Structure and Function of Biomolecules 2016/2017

Code: 100758
ECTS Credits: 6

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Contact

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Use of languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Other comments on languages

Most of the teaching materials used will be written in English and published in the Campus Virtual

Prerequisites

There are no official prerequisites. However, it is assumed that the student has assimilated the concepts acquired during the first term, particularly those contained in the subjects of Chemistry and Cell Biology, such as those related to chemical functional groups, chemical equilibrium, basic thermodynamics, biological membranes and cellular compartmentalization.

Objectives and Contextualisation

The course Structure and Function of Biomolecules is the first part of the subject "Biochemistry" in the Biology degree; it covers the structural and functional characteristics of biomolecules from a point of view which is basic and simple but also with the necessary depth required for further use, mainly related to the structure and function of enzymes and the bioenergetics concepts that will be used in the second part of the subject to be taught in the third term under the name Biosignalling and Metabolism. Similarly, the concepts on the structure and function of biomolecules are essential for the understanding of more specialised courses in the Biology degree.

Objectives:

• To understand, based on previously acquired chemistry knowledge, the fundamental structural characteristics of biological molecules, being able to draw conclusions about their stability, functionality and ability to replicate structures.
• To acquire the conceptual basis of bioenergetics processes as a primer to the second part of the subject Biochemistry, dedicated to metabolism.
• To understand the kinetics of enzymatic action in the context of the study of biological reactions and their metabolic relationships.
• To understand the basic methods of purification, characterization, structural analysis of biomolecules and recombinant DNA methodologies.

Content

THEORY
1. Elements, molecules and the physical environment of living beings.


3. Proteins: primary structure and biological functions.


4. Three-dimensional structure of proteins.


7. Carbohydrates.


Spectroscopic methods and their applications; absorption spectroscopy, fluorescence, circular dichroism, infrared spectroscopy. Mass spectrometry. Determining the three-dimensional structure of macromolecules by NMR and X-ray diffraction.

10. Recombinant DNA.

Brief introduction to nucleic acid metabolism: replication, transcription and translation. Materials and methods for DNA cloning: restriction enzymes, vectors, recombinant protein expression and purification methods. The most common methods of recombinant DNA technology. Applications to the production and modification of
proteins. DNA sequencing and genome projects. Some applications of genetic engineering. Genomics and proteomics.

11. Lipids and biological membranes.


PROBLEMS

This section will be based on a dossier that will be delivered at the beginning of the semester consisting of a series of problems related to the topics developed in the theory lectures. The characteristics of the various parts of the syllabus theory impose a concentration of the problems proposed on certain specific aspects: chemical balance and buffer systems, free energy and equilibrium constant, purification methods and analysis of macromolecules, enzyme kinetics and recombinant DNA.

LABORATORY

Two four-hour sessions:

1. Spectrophotometry as a method for determining the concentration of biomolecules. Preparation of buffer solutions.
2. Liquid chromatography and electrophoresis on SDS-polyacrylamide gels as methods for the analysis and purification of biomolecules.