

Study Programme: Chemistry			
Course Unit Title: Fundamentals of Biochemistry			
Course Unit Code: Z-302			
Name of Lecturer(s): Associate professor Dejan Orčić, Assistant Professor Emilija Svirčev			
Type and Level of Studies: Bachelor Academic Studies			
Course Status (compulsory/elective): Compulsory			
Semester (winter/summer): Summer			
Language of instruction: English			
Mode of course unit delivery (face-to-face/distance learning): Face-to-face			
Number of ECTS Allocated: 9			
Prerequisites: None			
Learning objectives (1) To introduce students to fundamental concepts of biochemistry, necessary for higher biochemistry courses, (2) to provide students with understanding of the relationship between biomolecules function and structure, (3) to develop practical skills and ability to apply standard experimental methods in solving biochemical problems.			
Learning outcomes After completing the course, student is able to: (1) demonstrate basic knowledge of chemical principles underlying biochemical processes, and to explain characteristics of biochemical reactions and living matter, (2) describe structure, chemical properties and biological functions of main groups of biomolecules (carbohydrates, proteins, lipids, nucleotides), and demonstrate the relationship between three-dimensional structure and biological functions of biomolecules, (3) demonstrate basic understanding of enzyme catalysis mechanisms, and kinetics and thermodynamics of enzyme-catalyzed reactions, (4) search biochemical sources and independently write basic texts on selected biochemical topics, (5) apply experimental methods in solving practical biochemical problems, and interpret experimental results.			
Syllabus			
<i>Theoretical instruction</i> Origin of life. Cell structure. Amino acids – structure and properties. Peptides – nomenclature, peptide bond properties, biologically active peptides. Proteins – 1° structure, 3D structure and stabilizing interactions, 4° structure, examples of globular and fibrillar proteins. Carbohydrates (mono-, oligo-, polysaccharides) – structure, nomenclature, biological functions. Glycoproteins, proteoglycans, peptidoglycans. Lipids – classification, structure and function of lipids (fatty acids, acylglycerols, phosphoglycerides, sphingolipids, waxes, steroids, terpenoids, fat-soluble vitamins). Biological membranes, membrane proteins, membrane transport mechanisms. Nucleobases, nucleosides, nucleotides, nucleic acids (DNA, RNA) – structure, nomenclature, function. Enzymes – properties, classification and nomenclature. Co-factors – classification, mechanism of action, water-soluble vitamins.			
<i>Practical instruction</i> Volumetric determination of amino acids pK_a and pI . pH-metric determination of protein pI . Color tests for amino acids and proteins. Protein coagulation. Albumins and globulins separation. Protein separation by disc-electrophoresis. Protein determination after Lowry (spectrophotometric) and Kjeldahl (titrimetric). Qualitative tests for carbohydrate classes. Sugar determination after Bertrand. Investigation of enzymes' properties – specificity, factors affecting reaction rate. Qualitative tests for fats. Spectrophotometric determination of total lipids and phospholipids in serum. Color tests for nucleobases. Spectrophotometric determination of nucleic acids. Identification by TLC of nucleobases in DNA hydrolisate.			
Required Reading: I. P. Karlson, Biochemistry, John Wiley, 2005.			
Weekly Contact Hours: 120		Lectures: 60	Practical work: 60
Teaching Methods: Lectures and lab work			
Knowledge Assessment (maximum of 100 points): 100			
Pre-exam obligations	points	Final exam	points
Activities	5	Written exam	60
Lab excersises	30		
Seminar work	5		