

Biochemistry

Calendar: 3rd semester

Contact Hours: 45h00 TP; 7h50 OT

Scientific Area: Biotecnologia

Learning outcomes of the curricular unit

The objective of this curricular unit is the knowledge and understanding of the properties and structure of the foremost classes of biomolecules (sugars, lipids, proteins and nucleic acids), their interactions with the solvent water, and the mechanisms by which they react in a controlled manner in the context of the living cell.

The student should be able to describe the structure and function of proteins, apply methods of isolation and characterization of protein, interpret enzyme kinetic parameters, understand the functions and chemical nature of diverse sugars and lipids, know the components and properties of biological membranes, the structure and characteristics of nucleic acid. He will know the role of ATP, NAD(P)H and FAD in the metabolism, and the major metabolic pathways, being capable of performing bioenergetic calculations.

The student should develop the capacity to relate and integrate all concepts so as to visualize the molecular functioning of the cell as a whole.

Syllabus

1. Introduction to biochemistry. Biodiversity of living organisms vs biochemical uniformity; different types of cells and their characteristics. Biological functions in aqueous system

2. Biomolecules: aminoacids and peptides: properties; Properties, function and structure of proteins; methods of isolation, purification and quantification of proteins; Enzymes – reaction mechanism and kinetics; Structure and function of lipids, biological membranes – composition, function and transport systems. Nucleic acids and nucleotides – structure, properties, role. Genetic information flux – replication, transcription and translation. Recombinant DNA technology. Structure and function of sugars.

3. Bioenergetics and metabolism: fundamentals of bioenergetic, metabolic pathway, catabolism and anabolism. Glycolysis, tricarboxylic acid cycle, pentose phosphate pathway, respiratory chain, beta-oxidation of fatty acids, degradation of amino acids for energy gain, urea cycle.

Demonstration of the syllabus coherence with the curricular unit's objectives

Biochemistry is a broad scientific field, that explains at a molecular level the chemical reactions that occur in a living cell. The syllabus of this curricular unit focuses on the most relevant aspects of biochemistry, namely the physical and chemical properties of the major biomolecules, and the most relevant metabolic pathways. Hence, the student will thus acquire a solid formation on the subjects that sustain biochemistry, that will allow him to have a broad view of the biochemical processes that occur in a living organism and justify life.

Teaching methodologies

Theoretical contents will be presented to the students by means of informatic support – power point slides, that will be made available to the students. The theoretical content will be intercalated by practical classes, in which series of exercises relating to the theory will be given. Case studies will also be performed, in which the students will be able to integrate the concepts apprehended so as to make a report.

Demonstration of the coherence between the teaching methodologies and the learning outcomes.

In this curricular unit it is intended that the students acquire knowledge about the nature and chemical properties of the 4 foremost types of biomolecules that are present in the cell, about the chemical processes in which they participate and understand the basic workings of a cell.

In this context an exhaustive exposition of the theoretical contents of the syllabus will be made. Solving of practical exercises, intercalating the theory classes, will allow the students to recall and integrate learned concepts in a context of practical application. In this sense, real cases –case studies – will be submitted for analysis, so as to create the sense of treating the results of a practical laboratory situation. Monography works will be used to contextualize a practical application of biochemistry in industry. The final evaluation will take into account the level of acquired concepts in a final exam or tests, and also the capacity of the students to apply the knowledge in practical situation (reports of case studies and monography).