

**NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL
SCIENCES OF UKRAINE**
Department of Veterinary Surgery named after Academician I.O. Povazhenko

“ APPROVED ”
Faculty of Veterinary Medicine
« 01th » of June 2026

CURRICULUM OF THE ACADEMIC DISCIPLINE
"ANIMAL PATHOPHYSIOLOGY"

Field of Study 21 "Veterinary"

Specialty 211 "Veterinary Medicine"

Academic programme "Veterinary Medicine"

Faculty of Veterinary Medicine

Developed by: Yuliia PARAMONOVA, Assistant, Doctor of Philosophy (PhD)

(First Name SURNAME, academic position, academic degree, academic title)

Kyiv – 2026

Description of the Academic Discipline. Within the curriculum for training specialists in the field of "Veterinary Medicine," the academic discipline "Animal Pathophysiology" occupies an intermediate position between foundational and clinical disciplines. It transforms the knowledge and skills acquired by the higher education student during the study of general natural and foundational sciences.

The discipline aims to elucidate the functional disorders within the body that arise during disease. These disorders are closely linked to the body's structure and determine the manifestation of various signs and parameters critical for the clinical study of disease. Functional impairment, in turn, results from metabolic changes within an individual cell—meaning quantitative changes that precede qualitative disruptions of structure and function. A profound comprehension of the mechanism of these changes, which carry both a destructive and, simultaneously, a protective-adaptive character in the organism in response to the damaging effect of any factor, serves as the key to unraveling many mysteries of organismal biology. Consequently, it leads to scientifically grounded measures for the diagnosis, prevention of these disorders, and the treatment of the diseased animal.

Field of study, specialty, educational program, degree level		
Degree level	<i>«Master's»</i>	
Specialty	<i>211 "Veterinary Medicine"</i>	
Educational program	<i>"Veterinary Medicine"</i>	
Characteristics of the academic discipline		
Type	Compulsory (Mandatory)	
Total number of hours	180	
Number of ECTS credits	6	
Number of content modules	4	
Course project / paper:	--	
Form of assessment	<i>credit test / exam</i>	
Parameters of the academic discipline for full-time, part-time, and distance learning modes of higher education		
	Mode of higher education	
	full-time	part-time / distance
Year of study (training)	3	None
Semester	5 - 6	None
Lectures	<i>45 hours</i>	None
Practical classes / seminars	None	None
Laboratory classes	<i>90 hours</i>	None
Independent study	<i>45 hours</i>	None
Weekly classroom hours (full-time)	<i>5 semester – 5 hours</i> <i>6 semester – 4 hours</i>	None

1. Goal, competencies and program learning outcomes of the discipline

Goal – knowledge of the main regularities of the emergence, development and completion of pathological phenomena (disease). To consider pathological phenomena from the standpoint of dialectical materialism, the main stages of pathophysiology development, its achievements; connection with other disciplines; to highlight the importance of pathological physiology for the preventive direction in veterinary medicine; the value of pathological physiology for higher veterinary education and the development of scientific thinking of a veterinarian. To bring the higher education student closer to understanding and interpreting the deep pathogenetic mechanisms in the development of disease, which manifest in the organism in the process of disease emergence. To study the mechanisms of adaptation and compensation in pathological processes and injuries. On concrete examples to show the importance of experimental methods in the study of pathological phenomena.

List of academic disciplines that precede the study:

CC 5 Genetics.

CC 14 Anatomy of domestic animals.

CC 15 Cytology, histology, embryology.

CC 16 Principles of animal breeding.

CC 17 Veterinary microbiology.

CC 18 Animal biochemistry with principles of physical colloid chemistry.

CC 19 Animal physiology.

CC 20 Animal feeding.

CC 21 Veterinary immunology.

CC 22 Veterinary virology.

Acquisition of competencies:

integral competence (IC):

Ability to solve complex tasks and problems in the field of veterinary medicine, which involves conducting research and/or implementing innovations and is characterized by uncertainty of conditions and requirements.

general competencies (GC):

GC 7. Ability to conduct research at the appropriate level.

GC 8. Ability to learn and master modern knowledge.

GC 9. Ability to make grounded decisions.

GC 13. Ability to make decisions and act in compliance with the principle of inadmissibility of corruption and any other manifestations of dishonesty.

special (professional) competencies (PC):

PC 1. Ability to establish features of the structure and functioning of cells, tissues, organs, their systems and apparatuses of the organism of animals of different classes and species – mammals, birds, insects (bees), fish and other vertebrates.

PC 2. Ability to use tools, special devices, instruments, laboratory equipment and other technical means to perform necessary manipulations during professional activity.

PC 7. Ability to organize and conduct laboratory and special diagnostic investigations and analyze their results.

Program learning outcomes (PLO):

PLO 8. To monitor the causes of the spread of diseases of various etiologies and biological pollution of the environment by livestock waste, as well as materials and agents of veterinary purpose.

PLO 11. To summarize and analyze information regarding the effectiveness of the work of veterinary specialists of various subordination.

PLO 17. To know the rules and requirements of biosafety, bioethics and animal welfare.

Day One Competences:

1. To demonstrate understanding of the ethical and legal frameworks within which a veterinarian must work, including professional aspects, aspects related to the welfare of animals, animal owners, public health, societal and environmental aspects related to professional activity.

2. To understand scientific research methods, the contribution of foundational and applied research to science and the implementation of the 3Rs principle (Replacement, Reduction, Refinement).

4. To promote and monitor the preservation of health and safety of oneself, patients, animal owners, colleagues and the environment during professional activity; to demonstrate knowledge of quality assurance principles; to apply risk management principles in practice.

9. To be able to think critically, review and evaluate literature and presentations.

10. To understand and apply the principles of the One Health concept to ensure proper clinical practice in veterinary medicine, as well as scientifically grounded and evidence-based veterinary medicine.

11. To demonstrate the ability to critically analyze evidence, cope with incomplete information, resolve unforeseen situations and adapt knowledge, skills and practical abilities to various production situations.

15. To regularly participate in the processes of self-reflection and peer review in order to increase the efficiency of one's own work and the work of the entire team.

18. To conduct a full clinical examination and demonstrate personal capacity for independent clinical decision-making.

24. To use basic diagnostic equipment and effectively conduct animal examinations according to the specific case, in accordance with good health care and biosafety practice and current regulatory documents. To understand the contribution of digital tools and artificial intelligence to the theory and practice of veterinary medicine.

30. To properly perform aseptic procedures.

31. To safely perform sedation, general and regional anesthesia on an animal; to apply chemical methods of restraint.

32. To assess the state of the animal's pain response, manage pain and prevent pain in the animal proactively.

2. Program and structure of the academic discipline for:

– full-time mode of higher education (term of study 5 years 10 months)
specialty 211 "Veterinary medicine".

Modules and topics	Hours quantity													
	full-time education							part-time education						
	week	total	including					total	including					
			lec	pr	lab	ind	s.st.		lec	pr	lab	ind	s.st.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Module 1. Nosology. Pathogenic effect of environmental factors.														
Topic 1. Introduction. The subject and objectives of pathophysiology in conditions of intensification and specialization of animal husbandry. Methods of pathophysiology. The role of experiment in pathophysiology and main bioethics requirements for the use of warm-blooded animals in experiment. Brief data on the main stages of pathophysiology development.	1	5	2	-	2	-	1		-	-	-	-	-	-
Topic 2. General nosology. General etiology. General pathogenesis.	2	7	2	-	4	-	1		-	-	-	-	-	-
Topic 3. The role of external factors in pathology. Pathogenic effect of physical factors on the organism.	3	9	2	-	6	-	1		-	-	-	-	-	-
Topic 4. Pathogenic effect of chemical and biological factors on the organism.	4	9	2	-	6	-	1		-	-	-	-	-	-
Total Module 1		30	8	-	18	-	4		-	-	-	-	-	-
Module 2. Typical pathological processes.														
Topic 1. Reactivity of the organism and its role in pathology. Allergy.	5	6	2	-	2	-	1		-	-	-	-	-	-
Topic 2. Cell pathophysiology.	6	6	2	-	2	-	1		-	-	-	-	-	-
Topic 3. Pathophysiology of tissue growth. Tumors.	7	7	2	-	2	-	1		-	-	-	-	-	-
Topic 4. Pathophysiology	8	9	2	-	6	-	1		-	-	-	-	-	-

of local circulation. Hyperemia.													
Topic 5. Inflammation: etiology, classification.	9	7	2	-	2	-	1		-	-	-	-	-
Topic 6. Inflammation: pathogenesis and significance for the organism.	10	5	2	-	2	-	1		-	-	-	-	-
Topic 7. Pathophysiology of basal and carbohydrate metabolism.	11	5	2	-	2	-	1		-	-	-	-	-
Topic 8. Pathophysiology of lipid and protein metabolism.	12	5	2	-	2	-	1		-	-	-	-	-
Topic 9. Disorders of water-electrolyte metabolism and acid- base balance. Edemas.	13	5	2	-	2	-	1		-	-	-	-	-
Topic 10. Pathophysiology of starvation.	14	5	2	-	2	-	1		-	-	-	-	-
Topic 11. Pathophysiology of thermoregulation. Fever.	15	6	2	-	3	-	1		-	-	-	-	-
Total Module 2	60	22	-	27	-	11			-	-	-	-	-
Module 3. Pathophysiology of blood circulation and respiratory system.													
Topic 1. Pathophysiology of the blood system.	16-17	10	2	-	8	-	1		-	-	-	-	-
Topic 2. Pathophysiology of the cardiovascular system.	18-19	10	2	-	6	-	2		-	-	-	-	-
Topic 3. Pathophysiology of the respiratory system.	20-21	10	2	-	6	-	1		-	-	-	-	-
Total Module 3	30	6	-	20	-	4			-	-	-	-	-
Module 4. Pathophysiology of organs and systems of the organism.													
Topic 1. Pathophysiology of the digestive system.	22-23	10	2	-	4	-	4		-	-	-	-	-
Topic 2. Pathophysiology of the liver.	24-25	14	2	-	6	-	6		-	-	-	-	-
Topic 3. Pathophysiology of the kidneys.	26-27	14	2	-	6	-	6		-	-	-	-	-
Topic 4. Pathophysiology of the endocrine system, reproductive and lactation systems.	28-29	14	2	-	6	-	6		-	-	-	-	-
Topic 5. Pathophysiology of the nervous system. Concluding lecture.	30	7	1	-	3	-	4		-	-	-	-	-
Total Module 4	60	9	-	25	-	26			-	-	-	-	-

Total hours	180	45	-	90	-	45		-	-	-	-	-
Course project (work) in <small>(if included in the working curriculum)</small>		-	-	-	-	-		-	-	-	-	-
Total hours	180	45	-	90	-	45		-	-	-	-	-

3. Lecture topics

No	Topic	Hours Qty
1.	The subject and objectives of pathophysiology in conditions of intensification and specialization of animal husbandry. Methods of pathophysiology and main bioethics requirements for the use of animals in experiment.	2
2.	General nosology. General etiology. General pathogenesis.	2
3.	The role of external factors in pathology. Pathogenic effect of physical factors on the organism.	2
4.	Pathogenic effect of chemical and biological factors on the organism.	2
5.	Reactivity of the organism and its role in pathology. Allergy.	2
6.	Cell pathophysiology.	2
7.	Pathophysiology of tissue growth. Tumors.	2
8.	Pathophysiology of local circulation. Hyperemia.	2
9.	Inflammation: etiology, classification.	2
10.	Inflammation: pathogenesis and significance for the organism.	2
11.	Pathophysiology of basal and carbohydrate metabolism.	2
12.	Pathophysiology of lipid and protein metabolism.	2
13.	Disorders of water-electrolyte metabolism and acid-base balance. Edemas.	2
14.	Pathophysiology of starvation.	2
15.	Pathophysiology of thermoregulation. Fever.	2
16.	Pathophysiology of the blood system.	2
17.	Pathophysiology of the cardiovascular system.	2
18.	Pathophysiology of the respiratory system.	2
19.	Pathophysiology of the digestive system.	2
20.	Pathophysiology of the liver.	2
21.	Pathophysiology of the kidneys.	2
22.	Pathophysiology of the endocrine system, reproductive and lactation systems.	2
23.	Pathophysiology of the nervous system.	1

4. Laboratory class topics

No	Topic	Hours Qty
1.	Safety measures during work in the educational pathophysiological laboratory and completion of protocols of experimental sessions	2
2.	The role of the experimental method in pathophysiological research. Rules for the use of animals in experiments for educational purposes	2
3.	Reflective reactions of the organism to the action of pathogenic stimuli	2
4.	Barrier systems activity of the body and their role in pathology	2
5.	Pathogenic effect of electric current on the animal body	2
6.	The influence of altered atmospheric pressure on the animal organism	2
7.	Pathogenic effect of high and low temperatures on the animal organism	2
8.	The pathogenic influence of chemical factors on the animal organism	2
9.	The influence of heredity on the onset of diseases	2
10.	Modular control work 1	2
11.	Dependence of reactivity and resistance of the organism on the state of the nervous system	2
12.	Interaction of antigen and antibody	2
13.	Allergy	2
14.	Changes in the physico-chemical properties of tissues upon injury	2
15.	Hyperemia and ischemia	2
16.	Embolism, bleeding, thrombosis, and stasis	2
17.	Vascular and tissue changes during the onset of inflammation	2
18.	Biochemical properties of purulent exudate. The phenomenon of chemotaxis	2
19.	Change in body temperature and basal metabolic rate during fever	2
20.	Disorders of basal metabolism	2
21.	Disorders of acid-base balance	2
22.	Modular control work 2	2
23.	Edemas and dropsies	1
24.	Anemias	2
25.	Leukocytosis and leukocytopenia (leukopenia)	6
26.	Disorders of cardiac activity	6
27.	Pathophysiology of external respiration	4
28.	Modular control work 3	2
29.	Disorders of digestion in the stomach and intestines	4
30.	Pathogenic effect of bile on the organism	6
31.	Disorders of the excretory function of the kidneys	6
32.	The role of endocrine influences on metabolic changes during stress.	4
33.	Modular control work 4	2

34.	Disorders of the reflex activity of the nervous system	3
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5. Self-study topics

No	Topic	Hours Qty
1.	Experimental methodologies in veterinary medicine.	1
2.	Features of macrophages in ensuring homeostasis.	1
3.	Pathogenic effect of ionizing radiation on the animal organism.	1
4.	Pathogenic effect of noise on the animal organism.	1
5.	The role of heredity in the occurrence of pathological processes in animals.	1
6.	Autoantigen. Autoantibodies. Autoallergy.	1
7.	Main cell reactions to injury.	1
8.	Types of bleeding and mechanisms of their occurrence in animals.	1
9.	Inflammatory processes in different animal species.	1
10.	Main theories of the origin of inflammation.	1
11.	Avitaminosis and its effect on the animal organism.	1
12.	Micro- and macroelementoses and their effect on the animal organism.	1
13.	Dropsy, the mechanism of its occurrence.	1
14.	The effect of starvation on the maternal organism.	1
15.	The effect of different types of fever on the animal organism.	1
16.	Leukoses. Etiology, pathogenesis, and classification.	1
17.	Cardiac circulatory failure in different animals.	2
18.	Respiratory system disorders in different animals.	1
19.	Ileuses, their classification and pathogenesis.	4
20.	Disorders of the antitoxic and barrier functions of the liver.	2
21.	Jaundices and mechanisms of their occurrence.	4
22.	Pathogenesis of renal hypertension.	4
23.	Pathogenesis of kidney stone disease (nephrolithiasis).	2
24.	Stress and general adaptation syndrome.	4
25.	Pathogenesis of reproductive and lactation system disorders.	2
26.	Conduction disorders along nerve trunks.	4

6. Methods of assessing expected learning outcomes:

- oral or written examination;
- interview;
- exam;
- credit;
- module tests;

- control works;
- defense of laboratory works.

7. Teaching methods:

- problem-based learning method;
- practice-oriented learning method;
- visual method (method of illustrations, method of demonstrations);
- research-based learning method;
- method of educational discussions and debates;
- method of working with educational and methodological literature;
- provision of additional weekly consultations for higher education students;
- method of preparing presentations and speaking at scientific events;
- independent work (completion of tasks);
- individual research work of higher education students.

8. Assessment of learning outcomes.

Assessment of the higher education student's knowledge is carried out on a 100-point scale and is converted into a national grade according to the current "Regulations on Examinations and Credits at NULES of Ukraine".

8.1. Distribution of points by type of learning activity

Type of learning activity	Learning outcomes	Evaluation
Module 1. Nosology. Pathogenic effect of environmental factors.		
Topic 1. Introduction. The subject and objectives of pathophysiology in conditions of intensification and specialization of animal husbandry. Methods of pathophysiology and main bioethics requirements for the use of animals in experiments.		
Lecture 1.	To know: theoretical provisions: the subject and tasks of pathophysiology; forms of pathological phenomena; definitions of concepts "health" and "disease"; periods of disease development; classification of diseases; termination of the disease, terminal state, clinical and biological death; complete and incomplete recovery; sanogenesis; materialistic and idealistic approaches to studying the essence of the disease and the causes of its occurrence; types of experiment and its characteristics; methods of research that are applied in pathophysiology; methods of disease modeling in a pathophysiological experiment. To be able to: measure arterial pressure in animals; use an electrocardiograph and perform electrocardiography; register respiratory movements; apply cannulas to vessels; use an electrothermometer; prepare a preparation of an isolated heart for registration of its activity; conduct a recording of the work of an isolated heart; perform blood transfusion.	-
Laboratory work 1.		7
Self-study 1.		-
Topic 2. General nosology. General etiology. General pathogenesis.		

Lecture 2.	<p>To know: the essence of the integrity of the organism and its connection with the environment during the assessment of a diseased state; the role of structure and function in pathology; the mechanism of occurrence of reflex reactions and their role in pathology; etiology and pathogenesis; morpho-functional characteristic of the reflex arc, its changes during disease; the essence of regulation during pathology and its difference from the physiological one; features of reactions of isolated organs to pathogenic influence; the essence of adaptation and compensation under physiological conditions and in pathology; morpho-functional characteristic of the barrier systems of the organism; features of the blood-brain, ophthalmic and placental barriers; the barrier function of the skin, mucous membranes, liver, kidneys, lungs; the mechanism of detoxification of xenobiotics by the barrier systems of the organism; the role of histohematic barriers in pathology; features of macrophages in ensuring homeostasis; anatomical-topographic features of the frog's body; the essence of pinocytosis and phagocytosis.</p> <p>To be able to: register respiration in a rabbit; handle corrosive chemical substances; correctly immobilize frogs with an injection into the occipital foramen; insert a tube into the stomach of a rabbit; perform intravenous injections and injections into the heart cavity complying with the rules of asepsis and antisepsics.</p>	-
Laboratory work 1.		7
Laboratory work 2.		7
Self-study 1.		-
Topic 3. The role of external factors in pathology. Pathogenic effect of physical factors on the organism.		
Lecture 3.	<p>To know: the characteristic of the causes and conditions of disease onset from the standpoint of dialectical materialism; the doctrine of disease; the characteristic of the relationship between etiological and pathogenetic factors; the dialectical relationship of cause-and-effect relationships in the pathogenesis of disease; the leading link and vicious circles in pathogenesis; features of nervous-reflex, nervous-humoral, and cellular-humoral mechanisms in disease development; routes of spread of pathogenic agents in the organism; the response of the organism to the action of damaging factors — specific and nonspecific; the role of housing and exploitation of animals in pathology; the damaging effect of mechanical factors; types of electric current used in the national economy; conditions that determine the severity of the damaging effect of electric current; the mechanism of the damaging effect of electric current on the organism.</p> <p>To be able to: assemble an electrical circuit for conducting experiments according to a schematic diagram; fix laboratory animals on the operating table;</p>	-
Laboratory work 1.		7
Laboratory work 2.		7
Laboratory work 3.		7
Self-study 1.		-

	apply and secure electrodes on the animal's body; use measuring instruments, a rheostat, and an electric key; determine the main deviations from the norm in the activity of organs and systems under the influence of electricity; determine the heart rate and respiratory movements; analyze quantitative and qualitative changes in the organism under the influence of electric current.	
Topic 4. Pathogenic effect of chemical and biological factors on the organism.		
Lecture 4.	To know: the main groups of chemical substances, types of their damaging effect on the organism; the mechanism of defense of the organism against the action of chemical substances; local and general action of chemical substances; principles of detection of chemical substances in the organism; selectivity of action of chemical substances; the damaging effect of biological factors. To be able to: analyze the essence of changes occurring in the organism, including both pathological and defense-adaptive, specific and nonspecific, under the influence of various chemical substances; give a comparative assessment of possible mechanisms of detoxification in the organism of poisons of various origins.	-
Laboratory work 1.		7
Laboratory work 2.		7
Laboratory work 3.		7
Self-study 1.		7
Module intermediate control 1.		30
Total Module 1		100
Module 2. Typical pathological processes.		
Topic 1. Reactivity of the organism and its role in pathology. Allergy.		
Lecture 1.	To know: definition of the concept "reactivity"; the relationship of the concepts "reactivity" and "resistance" in pathology; classification of reactivity; factors of reactivity and resistance — specific and nonspecific; characteristic of the immunocompetent system; infectious and non-infectious immunity; cooperation of cells in immunity; the role of the nervous and endocrine systems in reactivity; the role of external and internal environmental factors in reactivity; immunological tolerance; definition of the concepts "allergy", "anaphylaxis", "idiosyncrasy"; types of allergic reactions; local and general manifestation of anaphylaxis; stages of anaphylaxis; the use of allergic reactions in the diagnostics of infectious and invasive diseases; the essence of active and passive sensitization, desensitization and anaphylaxis, and parallergy; features of the course of allergic reactions in different animals; the role of immunological and biochemical factors in the development of allergic reactions. To be able to: use an apparatus for studying hypobaric conditions; perform injections, resuscitation; execute	-
Laboratory work 1.		5
Self-study 1.		-

	intraperitoneal, subcutaneous, intravenous injections on guinea pigs under conditions of asepsis and antiseptics; anatomize animals that have died; determine the clinical state of an animal in norm and pathology.	
Topic 2. Cell pathophysiology.		
Lecture 2.	To know: cell structure, main properties and functions of the membrane, cytoplasm and subcellular structures; the role of the sodium-potassium pump of cells in transmembrane transport in norm and during injury; dislocations and the role of enzyme systems in metabolism and energy in the cell; the role of calcium ions in cell injury; specific and nonspecific pathophysiological manifestations of cell injury; concepts of parabiosis, paranecrosis, necrobiosis, necrosis; lipid peroxidation and membrane damage; lysosomes and their role in the pathogenesis of cell activity disruption after its injury; mitochondria and their role in cell activity in norm and pathology. To be able to: distinguish changes in the hydrophilicity of tissue colloids during their injury.	-
Laboratory work 1.		5
Self-study 1.		-
Topic 3. Pathophysiology of tissue growth. Tumors.		
Lecture 3.	To know: the main forms of tissue growth disruption; the main types of hyperbiotic processes and their characteristic; the main types of hypobiotic processes and their characteristic; tumors their classification and characteristic; theories of tumor origin. Mutations in animal husbandry. To be able to: distinguish mutations; transplant tumors; distinguish changes in tissues during tumors; distinguish types of tumors.	-
Laboratory work 1.		5
Self-study 1.		-
Topic 4. Pathophysiology of local circulation. Hyperemia.		
Lecture 4.	To know: morphofunctional characteristic of the microcirculatory unit; nervous and humoral regulation of blood flow; modern understanding of metabolism between blood and tissues; definition, causes, pathogenesis, signs and consequences of arterial hyperemia, venous hyperemia, ischemia; blood supply of the rabbit's ear; definition, causes, pathogenesis and consequences of embolism, hemorrhage, thrombosis, stasis and conditions that promote their development; types of thrombi; types of infarctions and conditions of their occurrence; modern understanding of blood coagulation and anticoagulation systems; blood coagulation disorders. To be able to: reproduce a model of arterial and venous hyperemia, ischemia, by compressing vessels that bring and drain blood, or by affecting receptors with mechanical and chemical factors; conduct observations of the state of capillary blood flow; analyze the obtained results, coordinating them with knowledge of blood flow, histology, physiology and	-
Laboratory work 1.		5
Laboratory work 2.		5
Laboratory work 3.		5
Self-study 1.		-

	biochemistry; prepare a frog mesentery preparation; perform intracardiac injections.	
Topic 5. Inflammation: etiology, classification.		
Lecture 5.	To know: definition of the concept “inflammation”; causes of inflammation; cause-and-effect relationships in the pathogenesis of inflammation; manifestation of dialectical laws and categories in inflammation; mechanisms of the origin of redness, pain, swelling, high temperature in inflammation; principles of classification of inflammation. To be able to: prepare a frog mesentery preparation, work with a microscope, find the microcirculatory bed.	-
Laboratory work 1.		5
Self-study 1.		-
Topic 6. Inflammation: pathogenesis and significance for the organism.		
Lecture 6.	To know: pathogenesis of inflammation; main changes of tissues in the inflammation zone; definition of the concept “alteration” and its role in inflammation; definition of the concept “vascular reaction”, its stages and role in inflammation; definition of the concept “proliferation” and its role in inflammation. To be able to: prepare a frog mesentery preparation, work with a microscope, find the microcirculatory bed.	-
Laboratory work 1.		5
Self-study 1.		-
Topic 7. Pathophysiology of basal and carbohydrate metabolism.		
Lecture 7.	To know: the definition and essence of metabolism (basal, protein, carbohydrate, fat, water-electrolyte, vitamin, and others); indicators of metabolic disorders; regulation of metabolism and its disorders; classification of hyperglycemia and hyperlipemia; the essence and significance of diabetes mellitus for the organism; the essence and pathogenesis of ketosis in highly productive animals. To be able to: determine the basal metabolism by indirect method.	-
Laboratory work 1.		4
Self-study 1.		-
Topic 8. Pathophysiology of lipid and protein metabolism.		
Lecture 8.	To know: the main stages of lipid and protein metabolism disorders, lipemias and their characteristic; the role of metabolic disorders in the pathogenesis of diseases. To be able to: determine lipid and protein metabolism disorders.	-
Laboratory work 1.		4
Self-study 1.		-
Topic 9. Disorders of water-electrolyte metabolism and acid-base balance. Edemas.		
Lecture 9.	To know: the physiology of water-salt metabolism and its regulation; Starling's law in the development of edema; pathogenetic classification of edemas and the mechanisms of their occurrence; the difference between transudate and exudate; signs and consequences of edemas and their significance for the organism; buffer systems of the organism; types of acidosis and alkalosis; mechanisms of eliminating acidoses and alkaloses; consequences of acidoses and alkaloses for the organism; the role of housing and	-
Laboratory work 1.		4
Self-study 1.		-

	feeding conditions in the occurrence of acidoses and alkaloses. To be able to: model congestive and osmotic edemas; analyze the obtained results; distinguish congestive edemas from osmotic and membranogenic ones; determine the type and degree of acid-base balance disorders; analyze the obtained results, as well as changes in the organism.	
Topic 10. Pathophysiology of starvation.		
Lecture 10.	To know: the definition, periods, essence, and consequences of starvation; weight loss by periods of starvation; the duration of starvation; the effect of starvation on the organism. To be able to: determine the periods of starvation depending on clinical signs and changes in metabolism.	-
Laboratory work 1.		4
Self-study 1.		-
Topic 11. Pathophysiology of thermoregulation. Fever.		
Lecture 11.	To know: the physiology of thermoregulation; definition and essence of the concept "fever"; causes of fever; the mechanism of action of pyrogens; the mechanism of development of fever; the role of neuroendocrine factors in the pathogenesis of fever; the scheme of development of fever; stages of fever; principles of classification of fever; termination of fever; functions of organs and systems during fever; metabolism during fever; the difference between fever and hyperthermia; the significance of fever for the organism; the contribution of domestic scientists to the study of the etiology and pathogenesis of fever; the manifestation of the laws and categories of materialistic dialectics in pathology using the example of the febrile process. To be able to: determine the types and forms of fever; use equipment for studying basal metabolism; master the methods of statistical processing of numerical data.	-
Laboratory work 1.		5
Laboratory work 2.		5
Self-study 1.		4
Module intermediate control 2.		30
Total Module 2		100
Module 3. Pathophysiology of blood circulation and respiratory system.		
Topic 1. Pathophysiology of the blood system.		
Lecture 1.	To know: the concept of normoblastic and megaloblastic types of erythropoiesis; anemias, their classifications, types; clinical manifestation of anemia; quantitative and qualitative changes of erythrocytes during anemia; the mechanism of compensatory reactions in acute and chronic anemias; leukopoiesis in norm and pathology; distinctive morphological and functional signs of various forms of leukocytosis; the pathogenesis and significance for the organism of the	-
Laboratory work 1.		7
Laboratory work 2.		7
Laboratory work 3.		7
Laboratory work 4.		7
Self-study 1.		-

	<p>main types of leukocytosis; the pathogenesis and consequences of the main types of leukopenia; the concept of the leukogram and leukocytic profile; the concept of nuclear shift and its types; morphological characteristics of blood during various forms of leukocytosis.</p> <p>To be able to: perform intravenous and subcutaneous injections; take blood samples; collect and prepare blood samples for the examination of hemoglobin content and the number of leukocytes and erythrocytes; prepare, fix, and stain smears; use the oil immersion system of a microscope for research; charge the Goryayev chamber with samples for counting erythrocytes and leukocytes; differentiate normal erythrocytes from their pathological forms; prepare and stain smears to study the blood picture; perform leukocyte counting; record various forms of leukocytes using a key counter and a simplified tabular method; derive the leukogram and leukocytic profile.</p>	
Topic 2. Pathophysiology of the cardiovascular system.		
Lecture 2.	<p>To know: the physiology of cardiac activity; regulation of cardiac activity; mechanisms of the emergence and conduction of biopotentials in the myocardium; the nature of the blood supply to the heart muscle and metabolism within it; the essence of circulatory insufficiency, its types and causes; mechanisms of compensation for circulatory insufficiency and the role of neurohumoral regulation in them; forms of circulatory insufficiency and their main signs; cardiac circulatory insufficiency and its types; causes of heart failure and the mechanism of its compensation; main manifestations of disorders in myocardial automatism, conduction, excitability, and contractility; vascular circulatory insufficiency and its types.</p> <p>To be able to: create experimental models of disorders in myocardial automatism, conduction, and contractility; register and analyze the main disorders of cardiac activity (specifically of ventricles and atria); use an electrocardiograph and other equipment.</p>	-
Laboratory work 1.		6
Laboratory work 2.		6
Laboratory work 3.		6
Self-study 1.		-
Topic 3. Pathophysiology of the respiratory system.		
Lecture 3.	<p>To know: the main forms of external and internal respiration disorders; indicators of external respiration disorders; signs and consequences of respiration regulation disorders; dyspneas, their origin and significance; cough, its origin and significance for the organism; the role of respiratory organ pathology in the development of external respiration insufficiency; hypoxia and the principles of its classification; changes in the organism during hypoxia; defense-adaptive reactions in the organism during hypoxia; the</p>	-
Laboratory work 1.		6
Laboratory work 2.		6
Laboratory work 3.		6
Self-study 1.		6

	<p>role of the Hering-Breuer reflex and its dysfunction in the development of dyspnea; dysfunction of lung tissue during its pathology; pneumothorax, its types and consequences.</p> <p>To be able to: register animal respiration; perform intrathoracic injections; analyze the sequence of changes in the organism during respiration disorders (at the level of the whole organism, organ, tissue, and molecule); pathological states of the organism caused by respiration disorders; evaluate the nature and strength of adaptive-compensatory capacities in each specific case.</p>	
Module intermediate control 3.		30
Total Module 3		100
Module 4. Pathophysiology of organs and systems of the organism.		
Topic 1. Pathophysiology of the digestive system.		
Lecture 1.	<p>To know: disorders of feed intake and processing in the oral cavity; disorders of feed moistening; disorders of bolus formation and its passage from the oral cavity into the stomach; digestion disorders in the forestomachs, stomach, small intestine, and large intestine; disorders of the secretory function of the pancreas; the mechanism of vomiting and its features in different animals; features of the secretory and motor functions of the digestive organs during dyspepsia.</p> <p>To be able to: perform titration, work with burettes and indicators; determine the pH of a liquid.</p>	-
Laboratory work 1.		5
Laboratory work 2.		5
Self-study 1.		-
Topic 2. Pathophysiology of the liver.		
Lecture 2.	<p>To know: the main functions of the liver and their role in the organism's vital activity; carbohydrate metabolism disorders in liver insufficiency; lipid metabolism disorders in liver insufficiency; protein and nitrogen metabolism disorders during functional disturbances and injuries of the liver; fatty degeneration (lipidosis); disruption of the liver's barrier function; disorders of the bile-forming and bile-excreting functions of the liver; main pathogenetic forms of jaundice and their consequences; consequences of liver insufficiency.</p> <p>To be able to: prepare a frog mesentery preparation and register blood flow disorders under the influence of bile; prepare a model to study cardiac activity disorders under the influence of bile and register them; model respiration disorders under the influence of bile and register them; conduct an examination of the general state of the organism and identify its deviations; prepare a frog preparation to study the effect of bile on the reflex activity of the spinal cord and evaluate changes in this activity.</p>	-
Laboratory work 1.		5
Laboratory work 2.		5
Laboratory work 3.		5
Self-study 1.		-

Topic 3. Pathophysiology of the kidneys.		
Lecture 3.	<p>To know: the regulation of filtration and reabsorption in the kidneys during various pathologies; homeostasis disorders caused by changes in renal function; factors causing renal dysfunction; disorders of glomerular filtration (primary urine formation); disorders of tubular reabsorption and secretion (secondary urine formation); main indicators of renal dysfunction; consequences of renal insufficiency; the mechanism of development of renal edema, hypertension, and anemia.</p> <p>To be able to: analyze the etiology and pathogenesis of disorders in the neurohumoral regulation mechanism of diuresis, as well as the process of primary and secondary urine formation; perform injections, work with an erythrohemometer and a refractometer.</p>	-
Laboratory work 1.		5
Laboratory work 2.		5
Laboratory work 3.		5
Self-study 1.		-
Topic 4. Pathophysiology of the endocrine system, reproductive and lactation systems.		
Lecture 4.	<p>To know: the role of endocrine regulation in the organism's vital activity in norm and pathology; causes of endocrine gland dysfunction; types of endocrine system dysfunction; consequences of the dysfunction of the pituitary gland, adrenal glands, thyroid gland, parathyroid gland, gonads, pancreas, hypothalamus, and thymus; main types and stages of stress; changes in the organism during stress; the role of stress states in the development of disease; stages of reproduction system disorders; hormones that affect the system of reproduction and lactation.</p> <p>To be able to: determine the level of energy metabolism; analyze and summarize the obtained results; model endocrine system disorders in an experiment depending on changes in the dysfunction of the glands of this system; analyze the etiology and pathogenesis of reproduction and lactation system disorders.</p>	-
Laboratory work 1.		5
Laboratory work 2.		5
Laboratory work 3.		5
Self-study 1.		-
Topic 5. Pathophysiology of the nervous system.		
Lecture 5.	<p>To know: the main forms of nervous activity disorders; indicators of nervous system dysfunction; consequences of peripheral nervous system dysfunction; consequences of damage to spinal cord neurons, sensory, and motor nerves; consequences of damage to the ascending and descending pathways of the spinal cord; consequences of dysfunction of the medulla oblongata and hypothalamus; disorders of the pyramidal and extrapyramidal pathways of the brain and their consequences; cerebellum dysfunction and its consequences; cerebral cortex dysfunction and its consequences; disorders of the trophic function of the nervous system; dysfunction of autonomic innervation and its consequences.</p> <p>To be able to: analyze changes in the activity of the reflex arc and its individual components; evaluate the</p>	-
Laboratory work 1.		5
Laboratory work 2.		5
Self-study 1.		5

	regulatory and integrating activity of all divisions of the nervous system and their role in the development of disease, as well as in the mobilization of defense-adaptive reactions.	
Module intermediate control 4.		30
Total Module 4		100
Class work	$(M1 + M2 + M3 + M4)/4 * 0,7 \leq 70$	
Exam/credit		30
TOTAL for discipline	$(\text{Class work} + \text{exam}) \leq 100$	

8.2. Scale for assessing the knowledge of a higher education student

Higher education student rating, point	National grade based on credit / exam results
90-100	Excellent
74-89	Good
60-73	Satisfactory
0-59	Unsatisfactory

8.3. Assessment policy

Deadlines and exam retaking rules	Works that are submitted late without valid reasons will be assessed with a lower grade. Module tests may be retaken with the permission of the lecturer if there are valid reasons (e.g. a sick leave).
Academic integrity rules	Cheating during tests and exams is prohibited (including using mobile devices). Term papers and essays must have correct references to the literature used.
Attendance rules	Attendance is compulsory. For good reasons (e.g. illness, international internship), training can take place individually (online by the faculty dean's consent).

9. Teaching and learning aids:

- e-learning course of the discipline (on the educational portal of NULES of Ukraine eLearn - <https://elearn.nubip.edu.ua/course/view.php?id=5238>);
- textbooks, manuals, workshops:
 Практикум з патофізіології тварин: Навчальний посібник / Мазуркевич А.Й., Савчук Т.Л., Малюк М.О., Харкевич Ю.О. Київ: НУБіП України, 2025 – 164 с
- lecture notes and their presentations (in electronic form);
- educational charts, educational films, video clips, and a multimedia system;
- workbooks for laboratory work (або laboratory workbooks);
- methodological materials on studying the academic discipline for full-time higher education applicants.

10. Recommended sources of information

1. Mazurkevych, A. I., Tarasevych, V. L., & Kluge, J. (2000). Animal Pathophysiology. Textbook. Kyiv: "Vyshcha Shkola". 235 p.
2. Cotran R.S., Kumar V., Robbins S.L. Robbins Pathology basis of disease. Pennsylvania. Philadelphia, Saunders. 2010. P.489.
3. Ataman, O. V. (2012). General Pathology. Textbook. Vinnytsia: Nova Knyha. 592 p.
4. Mazurkevych, A. I., Tarasevych, V. B., & Danilov, V. B. (2013). Animal Pathophysiology. Textbook. Kyiv: "Vyshcha Shkola". 414 p.
5. Zaiko, M. N., Byts, Yu. V., & Myslytskyi, V. F. (2014). Pathophysiology. Textbook. 4th ed. Kyiv: Medytsyna. 751 p.
6. Malyuk, M. O., Mazurkevych, A. I., Kharkevych, Yu. O., Klymchuk, V. V., Bokotko, R. R., Savchuk, T. L., Tarnavskyi, D. V., Egorov, O. V., Horkava, I. M., & Kovalenko, D. O. (2022). Protocol for Blood Sampling in Donor Animals (Rabbit, Cat, Dog, Pig, Horse). Kyiv. 13 p.
7. McGavin M., Zachary F. Pathologic Basis of Veterinary Disease. Westline Industrial Drive St. Louis, Missouri. 2007. P.1489.
8. Malyuk M.O., Yehorov O.V., Kharkevych I.O., Savchuk T.L., Klymchuk V.V. (2023). The state of the humoral and cellular links of immunity of recipient rabbits following allogeneic transfusion of erythrocyte mass. Regulatory Mechanisms in Biosystems, 14(3), 487-491.
9. Malyuk M. O., Yehorov, O. V., Kharkevych, I. O., Klymchuk, V. V., Savchuk, T. L. (2024). The content of leukocytes in the blood of recipient rabbits after allogeneic transfusion of packed red blood cells. Regulatory Mechanisms in Biosystems, 15(1), 37-41.
10. Paramonova, Yu., Mazurkevich, A., Kharkevych, Iu., & Savchuk, T. (2024). Radiological study of lung tissue in rats with bleomycin-induced fibrosis. Ukrainian Journal of Veterinary Sciences, 15(4), 63-79.
11. Law of Ukraine "On the Protection of Animals from Cruelty" Document 3447-IV, as amended on August 8, 2021, on the basis of 1684-IX. Available at: <https://zakon.rada.gov.ua/laws/show/3447-15#Text->.
12. Directive 2010/63/EU of the European Parliament and of the Council of 22 September 2010 on the protection of animals used for scientific purposes. Available at: <https://wecoop.eu>.