



GENERAL AND APPLIED ENZYMOLOGY AND LABORATORY

Enrollment year	2019/2020
Academic year	2021/2022
Regulations	DM270
Academic discipline	BIO/10 (BIOCHEMISTRY)
Department	DEPARTMENT OF BIOLOGY AND BIOTECHNOLOGY "LAZZARO SPALLANZANI"
Course	BIOTECHNOLOGY
Curriculum	Biomolecolare
Year of study	3°
Period	2nd semester (01/03/2022 - 14/06/2022)
ECTS	6
Lesson hours	60 lesson hours
Language	Italian
Activity type	WRITTEN AND ORAL TEST
Teacher	CHIARELLI LAURENT ROBERT (titolare) - 6 ECTS
Prerequisites	For a clear understanding of the structural and functional properties of proteins and enzymes, the knowledge of the principal bases of biochemistry is required.
Learning outcomes	The main aim of the course is to provide the basic knowledges about structure, mechanisms of action, regulation and biotechnological applications of the enzymes.
Course contents	General Enzymology (3 CFU) Structure and function relationship of the enzymes. Lock and key model, and induced fit model. The active site study: covalent labeling and affinity labeling; double labeling; quasi-substrate inhibitors, suicide inhibitors. Catalysis strategies: proximity and orientation, induced fit, covalent nucleophilic catalysis, general and specific acid-base catalysis. Structure and mechanism of action of lysozyme, glutathione reductase,

chymotrypsine. Enzyme kinetics: determination of the initial velocity (V_0), steady-state theory, Michaelis-Menten equation, Lineweaver-Burk method for V_{max} and K_m determination. Enzyme inhibition: competitive and non competitive inhibition. Enzyme activity regulation: effects of pH and temperature; allosteric enzymes, sequential transition and concerted transition models, homotropic and heterotropic effects. Covalent regulation of enzymes. Isoenzymes.

Laboratory of Applied Enzymology (3 CFU)

Method of extraction, purification and characterization of the enzymes. The laboratory experience consists in the purification of an enzyme, and in the characterization of its main kinetic properties. The main techniques approached are: preparation of buffers and solution; chromatographic techniques for protein purification, centrifugation, electrophoresis, protein and enzymatic assays, biochemical calculations for the determination of the kinetic parameters. The aim of this module is to provide the main knowledge and skill for enzyme investigation, and to understand the potential of enzyme catalysis in industrial and biomedical applications. The different biochemical techniques will be approached both theoretically and practically.

Teaching methods

Module General Enzymology: frontal lessons.
Module Laboratory of Applied Enzymology: a series of experiments conducted in educational laboratories, accompanied by short theoretical lessons on applied techniques.

Reccomended or required readings

I aGeneral Enzymology (3 CFU)
Lesson notes.
Texts: the same ones used for Biochemistry nd II courses (chapters about the biochemistry of enzymes).

Laboratory of Applied Enzymology (3 CFUs)
Lesson notes and provided material.
Reference texts for possible integrations: I principi di Biochimica di Lehninger (Nelson e Cox), Fondamenti di Biochimica (Voet, Voet, Pratt)

Assessment methods

Oral exam which includes the discussion of the written report about the laboratory experience of the Laboratory of Applied Enzymology Module

Further information

Students are required to bring a lab coat to wear during the experiments.

Sustainable development goals - Agenda 2030

[The goals](#)