Level: bachelor

Course title: Introduction to Biochemistry, B-604

Status: obligatory

ECTS: 8

Requirements: none

Learning objectives

(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.

Learning outcomes

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.

Syllabus

Theoretical instruction:

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.

Practical instruction:

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: enzymes kinetics and specificity. Determination of *Км* 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.

Weekly teaching load				Other:
Lectures: 2	Exercises: 2	Other forms of teaching: /	Student research: /	