

Biochemistry I

Code: 100877
ECTS Credits: 6

Degree	Type	Year	Semester
2500252 Biochemistry	FB	1	2

Contact

Name: María Rosario Fernández Gallegos
Email: Rosario.Fernandez@uab.cat

Use of languages

Principal working language: spanish (spa)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Other comments on languages

Mainly in Spanish but some teaching materials in Catalan

Prerequisites

It is recommended that the student has acquired the knowledge taught in the subjects of the first semester, in particular the contents of Foundations of General Chemistry, Cell Biology, and especially Basic Instrumental Techniques.

Objectives and Contextualisation

The subject Biochemistry I constitute the first part of the Subject "Biochemistry" of the Degree of Biochemistry and in which the structural and functional characteristics of the biomolecules from a basic point of view is studied. The knowledge acquired here, especially what refers to the structure and function of enzymes and concepts of bioenergetics, will be used in the second part of the subject, called Biochemistry II, which is taught in the third semester. In the same way, the concepts of structure and function of biomolecules are important for the follow-up of most subjects of the Degree in Biochemistry.

Content

Topic 1. ELEMENTS, MOLECULES AND PHYSICAL ENVIRONMENT.

Levels of structural organization of biomolecules. Types of bonds in molecules. The biological importance of water. Non-covalent interactions. Ionization of water. Acid-base. Ion balance and buffering systems.

Topic 2. PRINCIPLES OF BIOENERGETICS.

The transformations of energy to living organisms and thermodynamics. Free energy and equilibrium constant. Coupled reactions. Transfer of phosphate groups, and ATP paper. Oxidation reactions.

Topic 3. PROTEINS 1: PRIMARY STRUCTURE AND BIOLOGICAL FUNCTIONS.

Protein classes and their functions. Structure and properties of amino acids. Stereoisomers. Peptides and the peptide group. Analysis of the composition of amino acids and the sequence of proteins.

Topic 4. PROTEINS 2: THREE-DIMENSIONAL STRUCTURE OF PROTEINS.

Structuring levels of proteins. Secondary structure. Fibrous proteins. Globular proteins Protein folding: factors that determine it. Molecular Chaperones. Introduction to conformational diseases. Prediction of the protein structure. Quaternary structure. Determination of the three-dimensional structure of macromolecules by means of nuclear magnetic resonance and X-ray diffraction.

Topic 5. PROTEINS 3: RELATION STRUCTURE-FUNCTION AND EVOLUTION OF PROTEINS

Storage and transport of oxygen: myoglobin and hemoglobin. Myoglobin and hemoglobin as examples of protein evolution. Use of protein sequences for the analysis of evolutionary relationships. Allosterism and cooperativity of hemoglobin. Different forms of hemoglobin: physiological adaptation and molecular pathology.

Topic 6. BIOLOGICAL CATALYSIS

Nature and function. Classification and nomenclature of enzymes. Effects of catalysts on chemical reactions: general mechanisms. Description of enzymatic mechanisms. Enzymatic kinetics: Michaelis-Menten model. Enzymatic cofactors. Enzymatic inhibition. Regulation of enzymatic activity: allosterism, covalent modification and changes in enzyme concentration. Biomedical and biotechnological applications.

Topic 7. SUGARS AND POLYSACCHARIDES

Monosaccharides: description and properties. Classification. Monosaccharide derivatives. Disaccharides and Oligosaccharides. Structural and reserve polysaccharides. Glycoproteins, proteoglycans, and glycolipids. Oligosaccharide Markers

Topic 8. NUCLEIC ACIDS

Nature and function. Nucleotides. Primary structure of nucleic acids. Secondary structure: Watson and Crick model and alternative structures. Tertiary structure: overlap of DNA and transfer RNA. Complex DNA-proteins: organization of the chromosome.

Topic 9. RECOMBINANT DNA

DNA cloning materials and methodology. Construction of DNA libraries. Selection and search for DNA sequences: hybridization. The sequence of DNA. Genome projects Some applications of genetic engineering. Genomics and proteomics.

Topic 10. LIPIDS AND BIOLOGICAL MEMBRANE

Types of lipids and functions. Membrane structural lipids. Other lipids with specific biological activity. Lipoproteins Structure and properties of biological membranes.

PROBLEMS

The content of this section, which will be presented in the form of a dossier at the beginning of the semester, consists of a determined amount of statements of problems related to the topics developed in theory. The own characteristics of the different parts of the Theory's subject matter make the statements of the problems concentrate on certain aspects that are: chemical equilibrium and shock absorbers, free energy and constant equilibrium, methods of purification and analysis of macromolecules and Enzymatic kinetics.