



# UNIVERSITÀ DI PAVIA

Anno Accademico 2021/2022

## BIOCHEMISTRY

<b>Enrollment year</b>	2020/2021
<b>Academic year</b>	2021/2022
<b>Regulations</b>	DM270
<b>Academic discipline</b>	BIO/10 (BIOCHEMISTRY)
<b>Department</b>	DEPARTMENT OF BIOLOGY AND BIOTECHNOLOGY "LAZZARO SPALLANZANI"
<b>Course</b>	BIOLOGICAL SCIENCES
<b>Curriculum</b>	PERCORSO COMUNE
<b>Year of study</b>	2°
<b>Period</b>	1st semester (01/10/2021 - 14/01/2022)
<b>ECTS</b>	9
<b>Lesson hours</b>	72 lesson hours
<b>Language</b>	Italian
<b>Activity type</b>	ORAL TEST
<b>Teacher</b>	TORTI MAURO (titolare) - 9 ECTS
<b>Prerequisites</b>	Good knowledge on General and Organic Chemistry. The courses of General Chemistry and Organic Chemistry (first year) are propedeutic for Biochemistry
<b>Learning outcomes</b>	The aims include: the knowledge of the structure and function of the major macromolecules of biological interest with particular attention to the structural-functional relationships; the understanding of the metabolic processes and energetic pathways in the living cell and the mechanism for regulation and integration of the metabolism; the understanding of the mechanisms and signal transduction pathways for cellular communication
<b>Course contents</b>	Part 1. Structural and chemical features of amino acids. Peptides. Methods for analysis of protein biochemistry. Three dimensional structure of proteins. Collagens and immunogloblins. Proteins in oxygen

binding and transport: myoglobin and hemoglobin. Enzymes. Mechanisms of catalysis. Vitamins and coenzymes. Enzyme kinetics and mechanisms of regulation. Allosteric enzymes. Monosaccharides and polysaccharides. Proteoglycans and glycoproteins. Structural lipids and storage lipids. Lipids in the biological membranes. Membrane proteins: structure and function.

Part 2. Principles of bioenergetics. The role of ATP and phosphate group transfers. The importance of biological oxidations. The citric acid cycle. Oxidative phosphorylation and ATP synthesis. The chemiosmotic model. Regulation of mitochondrial function and ATP synthesis. Carbohydrate metabolism. Glycolysis. Gluconeogenesis. Glycogen metabolism. Shunt of pentose phosphate. Regulation of glucose metabolism in the liver and muscle under aerobic and anaerobic conditions.. Lipids metabolism. b-oxidation of fatty acids. The ketone bodies. Biosynthesis of fatty acid. Biosynthesis of fatty acid, triacilglicerols and phospholipids. Regulation of lipids metabolism. Amino acid catabolism. Transaminases. The urea cycle. General concepts on amino acids degradation. Protein synthesis. Hormonal regulation of fuel metabolism. insulin and glucagon. Molecular mechanisms of signal transduction.

**Teaching methods**

lectures in the classroom

**Reccomended or required readings**

Nelson DL, COX, MM : I Principi di Biochimica di Lehninger, Zanichelli; Berg JM, Tymoczko JL, Stryer L: Biochimica, Zanichelli; Campbell, Farrell: Biochimica, Edises, Bassi R, Boffi A, et al: Biochimica, Edi-Ermes

**Assessment methods**

Written test with different kind of questions (multiple choice, open question, text to be completed). It will also include description and illustration of chemical structures and metabolic pathways

**Further information**

Written test with different kind of questions (multiple choice, open question, text to be completed). It will also include description and illustration of chemical structures and metabolic pathways

**Sustainable development goals - Agenda 2030**

[The goals](#)