# SILABUS EDUCATIONAL COMPONENT

## BIOCHEMISTRY OF ANIMAL

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| speciality | 211 veterinary medicine | mandatory discipline | veterinary medicine |
| educational programme | Veterinary medicine | faculty | veterinary medicine |
| educational level | second (master's) level | department | physiology and biochemistry of animals |

## TEACHER

**Olha Denysova**

Higher education – speciality biologist, teacher of biology and chemistry
Scientific degree – Candidate of Biological Sciences 03.00.19 Cryobiology
Academic title – Associate Professor of the Department Physiology and Biochemistry of Animal
Work experience – more than 18 years
Indicators of professional activity on the subject of the course:

- author of more than 10 methodological developments;
- co-author of a textbook on biological chemistry;
- co-author of a textbook on the basics of cryobiology and cryomedicine;
- co-author of more than 30 thematic publications;
- participant of scientific and methodological conferences.

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| phone number | 0964975823 | email | denysova78@gmail.com | remote support | Moodle, Google Meet, YourTube - https://www.youtube.com/channel/UCDQ4o6bkiLItPdsaverherw |

The following are involved in teaching the discipline: Associate Professor, Candidate of Agricultural Sciences Nataliia Hladka, Associate Professor, Candidate of Agricultural Sciences Vita Prykhodchenko

| GENERAL INFORMATION ABOUT THE EDUCATIONAL COMPONENT | |
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| **Objective** | to form students' modern ideas about the chemical basis of life, based on knowledge of the chemical structure and properties of the main classes of biomolecules and their derivatives, the main pathways and mechanisms of metabolism and energy, features of regulation and integration of metabolic processes, biochemical mechanisms of preservation, transmission and implementation of genetic information. |
| **Format** | lectures, laboratory and practical classes, independent work, individual assignments. |
| **Details of the results of the study and the forms of their control** | • Be able to solve complex tasks and problems that arise in professional activities (GC2, GC3, SC2) / individual practical training.<br>• Ability to comply with the rules of labour protection, asepsis and antisepsis during professional activities. Ability to organise and conduct laboratory and special diagnostic tests and analyse their results (GC7, GC8, SC1) / individual practica training.<br>• Ability to think abstractly, analyse, synthesise, search, process information from various sources (GC1, SC6, SC7, PLO3) / individual practical classes. |
| **Scope and forms of control** | 7 ECTS credits (210 hours): 18 hours of lectures, 90 hours of laboratory and practical classes, 102 hours of independent study; current control (4 chapters); final control – exam. |
| **Teacher's requirements** | timely completion of tasks, activity, teamwork. |
| **Enrollment conditions** | «Free enrollment». |

| COMPLIANCE WITH THE EDUCATION STANDARD AND EDUCATIONAL PROGRAM | | | |
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| **Competences** | GC1. Ability to think abstractly, analyze and synthesize.<br>GC2. Ability to apply knowledge in practical situations.<br>GC3. Knowledge and understanding of the subject area and profession.<br>GC7. Ability to conduct research at an appropriate level.<br>GC8. Ability to learn and master modern knowledge.<br>SC1. Ability to establish the features of the structure and nutrition of cells, tissues, organs, their systems and apparatus of the body of animals of different classes and species.<br>SC2. Ability to use tools, special devices, instruments, laboratory equipment and other technical means to carry out the necessary manipulations in the performance of professional tasks.<br>SC6. Skills in using information and communication technologies<br>SC7. Ability to organise and conduct laboratory and special diagnostic tests and analyse their results. | **Programme learning outcomes** | PLO3. To determine the essence of physicochemical and biological processes that occur in the body of animals in normal and pathological conditions. |

## STRUCTURE OF THE EDUCATIONAL COMPONENT

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| **Chapter 1. BASICS OF PHYSICAL AND COLLOIDAL CHEMISTRY** | | | | | |
| **Lecture 1** | **Introduction. Fundamentals of physicochemical processes: pH as a key parameter of the environment, methods of its determination, biological role. Buffer systems.** | **LC 1** | **Introduction. Physical and chemical methods of research in biochemistry.** | **Independent work** | **Physical and colloidal chemistry.<br>1. Osmotic phenomena in living systems - endosmosis, exosmosis, turgor, lysis, haemolysis.<br>2. Osmotic resistance of erythrocytes (OR) and its practical use in clinical diagnostics.<br>3. Surface tension: experimental methods of determination and their importance in biochemistry.<br>4. Adsorption in biochemical systems: the role of surface active substances.<br>5. Colloidal solutions. High molecular weight compounds of biological fluids.** |
| **Lecture 2** | **Colloidal solutions: properties, structure, stability and biological significance in living organisms.** | **LC 2** | **Methods for determining the pH of water, acid solutions, blood serum and urine.** | | |
| | | **LC 3** | **Study of buffer solutions: preparation, characteristics and functions in biochemical systems.** | | |
| | | **LC 4** | **Study of the properties of buffer solutions: analysis of pH stability and their role in biochemical processes.** | | |
| | | **LC 5** | **Study of colloidal solutions: preparation, characteristics and methods of analysis.** | | |
| | | **LC 6** | **Study of colloidal solutions: properties, stability and role in biochemical systems.** | | |
| | | **LC 7** | **Surface phenomena and adsorption** | | |
| **Chapter 2. PROTEINS, NUCLEIC ACIDS. BIOLOGICALLY ACTIVE SUBSTANCES: VITAMINS, ENZYMES, HORMONES.** | | | | | |
| **Lecture 3** | **Vitamins: classification, chemical composition and role in metabolic processes of the body.Fat-soluble vitamins.** | **LC 8** | **Proteins. Qualitative reactions to proteins and amino acids.** | **Independent work** | **Proteins. Nucleic acids. General characteristics.<br>1. What diseases or health conditions can be associated with a deficiency or disruption of** |
| **Lecture 4** | **Hormones and their role in metabolic processes. Mechanisms of regulatory influence on metabolism.** | **LC 9** | **Physical and chemical properties of proteins. Classification of proteins.** | | |

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| | | LC 10 | Nucleic acids and their components. | | the structure of proteins and nucleic acids in the body?<br>2. What methods are used to study proteins and nucleic acids in scientific research?<br>3. What factors affect the folding and unfolding of proteins?<br>4. What technologies are used to produce and study proteins in industry and medicine?<br>Biologically important heterocyclic compounds. Vitamin-like compounds. Biochemical basis of veterinary enzymology. Hormones and other bioregulators of lipid origin. |
| | | LC 11 | Final lesson "Physical and colloidal chemistry. Proteins and nucleic acids" | | |
| | | LC 12 | Fat-soluble vitamins: their structure, methods of detection and biological role in the body. | | |
| | | LC 13 | Water-soluble vitamins: structure, functions and role of coenzymes in biochemical processes. | | |
| | | LC 14 | Enzymes: mechanisms of action, classification and their role in biochemical reactions. | | |
| | | LC 15 | Research of enzymes: experimental methods of structure and activity analysis. | | |
| | | LC 16 | Study of the regulation of enzymatic processes. Classification of enzymes. | | |
| | | LC 17 | Characteristics of individual representatives of hormones of the central endocrine glands. | | |
| | | LC 18 | Characteristics of individual representatives of hormones of the peripheral endocrine glands. | | |
| | | LC 19 | Final lesson "Biologically active substances" | | |
| **Chapter 3. METABOLISM AND ENERGETICS. CHEMISTRY AND METABOLISM OF MACROMOLECULES: CARBOHYDRATES AND LIPIDS.** | | | | | |
| Lecture 15 | Chemistry of carbohydrates. Carbohydrate metabolism: specificity and features in different animal species. | LC 20 | Biological membranes. Fundamentals of metabolism. Biological oxidation. | Independent work | Biological membranes:<br>1. Structure, components, characteristics of lipid components.<br>2. Membrane proteins and their functions. Transport of substances through biological membranes. Metabolism |
| Lecture 6 | Chemistry and metabolism of lipids. | LC 21-28 | Chemistry of carbohydrates. Carbohydrate metabolism (digestion, absorption, anaerobic and aerobic oxidation). | | |
| | | LC 29-34 | Chemistry of lipids. Lipid | | |

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| | | | metabolism (digestion, absorption, cellular metabolism). Chapter 3. | | (carbohydrates, lipids, proteins):<br>1. Metabolism during starvation in animals: how the body adapts to the lack of nutrients and what biochemical processes are activated.<br>2. Metabolic features in herbivores and carnivores: comparison of metabolic pathways in different species of animals depending on the type of diet.<br>Diseases associated with metabolic disorders in animals: e.g. diabetes mellitus, obesity, ketosis<br>Modifiers of substance transport.<br>Pathology of biological membranes.<br>Lipid peroxidation. |
| | | LC 35 | Final lesson on the topic "Carbohydrate and lipid metabolism" | | |
| **Chapter 4. METABOLISM OF PROTEINS AND NUCLEAR ACIDS. INTERRELATION AND REGULATION OF METABOLIC PROCESSES.** | | | | | |
| Lecture 7 | Protein metabolism. | LC 36 | Metabolism of simple proteins. Biological role, need and assimilation. | Independent work | 1. Clinical and diagnostic significance of transaminase determination.<br>2. Features of the functioning of the ornithine cycle in normal and pathological conditions.<br>3. End products of nitrogen metabolism in |
| Lecture 8 | Metabolism of complex proteins (chromo- and nucleoproteins). | LC 37 | Intermediates of protein metabolism and their characteristics. | | |
| Lecture 9 | Interrelation of metabolic processes. | LC 38 -39 | Protein metabolism. Protein biosynthesis. | | |
| | | LC 40-41 | Protein metabolism. General and specific pathways of amino acid transformation. | | |

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| | | LC 42-43 | Metabolism of complex proteins of nucleo- and chromoproteins (theoretical lesson). | | different animal species.<br>4. Blood coagulation factors |
| | | LC 44 | Integration of metabolic pathways. | | Veterinary drugs based on complex proteins |
| | | LC 45 | Final lesson on the topic “Fundamentals of metabolism. Metabolism of substances”. | | 5. Certain biochemical parameters of biological fluids as a reflection of the state of metabolism in the body. |
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**BASIC LITERATURE AND METHODICAL MATERIALS**

**References**


1. Nelson D.L. Lehninger Principles of Biochemistry / D.L. Nelson, A.L. Lehninger, M.M. Cox. – 4th edition. – Worth Publishing, 2000. – 1130 p.
2. Koolman J. Color Atlas of Biochemistry / J. Koolman, K. Rohm. – 2nd edition. – Thieme, 2005. – 476 p.
3. Biochemistry I / Frank Schmidt. – IDG Books Worldwide, Inc. An International Data Group Company, 2010. – 193 p.
4. Biochemistry II / Frank Schmidt. – IDG Books Worldwide, Inc. An International Data Group Company, 2010. – 273 p.
5. Stryer L. Biochemistry / L. Stryer, J.L. Tymoczko, J.M. Berg. – 5th edition. – W. H. Freeman Company, 2002. – 1050 p.
6. Vasudevan D.M. Textbook of Biochemistry for Medical Students / D.M. Vasudevan, S. Sreekumari, K. Vaidyanathan. – 7th edition. – Jaypee Brothers Medical Publishers, 2013. – 274 p.
7. Voet D. Biochemistry / D. Voet, J.G. Voet. – 3rd edition. – Wiley, John & Sons, Incorporated, 2003. – 1664 p.


**Methodological support**


1. Biochemistry [Text] : lecture workbook for foreign students 211 Veterinary medicine / V. Prichodchenko, N. Gladka, O. Denysova. - Kharkiv : EPC KSZA, 2021. - 311 p.
2. http://moodle.btu.kharkiv.ua/course/view.php?id=461#section-0
3. The use of metabolic therapy to correct metabolism [Text] / V. Prykhodchenko, N. Hladka, O. Denisova, Y. Moiseienko // Recent Trends in Science : Proceedings of the 3rd International Scientific and Practical Internet Conference, Dnipro, May 16-17, 2024. - Dnipro, 2024. - P. 14-16.

| GRADING SYSTEM | | | |
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| **SYSTEM** | | **MARKS** | **ACTIVITIES BEING EVALUATED** |
| **Final assessment** | **100 ECTS points (standard)** | **to 50** | **50% of the average grade for the chapters** |
| | | **to 50** | **final test** |
| **Rating of section** | **100 points total** | **to 50** | **answers to test questions** |
| | | **to 20** | **oral answers at laboratory and practical classes** |
| | | **to 30** | **result of mastering the block of independent work** |

**STANDARDS OF ACADEMIC ETHICS AND INTEGRITY**

**All participants in the educational process (including students) must adhere to the code of academic integrity and the requirements set out in the Regulation "On Academic Integrity of Participants in the Educational Process of BSTU": to be disciplined, well-mannered, respect each other's dignity, show goodwill, honesty, responsibility.**