UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

# COURSE SYLLABUS

# Biochemistry I

**2223-1-H4102D001-H4102D002M**

## Aims

The Biochemistry I Module aims : i) to provide the concepts necessary to understand the biological phenomena and the energetic changes connected to them, illustrating the complex chemical reactions that give rise to life. Object of study is the structure and transformation of cell components, such as proteins, carbohydrates, lipids, nucleic acids and other biomolecules. The description of the metabolism will take place both qualitatively and quantitatively. ii) to explain how organ functions can be regulated according to their particular biochemical processes, focusing on metabolic integration. iii) to explain how the regulation of metabolism occurs. iv) to illustrate the role of nutrients and balanced nutrition for maintaining the state of health.

## Contents

The Biochemistry I module will illustrate the importance of life-sustaining chemical reactions. The objects of study are the structure and the metabolic pathways involved in the transformations of cell components, such as proteins, carbohydrates, lipids, nucleic acids, and other biomolecules. Moreover, the main hormones and their role in the regulation of metabolism will be described. Finally, the main components of the foods will be described in relation to a healthy diet.

## Detailed program

General Biochemistry and Enzymology: Catalysis and enzyme kinetics. Vmax and Km. Factors influencing enzymatic activity. Inhibitors. Allosteric enzymes. Isozymes. Diagnostic use of enzymes and Bioenergetic isoenzymes: Respiratory chain and oxidative phosphorylation. Molecules with high energy content. The production of ATP. Inhibitors and decoupling of oxidative phosphorylation. Glucidic metabolism: Digestion, absorption and transport of carbohydrates. Glycolysis (aerobic and anaerobic). Regulation of glycolysis. Synthesis of glycogen and

glycogenolysis. Metabolism of galactose. Lipid metabolism: Digestion and absorption of lipids. Catabolism of lipids. beta-oxidation of fatty acids. Role of carnitine. Citric acid cycle. Lipogenesis: biosynthesis of fatty acids; biosynthesis of triglycerides. Regulation of lipolysis and lipogenesis. Metabolism of cholesterol and its derivatives. Cholesterol conversion into steroid hormones and bile salts. Metabolism of ketone bodies. Plasma lipoproteins. Protein metabolism: Digestion of proteins, absorption, and transport of amino acids. General metabolism of amino acids. Gluconeogenesis. Regulation of gluconeogenesis. Metabolism of purine and pyrimidine nucleotides: Purine and pyrimidine pathways. One carbon metabolism pathway. Vitamin B9. Vitamin B12. Integration of metabolisms. The feeding-fasting cycle. Clinical pearls associated with metabolisms malfunction. Biochemistry of nutrition: Biochemical aspects of digestive processes and nutrient absorption. Basal metabolism. Homeostasis of the carbohydrates, lipids, and proteins. Diet.

## Prerequisites

Basic knowledge of biology and chemistry.

## Teaching form

Frontal lectures. Students will also be involved in actively participating in lectures, bringing experiences to clinical cases to be discussed in the classroom. During the course, students will be divided into groups to discuss some biochemistry questions on the topics covered in class.

Lessons will be held in attendance, always subjected to eventual ministerial changes due to the COVID pandemic.

## Textbook and teaching resource

Biochemistry with clinical aspects , Thomas Devlin

Biochemistry, Berg et al

## Semester

II semester

## Assessment method

Exams will be held in attendance, always subjected to eventual ministerial changes due to the COVID pandemic.

A few information below:

Written and oral exam. The exam is positively evaluated with a mark of 18/30 or higher. Oral discussion of the

written with possible deepening of one or more topics. The questions proposed in the written exam (multiple choice and open) will be constructed in such a way as to induce the student to biochemical-clinical reasoning, to understand the units of measurement, and to be able to evaluate the skills and competencies acquired according to the objectives of the course.

## Office hours

on appointment

## Sustainable Development Goals