MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

State Biotechnological University

Educational and scientific institute/faculty
veterinary medicine
(name of educational and scientific institute/faculty)

"Approved"

Head of the Department
Animal physiology and biochemistry
(name of department)

_____(Denysova O.M.)
(signature) (last name and initials)

« 30 » June 2025

Department of " Animal Physiology and Biochemistry "
(name of department)

WORK PROGRAM
ACADEMIC DISCIPLINE
OK " Pathological Physiology "

(code and name of the academic discipline)

Level of higher education	second (name)
Field of knowledge	21 Veterinary medicine (code and name)
Specialty	211 Veterinary medicine (code and name)
Educational program	Veterinary medicine (name)

Kharkiv – 2025

Compilers: Professor Zhukova I.O.
(academic title, position, surname and initials)

The working program of the academic discipline was approved at an extended meeting of the Department of " Animal Physiology and Biochemistry "
(name of department)

Minutes dated: " 30 " June 20, 25 N. 20

The work program was agreed upon:

Guarantor of the educational program Veterinary Medicine
(name of the OPP)

"_ 30 _" ____ June ____2025_ (_____) Naumenko S.V.
(signature) (surname and initials)

The validity period has been extended to:

" __ " _____ 20 __ Protocol of № ___ from "____ " _____ 20 ___
head of the department _____ _____ (_____)
(name of the department) (signature) (last name and initials)

" __ " _____ 20 __ Protocol of № ___ from "____ " _____ 20 ___
head of the department _____ _____ (_____)
(name of the department) (signature) (last name and initials)

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head of the department _____ _____ (_____)
(name of the department) (signature) (last name and initials)

1. Description of the academic discipline

<table>
<tr><td rowspan="2">Name of indicators</td><td colspan="4">Characteristics of the academic discipline</td></tr>
<tr><td colspan="2">full-time education</td><td colspan="2">correspondence form of study</td></tr>
<tr><td rowspan="2">Number of credits 8.0</td><td colspan="4">Discipline status:</td></tr>
<tr><td colspan="4">mandatory</td></tr>
<tr><td rowspan="3">Sections - 4</td><td colspan="4">Year of training:</td></tr>
<tr><td>3</td><td>3</td><td></td><td></td></tr>
<tr><td colspan="4">Semester</td></tr>
<tr><td rowspan="9">Total hours 240.0</td><td>V</td><td>VI</td><td></td><td></td></tr>
<tr><td colspan="4">Lectures (year)</td></tr>
<tr><td>16</td><td>16</td><td></td><td></td></tr>
<tr><td colspan="4">Practical (seminar)</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Laboratory (hours)</td></tr>
<tr><td>44</td><td>52</td><td colspan="2"></td></tr>
<tr><td colspan="4">Independent work (hours)</td></tr>
<tr><td>60</td><td>52</td><td></td><td></td></tr>
<tr><td rowspan="2">Weekly hours for full-time study:
classrooms – 128 ;
independent work of the applicant – 112 .</td><td colspan="4">Type of control:</td></tr>
<tr><td>Non-differentiated credit</td><td>Exam</td><td></td><td></td></tr>
</table>

2. Purpose and objectives of the discipline

The methodology of the course "Pathological Physiology" is the formation of theoretical knowledge and practical skills for understanding the basic concepts of general nosology, the role of pathological factors of the external and internal environment and protective and compensatory means in the development of diseases, the analysis of typical pathological processes and diseases, their general patterns of development and completion, as well as the role of etiological and pathogenetic prevention and therapy.

Objectives of the discipline. The main objective of the academic discipline "Pathological Physiology" is to teach students medical thinking. Science is based on experimental data and theoretical provisions of anatomy, histology, physical and colloidal chemistry, biochemistry, and physiology.

The acquired fundamental data about the disease, the laws of its development will allow future specialists to more effectively carry out preventive treatment of the disease and animals. Knowledge of pathological physiology is basic for students to master such disciplines as pathological anatomy, epizootology, internal non-communicable diseases, veterinary and sanitary examination, parasitology, and the organization of veterinary affairs.

The discipline forms a competency that is integral to determining and assessing the health status of animals through monitoring and analysis, research, and critical clinical thinking in the process of applying knowledge of theoretical, practical, and evidence-based veterinary medicine.

The subject of study of pathophysiology is the general patterns (primarily of a functional nature at the levels of cells, organs, systems, and substances in general) that cause the development and course of the disease, mechanisms of resistance, sanogenesis, pre-disease, recovery, and consequences.

The basic subjects for successful mastery of the discipline of the educational program of the discipline are *(from the structural and logical scheme of the educational program for mandatory disciplines)* biology, anatomy, histology, organic and biological chemistry, and physiology.

This academic discipline provides the formation of the following program learning outcomes: *(from the educational program for mandatory disciplines)*

PLO1. Know and correctly use the terminology of veterinary medicine.

PLO2. Use information from domestic and foreign sources to develop diagnostic, treatment, and business strategies.

PLO3. Determine the essence of physicochemical and biological processes that occur in the animal body normally and during pathology.

3. Academic discipline program

Section 1. Pathophysiology as a science. Nosology. Pathophysiology of reactivity and immunity. Disorders of peripheral circulation and microcirculation.

Topic 1. Pathophysiology as a science. The role of pathophysiology in the training of a veterinary doctor. Nosology.

Summary of the topic. Subject and tasks of pathological physiology, its place in the system of higher veterinary education. Pathophysiology as a theoretical basis of modern veterinary medicine. Object and method of study. Moral and ethical aspects of animal experimentation. Experiment as an important method of scientific research of pathological phenomena and development of new treatment methods.

The concept of health and illness, principles of disease classification, their types and periods in the course, pathological manifestations, reaction, process, condition, general etiology and pathogenesis. The main pathogenetic mechanisms of disease development. Cause-and-effect relationships in the mechanism of disease occurrence. Mechanisms of prolongation and restoration of impaired functions. The effect of pathogenic factors of the external environment.

Recommended reading: 1 [pp. 9-21], 2, 3 [pp. 5-27], 4 [pp. 4-22], 5 [pp. 6-25], 6 [pp. 7-29], 11, 12, 18.

Topic 2. Reactivity. Pathology of reactivity

Summary of the topic. Shepherds phenomena of activity and resistance and their disorders, allergy, its types and mechanisms of development. Allergic reactions of the repeated type. Anaphylaxis, its pathogenesis. Allergic reactions of the free type. The importance of the nervous, immune and endocrine systems in the formation of the body's reactivity. Types of reactivity. Immunological reactivity. Mechanisms and components immunological reactions. The role of the interaction of immune factors in the immune response to substances.

Recommended reading: 1 [pp. 22-34], 2, 3 [pp. 59-80], 4 [pp. 23-53], 5 [pp. 26-52], 6 [pp. 13-27], 11, 12.

Topic 3. Pathophysiology of the cell

Summary of the topic. The main mechanisms of cell damage. Hereditary diseases of animals caused by gene mutations. Changes in the body during aging. Changes in the physicochemical properties of tissues during damage. Apoptosis and its significance for normal and pathological processes.

Recommended reading: 2, 4 [pp. 89-103], 5 [pp. 80-111], 6 [pp. 59-73], 11, 12, 13, 15.

Topic 4. Pathophysiology of peripheral circulation and microcirculation

Summary of the topic. Typical microcirculation disorders. Etiology and pathogenesis of the main pathologies of the microcirculatory bed (arterial, mixed and venous hyperemia, stasis and its types, thrombosis, sludge phenomenon, ischemia, infarctions, embolism, bleeding and hemorrhages).

Recommended reading: 1 [pp. 59-86], 2, 3 [pp. 129-149], 4 [pp. 74-95], 5 [pp. 80-111], 6 [pp. 69-97], 11, 12.

Section 2 Typical Pathological Processes. Inflammation. Fever. Pathology of Tissue Growth Metabolic Disorders

Topic 5. Pathophysiology remains

Summary of the topic. Etiology and pathogenesis at once. The main phases of the inflammatory process. Signs immediately. Biochemical and physicochemical changes in the area of the primary, pathogenesis of vascular changes. Mediators, respectively, their characteristics and purpose. Types and properties of exudate. The meaning is really for you. Neuroendocrine and immune mechanisms of regulation are felt. Alterative, exudative and proliferative simply.

Recommended literature: 1 [p. 89-131], 2, 3 [p. 150-169], 4 [p. 96-118], 5 [p. 112-143], 6 [p. 98-122], 10 [p. 111-144], 11, 12, 13 [p. 12-40].

Topic 6. Pathophysiology of thermal regulation. Fever

Summary of the topic. Etiology and pathogenesis of fever, stages and nature of thermoregulation at its various stages. Primary and secondary pyrogenic substances. Mediators of the fever process. Types of fever reactions. Dependence of the development of fever on the reactivity of harmful substances. Changes in metabolism and physiological functions during fever. Biological significance of fever for the patient's illness. Non-febrile processes (hyperthermia).

Recommended reading: 1 [c. 132-147], 2, 3 [c.225-260], 4 [p. 119-137], 5 [p. 139-172], 11, 12.

Topic 7. Pathophysiology of tissue growth. Tumors.

Summary of the topic. Studies the pathophysiology of tissue growth, hyperbiotic processes (hypertrophy and hyperplasia), regeneration, metabolism in regenerated tissue, factors that determine regeneration processes, hypobiotic processes, atrophy.

Tumors as a pathology of tissue growth, the main properties of benign and malignant diseases, etiology and pathogenesis of the final process, blastomogenesis and reactivity necessary for these pathologies. The impact of legislation on the body.

Recommended reading: 1 [pp. 148-169], 2, 3 [pp. 173-189], 4 [pp. 138-167], 5 [pp. 144-177], 6 [pp. 122-148], 11, 12, 15, 16.

Topic 8. Violations of water and electrolyte metabolism. Edema, dropsy.

Summary of the topic. Disturbances of water and electrolyte metabolism. Mechanisms of formation of springs and dropsy. Classification of pathogens by diseases. Importance for you.

Recommended reading: 1 [pp. 170-187], 2, 3 [pp. 190-200], 4 [pp. 168-177], 5 [pp. 178-190], 6 [pp. 149-161], 11, 12,

Topic 9. Metabolism and energy disorders.

Summary of the topic. Etiology and pathogenesis of metabolic disorders of carbohydrates, lipids, proteins, vitamins and trace elements. Basic metabolic disorders.

Recommended reading: 1 [p.188-210], 2, 3 [p. 178-217], 3 [p. 286-300]

Section 3. Pathophysiology of organs and systems. Pathophysiology of the blood, circulatory and respiratory systems

Topic 10. Pathophysiology of the blood system.

Summary of the topic. Disorders of the blood system. Changes in total blood volume, changes in the quantitative and qualitative composition of erythrocytes and leukocytes, principles of classification of blood diseases. Blood loss. Anemia. Hemoblastoses (leukemia, lymphoma, etc.). Pathological physiology of the blood coagulation and anticoagulation systems.

Recommended reading: 1 [pp. 211-248], 2, 3 [pp. 277-301], 7 [pp. 14-59], 20.

Topic 11. Pathophysiology of the circulatory system.

Summary of the topic. Circulatory system disorders. Circulatory insufficiency. Heart failure, its pathogenesis. Compensatory processes in cases of heart failure. Vascular failure, its pathogenesis. Heart defects. Arrhythmias. Violations of the physicochemical properties of blood vessels. Violations of blood pressure regulation.

Recommended reading: 1 [pp. 249-284], 2, 3 [pp. 301-323], 4 [pp. 218-232], 5 [pp. 215-235], 7 [pp. 60-'120], 23.

Topic 12. Pathophysiology of the respiratory system.

Summary of the topic. Respiratory system disorders, insufficiency of external and internal respiration, indicators of impaired lung ventilation (hyper- and hypoventilation, uneven ventilation) and central mechanisms of pulmonary respiration regulation, respiratory disorders during lung pathology (bronchitis, pneumonia, hyperemia, disease, physema), respiratory disorders due to impaired lung perfusion. Types of hypoxia, compensatory changes in cells and tissues during hypoxia (cyanosis, metabolic changes), the effect of hypoxia on the nervous and cardiovascular systems, kidneys.

Recommended reading: 1 [pp. 285-318], 2, 3 [pp. 262-270, 327-338], 4 [pp. 234-271], 5 [pp. 236-280], 7 [pp. 121-180], 22.

Section 4. Pathophysiology of organs and systems. Pathophysiology of digestive, urinary, nervous diseases and endocrine system

Topic 13. Pathophysiology of digestion.

Summary of the topic. The main causes and manifestations of digestive pathology. Pathophysiology of digestion in the single-chamber stomach and abomasum, hypo- and hyperacid state, gastritis. Digestive disorders in the ruminant antrum. Disorders of motor, secretory, absorption and excretory functions of the intestines, pathogenesis of dyspepsia. Disorders of the secretory function of the pancreas. Pancreatitis. Inflammatory processes of the gastrointestinal tract.

Recommended reading: 1 [pp. 319-341], 2, 3 [pp. 339-347], 4 [pp. 272-289], 5 [pp. 281-310], 7 [pp. 181-245].

Topic 14. Pathophysiology of the disease.

Summary of the topic. Etiology and pathogenesis of the development of major pathologies in the liver (hepatitis, hepatosis, cirrhosis, cholelithiasis). Icteric syndrome (jaundice). Etiology, pathogenesis and indicators of heart failure.

Recommended reading: 1 [c. 342-362], 2, 3 [c. 350-364], 4 [p. 290-299], 5 [p. 311-354], 7 [p. 246-300].

Topic 15. Pathophysiology of the urinary system.

Summary of the topic. General characteristics of renal dysfunction. Disorders of the functions of the glomeruli of nephrons and tubules, the processes of filtration,

reabsorption, secretion and excretion. The concept of renal failure. Acute and chronic renal failure. Uremia. General characteristics of the main syndromes and diseases of the kidneys (acute and painful glomerulonephritis, nephrotic syndrome, pyelonephritis). Urolithiasis, urethritis, cystitis.

Recommended reading: 1 [c. 363-391], 2, 3 [c. 365-379], 4 [p. 300-311], 5 [p. 355-4020], 7 [p. 301-357].

Topic 16. Pathophysiology of the nervous system.

Summary of the topic. Common causes of nervous system dysfunction. Dysfunction of nerve cells, conductors, inhibitory, adrenergic and cholinergic synapses. Pathological parabiosis and dominance. Disorders of motor function of the nervous system. Paralysis and paresis. Hyperkinesis. Ataxia. Asthenia. Astasis. Sensitivity disorders (hypoesthesia, hyperesthesia, anesthesia, paresthesia). Pain, its visibility, pathogenesis and significance for harmful substances. Nociceptive and antinociceptive mechanisms of pain reaction. Stress as a general adaptation syndrome. Disorders of higher nervous activity. Neuroses in animals.

Recommended reading: 1 [pp. 392-407], 2, 3 [pp. 402-413], 4 [pp. 312-320], 5 [pp. 311-334], 7 [pp. 358-412].

Topic 17. Pathophysiology of the endocrine system.

Summary of the topic. General characteristics of disorders of neuroendocrine regulation of system and organ functions. Syndromes and symptoms of neuroendocrine diseases of animals.

Recommended reading: 1 [pp. 408-420], 2, 3 [pp. 380-401], 5 [pp. 335-480], 7 [pp. 413-520].

4 Structure of the academic discipline

Name sections and topics	Number of hours					
	full-time form					
	Total volume	classroom				Independent work
		total	including			
			lectures	laboratory	practical	
1	2	3	4	5	6	7
Section 1. Pathophysiology as a science. Nosology. Pathophysiology of reactivity and immunity. Disorders of peripheral circulation and microcirculation.						
Topic 1. Pathophysiology as a science. The role of science in the training of a veterinary doctor. Nosology.	14		2	4	-	8
Topic 2. Reactivity. Pathology of reactivity	16		2	6	-	8
Topic 3. Pathophysiology of the cell	10		2	2	-	6
Topic 4. Pathophysiology of peripheral circulation and microcirculation	20		2	10		8
Total for section 1	**60**		**8**	**22**	**-**	**30**
Section 2 Typical Pathological Processes. Inflammation. Fever. Pathology of Tissue Growth Metabolic Disorders						
Topic 5. Pathophysiology remains	14		2	6	-	6
Topic 6. Pathophysiology of thermal regulation. Fever.	12		2	4	-	6
Topic 7. Pathophysiology of tissue growth. Tumors.	14		2	6	-	6
Topic 8. Violations of water and electrolyte metabolism. Edema, dropsy.	12		2	4	-	6
Topic 9. Metabolism and energy disorders.	8		-	2	-	6
Total for section 2	**60**		**8**	**22**		**30**
Section 3. Pathophysiology of organs and systems. Pathophysiology of the blood, circulatory and respiratory systems						
Topic 10. Pathophysiology of the blood system.	22		4	8	-	10
Topic 11. Pathophysiology of the circulatory system.	20		2	6	-	12
Topic 12. Pathophysiology of the respiratory system.	18		2	4	-	12
Total for section 3	**60**		**8**	**18**		**34**
Section 4. Pathophysiology of organs and systems. Pathophysiology of						

digestive , urinary, nervous diseases and endocrine system						
Topic 13. Pathophysiology of the digestive system.	14		2	8	-	4
Topic 14. Pathophysiology of the disease.	14		2	10	-	2
Topic 15. Pathophysiology of the urinary system.	12		2	6	-	4
Topic 16. Pathophysiology of the nervous system	12		2	6	-	4
Topic 17. Pathophysiology of the endocrine system	8		-	4		4
Total for section 4	**60**		**8**	**34**	**-**	**18**
Total hours	**240**		**32**	**96**	**-**	**112**

5 Lectures

№	Name of the lesson topic	Hours
Section 1. Pathophysiology as a science. Nosology. Pathophysiology of reactivity and immunity. Disorders of peripheral circulation and microcirculation		
1	Pathophysiology as a science. General doctrine of disease as a higher form of pathology. General nosology.	2
2	Pathophysiology of the cell.	2
3	Reactivity of harmful substances and its significance in pathology. Violation of immunological reactivity of you. immunodeficiency. Pathological immunological tolerance. Allergy.	2
4	Pathophysiology of peripheral circulation and microcirculation.	2
Section 2 Typical Pathological Processes. Inflammation. Fever. Pathology of Tissue Growth Metabolic Disorders		
5	Inflammation: etiology, pathogenesis, types.	2
6	Fever. Definition of the concept, general characteristics.	2
7	Pathology of tissue growth. Tumors.	2
8	Disturbances of water and electrolyte metabolism. Edema, dropsy.	2
Section 3. Pathophysiology of organs and systems. Pathophysiology of the blood, circulatory and respiratory systems		
9	Pathological physiology of the blood system. Anemias.	2
10	Pathological physiology of the blood system. Leukemias.	2
11	Pathological physiology of the circulatory system. General characteristics of circulatory system disorders.	2
12	Pathological physiology of the respiratory system.	2
Section 4. Pathophysiology of organs and systems. Pathophysiology of digestive, urinary, nervous diseases and endocrine system		
13	Pathological physiology of the digestive system.	2
14	Pathological physiology of the disease.	2

15	Pathological physiology of the kidneys.	2
16	Pathological physiology of the nervous and endocrine systems.	2
	Total	32

6 Laboratory activities

№	Name of the lesson topic	Hours
Section 1. Pathophysiology as a science. Nosology. Pathophysiology of reactivity and immunity. Disorders of peripheral circulation and microcirculation		
1	Experiment as the main method of studying pathophysiology. Hypoxia, its types. Mechanisms of hypoxia development and consequences. Compensatory phenomena in hypoxia. Modeling of acute hypoxia.	2
2	The effect of pathogenic factors of the external environment. The effect of high and low temperatures on the body. The effect of pathogenic factors of the external environment. Pathogenic effect of atmospheric pressure, electric current.	2
3	Pathophysiology of the cell. Changes in the physicochemical properties of tissue during damage. apoptosis	2
4	Nonspecific factors of protection of factors. Barrier adaptations of harmful substances. Mechanisms of sanogenesis. Mucilaginous seeds and their role in sanogenesis.	2
5	Allergy. Anaphylactic shock and Arthus phenomenon	2
6	Phagocytosis. Infectious process.	2
7	Peripheral circulation and microcirculation disorders. Hyperemia, ischemia	2
8	Peripheral circulation and microcirculation disorders, embolism, stasis, thrombosis.	2
9	Peripheral circulation and microcirculation disorders. Rheological properties of blood and their role in microcirculation disorders.	2
10	Peripheral circulation and microcirculation disorders. Bleeding, hemorrhages, heart attacks	2
11	Final lesson for Section I. Writing test tasks, solving situational problems, oral interview	2
Section 2 Typical Pathological Processes. Inflammation. Fever. Pathology of Tissue Growth Metabolic Disorders		
12	Experimental modeling in fact. Vascular changes of the inflammatory process	2
13	Types of exudate. Properties of purulent exudate	2

14	Mechanisms of proliferation. The proliferative type is very. Productive, it is visible	2
15	Fever. Features of the basic metabolism in laboratory animals in case of fever. Pyrogenic substances as the main criterion for the occurrence of a febrile reaction	2
16	Fever. Study of the features of neurohumoral regulation in the development of the febrile process. Dependence of the nature of the febrile reaction on the state of the nervous system.	2
17	Pathology of tissue growth. Hypertrophy, hyperplasia.	2
18	Tumors. Microscopic examination of smears. Classification of the solution by tissue type. Pathogenesis of the clinical process. The impact of legislation on the body.	2
19	The impact of legislation on the body. Tumors of epithelial, nervous, melanin-forming tissue. Multimedia demonstration of the development of the state.	2
20	Violation of basic metabolism.	2
21	Disturbances of water and electrolyte metabolism Edema	2
22	Disorders of carbohydrate and lipid metabolism. Disorders of protein metabolism.	2
Section 3. Pathophysiology of organs and systems. Pathophysiology of the blood, circulatory and respiratory systems		
23	Pathophysiology of the blood system. Determination of the number of blood parameters (erythrocytes and hemoglobin) using a spectrophotometer. Determination and analysis of hematocrit.	2
24	Red blood cell indices in various pathologies. Study of qualitative and quantitative changes in erythrocytes in anemias. Microscopic studies of animal blood smears in various pathologies.	2
25	Changes in white blood cell parameters in various diseases. Study of changes in the qualitative and quantitative composition of leukocytes. Determination of leukoformula.	2
26	Study of blood picture in various forms of leukemia. Changes in white blood cell counts in leukemia.	2
27	Pathophysiology of the circulatory system. Heart failure	2
28	Pathophysiology of the circulatory system. Cardiac arrhythmias	2
29	Etiology and pathogenesis and clinical manifestations of coronary heart disease in animals. Compensation for coronary heart disease	2

30	Pathophysiology of the respiratory system. Disorders of external respiration. Types of dyspnea. Respiratory failure Atelectasis, emphysema and pneumothorax.	2
31	Test control work, solving situational problems, oral interview	2
Section 4. Pathophysiology of organs and systems. Pathophysiology of digestive, urinary, nervous diseases and endocrine system		
32	Pathophysiology of the digestive system. Gastric digestion disorders.	2
33	Pancreatic secretion disorders.	2
34	Violation of bile secretion and intestinal juice secretion	2
35	Test control work, solving situational problems.	2
36	Study of functional indicators of the disease in its diseases	2
37	Pathogenesis of various types of jaundice in animals	2
38	Inflammatory and dystrophic processes in the liver (hepatitis, hepatosis, cirrhosis)	2
39	Gallstone disease, etiology and pathogenesis.	2
40	Test control work, solving situational problems.	2
41	Pathophysiology of the urinary system and kidneys. Renal dysfunction in nephritis and nephrosis. Renal failure. Uremia.	2
42	Urolithiasis. Types of kidney stones. Cylindruria. Types of cylinders. Microscopy of urine sediment.	2
43	Test control work, solving situational problems.	2
44	Pathophysiology of the nervous system. Functional disorders of nervous activity. Hyper and hypokinesias. Convulsions, their causes and pathogenesis.	2
45	Sensory and motor disorders in nervous pathologies, multimedia demonstration.	2
46	Nervous complications in various pathologies in animals.	2
47	Pathophysiology of the endocrine system. Causes and pathogenesis of endocrine disorders in animals.	2
48	Test control work, solving situational problems.	2
	Total	96

7 Independent work

№	Topic name	Hours
	Section 1. Pathophysiology as a science. Nosology. Pathophysiology of	

1	**reactivity and immunity. Disorders of peripheral circulation and microcirculation.**	
	The main historical stages of the development of pathophysiology.	2
	Pathogenetic effects on the body of various types of radiation (ultraviolet, infrared, ionizing X-rays), laser, atmospheric pressure.	2
	Etiotropic principle of prevention and therapy. Pathogenetic principle of therapy.	2
	Antibodies, their meaning, structure and classification. Immunity. Types of immunity. Mechanisms of immune response formation. Immunological tolerance. Immunological memory.	6
	Allergic reactions of the free type. Autoallergy. Paraallergy. Idiosyncrasy.	4
	The main mechanisms of cell damage. Hereditary diseases of animals caused by gene mutations. Changes in the body during aging.	4
	Mechanisms of stopping bleeding. Causes of blood clotting disorders. Rheological properties of blood and their role in microcirculation disorders.	6
	Etiology and pathogenesis of DIC syndrome (disseminated intravascular coagulation syndrome). Thrombophlebitis, varicose veins.	4
2	**Section 2. Typical pathological processes. Inflammation. Fever. Pathology of tissue growth. Metabolic disorders.**	
	The main theories explaining the genesis and significance for all this. The role of I. I. Mechnikov in the science of feedback. Chemotaxis factors. Neuroendocrine and immune mechanisms of regulation of the inflammatory process. Developmental features manifested in animals of different species.	4
	Mechanisms of proliferation. The proliferative type is very.	4
	The dependence of the development of fever on the reactivity of harmful substances.	4
	Hyperbiotic processes, regeneration and metabolism in regenerated tissue. Features of differences from normal tissues (biochemical, antigenic, functional atypia).	4
	Distribution of statistics in animals. Reactivity of harmful substances and blastomogenesis. Blastomatous cachexia.	2
	Classification and characterization of hazards.	4
	Fasting, its types. Complete fasting (causes, pathogenesis and main manifestations, metabolism, organs and systems during fasting). Incomplete fasting (causes, pathogenesis	4

	and main manifestations). Partial fasting (carbohydrate, protein, fat, vitamin, etc.). Therapeutic fasting, diet therapy.	
	The main causes of carbohydrate metabolism disorders. Cholesterol metabolism disorders. Causes of protein synthesis disorders in the body. Hyperazotemia. Disturbances in the activity of intracellular and extracellular enzymes. Fermentopathies in animals.	4
Section 3. Pathophysiology of organs and systems (blood, circulation, respiration)		
3.	Etiology and pathogenesis of blood. Compensatory (urgent and long-term) mechanisms in case of blood loss. Blood transfusion. Hematotransfusion shock.	4
	Violations of hemostasis. Hemophilia and features of its manifestation in animals. Violations of the blood clotting process in leukemia (hemorrhagic syndrome).	4
	Impaired functions and reactivity in leukemia.	4
	Pathology of platelets. Etiology and pathogenesis of thrombocytopathies. Changes in the physicochemical properties of blood.	4
	Myocardial fatigue due to its overload with excess volume and additional resistance to blood ejection. Neurogenic damage to the heart. Coronarogenic and non-coronary damage to the myocardium.	4
	Circulatory insufficiency in case of impaired blood flow to the heart. Violation of the physicochemical properties of blood vessels. Hypotension. atherosclerosis. Determination of total cholesterol in the blood serum of animals. Study of the causes and mechanisms of the development of hypo- and hypertension.	4
	Pericardial pathology.	2
	Respiratory function disorders caused by pathological changes in the structure and damage to the chest and respiratory muscles. Respiratory disorders due to impaired perfusion.	4
	Impairment of non-respiratory lung functions. The effect of hypoxia on the functions of the nervous, cardiovascular, respiratory and visual systems.	4
Section 4. Pathophysiology of organs and systems (digestive, diseases, renal, nervous, endocrine)		
4	Digestive disorders in the oral cavity. Main pathological processes in the oral cavity.	2

	Ulcerative colitis (etiology of celiac disease). Hormones of the digestive system, disorders of their regulatory functions (make a table).	2
	Digestive disorders in the ruminant antrum. Disorders of fermentation of the contents in the antrum: causes and consequences. Changes in the motor function of the antrum. Ruminal overflow. Tympania. Disorders of the antrum function in case of traumatic reticulitis.	2
	Pancreatic dysfunction. Causes and types of pancreatitis.	2
	Impairment of the barrier function of the disease. Impairment of metabolism of substances and energy in case of damage by the disease. The effect of bile components on the body in mechanical jaundice. Gallstone disease.	2
	Disturbances of neurohumoral regulation of urine formation and excretion. Extrarenal and renal factors of kidney damage. Pathogenesis of renal inflammation.	2
	Causes and mechanisms of development of urolithiasis in animals. Consequences of impaired non-diuretic kidney functions (arterial hypertension, anemia, impaired blood coagulation). Mechanism of renal hypertension. Quantitative and qualitative indicators of impaired diuresis.	2
	Nerve trophism and dystrophic process. Biochemical, structural and functional changes in denervated tissues. Nervous disorders in poisoning with neurotropic substances of various origins. Pathological pain, its significance for the body. Antinociceptive system, its significance in the pathogenesis of the disease.	2
	Endocrine disorders in animals. Dysfunctions of the hypothalamus, pituitary gland, pineal gland. Dysfunctions of the thyroid gland and parathyroid glands. Dysfunctions of the adrenal glands. Dysfunctions of the gonads.	2
	Total	**112**

8 Teaching methods

1. Lectures.
2. Laboratory classes.
3. Independent studies.

9. Control methods

- ❖ oral interview;
- ❖ test control;

- ❖ backfill;
- ❖ exam

During the current and final control of the assessment of learning outcomes in the discipline, there are standardized computer tests.

The final semester control (credit) is carried out based on the sum of the actually scored rating points from the current control and the individual educational and research task.

The current period during the semester by means of a survey (oral or test), as well as checking the quality of the independent work test.

When selecting the criteria for assessing the student's mastery of the discipline program, the program implementation and preparation of material in terms of lecture and laboratory tasks, as well as the performance of independent work provided for by the program, were taken into account.

All types of control (oral questioning, written questioning, test questioning) are closely related and organized in such a way as to stimulate effective independent work of applicants and ensure an objective assessment of the level of their knowledge.

After completing the study of the discipline (part of the discipline), the final test result in the test group (credit) and the applicant can score from 60 to 100 points inclusive at the control points during the semester.

10. Distribution of points obtained by applicants (credit)

In the process of studying the course, the success of applicants is determined by conducting ongoing and final controls (credit and exam).

Current testing, answers in class and control of independent work		Total points
Section 1	Section2	
T1-4	T5-9	**60-100**
0-100	**0-100**	

T__, T__... T__ – topics of sections.

The grade that a higher education applicant receives for conducting an intermediate (current) control (CurC) consists of the points that the applicant receives during testing (T), which are 30%; the points that the applicant receives during activity in classes (Cl), which are 40%; and the points for mastering the independent work block (InW), which are 30%.

$$CurC = \mathbf{T}x\mathbf{0,3}+\mathbf{Cl}x\mathbf{0,4}+\mathbf{InW}x\mathbf{0,3}$$

In each section of the educational component, current control is carried out (**current control** - CurC).

For applicants in the fall (spring) semester, when the final knowledge test is completed with an undifferentiated credit (UDC), the final sum of points (UDC points) is the arithmetic average of the points of the four current tests of the fall (spring) semester:

UDC points = **(**CurC **1+** CurC **2) / 2**

Based on the results of the semester control, the applicant's transcript is assigned a "pass/fail" grade on the national scale.

11. Distribution of points obtained by applicants (exam)

Ongoing testing and independent work				Total points	
Section 1	Section 2	Section 3	Section 4		
T1-4	T5-9	T10-12	T13-17	According to the results of the sections (P)	Exam (E)
0-100	0-100	0-100	0-100	((T 1 + T 2 + ... T 17) /n)x60%	Ex40%
Overall rating score (GRO = P+E)				**60-100**	

T 1 , T 2 ... T 17 – Section topics,
n – number of topics.

The final control of the academic performance of applicants is carried out in the form of an exam based on the results of computer testing. The exam grade for the educational component (discipline) is determined on a 100-point scale.

The exam grade (EG) is 40% of the total final grade (FG).

EG = ETS x 0,4

where: ES – exam score; ETS– exam testing scores, which account for 40% of the points scored during exam testing.

The final grade for the discipline is given on a 100-point scale. It is calculated as the average arithmetic value (AAV) of all the grades received by the student from the current control (CurC) of the assimilation of the material of the sections, with their subsequent conversion into points according to the following formula:

AAV = (CurC section1 **+** CurC section.2 **+** CurC section.3 **+** CurC section.4**) /** 4

CurCS = AAV x 0,6

where: CurCS – current control scores, which make up 60% of the total final score; AAV is the arithmetic average value of all grades received by the student from the current control

The applicant can score up to 60 points inclusive at the control points of the mastery of the sections within 2 semesters.

Thus, the final grade (FG) is calculated using the formula:

FG = EG + CurCS

The results of the tests are displayed in the SBTU Moodle system. All forms of control are included in the 100-point assessment scale.

12. Scale: national and ECTS and criteria assessment to determine the level of knowledge and skills

The control of students' knowledge and skills in the discipline is carried out based on the use of the transfer system and the accumulation of European ECTS credits.

Main provisions:

The total number of current tests that a student must pass in a discipline is based on the number of credits in the discipline.

Based on the results of the current control event, the student's level of mastery of the educational material is assessed according to the national scale and the *ECTS scale.*

The number of points received by the student in the final assessment corresponds to the grades on the national scale and the **ECTS scale** in accordance with Table 1.

1. Rating scale

100-point scale	**National scale**	**interpretation**	**ECTS scale**
90 – 100	excellent	**Excellent -** excellent answer, the work is fulfilled with only a small number of errors	**A**
82 – 89	good	**Very well-** above average with a few errors	**B**
74 – 81		**Well -** in general the correct answer, the work with a certain number of serious errors	**C**
64 – 73	satisfactory	**Satisfactorily –** not bad, but with big number of errors	**D**
60 – 63		**Quite satisfactorily –** the work meets the minimum criteria	**E**
35– 59	unsatisfactory	**Unsatisfactorily –** with the possibility to pass again	**FX**
0-34		**Unsatisfactorily –** with compulsory passing of the work once again	**F**

Passing the current tests is mandatory. The section is assessed as passed if the student scores the minimum required number of points or more.

The results of the rating from the section are provided to students no later than the third working day after the control event and, in the event of any complaints from students, are considered final.

If a student disagrees with the decision to assign him rating points for a section, he must immediately after their announcement send a written application to the head of the department and within the specified period take an oral certification of the section before the commission. The composition of the appeal commission in each specific case is determined by the head of the department. The decision of the commission is final.

A student who did not appear for the current examination has the right to take the missed current examination during the assessment week.

The final rating of the current performance in the discipline is calculated in the middle of the ratings from all sections. The semester grade is given to the student taking into account the results of the final and current control. The maximum number of points that a student can receive when studying the discipline is 100.

The exam involves a final test. If permission is granted for automatic crediting of the test, a student who has temporarily passed all current tests and has been

certified with an "excellent" grade based on their results may receive a credit automatically. The semester grade in this case is the average grade for the sections.

The teacher is obliged to submit the completed assessment and examination report to the academic department within the following deadline: for the exam - no later than the next working day after its completion.

The mastery of the independent work block was assessed on a scale in accordance with the following regulations (Table 2)

Table 2.

Independent work assessment SCALE

Evaluation criteria (100-point system, oral interview).

No.	Criteria	Maximum number of points	Description
1	Full answer	30 points	The answer covers all the main aspects of the question, revealing its content in accordance with the curriculum.
2	Correctness and accuracy of presentation	20 points	The answer contains no factual, logical, or terminological errors.
3	Consistency and logic	10 points	The answer is logically structured, without incoherent or chaotic fragments.
4	Language and style of presentation	10 points	The expression is competent, clear, using professional terminology.
5	Independence of thinking	10 points	The student demonstrates the ability to draw their own conclusions, analyze, compare, and give examples.
6	Additional knowledge (according to the main program)	10 points	The answer contains links to modern sources, interdisciplinary connections, and the latest data.
7	Ability to answer additional questions	10 points	The student confidently responds to the teacher's clarifying or probing questions, providing additional arguments or examples.

For conversion of grades on a 100-point scale to the national scale and ECTS scale, see the table:

Total points for all types of learning activities	Mark according to ECTS scale	Mark according to national scale
90 – 100	A	perfectly
82 – 89	B	good
74 – 81	C	
64 – 73	D	satisfactorily
60 – 63	E	
35 – 59	FX	unsatisfactory with the possibility of reassembly
0 – 34	F	unsatisfactory with mandatory re-study of the discipline

Activity on concepts was assessed on a scale with a maximum of 100 points in accordance with the following regulations (Table 3)

Table 3.

ACTIVITY ASSESSMENT SCALE IN CLASSES

ECTS scale	National scale	Points	Score interpretation
A	**Excellent**	**90-100**	The student actively works in the course of the course, gives complete answers to the teacher's questions and shows a deep mastery of the material, is able to express his own opinion when discussing situational tasks, shows the ability to independently and reasonedly present the material, analyze the identified facts, make independent generalizations and conclusions, correctly complete the educational tasks, has a full synopsis of the theoretical material. regular visit to the Moodle system
B	**Very well**	**82-89**	the student is actively working during the lessons, the questions are fully covered, the presentation of the material is logical, substantiated by facts, with references to literary sources, the coverage of questions with completed conclusions, the students' ability to analyze facts and events, as well as to complete educational tasks. But the answers contain inaccuracies, some minor errors, the presence of a full summary of the theoretical material, regular visit to the Moodle system
C	**Well**	**74-81**	The student is actively working during the lessons, the questions are fully covered, the

			presentation of the material is logical, substantiated by facts, with references to literary sources, the coverage of questions with complete conclusions, the students have the ability to analyze facts and events, as well as perform educational tasks. However, there are inaccuracies in the answers, some minor errors, there is insufficient reasoning when presenting the material, there is an incomplete synopsis of the theoretical material, partial access to the Moodle system
D	**Satisfactorily**	**64-73**	The student in all areas covers issues on the topic, demonstrates knowledge of lecture material and educational literature, tries to analyze facts and events, draw conclusions and solve situational problems. But in class, he behaves passively, responds only to the teacher's call, gives incomplete answers to questions, makes gross errors in covering theoretical material, incomplete notes on theoretical material, partial access to the Moodle system.
E	**Quite satisfactorily**	**60-63**	the student lacks understanding of the main essence of the question, conclusions, generalizations, demonstrated inability to solve situational problems, incomplete note-taking of theoretical material, partial access to the Moodle system.
FX, F	**Unsatisfactorily**	**0-59**	lack of desire to participate in the issues discussed, lack of notes, irregular visits to the Moodle system

Example: a student wrote the test tasks of the current control for 85 points. Multiply by 0.3. The result for the test is 25.5 points. For independent work, the student received 88 points. Multiply by 0.3. The result for it is 26.4 points. For activity on concepts - the student received 74 points. Multiply by 0.4. We get 29.6. The total number of points for the current control is 81.5 points. We average towards a larger number and get 82 points, which is equal to good B.

Regarding the student's final assessment, the results obtained for the student's current work (average grade for section 4, multiplied by 0.6) and the final test (multiplied by 0.4) need to be taken into account.

Example: Section I – 83 points, Section II – 95 points, Section III – 73 points, Section IV – 88 points. The sum of the points for the section is 339 / 4 = 84.75 (85) points – this is the average value. Next, 85 × 0.6 = 51 points. The student wrote the final exam with 91 points. 91×0.4 = 36.4 points. Therefore, the total number of points for the discipline is 51.0 + 36.4 = 87.4. We average towards a smaller number and get 87 points, which is equal to a good or B grade.

13. Methodological support

1. Pathological physiology. Workbook for laboratory and practical classes / Zhukova I.O., Kostyuk I.O., Kochevenko O.S., Bobrytska O.M., Vodop'yanova L.A., Antipin S.L., Yugai K.D., Kharkiv: SBTU, 2023. 112 p.

14. Recommended reading

1. Pathologic Basis of Veterinary Disease Expert Consult, 6th Edition: Zachary [*Source*: https://www.elsevier.ca/toc.jsp?isbn=9780323357753] and **[***Source*: http://evolve.elsevier.com/Zachary/McGavin/]

2. Robbins basic pathology / [edited by] Vinay Kumar, Abul K. Abbas, Jon C. Aster. – 9th ed. 2013 [*Source*: studentconsult.com]

3. Anatomy and Physiology of Animals/Nervous System. *Source*: http://en.wikibooks.org/w/index.php?oldid=1983931 *Contributors*: Adrignola, Jomegat, Recent Runes, Rlawson, Sunshineconnelly, 6 anonymous edits.

4. Color Atlas of Pathology. - Edited by J.E.van Dijk, E. Gruys and J.M.V.M. Mouwen. - 2007, Elsevier Limited. All rights reserved. [*Source*: htrpv/www.elsevier.com].

5. Textbook of veterinary physiology. / James G Cunninghum, Bradley G. Klein.– 2007 . [*Source*: htrpv/www.evolve.elsevier.com/ Cunninghum/ physiology] and [www.Elib4vet.com]

- Online textbook on Veterinary Clinical Pathology [http://eclinpath.com/] Veterinary Phisiology and applied Anatomy [*Source*: www.Elib4vet.com]
- Usefull resources: [https://vetbooks.ir/publish-year/2019/]Canine and Feline Respiratory Medicine, 2nd Edition [https://vetbooks.ir/canine-and-feline-respiratory-medicine-2nd-edition/]
- Veterinary Hematology: Atlas of Common Domestic and Non-Domestic Species, 3rd Edition [https://vetbooks.ir/veterinary-hematology-atlas-of- common-domestic-and-non-domestic-species-3rd-edition/]
- Hypertension in the Dog and Cat [https://vetbooks.ir/hypertension-in-the-dog-and-cat/]
- Sheep, Goat, and Cervid Medicine, 3rd Edition [https://vetbooks.ir/sheep-goat-and-cervid-medicine-3rd-edition/]
- Diseases of Poultry, 14th Edition [https://vetbooks.ir/diseases-of-poultry-14th-edition/]
- Withrow and MacEwen's Small Animal Clinical Oncology, 6th Edition [https://vetbooks.ir/withrow-and-macewens-small-animal-clinical-oncology- 6th-edition/]
- Handbook of Foodborne Diseases [https://vetbooks.ir/handbook-of-foodborne-diseases/]
- The Clinical Chemistry of Laboratory Animals, 3rd Edition [https://vetbooks.ir/the-clinical-chemistry-of-laboratory-animals-3rd-edition/]
- The Ethical Case Against Animal Experiments [https://vetbooks.ir/the-ethical-case-against-animal-experiments/]

15 Electronic information resources

1. Online textbook on Veterinary medicine Clinical Pathology [http://eclinpath.com/]
2. Canine and Feline Respiratory Medicine, 2nd Edition https://vetbooks.ir/canine-and-feline-respiratory-medicine-2nd-edition/]
3. Hypertension in that/that/that Dog and Cat [https://vetbooks.ir/hypertension-in-the-dog-and-cat/] .
4. http://moodle.btu.kharkiv.ua/course/view.php?id=467

16 Amendments and additions

(to methodological support and recommended literature)

What is removed from the work program	What is entered in the work program	Date of review department