

Study Programme: Bachelor Academic Studies in Biochemistry
Course Unit Title: Introduction to Biochemistry
Course Unit Code: B-604
Name of Lecturer(s): full professor, Neda Mimica-Dukić, assistant professor Emilija Svirčev
Type and Level of Studies: Bachelor of Science Degree
Course Status (compulsory/elective): compulsory
Semester (winter/summer): winter
Language of instruction: English
Mode of course unit delivery (face-to-face/distance learning): Face-to-face
Number of ECTS Allocated: 8
Prerequisites: None
<p>Course Aims:</p> <p>(1) to provide students with fundamental knowledge of basic cells biomolecules (structure and functions), needed to pursue further courses and research in the field of biochemistry, (2) elucidation of relationship between structure and bioactivity. (3) Developing students' practical skills and abilities to apply the standard experimental methods for the analysis of biological material.</p>
<p>Learning Outcomes:</p> <p>Upon completion of the course, students will be able to: (1) demonstrate knowledge of basic elements of the structure of biomolecules, from simple molecules to complex macromolecular and supramolecular structures, (2) describe the structure and chemical properties of carbohydrates, proteins, lipids, and nucleotides and their functions in the body, and show examples of how the three-dimensional structure of macromolecules determines their biological function, (3) use correctly biochemical vocabulary (4) browse biochemical literature (books, journals and Internet resources) and independently write simple text to the selected topic in the field of biochemistry, (5) to use chemical and biochemical methods in solving practical problems in biochemistry and interpret the obtained experimental results.</p>
<p>Syllabus:</p> <p><i>Theory</i></p> <p>Biochemistry and evolution, the cell as the basic unit of life. Basic thermodynamic principles of biochemical reactions. Cell as basic unit of life. Amino acids and primary structure of the proteins. Peptide bond and its properties. Three-dimensional structure of proteins and levels of protein organization (types of bonds that stabilize secondary and tertiary structure of the proteins). Allosteric regulation of oligomeric proteins (the case of haemoglobin). Introduction to enzymes and some basics of the kinetic of enzymatic reactions. Carbohydrates, classification, properties and functions. Polysaccharides: structural and storage polysaccharides. Glycosaminoglycans. Glycoproteins. Peptidoglycan framework in bacterial cell walls. Glycoproteins. N- and O-glycoproteins. Lipids – classification, structural and functional properties. Acilglycerols, phospholipids, sphingolipids, and glycolipids. Biological membranes: structure, assembly and transport through cell membranes. Vitamins insoluble (A,D,E,K) and soluble in water (B-complex, vitamin C) –structure and function. Biochemistry of vision. Nucleotides: structure, hierarchy of buildings, functions. Coenzymes. Classification and distribution of coenzymes. Nucleic acid: classification, structure and function.</p> <p><i>Practice</i></p> <p>Laboratory work follows theoretical instruction. Volumetric determination of pK and pI of amino acids. pH-metric determination of protein pI. Color reactions on amino acids, proteins, phosphoproteins. Protein coagulation. Determination of protein content: spectrophotometric (by Lowry) and volumetric (by Kjeldahl). Detection of particular carbohydrates in biological material. Quantitative determination of sugar according to Bertrand. Properties of enzymes:</p>

enzymes kinetics and specificity. Determination of K_M и v_{max} . Qualitative properties of lipids. Spectrophotometric determination of the content of total lipids and phospholipids in serum. Colored reactions of nucleobases. Identification of nucleobases in the DNA hydrolisate by TLC. Spectrophotometric determination of nucleic acids according to Spirin.

Required Reading: Donald Voet:

1. Voet, D.&Voet, J. : Fundamentals of Biochemistry, John Wiley&Sons, USA, 2013
2. Nelson, D.L., Coc, M.M.: Lehninger: Principle of Biochemistry, Fifth. Eddition, WH Freeman & Company, Newyork, 2008.
3. Rodwel, V., Bender, D., Bothan, K.M., Kennelly, P., Weil., P.A. Harper's Illustrated Biochemistry. 31.th edition, Mc Grow Hill Education, LANGE, 2018.

Weekly Contact Hours: 7 (105)	Lectures: 45	Practical work: 60
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Teaching Methods: Lectures, laboratory work, desk study projects, seminar

Knowledge Assessment (maximum of 100 points): 100

Pre-exam obligations	points	Final exam	points
Active class participation	5	written exam	50
Practical work	25	oral exam	10
Preliminary exam(s)		
Seminar(s)	10		

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.