UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Biological Chemistry

2122-2-E1301Q073

Aims

The course imparts basic knowledge of biochemistry, which represents the stock of knowledge and concepts required to address any further biological subject at the molecular and cellular level. In particular, it deals with protein chemistry, enzymology and metabolism.

A significant part of the teaching will be devoted to theoretical exercises, whereby students will be familiarized with basic chemical-physical laws that govern bi0logical phenomena.

1. Knowledge and understanding. Knowledge imparted provides the basic tools for the understanding of biological phenomena at the molecular and cellular level.

2. Applying knowledge and understanding. Knowledge imparted represents the basic background to address experimental issues in biology.

3. Making judgments. The course provides a knowledge basis for the understanding of scientific literature and for the critical assessment of issue related to biological experimentation.

4. Communication skills. The course imparts basic elements of scientific language currently adopted in the context of biological research.

5. Learning skills. Knowledge provided by the course represents a prerequisite for effective learning of contents subsequently imparted in several areas of biology.

Contents

Non-covalent interactions in aqueous solution

- Structural levels and properties of proteins

- Enzymology. Allosteric proteins

- Metabolism

Detailed program

1 - GENERAL PRINCIPLES

Structure and general properties of water. Intra- and intermolecular non-covalent interactions: their role in determining the properties of biological molecules. Acid-base dissociation in aqueous solutions. Buffer solutions.

2 – LEVELS OF STRUCTURAL ORGANIZATION IN PROTEINS

Structures of amino acids found in proteins. Physical and acid-base properties of amino acids. Properties of the peptide bond. Filamentous proteins. The different structural levels in proteins. Physical properties of proteins. Criteria of classification of proteins. Basic principles of protein folding. Methods of protein 3D structure prediction.

3 - ENZYMES

Mechanisms of enzyme catalysis. Examples of mechanisms of enzyme-catalyzed reactions. Steady-state enzyme kinetics. Physical factors affecting enzyme activity. Regulation of the enzyme activity: the role of inhibitors and activators.

4 – ALLOSTERIC PROTEINS

Definition and adaptive roles of allosteric behavior. Molecular mechanisms of allostericity. Interpretation of allosteric behavior at the molecular level. Some examples of allosteric proteins and enzymes. The globins.

5 – METABOLISM

Basic principles. Glycolysis and fermentations. The Krebs cycle. The oxidative phosphorylation. The pentose-phosphate pathway. Biosynthesis and degradation of lipids. Biosynthesis and degradation of amino acids. Glycogen metabolism. Gluconeogenesis. The nitrogen cycle in the biosphere. Integration of metabolic pathways. Basic concepts on the role and the action mechanisms of hormones.

Prerequisites

General and organic chemistry. Basic knowledge of cell biology

Teaching form

Lectures (6 cfu) and theoretical exercises (2 cfu).

Textbook and teaching resource

Campbell e Farrell: Edises

- Nelson, Cox: “Principi di biochimica di Lehninger”, Ed. Zanichelli

- Mathews, Van Holde, Ahern: “Biochimica”, Casa Editrice Ambrosiana.

- A text drawn up by the teacher is available online for free (https://sites.google.com/site/unibakeka/materiale-didattico).

Semester

First semester

Assessment method

Students must take two multiple choice tests (one for each teaching module) addressing all contents of the respective module. This is followed by a final oral examination, whereby students must prove to be acquainted with the basic concepts of the taught subjects.

Office hours

The teachers receive by appointment.