

National Pirogov Memorial Medical University, Vinnytsya

(name of central organ of management education, proprietor)

**DEPARTMENT OF EDUCATION AND SCIENCE, YOUTH AND
SPORT OF UKRAINE**

BIOLOGICAL AND BIOORGANIC CHEMISTRY

(name of educational discipline)

**PROGRAMME
of education discipline
preparations of specialist (stomatology)
(name educational qualification level)**

**straight 1101 «Medicine»
(code and name of speciality)**

**7.110106 «Stomatology»
(code and name of speciality)**

(Code OPP of 7.110101;)

Work programme from educational discipline “Bioorganic chemistry” for students with direction of preparation **1101 medicine** in speciality **7.110106- medicine**

Developers: head of department of biological and general chemistry of VN Pirogov MMU

Doctor of Medicine Zaichko N.V
Assistant of professor Smirnova O.V
Assistant Shunkov V.S.

Work programme approved
by the board department of **biological and general chemistry**
Protocol from “25” January 2013year, №1

Head of department _____ Zaichko
N.V._
(signature) (surname and initials)

“25” January 2013year, №1

Work programme approved by the board generally methodical - theoretical
discipline Vinnytsya National Pirogov Memorial Medical University
Protocol from “25” January 2013year, №1

Head of the Curriculum Board _____ Korol A. P.
(signature) (surname and initials)

**Description of curriculum from discipline «Medical chemistry»
for the students of stomatological faculty
Speciality 7.110106 «Stomatology»**

Form of education	Year of studies	Semester	Credits	Modules	Amount of hours					Types of control
					General	Audience			IWS	CMC (Differential test)
						Lecture	Practical lessons	CMC		
Daily	1	II	3	1	90	10	38	2	40	II semester

Note:

1 credit ECTS – 30 hours. Audience loading – 56%, IWS – 44%.

Correlation of amount hours of audience lessons to IWS: $50/40 = 1,25/1$

Educational work programme from medical chemistry is made on the basis of the program of educational discipline «Medical chemistry» for the students of higher medical establishments of formation III-IV of levels of accreditation, approved by order MES Ukraine t.Kyiv. Speciality: 7.110106 «Stomatology», Kyiv, 2012. (the program is developed by the worker of department of medical and general chemistry of the National Medical University of O.O.Bogomol'cya, t.Kyiv).

PURPOSE AND OBJECTIVES OF THIS DISCIPLINE

Bioorganic chemistry is one of the components in complex learning materials program course.

Chemistry is the basis of all biological processes among the sciences, which constitute the foundation of medicine. Chemical analysis methods are constantly used in the diagnosis of diseases and preventive medicine surveys.

Production, of piece of polymers based on chemical synthesis. Of particular importance are sections of chemistry in the study of normal and pathological processes in humans at the molecular and cellular levels, in the appearance and development of such disciplines as molecular biology, quantum chemistry, molecular kinetics, molecular pathology, clinical pharmacology, which is the theoretical basis of modern medicine.

Training of medical students, it need knowledge for understanding the functions of individual systems in the body as a whole body interaction with the environment and the ability to use different calculations for quantitative analysis of various processes is the aim and objective of this discipline.

2. Contents of subject

2.1. Lectures

	<i>Theme of lectures</i>	<i>Lecturer</i>	<i>Hours</i>
1	Basics of the reactivity of biologically active compounds.	Assistant Shunkov V. S.	2
2	Reactionary ability of hydrocarbons and their derivatives.	Assistant Shunkov V. S.	2
3	Carboxylic acids. Lipids.	Assistant Shunkov V. S.	2
4	Amino acids, peptides, proteins chemical properties, biological role.	Assistant Shunkov V. S.	2
5	Carbohydrates: classification, structure, chemical properties, application in medicine.	Assistant Shunkov V. S.	2

2.2 Plan of practical lessons

Theme of the practical lessons	Hours
Content module 1	
Classification of organic compounds. Nomenclature.	2
Spatial structure of biological active compounds. Enantiomerism and conformation isomerism.	2
Electronic structure of carbon atom, the nature of chemical bond. Conjugation and aromaticity of biological active compounds.	2
Electronic effects in biological active compounds.	2
Acidity and basicity of biological active compounds.	2
Reactivity of alkanes and halogen alkanes.	2
Reactivity of alkenes.	2
Reactivity of arenes.	
Nucleophilic addition reaction to oxo compounds.	2
Nucleophilic substitution reaction of carboxylic acids and their biological active derivatives.	2
Lipids.	2
Heterofunctional biological active compounds.	2
Content module 2	
Amino acids.	2
Peptides and proteins.	2
Content module 3	
Monosaccharides.	
Oligo- and Polysaccharides.	2
Content module 4	
Heterocyclic biological active compounds.	2
Nucleic acids.	2
Practical skills.	2
Module	2

3. Questions for self work hours

<i>Nº</i>	<i>Theme</i>	<i>Individual work</i>
1	<i>Classification of organic compounds. Theory of O.M. Butlerov is about the structure of organic compounds</i>	2
2	<i>Reactionary ability of derivative alkanes</i>	2
3	<i>Reactionary ability of oxo compounds. High-quality reactions</i>	2
4	<i>Heterofunctional of connection. Ketonic bodies</i>	2
5	<i>Amino acid. Specific reactions. Physical and chemical analysis of albumens</i>	4
6	<i>Carbohydrates. High-quality reactions. Derivatives of simple carbohydrates. Heteropolysaccharides</i>	4
7	<i>Heterocyclic connections. Nucleic acids</i>	4
	<i>At all</i>	20

4. Themes of individual work

1. Abstracts are on the themes of biological value of organic compounds.
2. Making of codegrams.
3. Preparation of tables.
4. Appearance is on a student a scientific conference.

5. List of literature:

Basic literature:

- 5.1. Tyukavkina N.A., Baukov Yu.I. Bioorganic chemistry. – M.: Medicine, 1985. – 478p.; 1991.–
- 5.2. Tyukavkina N.A., Bioorganic chemistry. – M.: GEOTAR-Media, 2009. – 416p.
- 5.3. Metodological books for laboraty work of bioorganic chemistry, editor Tyukavkina N.A.,. – M.: Medicine, 1985. – 256p.
- 5.4. Gubskiy Yu.I. Bioorganic chemistry.– Vinnytsya.: New book, 2004. – p. ISBN –7890–71–6.
- 5.5. Revo A.Ya. Copy-notes for practical work for organic chemistry. – M.: High school, 1980. – 161p.

Additional literature:

- 5.6. Grandberg I.I. Organic chemistry.– M.: High school, 1980. – 463p.
- 5.7. Rayls A., Smit K., Uord Base of organic chemistry (for students biological, medical and agricultural specialties). –M.: World, 1983. – 352p.
- 5.8. Terney A. Modern Organic chemistry – M.: the World, 1981. – t.1, 678p., t.2, 651p.
- 5.9. Chichibabin A.E. Basic of organic chemistry. – M.: Govchem, 1963. – t.1, 910p., t.2, 918p.
- 5.10. Karrer N. Course of organic chemistry. – L.: Govchempr, 1962. – 1215p.
- 5.11. Ovchinnikov Yu.A. Bioorganic chemistry. – M.: Inlightening, 1987. – 815s.
- 5.12. Stepanenko B.N. Course of organic chemistry. – M.: High school, 1972. – 600p.

6. The question before the current controle

1. Electroic structure of atom carbon and it chemical bonds.
2. Types of isomerism of organic compounds: cys-trans, enantiomerya, conformation isomerism.
3. Electronic effect in organic compounds.
4. Acidity and bacity of organic compounds.
5. Mechanism reaction radical substitution in alkane, electrophilic joining in alkenes, electrophilic substitution in arenes, nucleophilic substitution in halogenalkanes and ethanols, eliminoic in alcohols, nucleophilic joining in oxocompounds, nucleophilic substitution in carbonoacids and derivatives.

6. Heterofunctional that heterocycle organic compounds
7. Carbohydrates: monosaccharides, oligo-, polisaccharides.
8. Aminoacid and proteins.
9. Nucleic acid, structure, properties.

7. List of questions to final module

1. Bases of reactionary ability biologically active connections.

Question from the electronic structure of atom, spatial structure, electronic effects, acidity and basicity, biologically active connections given as tests.

2. Reactionary ability of oxocompounds.

Electronic structure of oxogroupe in aldehydes and ketones and mechanism of the nucleofilic joining. Reactions of co-operation of aldehydes with alcohols, ammonia and amines, aldol condensation. High-quality reactions are on aldehydes (reactions of Tollense, Trommere, Felling). A biological value of aldehydes and practical application of high-quality reactions is on aldehydes.

3. Reactionary ability of hydrocarboxylic acids and their derivatives.

Electronic structure of carboxy-group and mechanism of nucleofilic substitution. A mechanism of co-operation of hydrocarboxylic acids is with alcohols (formation of esteres - difficult ethers); a hydrolysis of esteres is in sour and alkaline environments; co-operating of halogenanhydres is with amoniak (formation of amides). Tioefires, their role in the organism of man. Reactions of acilation after participation acetyl-CoA, chart of formation of acetilkholine. Esteres and amides are in the organism of man. Acetylsalicylic.

4. Carbonhydratess.

Monosaccharides: glucose, lactoglucose, fructose, manose, ribose, desoxyribose. Structure, isomeres, chemical properties: formation of O- and N-glycosides, alkiluvannya and acilyuvannya oxogroup; high-quality reactions.

Oligosaccharides: saccharose, lactose, maltose, celobiose. Composition, structure, types of connections, spatial structure, chemical properties: formation of O- and N-glycosides, alkilation, acilation oxogroup; biological value.

Polysaccharidess: starch (amilose, amylopectin), hepatin, dextranes, cellulose. Composition, structure, types of connections, spatial structure, chemical properties, biological value.

Amino acid as morphons of peptids and albumens.

Composition, structure, isomerism, chemical properties, for carboxy- and aminogroup; acid-basic properties, IES, IET; high-quality and quantitative analysis. Reactions of amino acid are in the organism of man (decarboxilation, oxidation dezamination, inwardly molecular dezamination). Transformation of serine, tryptophane, is in the organism of man.

5. Peptids and squirrel: methods of selection, division, cleaning, determination of homogeneity of albumine. Analysis of amino acid sequence of peptids and albumine; synthesis of peptids and albumine (basic stages).

6. Nucleic acids. Structural components of nucleic acids, their structure, chemical properties. Nucleoside: composition, structure, type of connection, nomenclature.

Mononucleotides: composition, structure, types of connections, nomenclature.

Nucleotides as component part of coferments (coferment-A, NAD, NADF). RNA and DNA, composition, types of connections. Features of the second structure of DNA and tRNA. Biological value of nucleic acids ATP, composition, types of chemical connections; structure, biological value

7. Washed lipides. Fats. Higher fat acids: saturated and unsaturated, spatial structure of the unsaturated acids, chemical properties. Triacilglicerides (fats): composition, structure, chemical properties (hydrolysis, ionic number, peroxsidne oxidation, hydrogenation). Phosphatic acid: composition, structure, types of connections. Phosphoglicerides: structure of phosphate deslkholine, phosphatidilkolamine, phosphatidilserine, types of connections, biological value.

8. CRITERIA OF EVALUATION OF CREDIT MODULE

Credit module from bioorganic chemistry estimated thus:

80 – 71 point belongs, to a student who answered all theoretical questions correctly, and wrote the mechanisms of reactions, but did less serious errors or slips of the pen;

70 – 61 point belongs, to a student who gave an incomplete answer for theoretical questions, and did errors in writing of mechanisms of reactions;

60 – 50 point is given to, if a student who did essential errors. When answering for theoretical questions, wrong wrote the mechanisms of reactions.

Less than 50 point belong, to a student who gave wrong answers for theoretical questions, and did not write the mechanism of reactions.

9. PRACTICAL SKILLS WHICH STUDENT MUST USE:

- to work with literature educational and scientific, by chemical reference books, to use a technicals;
- to know safe work in a chemical laboratory (conduct with caustic, poisonous, volatile organic compounds, and also with steam-disengaging devices);
- to work with chemical tableware and conduct chemical experiment;
- to conduct the analysis of amino acid the method of paper chromatography;
- to conduct the division of mixture of matters the method of column chromatography;
- to classify organic compounds after a structure hydrocarboxylic skeleton and by nature functional groups;
- to use the rules of chemical nomenclature. To make the names after a structural formula and after the name to make the structural formula of representatives biologically important classes of organic compounds;
- to determine in a molecule the presence of center of khiral and to know about a spatial structure biologically important organic compounds, to make the models of organic compounds;
- after a structure to determine the presence of reactionary centers in a molecule, to determine their character: acid, basic, electrophilic or nucleophilic, and high-quality to estimate reactionary possibility of organic compounds;
- to conduct high-quality reactions on an unsaturation, presence a diolic fragment, on amino acid, glucose, fructose;
- to determine a high quality of diethylated ether, acetophene; - high-quality to determine an acetone and glucose in biological liquids;
- to analyse and process the results of experience. Skills of correct conduct of document
- compendia registration of records, protocols, laboratory magazine.

10. OBLIGATORY MINIMUM THEORETICAL QUESTIONS AND PRACTICAL SKILLS WITHOUT WHICH STUDENT CAN NOT GET POSITIVE ESTIMATION

As a result of study of discipline students must know:

- structure of basic classes of natural organic compounds – previous and structural elements of macromolecules;
- it is prognostication of chemical conduct of natural organic compounds in the certain terms of environment;
- possible ways and terms of transformation of functional groups in the major classes of natural organic compounds as bases them genetic connection in biochemical processes;

and able:

- to work with chemical tableware and conduct chemical experiment;
- to conduct the analysis of amino acid the method of paper chromatography;
- to conduct the division of mixture of matters of column chromatography;
- to determine in a molecule the presence of center of khiral and to make the picture of spatial structure biologically important organic compounds, to make the models of organic compounds;
- after a structure to determine the presence of reactionary centers in a molecule, to determine their character: acid, basic, electrophilic or nucleophilic, and high-quality to estimate reactionary possibility of organic compounds;
- to conduct high-quality reactions on an unsaturation, presence a diolic fragment, amino acid, glucose, fructose, alkaloids;
- to determine of high quality of diethylated ether, acetophene;
- high-quality to determine an acetone and glucose in biological liquids;
- to determine of high quality of diethylated ether, acetophene;
- high-quality to determine an acetone and glucose in biological liquids;
- to analyse and process the results of experience. To purchase skill of correct conduct of document – short notes, registration of records, protocols, laboratory magazine.

11. METHODOICAL PROVIDING OF OBJECT

1. Theses of lectures (summary).
2. Methodical materials are on the leadthrough of practical employments: it is Program from bioorganic chemistry for higher medical establishments of formation of Ukraine of III – IV levels of accreditation of 2005y. in obedience to the requirements of Bolonse process;
 - methodical developments of practical employments are for teachers;
 - it is collection of methodical developments of practical employments for students;
 - are columns of logical structures
 - are tests to every practical employment

12. List of educational equipment.

1. Tables.
2. Sliding seats.
3. Codegrams
4. Overhead projector.
5. Laboratory tableware.
6. Chemical reagents.