

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE**  
**Sumy National Agrarian University**

**Department of anatomy, normal and pathological physiology of  
animals**

"Approved"

Head of Department  
Kambur MD  
"24" 2020.

Syllabus TRAINING COURSE

for the academic year 2020-2021 ✓

Code: PN.07 – Animal Physiology

Specialty: 211 Veterinary medicine

Educational program: ' Veterinary medicine

Faculty: Veterinary Medicine

2020 – 2021 academic year

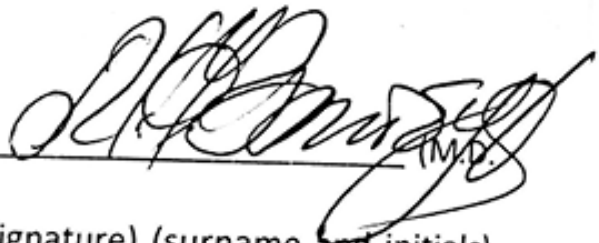
The work program on "Animal physiology" for students  
211 specialty "Veterinary Medicine"

Developers: PhD, associate of professor Kalashnyk O.M.

The work program endorsed by the department of anatomy, normal and  
pathological physiology of animals.


Minutes from "25\_" \_ MAY 2020 № 17

Head of the Department of Anatomy  
(Kambur)

  
(Signature) (surname and initials)



Agreed:

Guarantor of the educational  
program \_\_\_\_\_

  
(Ulko L.G.)

Dean \_\_\_\_\_ (Nechyporenko O.L.)

Methodist of the Department of Education Quality,  
licensing and accreditation \_\_\_\_\_

Registered in the electronic database: Date: 03.07. 2020.

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## 1. Description of discipline

Name of indicators	Areas of expertise, training direction, education and qualification level	Characterization of discipline	
		full-time education	
<b>Credits – 6</b>	21 "Veterinarian medicine" (code name)	<b>Normative.</b> <i>Discipline naturally scientific (fundamental) preparations</i>	
<b>Module – 4</b>	Specialty: 211- Veterinary Medicine	Year	
<b>Module content: 8</b>		2020-2021	
General amount of hours - <b>180</b>		<b>Course</b>	
		1	
		<b>Semester</b>	
		1	2
<b>A week's hours for the daily form of studies: audience – 2 independent work of student – 3</b>	<b>Educational qualification: Master of degree</b>	<b>Lectures</b>	
		8 hours	8 hours
		<b>Laboratory and practical</b>	
		8 hours	8 hours
		<b>Independent work</b>	
		44 hours	46 hours
		<b>Type of control:</b>	
<b>credit</b>	<b>Examination</b>		
		<b>Computer testing, tests, oral interviews using native preparations</b>	

**Note:** Correlation of amount of o'clock of audience employments makes to independent and work (%): for the daily form of studies - 50/50 (90/90)

**Note.** The ratio of hours of classes and of individual to self-term work is: for full-time education - 50%/ 50%

## 2. The purpose and objectives of discipline.

**Purpose:** to give students theoretical and practical knowledge in the course of physiological processes in animals of different kinds and to teach them management of physiological functions for increasing productivity, improving the quality of animal products.

**Objective:** to study the life of an organism, considering it as an integrated complex and dynamic system of physiological processes in animals and its

components (cells, subcellular structures, tissues, organs and organ systems) in their unity and relationship with the environment.

*Following the completion of the course the student should:*

**know:**

patterns of life processes (metabolism, respiration, circulation, digestion, excretion, etc ..) at different structural levels; mechanisms for interaction between the individual systems and organs as a whole with the environment; qualitative differences of physiological functions in animals that are in different environmental conditions; establishment of physiological functions, their formation at different stages of individual development; elements of conducting and organizations scientific physiological studies.

**be able to:**

practically apply this knowledge; use instruments, apparatus for the study and evaluation of the physiological state of animals; use their knowledge to solve theoretical and practical problems in veterinary medicine; apply the knowledge gained in the study of other disciplines and future practice; consider the relationship of animals from environmental conditions.

### **3. The program of the course**

**approved by the Academic Council SNAU from 01.07.2016 p. protocol № 11.**

#### **Module 1. General physiology of animals. Physiology of excitable tissues.**

**Semantic module 1. Basic principles of structural and functional organization of animals.**

**Topic 1. The cell as a structural and functional unit of an organism.** The structure of the cell. Functions cells' nucleus and organoids. The structure and function of membranes. Tissues, organs, organ systems. The main manifestations of life and their regulation (nervous, humoral). Reflex, reflex arc. Homeostasis. The body as the Self-Regulatory System. The life span of the different species. Productive period (active) ontogeny of animals.

Introduction to sociological laboratory. General methods of physiological studies, the rules of experimental animals, the rules of appliances. Occupational health and safety in the laboratory. Analysis of the reflex arc unconditional and conditional reflexes.

**Semantic module 2. General properties of excitable tissues. Physiology of muscles and nerves.**

**Topic 2. Physiological characteristics of excitable tissues, their common properties.** The concept of stimulus, irritation, irritability, excitability, excitation and inhibition, lability. Classification stimuli. Characteristics of the tissue excitability and conditions of excitement. Changes in tissue excitability of excitement. Functional mobility - lability. Bioelectric phenomena in the body. Nature membrane potential. Potential actions. Distribution of nerve impulses. Intercellular transfer excitation. Generation and transmission of excitation in the receptors. Teaching M.E. Vvedensky the unity of excitation and inhibition (parabiosis).

Production neuromuscular preparation. Effect of different stimuli on neuromuscular preparation. Threshold, submaximal and maximal stimulation of muscles. Direct and indirect stimulation of muscle. Lonely muscle contraction. Titanium contractions muscle. Working muscles. Influence of load and strength of the stimulus to work the muscles. Dynamometry. Fatigue of muscles.

Biological currents in living tissues. Experiments Galvani. Quiescent current actions and damage. Currents actions of human hands. Secondary tetanus. Parabiosis nerve. Polar law. The law cuts. Production neuromuscular drug. Effect of different stimuli on neuromuscular drug. Threshold, submaximal and maximal stimulation of muscles. Direct and indirect stimulation of muscle.

**Topic 3. Abbreviations and muscles work. Physiology of nerve fibers.** Ultrastructure and biochemical composition of muscle. The mechanism of muscle contraction. Molecular mechanisms of contraction. The energy of muscle contraction. Modes and types of muscle contractions. Working muscles. Fatigue of muscles. Muscle tone. Training muscles. Functional features smooth muscle. The influence of DC on living tissue. Polar law. Physiological elektroton. The structure and function of the neuron. Specialization neurons. The interaction of neurons. Synapses with chemical, electric and mixed transfer mechanisms. Brake and excitatory neurotransmitters. Integration activity of neurons in the central nervous system (convergence, divergence, relief, occlusion, feedback). Properties nerve fibers. Features of excitation in nerve fibers.

Lonely muscle contraction. Titanium contractions of muscles. Working muscles. Influence of load and strength of the stimulus to work the muscles. Dynamometry. Fatigue of muscles. Biological currents in living tissues. Experiments Galvani. Quiescent current actions and damage. Currents actions of human hands. Secondary tetanus. Parabiosis nerve. Polar law. The law cuts.

## **Module 2. Physiology of the central nervous system.**

### **Semantic module 3. Physiology of central nervous system (CNS).**

**Topic 4. Leading role in regulatory processes of the central nervous system of the body.** The evolution of the CNS. Types nervous system. The neural theory of the structure of the CNS. Neuron as a structural and functional unit of the CNS. Reflex - the basic act nervous activity. The reflex arc, its main elements. Reverse afferentation. Classification reflexes. Spinal reflexes. Measurement of reflex. Receptive field. The impact strength of the stimulus to reflection time. Reflex tone.

**Topic 5. Nerve centers and their properties.** Braking and Coordinating the activities of the CNS. Mechanisms central inhibition. Synapses and neurotransmitters CNS. The spinal cord, its main function. Dorsal and ventral roots. The centers of the spinal cord. Ascending and descending pathways of the spinal cord. Value hindbrain. Medulla oblongata. Centers and pathways of the medulla oblongata. Participation medulla in regulation of cardiac, respiratory and food reflexes. Features cranial nerves. Participation vestibular nuclei in the regulation of balance. The value of the pons.

The average brain. Dorsal and basal part of the midbrain. Value chotyryhorbykovoho body. Features red nucleus. The physiological significance of

the black substance. Mezentsefalni reflexes. Tonic brain stem reflexes (reflexes poses, rectifying and statokinetychni). Detserebratsiyana rigidity. Cerebellum. The functions of the cerebellum. The influence of the cerebellum on motor function and coordination. The consequences of the removal of the cerebellum (atony, ataxia, astasis). Interim brain. Physiology of the thalamus. Participation hills in the primary visual analysis and plastic tone. The hypothalamus. Its role in the regulation of autonomic functions. Centres regulation of protein, fat, carbohydrate and water-salt metabolism. Communication with the pituitary and other endocrine glands. The role of the hypothalamus in the formation of emotions and behavior. Epitalamus its functions.

Subcortical nuclei. Striopolidarna system. Functions pale striatum and nucleus. Participation subcortical nuclei in complex coordinated movements, the manifestation of instincts. Reticular formation, its functional significance. Descending and ascending paths. How reticular formation of the autonomous nervous system, its effects on the circulatory, respiratory, functions of internal organs. Activating influence of the reticular formation in the cerebral cortex. The limbic system of the brain. Components of the limbic system, its function. The participation of the limbic system in regulating the homeostasis of the internal organs and manifestations of reactions. The cerebral cortex of the brain. The evolution of the cerebral hemispheres. Methods functions of the cerebral cortex. Functional features of different parts of the cortex.

Physiology of the autonomic nervous system. Sympathetic and parasympathetic divisions of the autonomic nervous system, their functional features. The relationship between the sympathetic and parasympathetic innervation. The higher vegetative centers. How the autonomic nervous system of the central nervous system, in particular with bark cortex. Trophic function of the autonomic nervous system. Adaptive-trophic influence of the sympathetic nervous system. Triple control the nervous system. The irradiation and summation of excitation in the spinal cord. Syechenivske braking. Inhibition of spinal reflexes in frogs. Nervous regulation of muscle tone.

### **Module 3. Physiology of Higher Nervous Activity and Analyzers. Physiology of movement.**

#### **Semantic module 4. Understanding the higher nervous activity.**

**Topic 6. Understanding of higher nervous activity.** Ethology as the science of animal behavior. Teaching I.M. Sechenov and I.P. Pavlov reflex nature of the cerebral cortex. The principles of studying higher nervous activity.

Conditioned reflex as a form of animal adaptation to external conditions. Features unconditioned and conditioned reflexes. Terms formation of conditioned reflex. The physiological mechanism of a conditioned reflex. The biological significance of conditioned reflexes. The general laws of conditioned reflex activity. Methods of production of conditioned reflexes. The role of the cortex and subcortical structures in the formation of temporary connections.

Mechanism of purposeful behavior in terms of theory of functional systems. Unconditional and conditional (internal) inhibition of conditioned reflexes.

Generalization, induction, irradiation and concentration of excitation in the cerebral cortex during elaboration of conditioned reflexes. Analytical and synthetic activity of the cerebral cortex. The dynamic stereotype. The first and second alarm systems. Sleep and hypnosis. Theories of sleep. Mechanisms of consciousness, memory, thinking.

The value of I.P. Pavlov teaching on higher nervous activity for livestock. Type of higher nervous activity, their connection with the performance of farm animals.

Ethnology science of animal behavior. The forms of animal behavior - food, sex, parent, child, protection, hierarchical, comfortable. The role of hereditary and acquired factors in shaping behavior. The behavior of animals in different environmental conditions. Imprinting (remember) how and insight behavior.

Biological rhythms. The adaptation of animals to changing environmental conditions. The physiological basis of adaptation. Stress mechanism as adaptive restoration of homeostasis. The impact of stress on animal productivity. Prevention stressful events. Methods of food education and defense reflexes. Inhibition of conditioned reflexes.

### **Semantic module 5. Physiology analyzers (sensory systems). Physiology of movement.**

**Topic 7. Overview of analyzers.** Components of the analyzers - peryferychna, wiring, central. Basic properties analyzers and methods of their study. Classification analyzers: contact, distance. The role of the analyzers in the knowledge environment.

Visual analyzer. The value of the visual analyzer, structure and functions of its individual parts. Accommodation and adaptation. Sensor retina - cones, sticks. The perception of light, color, shape, size, distance and motion of objects. Binocular vision.

Auditory analyzer. The perception of the volume, pitch, tone sound. The functions of the external, middle and inner ear. Kortiyiv body, its physiological significance. Theories of hearing. Auditory sensitivity in different animal species. Binaural hearing. Adapting to sound and silence.

Vestibular analyzer. Receptor unit vestibular apparatus. Features function of the vestibular apparatus in a sharp acceleration and weightlessness.

Skin analyzer. Skin Receptors that perceive heat, cold, pain, touch, pressure. The biological significance of pain, its formation in the cerebral cortex. The mechanism reflected the feeling of pain. Adaptation to tactile and thermal stimuli.

Olfactory analyzer. The structure of the olfactory analyzer and physiology of smell. Classification odors. Physical and chemical theory odors. The role of the olfactory analyzer in the behavior of animals.

Taste analyzer. Structure taste analyzer. Taste receptors. The main sense of taste. The mechanism of taste sensations. Role taste analyzer in the behavior of animals.

Interoreceptive analyzer. Interoreceptors, their classification and function. Interoreceptors role in the cardiovascular, respiratory, digestive, excretory, motor systems. Motor analyzer, its role in motor acts. Interaction analyzers. Physiology

of movement. Types of movement. Physiological indicators fitness muscles. The mechanism of regulation of movement. Movement of poultry.

Research animals bottom eye (ophthalmoscopy). The reaction of the iris to light. Reflex of the cornea. Determination of near vision. Determination of ferrous anomalies (blindness). The blind spot in the eye. Visual illusions.

Definition visual impairments. Determination of sound localization. Bone and air conduction. Reflexes that have clinical significance. Defining spatial tactile sensitivity threshold (esteziometriya). Research otolitic apparatus. Review otolitiv under a microscope. Definition of taste sensitivity threshold.

#### **Module 4. Physiology of the blood system.**

##### **Semantic module 6. Blood as internal environment.**

**Topic 8. Structure and properties of animal blood.** Plasma and serum. Functions of blood. Depot. Physico-chemical properties of blood. Buffer systems and an alkaline reserve of blood. The concept of acidosis and alkalosis. Osmotic and oncotic blood pressure. The ionic composition of the blood. Plasma proteins, their characteristics; protein ratio. Regulation of the blood.

**Topic 9. Formed blood elements. Hematopoiesis.** Red blood cells, the number of farm animals and physiological significance. Hemoglobin, its value. Compounds of hemoglobin. The content of hemoglobin, color index, spectroscopy blood. Hemolysis. Osmotic resistance of erythrocytes. Erythrocyte sedimentation rate. Erythropoiesis and its regulation.

White blood cells, their types and functions. Phagocytosis. The total number of leukocytes in the blood of animals of different species. The concept of leukocytosis and leukopenia. Orthocytosis. Features separate forms of leukocytes. Cellular and humoral immunity.

Counting the number of red blood cells and white blood cells. Determining the amount of hemoglobin. Observation of phagocytosis. Erythrocyte sedimentation rate.

**Topic 10. Coagulation.** Platelets, their physiological role. Blood coagulation. The physiological essence and the mechanism of blood clotting. Blood clotting factors. The phenomenon of hemophilia. The speed of blood clotting in animals. Natural and artificial anticoagulants.

The doctrine of blood group. The system of blood groups in animals. Rh factor. Factors affecting the blood. Hematopoiesis and its regulation.

Hemolysis. Getting hemin crystals. Research compounds hemoglobin. Determination of blood groups in humans and compatibility of blood in farm animals. Determining Rh factor in humans. Preparation of blood smears. Output leykoformuly (leykohramy). Determination of color index.

#### **Module 5. Physiology of the digestive system.**

##### **Semantic module 5. Physiology of the digestive system.**

**Topic 11. Digestion in the mouth.** The essence of the digestive system. The main types of digestion. Physiological basis of hunger, satiety and thirst. Methods of studying digestion. The role of academician IP Pavlov and his school in the study of the physiology of digestion.



Digestion in the mouth. Acceptance of food and water in different animal species. Chewing. Secretory activity of the salivary glands. Structure and function of saliva. Features salivation in ruminants. Salivation in pigs. Salivation in horses. Regulation of salivation. Swallowing and its regulation. Species and age characteristics of digestion in the mouth.

Digestion in the single-chamber stomach. Secretory stomach area. The composition, properties and values of gastric juice. Role of hydrochloric acid. Mucus its value. Phases of gastric juice. Motor function of a stomach. The regulation of gastric motility. Go stomach contents into the duodenum. Vomiting, its mechanism and significance. Features digestion in the stomach of pigs. Features digestion in the stomach horses.

Features in the multi-digestion stomach. Digestion in the rumen. The value of microflora and microfauna scar. Digestion of proteins, carbohydrates and fats in ruminant proventriculus-ment markets. Hydrolysis of nitrogen containing substances in the proventriculus. The value of low volatile fatty acids formed during fermentation in proventriculus. The formation of gas in the rumen. The role of the grid, books in digestion. Motility proventriculus and its regulation. Ruminants process. Digestion in the abomasum its features. Features gastric digestion in young ruminants.

The process of digestion in front intestine. Monitoring the intake of feed and water the animals. Determination of the number and viscosity of saliva obtained from animals, under conditions of action of various stimuli (bread, milk, hydrochloric acid). The values of digestible ability of gastric juice. Phases of gastric acid secretion. Action gastric juice protein. Action chymosin milk. Action pancreatic enzymes to proteins and fats. Research rumen microflora content (Observer ciliates). Burn scar reduction. Observation of gum. Evacuation function of the stomach. Record gastric motility dog.

**Topic 12. Digestion in the intestine. Absorption.** Digestion in the small intestine. The function of the pancreas. Structure and properties of pancreatic juice, its significance in the process of intestinal digestion. Hydrolysis of the contents of the small intestine (the optimum pH for hydrolysis substrate hydrolysis products). Regulation of pancreatic secretory function in animals. Bile formation and bile. The composition and value of bile in digestion. Abdominal and parietal digestion.

The role of intestinal juice in digestion. Motility intestines. The mechanism of absorption. Regulation of absorption. Digestion in the large intestine. Secretory function of the large-kyshe chnyka. The role of microflora. Motor function. Features digestion in the large intestine of horses. Duration of feed in the digestive canal different animal species. Defecation. Features digestion in birds. The value of pancreatic juice in the digestion. Research bile. Definition of motor function of the intestine.

## **Module 6. Physiology of the circulatory system and lymph circulation.**

### **Physiology of the respiratory system.**

## **Semantic module 8. Physiology of blood circulation and lymph circulation.**

**Topic 13. Physiology of blood circulation and lymph circulation.** The evolution of the cardiovascular system. Movement of blood, large and small

circulation. Methods of functional state of the cardiovascular system. Structure and function of the myocardium. Cardiac cycle. Periods and phases of the heart. The systolic and minute volume of blood. The properties of the heart muscle. The rhythm and heart rate. The phenomenon of automaticity of the heart. Conducting system of the heart. Bioelektrychni effects in heart muscle. Electrocardiography and other methods of cardiac activity. Intracardial and extracardiac regulation of the heart. Nervous and humoral regulation of cardiac activity.

Patterns of movement of the blood vessels. Functional groups of blood vessels. Factors that provide blood flow to the system of arterial and venous vessels. The velocity of the blood vessels. Blood pressure and its definition. Arterial and venous pulse. Pulse. Features of circulation in various organs. Blood circulation in different physiological states of the body (muscle work, pregnancy, lactation, etc.).

Regulation of circulation. Vasomotor center. Nervous and humoral regulation of blood circulation. Age features circulatory system.

Lymph its value. The exchange of substances between the blood, lymph and tissues of animals. Lymfoobih. The role of lymph nodes. Theory formation of lymph. Lymphogenous substance. Neuro-humoral regulation mechanisms lymph.

The properties of the heart muscle. Registration cardiac activity in the frog. Analysis mehanokardiohramy. Beats. Effect of temperature on the heart. The study of the heart. Automatism heart. Stanniusa ligatures. Effect of potassium and calcium and adrenaline on heart isolated toad. The influence of the vagus nerve on the heart frog. Frog reflex cardiac arrest. Tryheminovahalnyy reflex.

Echocardiography. Measuring blood pressure in humans and animals. Monitoring of blood flow in the vessels of the frog. Adjacent vascular reflexes in rabbits. Determination of cardiac shock. Pulse animals. Echocardiography. Percussion and auscultation of the heart muscle.

### **Semantic module 9. Physiology of the respiratory system.**

**Topic 14. Physiology of the respiratory system.** Regulation of breathing essence of the process of breathing. Respiratory and their functions. External breathing. The role of the upper respiratory tract. Pulmonary respiration, its mechanism (the act of inhaling and exhaling). The life and maximum lung capacity. Ventilation. The frequency of respiratory movements. Minute volume of breath. The exchange of gases between alveolar air and blood. Transportation emissions blood oxygen capacity of the blood. The mechanism of gas exchange between blood and tissues. Regulation of breathing. The respiratory center. Self-regulation of breathing. Nervous and humoral regulation of breathing.

Changes in breathing during muscular work. Breathing in conditions of high and low atmospheric pressure. A change in breathing animals because of their age, productivity and welfare. Methods respiratory system. Relationship breathing and circulation. Breathing in the fetus. Features of breathing in birds. Voice of animals.

Studies in animals breathing. Demonstration frog in motion lung machine Donders. The function of the intercostal muscles. Monitoring the movement of ciliated epithelium. Analysis of inhaled and exhaled air. Determination of lung

capacity. Determination of minute volume of the lungs. Counting the number of respiratory movements in different animals. Types of breathing in farm animals.

### **Module 7. Physiology metabolism and energy. Physiology selection.**

#### **Semantic module 10. Physiology of metabolism and energy.**

**Topic 15. Metabolism and energy.** The biological significance of metabolism and energy. Circulation of substances in the animal body and its relationship with the environment. Assimilation and dissimilation. Methods of studying metabolism. Plastic energy value and nutrients. Overall, primary and intermediate metabolism.

Sharing protein. The physiological significance of amino acid composition of proteins for the body of animals. Full and defective proteins. The exchange of amino acids. The exchange of complex proteins. The need of the body in proteins. Nitrogen balance. Regulation of protein metabolism.

Exchanging carbohydrates. The value of carbohydrates to the body. Anaerobic and aerobic breakdown of carbohydrates. Regulation of carbohydrate metabolism.

Lipid metabolism. Energy and plastic features lipids. The formation and decomposition of fats in the body. Exchange of phospholipids and sterols. Regulation of lipid metabolism. The relationship of the metabolism of proteins, fats and carbohydrates. Features of the exchange of nutrients in ruminants.

Exchange of minerals. Macro- and micronutrients. Regulation of mineral metabolism. Sharing water. The value of water in the body, sources of water and its contents in the tissues of the body. Regulation of water metabolism. Hidratatsiyna and tissue water. The role of liver in metabolism.

Vitamins. General characteristics. Fat-soluble vitamins, their role in animals. Water-soluble vitamins, and their physiological significance. The need for vitamins. Antivitamins. Vitamin-like substance.

The exchange of energy. Energy sources and use. Methods of study energy metabolism. Direct and indirect calorimetry. Respiratory rate and caloric. Factors determining the level of metabolism. The influence of external and internal factors in energy metabolism (ambient temperature, feed intake, age, lactation, pregnancy, etc.). Law izodynamichnoho replacement of nutrients in the exchange.

Thermoregulation. Temperature limits of life. The body temperature. Mechanisms of thermoregulation. Chemical and physical thermoregulation in animals of different species and age groups. The role of the skin in the process thermoregulation. Ways heat. The influence of external and internal factors on body thermoregulation farm animals. The temperature homeostasis as a necessary condition of life. Nervous and humoral regulation of temperature homeostasis. Determination of the energy metabolism of farm animals. Measuring body temperature in agricultural animals. Definition of basic metabolism.

#### **Semantic module 11. Selection physiology.**

**Topic 16. Selection physiology. Urinating and its regulation. Physiology of skin.** Selecting and its importance for the body. The value of the allocation in maintaining homeostasis: blood osmotic pressure, mineral and organic composition of blood, water balance, acid-base balance. Evolution of the selection.

Physiology of the kidney. Kidney - the main organ allocation. Methods of study of renal function. Nephron - functional unit of the kidney. Features of circulation in

the kidney. The formation of urine (filtration, reabsorption, secretion and synthesis). Nervous and humoral regulation of urine formation. Composition, properties urine of animals of different species. The function of the bladder. The mechanism and regulation of urination. The consequences of the removal of the kidneys. Artificial kidney. Urinating in birds. Excretory function of the respiratory and digestive system.

Physiology of the skin. The value of the skin as an organ allocation. Sweat glands. The composition, properties and values sweat. Regulation sweating. The sebaceous glands, their value. Seasonal changes in the skin. Functions and development of hair follicles. Factors affecting hair growth. Physiology molting. Obtaining the urine of animals. Research density and urine reactions.

**Module 8. Physiology of the endocrine glands. Physiology of reproduction.  
Physiology of lactation.**

**Semantic module 12. Endocrine glands.**

**Topic 17. Endocrine glands.** The concept of endocrine glands. Methods functions of the endocrine glands. The concept of hormones. The mechanism of action of hormones.

Pituitary. Hormones adeno- and neurohypophysis. Interaction with other pituitary glands of internal secretion. The role of the hypothalamus. Neurosecretion hypothalamus, liberyny, statins. Hypothalamic-pituitary system.

The thyroid gland and its hormones. Hyper- and hypothyroidism thyroid gland. Regulation of thyroid function. Parathyroid gland, their structure and function. Regulation of parathyroid gland function. Adrenal gland. The morphology of cortical and medullary layers cancer. Hormones cortical layer of the adrenal glands, their role in the body. The mechanism of action of the adrenal cortex. Hormones medulla, their impact on body functions. Sympathoadrenal system. Regulation of hormone secretion of adrenal glands. Value for adrenal hormones defense reactions. Age changes.

Pancreas as an organ of internal secretion. Hormones of the pancreas. Hyper- and hypofunction of the pancreas. The role of pancreatic hormones in the regulation of carbohydrate and lipid metabolism. Regulation of endocrine function of the pancreas.

Inkretorna function of the gonads. Hormones male and female gonads. The placenta as endocrine glands. Regulation of endocrine function of male and female gonads. Influence of castration on the level of physiological processes. The physiological significance of the pineal gland and the thymus. Peptides. Prostaglandins, their effect in animals. Tissue hormones.

The role of the nervous system in regulating the function of the endocrine glands. The relationship between endocrine glands. The use of hormones and hormones to enhance productivity of farm animals. Effect of adrenaline on the apple of the eye frog. Removing the pituitary gland in frogs. The impact on the adrenaline and pituitrin frog melanophores skin. Effect of estrogen on the selection of sperm in male frogs.

**Semantic module 13. Physiology of reproduction.**

**Topic 18. Physiology of reproduction.** Reproduction – one of the fundamental properties of living beings. Sexual reproduction. Sexual and physiological maturity of males and females.

Physiology of the male reproductive system. Spermatogenesis. The secretion of the paranasal gonads in male animals. The formation of sperm. Sperm, its composition and physico-chemical properties. Nervous and hormonal regulation of sexual functions of male animals.

Physiology breeding females. Oocyte maturation, follicular development. Ovulation and corpus luteum formation in the ovaries of females. Hunting and estrus. Gender and sexual cycle in females season farm animals. Appearance sexual cycle. Nervous and humoral regulation of sexual cycle of females. Sexual reflexes. Sexual behavior. Pairing as skladnorefleksivnyy act. Type insemination. The process of fertilization, development of fertilized egg (zygote). Pregnancy and its characteristics in animals of different species. Functional changes in the body of females associated with pregnancy. The formation and function of membranes. Types and function of the placenta. Growth and development of the fetus. Power fetus. Features of the blood supply to the fetus. The relationship of the mother and the fetus. The process of confinement and its regulation. Postpartum recovery period.

Physiological basis of artificial insemination and embryo transplants. Factors that violate reproductive function. Methods of regulation of reproductive function of animals with hormones. Reproduction poultry. The formation of germ cells in male and female birds. Formation eggs, egg-laying. Factors that stimulate egg. Nervous and humoral regulation of these processes.

Investigation of sperm under a microscope. Determination of the number of sperm in the ejaculate. Defining sexual cycle in rodents by smears of the vagina. Obtaining eggs from the oviduct. Determining the nature zherebnosti mares vaginal mucus.

#### **Semantic module 14. physiology of lactation.**

**Topic 19. Physiology of lactation.** The concept of lactation as a function of the whole organism. Growth and development of mammary glands. Physiology molokoutvorennya. Synthesis components of milk. Predecessors of the components of milk. Milk and colostrum, their composition in different animal species. The relationship formation processes milk from the cows digestive Rubtsov, with the function of the liver and other organs. Neurohormonal regulation of the secretory function of the breast. Capacitive system udder. Smooth muscle alveoli, ducts and tanks, their role in the accumulation of milk and its allocation during milking and sucking. Output of milk. Reflex of milk and its inhibition. Physiological basis of increasing milk production animals. The impact of environmental factors on the lactation process. Reflex of milk. Output of milk and neurohumoral regulation of this process. Company rozdoiyuvannya cows. Physiological basis of machine milking and ways to improve it. The concept of sustainability cows to stress. The duration of lactation in animals of different species. The influence of various factors on the composition of milk. Increasing milk production animals. Preparation heifers before

calving and subsequent milking. Stimulation and inhibition and inhibition of lactation.

Definition vnutrishnotsystemalnoho pressure in the breast ruminants. Study of milk. Observation of milk fat globules under the microscope. Research capacitive systems udder.

#### 4. The structure of the course.

Names of content modules and topics	Number of hours					
	full-time					
	in all	including				
l		p	lab	ind	i.w.	
1	2	3	4	5	6	7
<b>3 semester</b>						
<b>Module 1. General physiology of animals. Physiology of excitable tissues.</b>						
<b>Semantic module 1. Basic principles of structural and functional organization of animals.</b>						
<b>Topic 1.</b> The cell as a structural and functional unit of an organism.	6	2		2		2
<b>Total for the semantic module 1</b>	<b>6</b>	<b>2</b>		<b>2</b>		<b>2</b>
<b>Semantic module 2. General properties of excitable tissues. Physiology of muscles and nerves.</b>						
<b>Topic 2.</b> Physiological characteristics of excitable tissues, their common properties. Abbreviations and muscles work. Physiology of nerve fibers.	18	2		4		12
<b>Total for the semantic module 2</b>	<b>18</b>	<b>2</b>		<b>4</b>		<b>12</b>
<b>Total hours</b>						
	<b>24</b>	<b>4</b>		<b>6</b>		<b>14</b>
<b>Semantic module 3. Physiology of central nervous system (CNS).</b>						
<b>Topic 3.</b> Leading role in regulatory processes of the central nervous system of the body.	18	2		4		12
<b>Topic 4.</b> Nerve centers and their properties.	16			4		12
<b>Total for the semantic module 3</b>	<b>34</b>	<b>2</b>		<b>8</b>		<b>24</b>
<b>Total hours</b>						
	<b>58</b>	<b>6</b>		<b>14</b>		<b>38</b>
<b>Module 2. Physiology of Higher Nervous Activity and Analyzers. Physiology of movement.</b>						
<b>Semantic module 4. Understanding the higher nervous activity.</b>						
<b>Topic 5.</b> Understanding of higher nervous activity	4	2		2		
<b>Total for the semantic module 4</b>	<b>4</b>	<b>2</b>		<b>2</b>		
<b>Semantic module 5. Physiology analyzers (sensory systems).</b>						
<b>Topic 6.</b> Overview of analyzers.	6	2		2		2

<b>Total for the semantic module 5</b>	6	2		2		2
<b>Total hours</b>	<b>10</b>	<b>4</b>		<b>4</b>		<b>2</b>
<b>Semantic module 6. Blood as internal environment.</b>						
<b>Topic 7.</b> Structure and properties of animal blood.	18	2		4		12
<b>Topic 8.</b> Formed blood elements. Hematopoiesis.	18	2		4		12
<b>Topic 9. Coagulation.</b>	6	2		4		10
<b>Total for the semantic module 6</b>	<b>52</b>	<b>6</b>		<b>12</b>		<b>34</b>
<b>Total hours</b>	<b>22</b>	<b>6</b>		<b>12</b>		<b>6</b>
<b>Total hours per semester</b>	<b>120</b>	<b>16</b>		<b>30</b>		<b>74</b>
<b>4 semester</b>						
<b>Module 3. Physiology of the digestive system.</b>						
<b>Semantic module 7. Physiology of the digestive system.</b>						
<b>Topic 10.</b> Digestion in the mouth.	8	2		4		2
<b>Total for the semantic module 7</b>	<b>8</b>	<b>2</b>		<b>4</b>		<b>2</b>
<b>Total hours</b>	<b>8</b>	<b>2</b>		<b>4</b>		<b>2</b>
<b>Module 4. Physiology of the circulatory system and lymph circulation. Physiology of the respiratory system.</b>						
<b>Semantic module 8. Physiology of blood circulation and lymph circulation.</b>						
<b>Topic 11.</b> Physiology of blood circulation and lymph circulation.	8	2		4		2
<b>Total for the semantic module 8</b>	<b>8</b>	<b>2</b>		<b>4</b>		<b>2</b>
<b>Semantic module 9. Physiology of the respiratory system.</b>						
<b>Topic 12.</b> Physiology of the respiratory system.	8	2		4		2
<b>Total for the semantic module 9</b>	<b>8</b>	<b>2</b>		<b>4</b>		<b>2</b>
<b>Total hours</b>	<b>22</b>	<b>4</b>		<b>12</b>		<b>6</b>
<b>Module 5. Physiology metabolism and energy. Physiology selection.</b>						
<b>Semantic module 10. Physiology of metabolism and energy.</b>						
<b>Topic 13.</b> Metabolism and energy.	10	2		4		4
<b>Total for the semantic module 10</b>	<b>10</b>	<b>2</b>		<b>4</b>		<b>4</b>
<b>Semantic module 11. Selection physiology.</b>						
<b>Topic 14.</b> Selection physiology. Urinating and its regulation. Physiology of skin.	6			4		2
<b>Total for the semantic module 11</b>	<b>6</b>			<b>4</b>		<b>2</b>
<b>Total hours</b>	<b>16</b>	<b>2</b>		<b>16</b>		<b>1</b>
<b>Module 6. Physiology of the endocrine glands. Physiology of reproduction. Physiology of lactation.</b>						
<b>Semantic module 12. Endocrine glands.</b>						
<b>Topic 15.</b> Endocrine glands.	6	2		2		2
<b>Total for the semantic module 12</b>	<b>6</b>	<b>2</b>		<b>2</b>		<b>2</b>
<b>Semantic module 13. Physiology of reproduction. Physiology of lactation.</b>						

<b>Topic 16.</b> Physiology of reproduction. Physiology of lactation.	10	4		4		2
<b>Total for the semantic module 13</b>	<b>10</b>	<b>4</b>		<b>4</b>		<b>2</b>
<b>Total hours</b>	<b>20</b>	<b>6</b>		<b>4</b>		<b>4</b>
<b>Total hours per semester</b>	<b>60</b>	<b>14</b>		<b>30</b>		<b>16</b>
<b>Total hours</b>	<b>180</b>	<b>30</b>		<b>60</b>		<b>90</b>

### 5. Topics and lectures plan.

No	Topic subject and plan	Number of hours
	3 semester	
1	<p><b>Topic 1. The cell as a structural and functional unit of an organism</b></p> <p>1. The content and objectives of discipline "Physiology of Animals". The subject of animal physiology. Place physiology of science, its role in training direction "Veterinary Medicine".</p> <p>2. The structure of the cell. Functions core and organoids cells.</p> <p>3. The structure and function of membranes.</p> <p>4. Tissues, organs, organ systems.</p>	2
2	<p><b>Topic 4. Subject leading role in regulatory processes of the central nervous system of the body.</b></p> <p>1. Overview of the structure and function (CNS).</p> <p>2. Leading role in regulatory processes of the central nervous system of the body. The evolution of the CNS. Diffuse, ganglion types and tubular structure of the nervous system.</p> <p>3. Neuron theory of the CNS structure. Neuron as a structural unit of the CNS.</p> <p>4. Reflex - the basic act nervous activity. The reflex arc, its main elements. Reverse afferentiation. Classification reflexes.</p>	2
3	<p><b>Topic 6. Understanding of higher nervous activity. Ecology as the science of animal behavior.</b></p> <p>1. Principles of studying higher nervous activity</p> <p>2. Conditioned reflex as a form of animal adaptation to external conditions exist tub. Features unconditioned and conditioned reflexes.</p> <p>3. Methods of production of conditioned reflexes. The role of the cortex and subcortical structures in the formation of temporary connections.</p> <p>4. Generalization, induction, irradiation and concentration of excitation in the cerebral cortex in the process of conditioned reflexes.</p> <p>5. Ethology as the science of animal behavior.</p>	2



4	<p><b>Topic 7. Physiology of analyzers.</b></p> <ol style="list-style-type: none"> <li>1. Overview of analyzers. Parts analyzers - peripheral, wiring, central.</li> <li>2. Basic properties analyzers and methods of their study. Classification analyzers: contact, distance.</li> <li>3. Visual and auditory analyzer.</li> <li>4. Skin Analyzer.</li> <li>5. Olfactory analyzer.</li> <li>6. Taste analyzer.</li> </ol>	2
5	<p><b>Topic 8. Structure and properties of animal blood.</b></p> <ol style="list-style-type: none"> <li>1. Blood as internal environment.</li> <li>2. Physical and chemical properties of blood.</li> <li>3. Buffer alkaline reserve system and blood. The concept of acidosis and alkalosis.</li> <li>4. Proteins of blood plasma, their characteristics.</li> </ol>	2
6	<p><b>Topic 9. Formed blood elements.</b></p> <ol style="list-style-type: none"> <li>1. Formed blood elements. Hemolysis.</li> <li>2. Hemoglobin, its value. Compounds of hemoglobin. The content of hemoglobin, color index, spectroscopy blood.</li> </ol>	2
7	<p><b>Topic 9. Formed blood elements.</b></p> <ol style="list-style-type: none"> <li>1. White blood cells, their types and functions. The total number of leukocytes in the blood-ment markets of various kinds. The concept of leukocytosis and leukopenia.</li> <li>2. Leukocyte formula. Features separate forms of leukocytes.</li> </ol>	2
8	<p><b>Topic 10. Blood coagulation.</b></p> <ol style="list-style-type: none"> <li>1. Physiological essence and the mechanism of blood clotting.</li> <li>2. Platelets, their physiological role.</li> <li>3. Factors coagulation.</li> <li>4. Factors affecting the blood. Hematopoiesis and its regulation.</li> </ol>	2
4 semester		
9	<p><b>Topic 11. Digestion in the mouth.</b></p> <ol style="list-style-type: none"> <li>1. The essence of digestion. The main types of digestion.</li> <li>2. The composition and function of saliva. Regulation of salivation.</li> <li>3. Swallowing and its regulation.</li> <li>4. Digestion in the single-chamber stomach.</li> <li>5. Phase gastric juice.</li> <li>6. Vomiting, its mechanism and significance.</li> <li>7. Features in multi digestion stomach. Digestion in the rumen. The value of microflora and microfauna scar.</li> <li>8. The role of the grid, books in digestion.</li> </ol>	2

10	<p><b>Topic 13. Physiology of blood circulation and lymph circulation.</b></p> <ol style="list-style-type: none"> <li>1. Evolution of the cardiovascular system. Methods of functional state of the cardiovascular system.</li> <li>2. Structure and function of the myocardium. Cardiac cycle. Periods and phases of the heart. The systolic and minute volume of blood. The properties of the heart muscle. The rhythm and heart rate. The phenomenon of automaticity of the heart. Conducting system of the heart.</li> <li>3. Patterns of movement of blood vessels. The velocity of the blood vessels.</li> </ol>	2
11	<p><b>Topic 14. Physiology of the respiratory system. Regulation of breathing.</b></p> <ol style="list-style-type: none"> <li>1. The essence of the process of breathing. Respiratory and their functions. External breathing.</li> <li>2. Pulmonary respiration, its mechanism (the act of inhaling and exhaling).</li> <li>3. The life and maximum lung capacity. The exchange of gases between alveolar air and blood. Regulation of breathing.</li> <li>4. respiratory center. Self-regulation of breathing. Nervous and humoral regulation of breathing.</li> <li>5. Breathing in the fetus. Features of breathing in birds. Voice of animals.</li> </ol>	2
12	<p><b>Topic 15. Metabolism and energy.</b></p> <ol style="list-style-type: none"> <li>1. The biological significance of metabolism and energy. Circulation of substances in the animal body and its relationship with the environment.</li> <li>2. Assimilation and dissimilation.</li> <li>3. The protein metabolism. Regulation of protein metabolism.</li> <li>4. Exchange of carbohydrates. Regulation of carbohydrate metabolism.</li> <li>5. Exchange of lipids. The formation and decomposition of fats in the body. Vitamins.</li> <li>6. Exchange of minerals.</li> <li>7. Exchange of energy.</li> <li>8. Thermoregulation.</li> </ol>	2

13	<p><b>Topic 17. Endocrine glands.</b></p> <ol style="list-style-type: none"> <li>1. The concept of endocrine glands. The concept of hormones. The mechanism of action of hormones.</li> <li>2. Pituitary. Hormones adeno- and neurohypophysis. Hypothalamic-pituitary system.</li> <li>3. The thyroid gland and its hormones. Parathyroid glands, their structure and function. Regulation function of parathyroid glands.</li> <li>4. Adrenal gland. The morphology of cortical and medullary layers cancer.</li> <li>5. Pancreas as an organ of internal secretion.</li> <li>6. Incretioion function of the gonads. Hormones male and female gonads.</li> <li>7. Physiological significance of the pineal gland and the thymus.</li> <li>8. Peptides. Prostaglandins, their effect in animals. Tissue hormones.</li> </ol>	2
14	<p><b>Topic 18. Physiology of reproduction.</b></p> <ol style="list-style-type: none"> <li>1. Sexual and physiological maturity of males and females.</li> <li>2. Physiology of the male reproductive system. Spermatogenesis. The formation of sperm. Sperm, its composition and physico-chemical properties.</li> <li>3. Physiology of breeding females.</li> <li>2. The sexual cycle. Growth and development of follicles. The formation and maturation of female gametes – eggs.</li> <li>3. ovulation. The formation of the corpus luteum.</li> <li>4. Sexual reflexes. Sexual behavior.</li> <li>5. Pregnancy duration in different animal species.</li> <li>6. The process generations, its regulation. Postpartum recovery period.</li> </ol>	2
	<p><b>Topic 19. Physiology of lactation.</b></p> <ol style="list-style-type: none"> <li>1. The concept of lactation as a function of the whole organism. Growth and development of mammary glands.</li> <li>2. Synthesis components of milk.</li> <li>3. Neurohormonal regulation of the secretory function of the breast.</li> <li>4. Capacitive system udder.</li> <li>5. Withdrawal milk. Reflex of milk and its inhibition.</li> </ol>	2
	<b>In all</b>	<b>30</b>

### 8. The topic of laboratory lessons.

№	Topics	Number of hours
	<b>3 semester</b>	
1	General methods of physiological studies, rules for dealing with experimental animals, the rules of appliances. Occupational health and safety in the laboratory.	2
2	Making of the neuromuscular preparation. Effect of different stimul on	2

	neuromuscular preparation.	
3	Definition of single and tetanic muscle contractions. Experiments of Galvani.	2
4	Investigation of the influence stimulus load and strength on the work of muscles.	2
5	Research dynamometry and muscle fatigue.	2
6	Measurement of time reflex. Spinal reflexes.	2
7	Definition of the receptor fields.	2
8	The study of the nervous regulation of muscle tone.	2
9	Methods of creating food conditional reflex.	2
10	Methods of creating a conditional reflex.	2
11	Determine the breaking of conditional reflexes.	2
12	Research animals bottom eye (ophthalmoscopy). The reaction of the iris to light. Determination of near vision.	2
13	Determination of colored anomalies (blindness). The blind spot in the eye. Visual illusions.	2
14	Determination of hearing severity. Determination of sound localization. Bone and air conduction.	2
15	Determination the spatial threshold of tactile sensitivity threshold (esteziometriya). Reflexes that have clinical significance.	2
	<b>4 semester</b>	
16	The process of digestion in front intestine.	4
17	Determination the properties of saliva (viscosity, the presence of mucin, alkalinity).	4
18	Auscultation of the stomach and intestines.	2
	The value of digestible ability of gastric juice.	2
19	The value of digestible ability of pancreatic juice and bile in the digestive process.	2
20	The properties of the heart muscle.	6
21	Research of of the heart work.	2
22	Research of arterial pulse and pressure.	4
23	Effects of different stimuli on the heart.	4
	<b>In all</b>	<b>60</b>

### 9. Independent work.

№	Topics	Number of hours
1	Vvedensky M.E. doctrine of the unity of the nature of excitation and inhibition. Functional features smooth muscle. Integration activity of neurons in the central nervous system.	14
2	Physiology of the autonomic nervous system. The limbic system of	14

	the brain.	
3	Imprinting (memorizing) insight as a form of behavior. Biological rhythms. The adaptation of animals to changing environmental conditions. The physiological basis of adaptation. Interoreseptornyy analyzer. Interoreceptors, their classification and function. Interoreceptors role in the cardiovascular, respiratory, digestive, excretory, motor systems. Types of movement. Physiological indicators fitness muscles. The mechanism of regulation of movement. Movement of poultry.	14
4	Determination of blood groups in humans and compatibility of blood in farm animals. Determining Rh factor in humans. Factors affecting the blood. Hematopoiesis and its regulation. The phenomenon of hemophilia. The speed of blood clotting in animals. Natural and artificial anticoagulants.	14
5	The role of academician IP Pavlov and his school in the study of the physiology of digestion. Features digestion different animal species. Hydrolysis of nitrogen containing substances in the proventriculus. Features gastric digestion in young ruminants.	18
	At all fo 3 semester	<b>74</b>
6	Bioelectric phenomena in the cardiac muscle. Changes in breathing during muscular work.	2
7	The value of water in the body, sources of water and its contents in the tissues of the body.	2
8	Seasonal changes in the skin. Physiology molting	4
9	Methods of regulation of reproductive function of animals with hormones.	4
10	The influence of various factors on the composition of milk.	4
	At all fo 4 semester	<b>16</b>
	<b>At all</b>	<b>90</b>

## 10. Methods of study.

### 1. Methods of learning source of knowledge.

1.1. Verbal: story, explanation, conversation (heuristic and reproductive), lectures, instruction, work with the book (reading, transfer, discharge, a plan, reviewing, summarizing, supporting lecture notes, etc.).

1.2. Visual: demonstration, illustration, observation.

1.3. Practical: a laboratory method, practical work.

### 2. Methods of training in logic the nature of knowledge.

2.1. Analytical

2.2. Synthesis

2.3. Inductive method

2.4. Deductive method

2.5. Traduktyvnyy method

**3. Methods of studying the nature and level of independent intellectual activity of students.**

3.1. Problematic

3.2. Part-search (heuristic)

3.3. Exploratory

3.4. Reproductive

3.5. Explanatory, demonstrative

**4. Active teaching methods** - the use of multimedia teaching aids, **Kahoot**, debates, excursions, classes in the workplace.

**5. Interactive learning technologies** - the use of multimedia technologies, interactive whiteboards and spreadsheets, **Zoom** and others.

**11. Control methods.**

1. Rating control a 100-point scale assessment ECTS

2. Holding control over the intermediate term (intermediate certification)

3. Polycriteria assessment of the current work of students:

- the level of knowledge demonstrated in practical laboratory sessions and seminars;

- activity when discussing issues submitted to school;

- results of laboratory work and protection;

- express control during practical classes;

- self study topics in general or specific issues;

- writing essays;

- test results;

- writing assignments during the tests.

**12. Distribution points that receive students**

Routine testing and independent work										ISW	In all for the modules and ISW	Attestation	Total
Module 1 - 18 points					Module 2 - 14 points								
SM 1 - 6 p.	SM 2 - 6 p.	SM 3 - 8 p.		SM 4 - 4 p.	SM 6 - 32 p.								
T-1	T-2	T-3	T-4	T-5	T-6	T-7	T-8	T-9					
6	6	8	6	4	6	8	8	6	15	85 (70+15)	15	100	

## Distribution points that get students

Routine testing and independent work							I S W	In all for the modules and ISW	Attestation	Final exam	Total
Module 3 - 8 points	Module 4 - 18 points		Module 5 - 14 points		Module 6 - 20 points						
SM 7 - 8 p.	SM 8 - 8 p.	SM 9 - 5 p.	SM 10 - 8 p.	SM 11 - 8 p.	SM 12 - 8 p.	SM13 - 12 p.	15	55 (40+15)	15	30	100
T-10	T-11	T-12	T-13	T-14	T-15	T-16					
8	8	10	8	6	8	12					

## Grading scale: national and ECTS

Total points for all the educational activities	Marc ECTS	Assessment of national scale	
		for exam, course project (work), practice	credit
90-100	<b>A</b>	perfectly	counted
82-89	<b>B</b>	fine	
75-81	<b>C</b>		
69-74	<b>D</b>	satisfactorily	
60-68	<b>E</b>		
35-59	<b>FX</b>	unsatisfactory with the possibility of re-drafting	not reckoned with the possibility of re-drafting
1-34	<b>F</b>	unsatisfactorily with obligatory repeated study of discipline	not credited with obligatory repeated study of discipline

## 13. Recommended literature.

### Basic.

1. Мазуркевич А.Й., Карповський В.І., Камбур М.Д. та ін. Фізіологія тварин. – Вінниця: Нова книга, 2010. – 418 с.
2. Фізіологія тварин / [Мазуркевич А.Й., Карповський В.І., Камбур М.Д. та ін.] – Вінниця: Нова книга, 2010. – 418 с.
3. Фізіологія сільськогосподарських тварин (словник-довідник) Юдінцева В.М, Замазій М.Д. (Камбур М.Д). – Полтава. - 1999 р.
4. Практикум з фізіології с.г. тварин Камбур М.Д., Мазуркевич А. І. – Київ. - 2004 р.
5. Фізіологія с.г. тварин під ред.проф. Науменко В.В. - Київ, Агропромвидав Україна. - 1997. - 482 с.
6. Атлас з нормальної фізіології під редакцією проф. Н.А. Агаджаняна Н.А.- Москва, “Высшая школа”. - 1987. - 352 с.

### Auxiliary

1. Загальний курс фізіології чоловіка та тварин під редакцією проф. Ноздрачева А.Д. - Москва “Высшая школа”. - 1991 - у двох томах . - 1023 с.

2. Фізіологія сільськогосподарських тварин під редакцією проф. Голікова Н. А. - Москва, ВО "Агропромиздат" – 1991. - 431 с.
3. Словник-довідник з анатомії та фізіології с.г.тварин, В.І.Кіндя, Ю.А.Куровський, та ін. - Київ, "Урожай" . - 1993. - 431с.
4. Фізіологія сільськогосподарських тварин під редакцією проф. Гіоргієвського В.І. - Москва, ВО "Агропромиздат". - 1990. - 511 с.
5. Фізіологія сільськогосподарських тварин, практикум, під редакцією проф. Науменко В.В. - Київ, Агропромвидав України - 1991. - 231 с.
6. Фізіологія сільськогосподарських тварин під редакцією проф. Науменко В.В. - Київ, Агропромвидав України. – 1997. - 482 с.
7. Фізіологія людини і тварини: Підручник / Г. М. Чайченко., В. О. Цибе