**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE**
**SUMY NATIONAL AGRARIAN UNIVERSITY**
**Faculty of Veterinary Medicine**
Department of therapy, pharmacology, clinical diagnostics and biochemistry

# MODULE SYLLABUS

# ORGANIC CHEMISTRY WITH VETERINARY BIOCHEMISTRY

_ required __

**Implemented in the "Veterinary Medicine" Academic Program**

**Area of specialization 211 " Veterinary Medicine"**

**at the second (master 's) level of higher education**

**Sumy** – 2024

Author: _____ Morozov B.S. **doctor of philosophy**

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|---|---|
| Considered, approved and approved at the meeting of the department therapy, pharmacology, clinical diagnostics and biochemistry _____ | protocol from 05.06.2024 № 15 |
| | The head departments _____ _____ |

**Approved by:**

Guarantor of the Academic program _____

Dean of the Faculty _____ (O. Nechyporenko)

Work program review (attached) provided: _____

_____

Methodist of the Department of Education Quality, licensing and accreditation _____ (_____)
(signature) (Full name)

Registered in the electronic database: date: 21.06. 2024

Author: _____ Morozov B.S. **doctor of philosophy**

| | |
|---|---|
| Considered, approved and approved at the meeting of the department therapy, pharmacology, clinical diagnostics and biochemistry _____ | protocol from 05.06.2024 № 15 |
| | The head departments _____ _____ |

**Approved by:**

Guarantor of the Academic program _____

Dean of the Faculty _____(O. Nechyporenko)

Work program review (attached) provided: _____

_____

Methodist of the Department of Education Quality,
licensing and accreditation _____ (_____)
(signature) (Full name)

Registered in the electronic database: date: _____2024

**Syllabus review data:**

| Academic year in which changes are made | The number of the application to the work program with a description of the changes | The changes have been reviewed and approved | | |
|---|---|---|---|---|
| | | Date and number of the minutes of the meeting of the department | Head of Department | Guarantor of the educational program |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| **1. MODULE OVERVIEW** | | | | | |
|---|---|---|---|---|---|
| 1. | Name OK | Organic chemistry with clinical biochemistry | | | |
| 2. | Faculty / department | Veterinary Medicine / therapy, pharmacology, clinical diagnostics and biochemistry | | | |
| 3. | Status OK | Obligatory | | | |
| 4. | Program / Specialty (programs), the component of which is OK for (to be filled in for mandatory OK) | Veterinary medicine / 211 «Veterinary medicine» | | | |
| 5. | OK can be suggested for (to be filled in for sample OK) | - | | | |
| 6. | Semester and duration of study | 2 semester, 15 weeks | | | |
| 7. | Number of ECTS credits | 5 | | | |
| 8. | The total number of hours and their distribution | Contact work (classes) | | | Individual work |
| | | Lectures | Practical / seminar | Laboratory | |
| 9. | 1- Semester | 2 | | 6 | 142 |
| 10. | Language of instruction | Ukrainian | | | |
| 11. | Teacher / Coordinator of the educational component | Morozov Bogdan Stanislavovych **doctor of philosophy** | | | |
| 11. | Contact Information | Bogdan Stanislavovych Morozov<br>Position: Doctor of Philosophy of the Department of Therapy, Pharmacology, Clinical Diagnostics and Biochemistry<br>Workplace: office. 25 building of veterinary medicine<br>E-mail: MorozovBS@meta.ua<br>Tel. (066) 3130411<br>Consultation hours: every Monday from 13:00 to 14:00 | | | |
| 12. | General description of the educational component | The educational component includes sections of organic chemistry and clinical biochemistry, which are necessary for a deep understanding of the essence of biochemical processes that occur in the body of animals in normal and pathological conditions. The subject of this course is the chemical laws and reactions that underlie the physiological and biochemical functions of a living organism. The study of the discipline involves students' practical mastery of the methods of laboratory research of samples of biological material of animals, the ability to interpret their results and substantiate the established diagnosis | | | |
| 13. | The purpose of the educational component | The goal of the initial course is to master the theoretical and practical basics of organic chemistry and clinical biochemistry, which will allow the student to form a complex of chemical knowledge and skills aimed at actively forming professional skills | | | |

| | | |
|---|---|---|
| | | necessary for understanding the peculiarities of the functioning of the animal organism. |
| 14. | Prerequisites for studying OK, connection with other educational components of OP | 1. The educational component is based on knowledge of chemistry (terminology, basic laws and concepts, atomic structure, types of chemical bonds), physics (understanding of the basic patterns of chemical reactions), experimental techniques (knowledge of chemical utensils, concentrations).<br>2. The educational component is the basis for the OK "Veterinary pharmacology of medicinal and poisonous plants", "Veterinary toxicology", "Clinical and laboratory diagnosis of animal diseases", "System of analysis of dangerous factors and control at critical points" |
| 15. | The policy of academic integrity | Observance of academic integrity for students of higher education involves: independent performance of educational tasks, tasks of current and final control of study results; references to sources of information in the case of using ideas, statements, information; compliance with copyright legislation; providing reliable information about the results of one's own educational or scientific activities.<br>Violations of academic integrity when studying the OC "Organic Chemistry with Clinical Biochemistry" are considered to be: academic plagiarism, academic fraud (writing off, cheating, passing off someone else's work as one's own), use of electronic devices during the final control of knowledge.<br>For violation of academic integrity, students may be held to the following academic responsibility:<br>**Academic plagiarism**- score 0, repeat the task.<br>**Academic fraud**– cancellation of received points; re-passing the assessment re-performance of work not performed independently;**Use of electronic devices during final control of knowledge**- suspension from performance of work, grade 0, re-passing of the final control |

## 2. LEARNING OUTCOMES FOR THE EDUCATIONAL COMPONENT AND THEIR RELATIONSHIP WITH PROGRAM LEARNING OUTCOMES

| **OK training results:**<br>After studying the educational component, the student is expected to be able to..." | Program learning outcomes that the OC is aimed at achieving (indicate the number according to the numbering given in the EP)[1] | | | | How is DRN assessed? |
|---|---|---|---|---|---|
| | PRN01 | PRN03 | PRN07 | PRN15 | |
| DRN 1. Understandthe chemical nature of physiological processes in the animal's body with the participation of organic substances, which determines their | X | | | | Interactive testing to check mastery of theoretical material, |

[1]Must comply with the Matrix for providing program learning outcomes with the relevant components of the educational program, indicated for compulsory educational components of level 1 and 2 EP, for all (compulsory and selective OC) EP III

| | | | | | |
|---|---|---|---|---|---|
| subordination to basic chemical laws | | | | | exam |
| DRN 2. Establish relationships between the passage of chemical and biological processes occurring in the body of animals in normal and pathological conditions | | X | | | Passing a comprehensive written control, exam |
| DRN 3. Be able to use laboratory equipment and chemical reagents in compliance with the rules of safe storage and use when conducting specialized research | | | | X | Protection of laboratory reports |
| 4. Formulate conclusions, recommendations, advice on keeping, feeding and treating animals or establish a diagnosis based on the results of laboratory tests | | | X | | Protection of laboratory reports, exam |

## 3. CONTENT OF THE EDUCATIONAL COMPONENT (SCHOOL PROGRAM)

| Subject.<br><br>List of questions that will be considered within the topic | Distribution within the total time budget | | | | Recommended reading |
|---|---|---|---|---|---|
| | Classroom work | | | Myself. Job | |
| | OK | Pz/sem. With | Lab. With. | | |
| **Topic 1. Introduction. Safety rules and rules for working in the laboratory**<br>Rules for working in the laboratory with reagents. Safety rules. First aid. Familiarity with laboratory glassware and other equipment. The simplest operations with substances<br><br>**Topic 1.1:**Theoretical foundations of organic chemistry<br><br>Theory of the structure of organic compounds O.M. Butlerovo.<br><br>The emergence of theoretical concepts in organic chemistry. Structure of the carbon atom. Hybridization. Chemical bond. Covalent bond. Chemical reaction. Types of chemical reactions. Classification of organic compounds.<br><br>Qualitative analysis of organic compounds Laboratory work No. 1. Discovery of carbon, hydrogen, nitrogen, sulfur, halogens. | 2 | | 6 | 28 | 2,3,5,4,7,10 |
| **Topic 2. Hydrocarbons**<br><br>**Saturated hydrocarbons (alkane).**Homologous series of alkanes. Radicals. The nomenclature is rational and systematic. The concept of primary, secondary, tertiary carbon atom. Isomerism. Preparation of saturated: W*urtz reaction from salts of carboxylic acids, from unsaturated hydrocarbons. Natural sources of saturated hydrocarbons. Oil refining. Physical and chemical properties of saturated hydrocarbons. Solubility. Substitution reaction. Reaction of halogenation, nitration, sulfonation and sulfochlorination. Use of hydrocarbons. | | | | 28 | 2,3,4,7,11 |

| | | | | | |
|---|---|---|---|---|---|
| **Ethylene hydrocarbons. Alkenes.**Homologous series. General formula. SP2 – carbon atom hybridization. Dual connection device. The nomenclature is rational and systematic. Preparation of alkenes. Zaitsev's rule. Preparation from alcohols by their dehydration, from halogen derivatives. Chemical properties of alkenes. Addition reaction: halogens, hydrogen halides, water. Reaction with aromatic hydrocarbons. Oxidation reaction – Wagner. Preparation of esters. Polymerization reactions<br><br>**Acetylene hydrocarbons. Alkynes.**Common feature. SP – carbon atom hybridization. The structure of acetylene from an electronic point of view. The nomenclature is rational and systematic. Preparation of compounds with a triple bond: from carbide, dihalogen derivatives. Reactions of addition, substitution, di- and thirimerization. Application in industry.<br><br>**Laboratory work No. 2.**Production and study of saturated and unsaturated hydrocarbons<br><br>**Aromatic hydrocarbons. Arenas.**Features of the structure of the benzene molecule. Aromaticity, Hückel's rule. Nomenclature: ortho, target, position pair. Preparation of aromatic compounds. Wurtz-Fittig reaction, dehydrogenation of carbonocyclic compounds. Physical characteristics. Chemical characteristics. Substitution rule; orientants of the first and second kind Reaction of nitration, halogenation, oxidation.<br><br>**Laboratory work No. 3.**Preparation and study of parameters of aromatic | | | | 28<br><br>28 | 2,3,4,7,10<br><br>2,3,4,7,10 |

| | | | | | |
|---|---|---|---|---|---|
| compounds.<br><br>**Laboratory work No. 4.**Study of the properties of halogenated hydrocarbons. | | | | 28 | 5.11<br><br>5,6,11 |
| Total | 2 | | 6 | 142 | |

## 4. METHODS OF PRESENTATION AND TEACHING

| RNN | **Teaching methods**(work carried out by the teacher during classroom lessons, consultations) | **Number of hours** | **Teaching methods**(what types of learning activities should the student complete independently) | Number of hours |
|---|---|---|---|---|
| DRN 1. Understandthe chemical nature of physiological processes in the animal's body with the participation of organic substances, which determines their subordination | *Explanatory and reproductive*methods: lecture, story-explanation, conversation, aimed at highlighting the value-oriented content of educational material (in the context of professional tasks)<br><br>Using the | 20 | working with textbooks, manuals, Internet materials; illustration, demonstration, performing experiments, exercises, didactic tasks, independent work, etc. | 20 |

| | | | | |
|---|---|---|---|---|
| to basic chemical laws | platformMOODLE, PADLET, ZOOM during blended learning. | | | |
| DRN 2. Establish relationships between the passage of chemical and biological processes occurring in the body of animals in normal and pathological conditions | *Partial search methods*: problem-dialogue, modeling, case method, etc.<br><br>*Inductive methods*-associated with the prediction of observations and experiments based on experimental data<br><br>Using the platformMOODLE, Google Meet, ZOOM during blended learning. | 20 | independent search for educational information, performing laboratory work with partially search content, complex didactic tasks and objectives. | 20 |
| DRN 3. Be able to use laboratory equipment and chemical reagents in compliance with the rules of safe storage and use when conducting specialized research | *Visual methods*– demonstration of experiments<br><br>*Practical methods*–work with reagents, laboratory glassware and instruments in compliance with safety regulations. | 18 | Preparing for a laboratory lesson, performing and preparing a report on the results of laboratory work | 18 |
| 4. Formulate conclusions, recommendations, advice on keeping, feeding and treating animals or establish a diagnosis based on the results of laboratory tests | *Deductive methods*related to wordinggeneral provisions, formulas, laws and their application to specific tasks.*Inductive methods*-associated with the prediction of observations and experiments based on experimental data | 18 | Reading literature on the topic, preparing for a laboratory lesson, completing and preparing a report on the results of laboratory work | 16 |

## 5. ASSESSMENT FOR THE EDUCATIONAL COMPONENT

### 5.1.Diagnostic evaluation (noted if necessary)

### 5.2.Summative assessment

5.2.1. Training is provided to assess expected results

| No. | Summative assessment methods | Points / Weight in the overall assessment | Date of preparation |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1. | Drawing up a comprehensive written control | *(3*x15) points /45% | 7, 10, 14 weeks |
| 2. | Laboratory work report | *25 points / 25%* | by 14-15 weeks |
| 3. | Final control: exam | *30 points/30%* | Exam week |

5.2.2. Criteria for evaluation

| **Component**[2] | **Unsatisfactory** | **Satisfactorily** | **Fine** | **Great**[3] |
|---|---|---|---|---|
| Preparation of a comprehensive written thematic test (3 works) | *<5 points* | *5-8 points* | *9-12 points* | *13-15 points* |
| | An abbreviated condition of the problem has been compiled, reaction equations and formulas are missing | An abbreviated condition of the problems was drawn up, the calculation was performed only using the ready-made formula | The necessary formulas of substances and reaction equations are given; solutions to problems contain errors | The tasks were completed in full, the presentation is logical and rational, conclusions and generalizations are well-reasoned |
| Laboratory work report | *<5 points* | *6-15 points* | *16-22 points* | *23-25 points* |
| | the main content of the material is not presented, there are not enough conclusions and generalizations | there are gaps in the presentation of the material, the presentation is not systematized, conclusions and generalizations are poorly argued, and there are errors in them | there are minor shortcomings in the presentation of the material, the presentation is not sufficiently systematized, there are some inaccuracies in the conclusions and generalizations | the material is presented in full, the presentation is logical, conclusions and generalizations are reasoned |
| Final control: exam | <14 points | 15-20 | 21-26 | 27-30 |
| | Ticket issues not resolved | No more than two problems solved | No more than three tasks solved | Three problems are revealed and a practical solution is proposed |

**5.3.Formative assessment:**

To assess current progress in learning and understand areas for further improvement, it is provided

[2]Specify the summative assessment component

[3]Indicate the distribution of points and the criteria determining the level of assessment

| No. | **Elements of formative assessment** | **date** |
|---|---|---|
| 1 | Interactive testing to check mastery of lecture material | 10 minutes at the beginning of the laboratory session |
| 2 | Checking individual homework, discussion with the teacher and self-correction of completed work by students | Within a week after completion |
| 3 | Surveys and oral comments from the teacher based on the results | weekly |
| 4 | Checking the results of experiments in laboratory work with feedback | Within a week after completion |

## 6. LEARNING RESOURCES (LITERATURE)

6.1. main sources

6.1.1. Textbooks and manuals


1. Veterinary clinical biochemistry: textbook / V.I. Levchenko et al., ed. V.I. Levchenko and V.V. I got in. 2nd ed., revised. and additional Bila Tserkva, 2019. 416
2. Organic chemistry / Snitinsky V.V., Fedevich E.V., Solovodinskaya I.E., Shkumbatyuk R.S., Vishchur O.I. - Lviv: SPOLOM, 2016. - 300 s.
3. Organic chemistry. Workshop: textbook. allowance. for agricultural studies. closing III-IV levels of accreditation according to special. "Veterinary Medicine", "Zoo Engineering", "Agronomy" / A. I. Kononsky. – K.: Higher School, 2002. – 248 p.
4. Biochemistry. Workshop/ L.I. Ostapchenko, I.V. Kompanets, O.V. Skopenko et al. – K.: Publishing and Printing Center *Kiev University*, 2018.- p.296
5. Biochemistry short course. Part 1. / Z.M. Skorobogatova, M.A. Stashkevich, A.G. Matvienko. – Biocomposite, 2021. – 148 p.
6. Clinical biochemistry: a textbook for students of physical education universities. – L.: Leningrad State University of Physical Culture, 2015. – 228 p.


6.1.2. Methodological support


7. **Morozov B.S.**Bioinorganic and analytical chemistry. Guidelines for conducting laboratory and practical classes. Guidelines for full-time students of the Faculty of Veterinary Medicine Sumy.2023. – 33 s.
8. **Morozov B.S.**Bionerganic and analytical chemistry “Guidelines for carrying out laboratory work.” Guidelines for full-time students of the Faculty of Veterinary Medicine Sumy.2023. – 25 s.


6.2. Additional sources


9. Koval T.V. Biochemistry of animals: textbook [textbook. allowance. for students in the areas of "Technology of production and processing of livestock products" and "Veterinary medicine"] / T.V. Koval, O.V. Ovcharuk. – Kamenets-Podolsky: Publisher PE Zvoleyko D.G., 2016. – 440 p.
10. Kravchenko M.I., Ivchenko V.D. Organic chemistry: guidelines for performing laboratory work for 1st year students of specialties 211 "Veterinary Medicine", 212 "Veterinary Hygiene, Sanitation and Expertise" of the educational degree "Master". – Sumy, 2021. – 36 p.
11. Kravchenko M.I., Ivchenko V.D. Organic chemistry. Guidelines for independent study of the module "Theoretical Foundations of Organic Chemistry" by 1st year students of specialties 211 "Veterinary Medicine" and 212 "Veterinary Hygiene, Sanitation and Expertise" of the educational degree "Master" - Sumy: SNAU, 2021.
12. Kravchenko M.I., Ivchenko V.D. Organic chemistry. Part 1. Hydrocarbons: lecture notes for 1st year students of specialties 211 Veterinary Medicine, 212

Veterinary Hygiene, Sanitation and Expertise of the Master's degree. – Sumy, 2021. – 51 p.

13. Nomenclature of organic compounds: textbook/V.S. Tolmacheva, E.M. Kovtun, O.A. Dubovik and others. – Ternopil: Traveler, 2014 – 12 p.
14. Organic chemistry. Tests with explanations: textbook. allowance. O-64 for students higher textbook closing / V. P. Chernykh, L. A. Shemchuk, T. A. Kolesnikova, etc.; ed. V. P. Chernykh. – 3rd ed., stereotype. – Kh.: NUPh, 2017. – 460 p.
15. Pharmaceutical chemistry: textbook (University I-III years a.) / G.P. Scissor. – 2nd ed., ed., K: Institute of Medicine, 2015. – 352 p.

6.2.Software

Software(to support distance learning (Moodle), Zoom, Google Meet, etc.

Addition

**Review of the work program (syllabus)**

| The parameter by which the work program (syllabus) of the educational component is assessed by the guarantor or member project team | Yes | No | A comment |
|---|---|---|---|
| Learning outcomes for the educational component (EC) comply with the NQF | | | |
| The learning outcomes for the educational component (ER) correspond to the stipulated ERN (for mandatory OC) | | | |
| The learning outcomes for the educational component make it possible to measure and evaluate the level of their achievement. | | | |

Member of the project group OU 21 Veterinary Medicine Shkromada O.I. _____
(Name) (FULL NAME) (signature)

| The parameter by which the work program (syllabus) of the educational component is assessed by the teacher of the corresponding department | Yes | No | A comment |
|---|---|---|---|
| General information about the educational component is sufficient | | | |
| Learning outcomes for the educational component (EC) comply with the NQF | | | |
| Learning outcomes for the educational component (ELC) allow you to measure and evaluate the level of their achievement | | | |
| Learning outcomes (LLO) relate to students' competencies, not the content of the discipline (containing knowledge, abilities, skills, and not the topics of the discipline's curriculum) | | | |
| The content of the OK is formed in accordance with the structural and logical diagram | | | |
| Learning activity (teaching and learning methods) allows students to achieve expected learning outcomes (ELO) | | | |
| The educational component involves learning through research that is appropriate and sufficient for the appropriate level of higher education | | | |
| The assessment strategy within the educational component is in accordance with the University/Faculty policy | | | |
| The provided assessment methods allow us to assess the degree of achievement of learning outcomes for the educational component | | | |
| The student load is adequate to the volume of the educational component | | | |
| Recommended learning resources are sufficient to achieve learning outcomes (LLO) | | | |
| Literature is relevant | | | |

Reviewer (teacher)

_____

(Name) (position, full name) (signature)