Prerequisites for studying the educational component: The study of pathological physiology forms the ability of applicants for higher education to understand the causes, conditions, mechanisms of development and manifestation of human diseases; analyze, draw conclusions regarding the causes and mechanisms of functional, metabolic, structural disorders of organs and body systems in these diseases; provides fundamental training and the acquisition of practical skills for the subsequent professional activity of a pharmacy specialist. Pathophysiology as an academic discipline: a) is based on the basic provisions and knowledge of anatomy, histology, biological physics, inorganic and organic chemistry, biology with the basics of genetics, physiology, previously studied by students, integrates with these disciplines; b) develops professional skills for clinical thinking; provides the possibility of diagnostics, treatment, prevention of the onset and development of diseases; c) creates theoretical foundations for students to master pharmacology, clinical pharmacology, pharmacotherapy, clinical laboratory diagnostics.
The subject of educational component study is the general patterns of the functioning of the organism of the sick person, which arise at the level of cells, organs, systems and the organism of the patient as a whole; determining the mechanisms of resistance and pre-illness, the emergence and course of human diseases and their consequences.
Information content of the educational component. _8_ECTS credit 240 hours are assigned to the study of the educational component.

2. Objectives and tasks of the educational component

The purpose of teaching the educational component "Pathological Physiology"

The purpose of teaching the educational component "Pathological Physiology" is to develop in-depth theoretical knowledge and practical skills for students to understand the basic concepts of general nosology, the role of destructive (destructive) and protective-compensatory phenomena in the development of the disease, analysis of typical pathological processes and their general patterns of development, assessment of the harmful effects of unsystematic and unreasonable use of drugs, interpretation of the basic principles of etiological and pathogenetic prevention and therapy of diseases.
The main tasks of the educational component "Pathological Physiology" are to study the problems of both general pathology (general doctrine of the disease, general etiology, general pathogenesis, etc.) and special pathological physiology (study of pathophysiological patterns of development of diseases and syndromes), which contribute to the solution of issues of prevention, diagnosis and treatment of individual nosological forms. During the study of the educational component, the foundations are laid for further study of microbiology, biochemistry, pharmacology, pharmacotherapy by higher education students, which involves the integration of teaching with these educational components and the development of skills to apply knowledge of pathological physiology in the process of further education and professional activity.

3. Competence and planned educational outcomes

Educational component « Pathological physiology» ensures the acquisition of applicants for higher education the following **competences**:

General:

GC 2 Ability to apply knowledge in practical situations, make reasonable decisions.
GC 4. Ability to abstract thinking, analysis and synthesis, to learn and be modernly trained.

GC 6. Knowledge and understanding of the subject area and understanding of professional activity.
GC 8. Ability to communicate in the state language both orally and in writing, ability to communicate in a foreign language (mainly English) at a level that ensures effective professional activity.
GC 12. Ability to conduct research at the appropriate level.

Specific (professional):

PC 1. Ability to conduct sanitary and educational work among the population to prevent common diseases, prevent dangerous infectious, viral and parasitic diseases, as well as to facilitate the timely detection and maintenance of adherence to treatment of these diseases in accordance with their medical and biological characteristics and microbiological characteristics.
PC 3. Ability to provide the first aid to patients and victims in extreme situations and emergencies.
PC 4. Ability to ensure the rational use of prescription and over-the-counter medications and other pharmaceutical products in accordance with physicochemical, pharmacological characteristics, biochemical, pathophysiological features of a particular disease and pharmacotherapeutic regimens for its treatment.

Integrative final program learning outcomes (PLO), the formation of which is facilitated by the educational component:
PLO 1. To carry out professional activities in social interaction based on humanistic and ethical principles; to identify future professional activities as socially significant for human health.
PLO 2. To apply knowledge of general and professional disciplines in professional activities.
PLO 4. To demonstrate the ability to independently search, analyze and synthesize information from various sources and use these results to solve typical and complex specialized tasks of professional activity.
PLO 12. To analyze the information obtained as a result of scientific research, summarize, systematize and use it in professional activities.
PLO 15. To provide home care to patients in emergencies and victims in extreme situations.
PLO 16. To determine the influence of factors influencing the processes of absorption, distribution, deposition, metabolism and excretion of the drug and due to the condition, features of the human body and physico-chemical properties of medications.

As a result of studying the educational component, the applicant for higher education will be
know:

- •basic concepts of general nosology
- the role of causes and conditions, heredity and constitution, age, reactivity and resistance in the onset of diseases
- causes and mechanisms of development of typical pathological processes
- causes and mechanisms of development of typical metabolic disorders
- quantitative and qualitative changes in the cells of the blood system
- major disorders of the cardiovascular system, respiratory system, digestion, liver, kidneys
- causes and mechanisms of violations of regulatory systems (endocrine and nervous)

be able to:

- interpret the causes, mechanisms of development and manifestations of typical pathological processes and the most common diseases
- analyze, draw conclusions regarding the causes and mechanisms of functional, metabolic, structural disorders of organs and body systems in diseases

possess:

- methods of modeling peripheral circulatory disorders
- methods of modeling acute inflammation;
- methods of differentiating temperature curves;

• methods of modeling diabetes mellitus;
• Methods for determining the body mass index.

4. The educational component structure

Names of content modules and topics	The amount of hours					
	full time study					
	the whole amount	including				
		L.	sem.	Practical lessons	lab.	self-study
1	*2*	*3*	*4*	*5*	*6*	*7*
Module 1: General pathophysiology						
Content module 1. General pathophysiology						
Topic 1. Subject and tasks of pathological physiology. Methods of pathophysiological research.	4			1		3
Topic 2. The doctrine of the disease.	4			2		2
Topic 3. The role of heredity and constitution in pathology.	5			1		4
Topic 4. Pathogenic effect of environmental factors.	6			2		4
Topic 5. The role of reactivity in pathology. Impaired immune reactivity. Allergy.	8	1		3		4
Topic 6. The role of age factors in pathology.	5			2		3
Semantic module 1.	1			1		
The whole amount of hours for the content module 1	**33**	**1**		**12**		**20**
Content module 2. Typical pathological processes						
Topic 7. Cell damage	4			1		3
Topic 8. Fasting	5			2		3
Topic 9. Local circulatory disorders	7	1		3		3
Topic 10. Inflammation	7	1		3		3
Topic 11. Hypoxia	7	1		3		3
Topic 12. Fever	7			3		4
Topic 13. Pathology of tissue growth. Tumors	9	1		5		3
Semantic module 2.	1			1		
The whole amount of hours for the content module 2	**47**	**4**		**21**		**22**
Content module 3. Typical metabolic disorders						
Topic 14. Disorders of carbohydrate metabolism. Diabetes.	11	1		6		4
Topic 15. Disorders of protein metabolism.	8	1		3		4
Topic 16. Disorders of fat metabolism.	8	1		3		4
Topic 17. Disorders of water-salt metabolism.	5			3		4
Topic 18. Disorders of acid-base balance.	5			1		4
Semantic module 3.	1			1		
The whole amount of hours for the content module 3	**38**	**3**		**17**		**20**

Total number of hours by module 1	**120**	**8**		**50**		**62**
Module 2. Pathophysiology of organs and systems						
Content module 4. Pathophysiology of the blood and systemic circulation and external respiration						
Topic 19. Violation of the circulating blood volume.	5			3		2
Topic 20. Pathophysiology of the red blood system	6	1		3		2
Topic 21. Pathophysiology of the white blood system	5			3		2
Topic 22. Pathophysiology of the blood coagulation system	5			3		2
Topic 23. Pathophysiology of the heart	8	1		5		2
Semantic module 4.	1			1		
The whole amount of hours for the content module 4.	**30**	**2**		**18**		**10**
Content module 5. Pathophysiology of blood vessels, external respiration, digestive system, liver and biliary system						
Topic 24. Pathophysiology of blood vessels	11	1		6		4
Topic 25. Pathophysiology of external respiration.	7			3		4
Topic 26. Pathophysiology of Digestion.	11	1		6		4
Topic 27. Pathophysiology of the liver and biliary system.	10	1		5		4
Semantic module 5.	1			1		
The whole amount of hours for the content module 5.	**40**	**3**		**21**		**16**
Content module 6. Pathophysiology of the urinary, endocrine and nervous systems						
Topic 28. Pathophysiology of the kidneys.	10	1		6		3
Topic 29. Pathophysiology of the endocrine system	10	1		6		3
Topic 30. Pathophysiology of the nervous system.	6,5	1		2		3,5
Semantic module 5.	1			1		
The whole amount of hours for the content module 6	**27,5**	**3**		**15**		**9,5**
Total number of hours by Module 2	**67,5**	**8**		**54**		**58**
Exam	22,5					22,5
Total number of hours	**240**	**16**		**104**		**120**

5. Contents of the educational component

Module 1. General pathophysiology

Content module 1. General nosology

Topic 1. Subject and tasks of pathological physiology. Methods of pathophysiological research. Pathological physiology as a science. Its place in the system of medical and pharmaceutical knowledge. Pathophysiology as an academic discipline, its structure. The problem of pathological physiology. Methods of pathological physiology. Experiment as the main method of pathophysiology. Techniques used in the study of pathological processes.

Topic 2. The doctrine of the disease. The concepts of "health", "diseases", "pathological process", "pathological condition", "pathological reaction". Disease classification principles. Disease periods, their characteristics. The concept of terminal states. Pathophysiological bases of resuscitation. Etiology: definition, role of causes and conditions in the onset of the disease. The concept of "risk factors". The concept of "iatrogenic disease" and "disease of civilization."

Pathogenesis: definition, basic provisions of pathogenesis. Ways to generalize the pathological process. Etiotropic and pathogenetic principles of disease treatment.

Topic 3. The role of heredity and constitution in pathology. The role of heredity and constitution in the development of diseases. The concept of hereditary and congenital diseases. Gene and chromosomal diseases: their etiology, pathogenesis. General characteristics of Down syndrome, Klinefelter, Shereshevsky-Turner. The role of age factors in the development of pathology. The concept of antenatal pathology. Aging. General features and patterns of aging. Geroprotection methods.

Topic 4. Pathogenic effect of environmental factors. Pathogenic effect of environmental factors. Pathogenic effect of infrared and ionizing radiation on the body. Acute radiation sickness: etiology, pathogenesis, periods of bone marrow form. The mechanism of damage when exposed to ionizing radiation. Long-term consequences of exposure to ionizing radiation. The concept of chemical pathogenic factors, their toxicity, carcinogenicity, teratogenicity, allergenicity. Pathophysiological aspects of alcoholism, drug addiction, substance abuse.

Topic 5. The role of reactivity in pathology. Impaired immune reactivity. Allergy.

The concept of the reactivity of the organism, its types. Dependence of reactance on sex, age, heredity, etc. The concept of immune reactivity. Types of immune response. General patterns of disorders of the immune system. Causes and mechanisms of development of primary immunodeficiencies. Acquired immunodeficiency syndrome (AIDS), etiology, pathogenesis. Allergy: definition, etiology, classification of allergic reactions. Autoimmune diseases: definition, examples. Allergy: stages of development, their characteristics. Definition of the term "anaphylaxis". Examples of general and local anaphylactic reactions. Anaphylactic shock: etiology, pathogenesis, signs, emergency measures. Characteristics of immediate allergic reactions: urticaria, Quincke's edema, hay fever, atopic bronchial asthma. Allergy treatment principles, concept of desensitization. Prevention of allergic diseases.

Topic 6. The role of age factors in pathology. The concept of age-related pathology. Stages of human development: stage of physiological development, stage of maturity, stage of aging. Aging: definition, causes of aging, types and pathogenesis. Aging classification. Changes in the body during aging: at the cellular, tissue and organ levels; in the musculoskeletal system, the blood and immunity system; cardiovascular, respiratory, digestive systems; liver, kidneys, endocrine system; integumentary, nervous and sensory systems. The concept of "progeria", types and their characteristics. Anti-aging principles and methods.

Content module 2. Typical pathological processes

Topic 7. Cell damage. The definition of "cell damage". Principles of classification. Universal mechanisms of cellular damage. Energy-deficient mechanisms of cell damage. Electrolyte-osmotic mechanisms of cell damage. Calcium group of the molecular mechanism of cell damage. Acidotic mechanism of cell damage. Lipid mechanisms of cell damage. Protein (protein) mechanisms of cell damage. Nucleic mechanisms of cell damage. Signs of cell damage. Protective and compensatory mechanisms in case of cell damage. Cell death (apoptosis, necrosis), their signs.

Topic 8. Fasting. Definition of the concept, types of fasting. External and internal causes of starvation. Characteristics of metabolic and metabolic disorders in certain periods of complete starvation with water. Pathophysiological features of incomplete starvation. Types, etiology, pathogenesis of partial (qualitative) starvation. Protein-calorie deficiency, its forms: alimentary insanity, kwashiorkor. Factors affecting the body's stability during fasting. The concept of therapeutic fasting. Basic principles of fasting treatment.

Topic 9. Local circulatory disorders. The main forms of peripheral circulatory disorders. Arterial hyperemia: definition, etiology and pathogenesis, signs, significance for the body. Venous hyperemia: definition, etiology and pathogenesis, signs, consequences. Ischemia: definition, classification, etiology and pathogenesis, signs, consequences. Stasis: definition, types, etiology and pathogenesis, consequences. Thrombosis: definition, types of thrombi, conditions and stages of thrombus formation, consequences. Embolism: definition, classification, mechanisms of development. Typical microcirculation disorders: classification,

developmental mechanism. Typical disorders of lymph flow: forms, main manifestations of insufficiency of lymph circulation.

Topic 10. Inflammation. The concept of cell damage. Exo and endogenous causes of cell pores. Types of damage. Cell death (necrosis, apoptosis), their signs. Universal mechanisms of cellular damage. Mechanisms of cell defense and adaptation of cells to the action of damaging factors. Inflammation: definition, classification, etiology and pathogenesis. Local and general signs of inflammation, the mechanism of their development. Inflammation mediators, their classification. Formation mechanisms and biological action. Exudation: definition, mechanisms, types of exudates. Vascular reactions with inflammation. Metabolic and physicochemical changes in the focus of inflammation, the mechanism of their development. Phagocytosis: definition, types, stages, classification of phagocytes, mechanisms of phagocytosis disorders. Causes and mechanisms of proliferation. Principles of treating inflammation.

Topic 11. Hypoxia. Hypoxia: definition, classification, etiology and pathogenesis of the main types of hypoxia. Changes in the gas composition of arterial and venous blood in various types of hypoxia. Resistance of certain organs and tissues to hypoxia. Compensatory and adaptive mechanisms for hypoxia. Iso and hyperbaric oxygenation. Oxygen toxicity. Hyperoxia and free radical reactions.

Topic 12. Fever. Infectious process: etiology, pathogenesis, manifestations. The role of the properties of the pathogen and the reactivity of the organism in the development of the infectious process. Fever: definition, etiology and pathogenesis. Stages of development of fever. Types of temperature curves. Changes in the functions of organs and systems with fever. The biological significance of fever for the body. Concept of pyrotherapy. Fever and hyperthermia, their comparison.

Topic 13. Disorders of tissue growth. Tumors. General characteristics of the main types of tissue growth disorders. The concept of hypo- and hyperbiotic processes: atrophy, hypertrophy, hyperplasia, regeneration, tumors. Atrophy: definition, types, mechanisms of development. Hypertrophy (hyperplasia): definition, types, mechanisms of development. Tumors: definition, etiology and pathogenesis. Features of tumor growth. Differences between benign and malignant tumors. Methods of experimental reproduction of tumors. Clinical stages of cancer. Metastasis: definition, ways of metastasis. Principles of the treatment of malignant tumors.

Content module 3. Typical metabolic disorders

Topic 14. Disorders of carbohydrate metabolism. Diabetes. Complications. Hypo- and hyperglycemia: etiology and pathogenesis, consequences. Diabetes mellitus: definition, classification, etiology, pathogenesis. Clinical signs of diabetes mellitus, the mechanism of their development. Describe pancreatic and postpancreatic insulin deficiency. Complications of diabetes mellitus. Treatment principles. Hyperglycemic coma: etiology, pathogenesis, signs, emergency care. Hypoglycemic coma: etiology, pathogenesis, signs, emergency care.

Topic 15. Disorders of protein metabolism. Nitrogen balance, its violation. Stages of protein metabolism disorders. Disorders of intake, digestion and absorption of amino acids. Violation of the synthesis and breakdown of proteins in cells and tissues (assimilation of proteins). Violation of intermediate protein metabolism (amino acid metabolism). Hereditary disorders of amino acid metabolism: phenylketonuria, alkaptonuria, tyrosinosis, albinism. Disorders of the final stages of protein metabolism. Gout: definition, etiology and pathogenesis, signs, prevention and principles of pathogenetic therapy.

Topic 16. Disorders of fat metabolism. Stages of lipid metabolism disorders. The main types of blood plasma lipoproteins. Violation of blood lipid transport. Violation of lipid deposition in adipose tissue. Violation of fat metabolism in the liver. Disturbance of fat metabolism in peripheral tissues. Obesity: definition, classification; etiology and pathogenesis of certain forms. Medical problems associated with obesity.

Topic 17. Violation of water-salt metabolism. General characteristics of water-electrolyte metabolism and its disorders. Dyshydria: definition, types, clinical manifestations. Dehydration: definition, types, their characteristics. Hyperhydration: definition, types, their

characteristics. Edema definition, classification, mechanisms of development. Disorders of sodium metabolism in the body: types, their characteristics. Disorders of potassium metabolism in the body: types, their characteristics. Disorders of calcium metabolism in the body: types, their characteristics.

Topic 18. Violation of acid-base balance. Acid-base state: definition, basic parameters, mechanisms for maintaining a constant concentration of hydrogen ions in the body. Characteristics of violations of the acid-base state. Gas acidosis: definition, causes, change in indicators, protective-compensatory reactions and correction. Non-gas acidosis: definition, types, changes in indicators, protective-compensatory reactions and correction. Gas alkalosis: definition, causes, change in indicators, protective-compensatory reactions and correction. Non-gas alkalosis: definition, types, causes, change in indicators, protective-compensatory reactions and correction.

Semester control of the module: "General pathophysiology"

Module 2. Pathophysiology of organs and systems

Content module 4. Pathophysiology of the blood system, cardiovascular and respiratory systems

Topic 19. Violation of the circulating blood volume. Hypo- and hypervolemia: definition, varieties, their characteristics. Blood loss: etiology, pathogenesis, clinical manifestations. Urgent and long-term mechanisms of compensation for acute blood loss.

Topic 20. Pathophysiology of the red blood system. Qualitative and quantitative changes in erythrocytes in anemia. Erythrocytosis: definition, types, their characteristics. Anemia: definition of the concept, principles of classification. Posthemorrhagic anemias: types, etiology, pathogenesis, blood picture, principles of treatment. Iron deficiency anemia: etiology, pathogenesis, signs, blood picture, principles of treatment. B 12 deficiency and folate deficiency anemia: etiology, pathogenesis, signs, blood picture, principles of treatment. Acquired and hereditary hemolytic anemia: etiology, pathogenesis, blood picture, manifestations.

Topic 21. Pathophysiology of the white blood system. Qualitative and quantitative changes in leukocytes. Leukocytosis: types, causes and mechanisms of development. Leukemoid reactions. Leukopenia: types, causes and mechanisms of development. Agranulocytosis: definition, etiology and pathogenesis. Acute leukemia: etiology, pathogenesis, blood picture, manifestations, principles of treatment. Chronic leukemia: etiology, pathogenesis, blood picture, manifestations, principles of treatment.

Topic 22. Pathophysiology of the blood coagulation system. Hemorrhagic diathesis: definition, classification. Hemophilia: etiology, pathogenesis, clinical signs. Thrombocytopenic purpura: etiology, pathogenesis, clinical signs. Hemorrhagic vasculitis: etiology, pathogenesis, clinical signs. Disseminated intravascular coagulation syndrome: principles of classification, etiology, pathogenesis, clinical manifestations. Role in pathology.

Topic 23. Pathophysiology of the heart. Circulatory failure: definition, forms and stages of development. Heart failure: definition of the concept, principles of classification. Reasons for overloading the heart with volume and resistance. Mechanisms of immediate and long-term adaptation of the heart to excessive stress. Myocardial hypertrophy, its pathogenesis (according to FS Meerson). Features of the hypertrophied myocardium. Coronary and non-coronary myocardial lesions. The concept of coronary heart disease. Angina pectoris: definition, etiology, pathogenesis, signs, emergency care. Myocardial infarction: definition, etiology, pathogenesis, signs (characteristics of pain and resorption-necrotic syndromes), ECG changes, principles of treatment. Violation of the rhythm of the heart: arrhythmias, definitions. Experimental modeling. Causes, mechanisms of violations of automatism, excitability, conductivity.

Content module 5. Pathophysiology of blood vessels, external respiration, digestive system, liver and biliary system

Topic 24. Pathophysiology of blood vessels. The concept of vascular insufficiency. Views. Causes and mechanisms of its development. Atherosclerosis: definition, etiology, modern theories of pathogenesis. Characteristics of the morphological stages of the development of

atherosclerosis. Clinical manifestations of the most typical forms of atherosclerosis. Prevention and treatment of atherosclerosis. Arterial hypertension: definition, classification. Etiology and pathogenesis of primary and secondary arterial hypertension. The concept of hypertension. Primary hypertension as a multifactorial disease: the role of heredity and external factors in the development of primary hypertension. Development stages. Hypertensive crisis: definition, classification, characteristics of various forms. General principles of pathogenetic therapy. Acute and chronic arterial hypotension, causes and mechanisms of development. Acute vascular insufficiency (fainting, collapse, shock).

Topic 25. Pathophysiology of external respiration. Insufficiency of external respiration, definitions, principles of classification, causes. Dysregulatory insufficiency of external respiration, causes, mechanisms. Ventilation obstructive insufficiency of external respiration, causes, mechanisms. Restrictive ventilation insufficiency of external respiration, causes, mechanisms. Parenchymal insufficiency of external respiration, causes, mechanisms. Shortness of breath: types, causes, mechanisms of development. Types and mechanisms of occurrence of periodic and terminal respiration. Asphyxia: definition of the concept, etiology, characteristics of the stages.

Topic 26. Pathophysiology of digestion. Digestive failure concept. Principles of classification. Etiological factors of insufficient digestion. Etiology and pathogenesis of digestive disorders in the oral cavity (violation of chewing, salivation and swallowing). Indigestion in the stomach. Causes of disorders of motor and secretory functions of the stomach. Types of gastric secretion disorders. Disorders of gastric motility: hypo- and hyperkinesis, pylorospasm and pyloric stenosis, definitions. Acute and chronic gastritis: etiology, pathogenesis, signs, principles of treatment. Peptic ulcer and duodenal ulcer: definition, etiology, pathogenesis, signs. Complications of gastric ulcer and duodenal ulcer. Principles of pharmacokorrection. Pancreatitis: definition, types, etiology, pathogenesis, signs. Pathogenesis of pancreatic shock.

Topic 27. Pathophysiology of the liver and biliary system. Hepatic failure: definition, etiology, pathogenesis, clinical manifestations. Jaundice: definition, types, causes and mechanisms of their development. The concept of cholemic and acholic syndromes. Liver cirrhosis: definition, etiology, pathogenesis, morphological and clinical signs. Portal hypertension syndrome. Hepatic coma: etiology, pathogenesis, signs, principles of treatment.

Content module 6. Pathophysiology of the urinary, endocrine, nervous systems

Topic 28. Pathophysiology of the kidneys. Causes and mechanisms of violations of filtration, reabsorption and secretion processes in the kidneys. Functional tests to determine the impairment of renal function. Qualitative and quantitative changes in urine, their characteristics. Pyelonephritis: definition, etiology, pathogenesis, signs, changes in urine, principles of treatment. Glomerulonephritis: definition, etiology, pathogenesis, clinical syndromes, treatment principles. Renal failure: definition, classification, causes of development, signs. Uremia: concept, signs. Renal colic: signs, emergency measures.

Topic 29. Pathophysiology of the endocrine system. General disorders of the endocrine system (hypo-, hyper- and dysfunction). Primary and secondary endocrinopathies. Pituitary hyperfunction: etiology, pathogenesis, nosological forms, their characteristics. Hypophysis of the pituitary gland: etiology, pathogenesis, nosological forms, their characteristics. Thyroid hyperfunction: etiology, pathogenesis, nosological forms, their characteristics. Hypofunction of the thyroid gland: etiology, pathogenesis, nosological forms, their characteristics. Hyper- and hypofunction of the parathyroid glands: etiology, pathogenesis, nosological forms, their characteristics. Adrenal hyperfunction: etiology, pathogenesis, nosological forms, their characteristics. Hypofunction of the adrenal glands: etiology, pathogenesis, nosological forms, their characteristics. Characteristics of hypo- and hyperfunctions of the gonads. Adrenogenital syndrome: concept, characteristics.

Topic 30. Pathophysiology of the nervous system. The concept of disorders of the sensory, motor and trophic functions of the nervous system. Pain as a kind of sensitivity. Pain: etiology, pathophysiology of pain, forms of pathological pain, general reactions of the body to pain. The principles of pain therapy. Impairment of the sensory function of the nervous system: causes, main manifestations. Violation of the integration functions of the central nervous system.

Impaired motor function of the nervous system. Experimental modeling of movement disorders. Peripheral and central paralysis and paresis: causes, mechanisms, manifestations. Myasthenia gravis: definition, etiology, pathogenesis, manifestations. Epilepsy: definition, etiology, pathogenesis, manifestations. General concepts of neurosis and psychosis. Hysteria: definition, signs. The concept of stress. Stages of development of the general adaptation syndrome. The concept of "disease of adaptation".

Semester control of the module: "Pathophysiology of organs and systems"

Semester exam

6. Topics of lectures

№ з/п	Topic titles	Volume in hours
1	Topic 5. The role of reactivity in pathology. Impaired immune reactivity. Allergy.	1
2	Topic 9. Local circulatory disorders.	1
3	Topic 10. Inflammation.	1
4	Topic 11. Hypoxia.	1
5	Topic 13. Pathology of tissue growth. Tumors.	1
6	Topic 14. Disorders of carbohydrate metabolism. Diabetes.	1
7	Topic 15. Disorders of protein metabolism.	1
8	Topic 16. Disorders of fat metabolism.	1
9	Topic 20. Pathophysiology of the red blood system.	1
10	Topic 23. Pathophysiology of the heart.	1
11	Topic 24. Pathophysiology of blood vessels.	1
12	Topic 26. Pathophysiology of digestion.	1
13	Topic 27. Pathophysiology of the liver and biliary system.	1
14	Topic 28. Pathophysiology of the kidneys.	1
15	Topic 29. Pathophysiology of the endocrine system.	1
16	Topic 30 Pathophysiology of the nervous system.	1
	The whole amount of hours	**16**

7. Topics of seminars

It is not provided by the curriculum.

8. Topics of practical classes

№ з/п	Topic titles	Volume in hours
1	Topic 1. Subject and tasks of pathological physiology. Methods of pathophysiological research.	1
2	Topic 2. The doctrine of the disease.	2
3	Topic 3. The role of heredity and constitution in pathology.	1
4	Topic 4. Pathogenic effect of environmental factors.	2
5	Topic 5. The role of reactivity in pathology. Impaired immune reactivity. Allergy.	3
6	Topic 6. The role of age factors in pathology.	2
7	**Semantic module 1.**	1
8	Topic 7. Cell damage.	1
9	Topic 8. Fasting.	2
10	Topic 9. Local circulatory disorders.	3
11	Topic 10. Inflammation.	3
12	Topic 11. Hypoxia.	3
13	Topic 12. Fever.	3
14	Topic 13. Pathology of tissue growth. Tumors.	5
15	**Semantic module 2.**	1

16	Topic 14. Disorders of carbohydrate metabolism. Diabetes.	6
17	Topic 15. Disorders of protein metabolism.	3
18	Topic 16. Disorders of fat metabolism.	3
19	Topic 17. Disorders of water-salt metabolism.	3
20	Topic 18. Disorders of acid-base balance.	1
21	**Semantic module 3.**	1
22	Topic 19. Disorders of the circulating blood volume.	3
23	Topic 20. Pathophysiology of the red blood system.	3
24	Topic 21. Pathophysiology of the white blood system.	3
25	Topic 22. Pathophysiology of the blood coagulation system.	3
26	Topic 23. Pathophysiology of the heart.	5
27	**Semantic module 4.**	1
28	Topic 24. Pathophysiology of blood vessels.	6
29	Topic 25. Pathophysiology of external respiration.	3
30	Topic 26. Pathophysiology of digestion.	6
31	Topic 27. Pathophysiology of the liver and biliary system.	5
32	**Semantic module 5.**	1
33	Topic 28. Pathophysiology of the kidneys.	6
34	Topic 29. Pathophysiology of the endocrine system.	6
35	Topic 30 Pathophysiology of the nervous system	2
36	**Semantic module 6.**	1
	The whole amount of hours	**104**

9. Topics of of laboratory classes.

It is not provided by the curriculum.

10. Self-study work

№ з/п	Topic titles	Volume in hours
1	Topic 1. Subject and tasks of pathological physiology. The doctrine of the disease. Methods of pathophysiological research.	3
2	Topic 2. The doctrine of the disease.	2
3	Topic 3. The role of heredity and constitution in pathology.	4
4	Topic 4. Pathogenic effect of environmental factors.	4
5	Topic 5. The role of reactivity in pathology. Impaired immune reactivity. Allergy.	4
6	Topic 6. The role of age factors in pathology.	3
7	Topic 7. Cell damage.	3
8	Topic 8. Fasting.	3
9	Topic 9. Local circulatory disorders.	3
10	Topic 10. Inflammation.	3
11	Topic 11. Hypoxia.	3
12	Topic 12. Fever.	4
13	Topic 13. Pathology of tissue growth. Tumors.	3
14	Topic 14. Disorders of carbohydrate metabolism. Diabetes.	4
15	Topic 15. Disorders of protein metabolism.	4
16	Topic 16. Disorders of fat metabolism.	4
17	Topic 17. Violation of water-salt metabolism.	4
18	Topic 18. Violation of acid-base balance.	4
19	Topic 19. Violation of the circulating blood volume.	2
20	Topic 20. Pathophysiology of the red blood system.	2

21	Topic 21. Pathophysiology of the white blood system.	2
22	Topic 22. Pathophysiology of the blood coagulation system.	2
23	Topic 23. Pathophysiology of the heart.	2
24	Topic 24. Pathophysiology of blood vessels.	4
25	Topic 25. Pathophysiology of external respiration.	4
26	Topic 26. Pathophysiology of digestion.	4
27	Topic 27. Pathophysiology of the liver and biliary system.	4
28	Topic 28. Pathophysiology of the kidneys.	3
29	Topic 29. Pathophysiology of the endocrine system.	3
30	Topic 30. Patphysiology of the nervous system.	3,5
	Exam	22,5
	The whole amount of hours	**120**

Tasks for Self-study work

1. Higher education applicants independently work on topics of independent work in the discipline that are not included in the plan of classroom classes, using basic, additional educational literature and Internet resources.
2. Evaluation of topics that are submitted only for independent work and are not included in the topics of classroom training is controlled during the control of content modules and during the semester exam.

11. Criteria and evaluation order of educational outcomes

The study of the educational component takes place over two semesters, each of which ends with a semester test. Semester grades are based on the current academic performance of the student. The study of the educational component ends with a semester exam.

Evaluation system for the educational component

The results of semester control in the form of a semester test are evaluated on a 100-point, undifferentiated scale ("passed", "failed") and on the EKTS scale.

Points for the educational component are awarded according to the following ratio:

Types of evaluation	**Number of points**
Module 1	
Content module 1 1. Evaluation of topics 1-6: in-class work (oral questioning, test tasks, practical assignments or case studies). 2. Control of the content module 1: theoretical questions and test tasks.	30-50
Content module 2 1. Evaluation of topics 7-13: in-class work (oral questioning, test tasks, practical assignments or case studies). 2. Control of the content module 1: theoretical questions and test tasks.	30-50
Content module 1 1. Evaluation of topics 14-18: in-class work (oral questioning, test tasks, practical assignments or case studies). 2. Control of the content module 1: theoretical questions and test tasks.	30-50
Semester control of module 1 (ΣCM1+CM2+CM3)/1.5	***60-100***
Module 2	
Content module 2	30-50

1. Evaluation of topics 19-23: in-class work (oral questioning, test tasks, practical assignments or case studies). 2. Control of the content module 1: theoretical questions and test tasks.	
Content module 2 1. Evaluation of topics 24-27: in-class work (oral questioning, test tasks, practical assignments or case studies). 2. Control of the content module 1: theoretical questions and test tasks.	30-50
Content module 2 1. Evaluation of topics 28-30: in-class work (oral questioning, test tasks, practical assignments or case studies). 2. Control of the content module 1: theoretical questions and test tasks.	30-50
Semester control of module 2 (ΣCM4+CM5+CM6)/1.5	***60-100***

The independent work of higher education students is assessed during the current control and during the control of the content module.

Evaluation of the performance of higher education students for each of the planned types of work in the classroom and during control is carried out according to the following criteria:

Types of work for which the applicant receives points	**Maximum number of points per type of work**	**Evaluation criteria**
work in classes (1-6) of content module 1 (min-18- max30) work at classes (7-13) of content module 2 (min-21- max 35) work at classes (14-18) of content module 3 (min-18- max30) work in classes (19-23) of content module 4 (min-18- max30) work in classes (24-27) of content module 5 (min-21- max 35) work at classes (28-30) of content module 6 (min-15- max 25)		
Oral survey	**2**	**2 points** - the student gives comprehensive answers to theoretical questions of the teacher; shows comprehensive and in-depth knowledge of theoretical material, demonstrates knowledge of additional literature on the topic of the class; thinks logically and constructs an answer.
		1,5 points - the student has mastered the theoretical material well, but makes certain inaccuracies and mistakes in the logic of the presentation of theoretical content, which he or she has eliminated with the help of the teacher.
		1 points - the higher education student has basically mastered the theoretical knowledge of the educational component, but answers unconvincingly, additional questions cause uncertainty.
		0,5 points - the student has a low level of theoretical knowledge, confuses concepts, and additional questions indicate a lack of stable knowledge.
		0 points - the student has not mastered the educational material of the educational component, does not know scientific facts, definitions, and has little or no knowledge of primary sources and recommended literature.
preparation of test tasks	**1**	**1 point** - the applicant for higher education gave correct answers to 90-100% of the test tasks.
solving a situational problem,	**2**	**2 points** - the higher education student demonstrates a high level of mastery of practical skills; makes a detailed analysis and provides correct answers to situational tasks on the topic.

mastering practical skills		**1,5 points** - the student has mastered the practical skills, but makes certain inaccuracies and mistakes when analyzing the situational task.
		1 points - the applicant for higher education does not accurately answer questions of a practical nature; when performing a situational task, he/she answers 50% of the questions.
		0,5 points - the higher education applicant has not mastered practical skills; when performing a situational task, he/she answers 40% of the questions, is unable to justify the answer based on the data provided.
		0 points - practical skills are not formed; the higher education student does not provide answers to the questions of the situational task.
Control of content modules 1, 3, 4 (min-12- max20)		
oral interview or written work	**15**	**5 points** for 1 question
		5 points - the student gives comprehensive answers to theoretical questions of the teacher; shows comprehensive and in-depth knowledge of theoretical material, demonstrates knowledge of additional literature on the topic of the class; thinks logically and constructs an answer.
		4 points - the student has mastered the theoretical material well, but makes certain inaccuracies in the logic of the presentation of theoretical content.
		3 points - the applicant has satisfactorily mastered the theoretical material, but makes mistakes in the logic of the presentation of theoretical content.
		2 points - the higher education student has basically mastered the theoretical knowledge of the educational component, but answers unconvincingly, additional questions cause uncertainty.
		1 points - the student has a low level of theoretical knowledge, confuses concepts, and additional questions indicate a lack of stable knowledge.
		0 point - the student has not mastered the educational material of the educational component, does not know scientific facts, definitions, and has little or no knowledge of primary sources and recommended literature.
testing	**5**	One correct answer is worth 0.25 points. 20 tests x 0.25 = ***5 points***
Control of content modules 2, 5 (min-9- max15)		
oral interview or written work	**9**	**3 points** for 1 question
		3 points - the student gives comprehensive answers to theoretical questions of the teacher; shows comprehensive and in-depth knowledge of theoretical material, demonstrates knowledge of additional literature on the topic of the class; thinks logically and constructs an answer.
		2 points - the student has mastered the theoretical material well, but makes certain inaccuracies and mistakes in the logic of the presentation of theoretical content.
		1 point - the student has a low level of theoretical knowledge, confuses concepts, and additional questions indicate a lack of stable knowledge.

		0 points - the student has not mastered the educational material of the educational component, does not know scientific facts, definitions, and has little or no knowledge of primary sources and recommended literature.
testing	**6**	One correct answer is worth 0.25 points. 20 tests x 0.3 = ***6 points***
Control of content module 6 (min-15- max25)		
oral interview or written work	**20**	**5 points** for 1 question
		5,0 points - the student gives comprehensive answers to the teacher's theoretical questions; demonstrates comprehensive and deep knowledge of theoretical material, demonstrates knowledge of additional literature on the topic of the class; thinks logically and constructs an answer.
		4 points - the student has mastered the theoretical material well, but makes certain inaccuracies in the logic of the presentation of theoretical content.
		3 points - the applicant has satisfactorily mastered the theoretical material, but makes mistakes in the logic of the presentation of theoretical content.
		2 points - the higher education student has basically mastered the theoretical knowledge of the educational component, but answers unconvincingly, additional questions cause uncertainty.
		1 point - the student has a low level of theoretical knowledge, confuses concepts, and additional questions indicate a lack of stable knowledge.
testing	**5**	One correct answer is worth 0.25 points. 20 tests x 0.25 = **5 points**

Scoring scheme and distribution of points

Current testing and self-study							
Module 1							
Content module 1							
T1	T2	T3	T4	T5	T6	CCM 1	
3-5	3-5	3-5	3-5	3-5	3-5	12-20	***30-50***
Content module 2							
T7	T8	T9	T10	T11	T12	T13	CCM 2	
3-5	3-5	3-5	3-5	3-5	3-5	3-5	9-15	***30-50***
Content module 3							
T14	T15	T16	T17	T18		CCM 3	
6-10	3-5	3-5	3-5	3-5		12-20	***30-50***
Total for studying M1: (ΣCM1+CM2+CM3)/1,5							***60-100***
Module 2							
Content module 4							
T19	T20	T21	T22		T23	CCM 4	
3-5	3-5	3-5	3-5		6-10	12-20	***30-50***
Content module 5							
T24	T25	T26	T27	CCM 5			
6-10	3-5	6-10	6-10	9-15			***30-50***
Content module 6							
T28	T29	T30	CCM 6				
6-10	6-10	3-5	15-25				***30-50***
Total for studying M2: (ΣCM4+CM5+CM6)/1,5							***60-100***

Based on the results of studying the topics of the discipline, an overall grade is formed by the sum of the current rating and the result of the final module control, respectively. The higher education applicant is assigned a grade in accordance with the following scale of knowledge assessment:

Total points	Marks ECTS	Score on the national scale	
		mark	credit
90 – 100	A	perfectly	satisfactorily
82-89	B	good	
74-81	C		
64-73	D	satisfactorily	
60-63	E		
35-59	FX	unsatisfactorily	satisfactorily

Exam

A higher education student is considered admitted to the exam in a discipline if he or she has attended all classroom sessions provided for in the curriculum, completed all types of work provided for in the work program of the discipline and, while studying it during the term of study, has scored a number of points not less than the minimum of 60 points. The maximum number of points that a student can score for current academic activities is 100 points. The semester exam is conducted in the form of written work, during which the theoretical and practical skills of higher education students are assessed. The semester exam ticket consists of 3 theoretical questions and a practical assignment, which consists of a case study and 20 test questions. Evaluation of theoretical questions: each theoretical question is worth 20 points. Evaluation of the practical task: the case study is worth 20 points, and the test tasks are worth 20 points. One correct answer is worth 1.0 points. 20 tests x 1.0 = 20 points. Semester exams are graded according to the ECTS scale, 100-point and four-point scale ("excellent", "good", "satisfactory", "unsatisfactory").

The name of the task	**Assessment points**
Assessment of the theoretical question	***Max 20 points***
The applicant for higher education has firmly acquired theoretical material, has a deep and comprehensive knowledge and gives the contents of the question, using the main provisions of the recommended literature, logically thinks and builds the answer, freely uses the acquired theoretical knowledge. No mistakes. The question is 100% solved.	20
The applicant for higher education has firmly acquired theoretical material, knows and gives the content of the question, logically thinks and builds the answer, freely uses the acquired theoretical knowledge, but admits certain inaccuracies in the logic of the presentation of theoretical material. The question is 95% solved.	19
The applicant for higher education is well versed in the theoretical material, possesses most knowledge of the recommended literature, but admits inaccuracies in the logic of the presentation of theoretical material and definitions. The question is 90% solved.	18
The applicant for higher education is well acquainted with theoretical material, knows and gives the content of the subject, but admits certain inaccuracies in the logic of the presentation of theoretical material, definitions, formulations. The question is 85% solved.	17
The applicant for higher education is well versed in theoretical material, gives the essence of the matter, but admits errors in logic of theoretical material, makes errors in definitions, classifications The question is 80% solved.	16

The applicant for higher education has satisfactorily absorbed the theoretical material, sets out the essence of the matter, but is unconvincing, admits errors in the presentation of the material. The question is 75% solved.	15
The applicant for higher education has satisfactorily absorbed the theoretical material, sets out the essence of the question, but is unconvincing, admits errors in definitions, classifications, stage descriptions. The question is 70% solved.	14
The applicant for higher education has satisfactorily absorbed the theoretical material, gives the substance of the matter, but admits errors in the presentation of the material. The question is 65% solved.	13
The applicant for higher education has not fully absorbed the theoretical material, does not answer the questions unconvincingly, confuses the concepts. Inaccuracies and gross mistakes in the presentation of the material. There is no response logic. The question is 60% solved.	12
The applicant for higher education has not absorbed theoretical material, does not know scientific facts, definitions, is not guided in recommended literature; there is no scientific thinking. The question is not solved.	0

The name of the task	**Assessment points**
Assessment of the situational task	***Max 20 points***
The applicant for higher education provided a correct and reasoned answer to the question of the situational task. The question is 100% answered.	20
The applicant for higher education correctly answered the question of the situational task, but did not provide a justification for the answer. The question is revealed by 50%.	10
The applicant for higher education did not provide a correct answer to the question of the case study and did not provide a justification for the answer.	0

The name of the task	**Assessment points**
Assessment of test tasks	***Max 20 points***
The correct answer to 1 test task	1.0
20 test tasks x 1.0 points	20

12.Forms of progress and semester supervision of academic achievements

Semester control is carried out in the form of a semester test and a semester exam.
Forms:
- current control: oral questioning, test control, content module control work;
- exam: written work (assessment).

13. Methodological support

1. Presentation of lectures.
2. Information posters and tables.
3. Guide for practical classes.
4. Tests for current control.
5. Tests for the final module control.

14. Reading suggestions

The main reading suggestions

1. General and Clinical Pathophysiology / edited by A. V. Kubyshkin, A. I. Gozhemko. – Second edition. – Vinnytsia: Nova Knyha, 2016. – 656 p.
2. Workbook Pathological Physiology preparation for the unified state qualification exam: the integrated test exam “Krok 1. Pharmacy” and English language proficiency test / N. M. Kononenko, S. I. Myronchenko, V. A. Rybak [et al.]; ed. by.: prof. N. M. Kononenko. 3rd ed. Kharkiv: NUPh, 2022. 185p.
3. Workbook on pathological physiology for lectures, practical classes and self-study work: study guide / N. M. Kononenko, V. V. Hnatiuk, S. I.Myronchenko [et al.]; ed. by.: prof. N. M. Kononenko. Kharkiv: NUPh, 2021. 139 p.
4. Pathological physiology. Module 1: teaching aid for teachers for practical training with applicants for higher education specialty «226 Pharmacy, industrial pharmacy» of the educational and professional program «Pharmacy» / N. M. Kononenko, V. V. Gnatyuk, V. A. Rybak [et al.]. Kharkiv: NUPh, 2021. 260 p.
5. Pathological physiology. Module 1: teaching aid for practical training for applicants for higher education in the specialty «226 Pharmacy, industrial pharmacy» of the educational and professional program «Pharmacy» / N. M.Kononenko, V. V. Gnatyuk , V. A. Rybak [et al.]. Kh.: NUPh, 2021. 245 p.
6. Pathological Physiology: Manual for students of higher schools / S. I. Kryzhna, N. M. Kononenko, T. I. Tyupka [et al.]. Kharkiv: NUPh: Golden Pages, 2012. 200 p.

Supplementary reading suggestions

1. Pathophysiology: textbook / N. V. Krishtal, V. A. Mikhnev, N. N. Zayko et al. – 2nd edition, corrected. – Kiev : Medicine, 2018. – 656 p.

15. Electronic resources, including the Internet

1. Website of the Department of of Physiology and Pathological Physiology: https://pat.nuph.edu.ua/
2. Library of NUPh: e-mail https://lib.nuph.edu.ua/
3. Distance learning website: https://pharmel.kharkiv.edu/
4. International Journal of Physiology and Pathophysiology: https://www.begellhouse.com/ru/journals/physiology-and-pathophysiology.html