COURSE DATA

DATA SUBJECT

Code: 36363
Name: Biological chemistry and Biochemistry
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1212 - Degree in Gastronomic Sciences	Facultat de Farmàcia i Ciències de l'alimentació	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1212 - Degree in Gastronomic Sciences	Chemistry	BASIC

COORDINATION

GOMAR ALBA MERCE

SUMMARY

Biological Chemistry and Biochemistry I is a first year (second semester) basic subject of the Degree in Gastronomic Sciences (University of Valencia). This subject accounts for a total of 6 ECTS in the curriculum.

The aim of the course is to provide an overview of the fundamentals of biochemistry, including the structure and function of biomolecules, enzymology, the structure and function of nucleic acids, basic concepts of bioenergetics and an overview of metabolism and its regulation.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

To study Gastronomic Sciences, it is recommended to have a basic knowledge about biology, chemistry, physiscs and mathematics.

COMPETENCES / LEARNING OUTCOMES

1212 - Degree in Gastronomic Sciences

Conocer las principales rutas metabólicas y obtener una visión integrada de los procesos de obtención de energía.

Know the structure and properties of biological macromolecules and their relationship with the function that they perform.

DESCRIPTION OF CONTENTS

1. Introduction.

Concept and historical perspective. Biochemical research today and its relationship with Gastronomy. Bibliographic databases.

2. Amino acids and primary structure of proteins.

Amino acids: structure, properties and classification. Peptide bond: characteristics and properties. Protein primary structure.

3. Three-dimensional structure of proteins.

Secondary structure: ¿ helix and ß sheet. Tertiary structure. Quaternary structure. Folding and stabilization of proteins. Denaturation and renaturation of proteins, relevance in gastronomy. Structural classification of proteins: fibrous proteins and globular proteins. Isolation, purification and characterization of proteins. Chromatography and electrophoresis.

4. Enzymes: Basic Concepts and enzyme kinetics.

Active center: concept and general characteristics. Enzymatic catalysis. Coenzymes: an overview.

Nomenclature and classification of enzymes. Enzyme kinetics. Effect of substrate concentration: Michaelis-Menten equation. Effect of enzyme concentration, pH and temperature.

5. Regulation of enzyme activity.

Reversible and irreversible enzyme inhibition. Enzymatic regulation by covalent modification. Activation of zymogens.

6. Enzymology of food processing

Characteristics of the industrial enzymes. Aplications. Carbohydrases: amylases, pectinases, cellulases. Proteases. Lipases. Enzymes used in making bread, beer and cheese.

7. Structure and function of carbohydrates and lipids

General classification of carbohydrates and their function. Major monosaccharides and their derivatives. Disaccharides and homopolysaccharides. Complex carbohydrates. Lipids: mportance, functions and general characteristics. Storage Lipids. Membrane lipids.

8. Structure and function of nucleotides and nucleic acids.

Chemical structures of the nucleotides. Chemical composition of nucleic acids. Molecular mechanisms involved in transmission of genetic information. DNA replication. Transcription. Protein synthesis.

9. Introduction to metabolism.

Basic concepts of metabolism. Thermodynamic principles applied to living systems. Potential transfer of phosphate groups. Electronic carriers. Characteristics of the metabolic pathways. Overview of the metabolic pathways. Hormonal regulation of metabolism.

10. Glycolysis and metabolic fates of piruvate

Introduction to the metabolism of carbohydrates. Glucose transporters. React sequence: preparatory phase and phase of benefits. Regulation of glycolysis. Metabolism of other hexoses: fructose, galactose and mannose. Lactic and alcoholic fermentations. Entry of pyruvate into aerobic metabolism: conversion to acetyl-CoA.

11. The citric acid cycle.

Overview. Reaction sequence and energy conservation. Control mechanisms of the citric acid cycle. Amphibolic nature and anaplerotic reactions.

12. Electronic transport and oxidative phosphorylation.

Overview. Mitochondrial electron transport chain. Chemiosmotic theory. Oxidative phosphorylation. Mitochondrial transport systems. Energy efficiency of oxidative phosphorylation. Integrated control of the ATP synthesis. Inhibitors and uncoupling molecules.

13. Gluconeogenesis, glycogen metabolism and the pentose phosphate pathway

General features of gluconeogenesis. Precursors for the synthesis of glucose. Specific reactions of gluconeogenesis. Regulation of gluconeogenesis. Intertissue relationships in the hepatic synthesis of glucose. Glycogen breakdown. Glycogen synthesis. Control of glycogen metabolism. Pentose phosphate pathway: functions, tissue and subcellular localization. Reaction sequence. Regulation.

14. Lipid metabolism

Lipid transport: lipoproteins. Mobilization of triacylglycerols stores. Fatty acid oxidation. Metabolism of ketone bodies. Lipogenesis: biosynthesis of fatty acids and triacylglycerols. Regulation of fatty acid metabolism. Coordinated regulation of synthesis and degradation of fatty acids.

15. Metabolism of nitrogenous compounds

Introduction to amino acid metabolism. Origin and fate of amino acids in mammals. Catabolism of amino acids. Nitrogen excretion and the urea cycle. Nucleotide metabolism: an overview.

16. Integration of metabolism and tissue and organ specialization

Introduction. Interdependence of the major organs in fuel metabolism. Main processes of fuel storage, mobilization and use during the well-fed state, starvation, diabetes mellitus and exercise.

17. Laboratory sessions

Isolation and purification of the enzyme invertase. Determination of enzymatic activity and protein concentration. Evaluation of the purification process. Viewing the activity of protease from their natural source. Determination of the presence of starch in food.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	45,00
Laboratory	15,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	2,00
Independent study and work	58,00
Preparation of lessons	20,00
Preparation for assessment activities	10,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

Lectures. The will develop the essential concepts of the subject.

Classroom practicals: resolution of problems, resolution of cases and teamwork. During these classes, the students will specifically apply the knowledge that they have acquired during the lectures. The resolution of problems with a critical spirit will be potentiated.

Practicals. They will be held in groups of 16 students. They should allow students to become familiar with some basic techniques of biochemistry and molecular biology, to acquire some skills in lab work and to critically analyze the results, as well as to complement the concepts learned during the lectures. Attendance will be compulsory. There will be 3 laboratory sessions in groups of 2 students. Once finished, each working group should elaborate and present a written results report.

Seminars. All students should prepare and give a seminar, which should focus on issues raised by the teacher responsible for the subject within the overall objectives of the course. Each group must hand in a written report on the proposed topic, including references used for the preparation thereof and a copy of the artwork used in the presentation. The exhibition theme will be proposed in public session and it will use any means of presentation that the group members see fit. After the presentation, open discussion among participants, moderated by the teacher.

EVALUATION

1. Theory. Written exam: short questions and multiple choice questions. **65 points**. To pass the course, a minimum

2. Practicals: Written exam: problems and short questions or multiple choice questions. Laboratory practices represent **15 points** of the final grade for the course. Attendance at practical classes is mandatory. The practical classes will be evaluated by conducting a written test (10 points) on the content of the practical sessions, which may take place at a different call of the final theory exam date, and a memory with the results obtained in the practices (5 points). To pass the course must have obtained a **minimum score on the written exam of 5 points (out of 10)**.

3. Seminars. 10 points. Evaluation of the preparation, contents and presentation of the work; progress in the appropriate use of scientific language; raising doubts; critical thinking and ability to collaborate with the rest of the group. The possibility of implementation and evaluation of written memories by students will be contemplated.

4.Continuous assessment. 10 points.

It will be assessed directly of the work and student's attitude in lectures, practical, in solving issues, problems and s
To pass the course a **50 points** of the total score is required, with a **minimum of 32.5 points in the theory exam and**

Students who fail to pass in the first call will keep for the second call the score obtained in the theory written exam if they reach 32.5 points or the score of the practicals written exam if they reach 5 points. In addition, they will keep the score of the seminar and the Practicals Results Report in the remaining calls.

REFERENCES

Basic References

Reference b1: NELSON, D.L. y COX, M.M.: Lehninger. Principios de Bioquímica. 6ª ed. Ediciones Omega, Barcelona, 2014.

Reference b2: VOET, D.; VOET, JG. and PRATT, CW. Fundamentos de Bioquímica. La vida a nivel molecular. 2ª ed., Ed. Panamericana. Madrid, 2007 (4ª ed. en inglés,2011).

Reference b3: FEDUCHI, E., ROMERO, C., BLASCO I., S. y GARCIA-HOZ, C.: Bioquímica Conceptos esenciales. 2ª ed., Ed. Panamericana. Madrid, 2015.

Reference b4: STRYER, L.; BERG,J.M.; TYMOCZKO, J.L. Bioquímica. 7ª ed., Ed. Reverté, Barcelona, 2013.
Reference b5: VOET, D. and VOET, J.G.: Bioquímica. 3ª ed., Ed. Panamericana, Madrid, 2006.

Reference b6: WATSON J.D.: Biología Molecular del Gen 5ª ed, Ed. Panamericana, Madrid, 2006.

Reference b7: DEVLIN, T.M.: Bioquímica: libro de texto con aplicaciones clínicas. 4ª ed., Ed. Reverté, Barcelona, 2004. (7ª ed. en inglés, 2010).

Additional References

Reference c1: ALBERTS, B. Biología Molecular de la célula. 5ª ed. Ediciones Omega, Barcelona, 2010.

Reference c2: HORTON, H.R., MORAN, L.A., SCRIMGEOUR, K.G. y RAWN, J.D.: Principles of biochemistry. 4th ed., Prentice-Hall, New Jersey, 2006.

Reference c3: LODISH, BERK, MATSUDAIRA, KAISER; KRIEGER; SCOTT; ZIPURSKY, DARNELL. Biología Celular y Molecular. 5ª ed., Ed. Panamericana, 2005

Reference c4: MATHEWS, C.K., VAN HOLDE, K.E., AHERN, K.G.: Bioquímica. 3ª ed., Pearson Education (Addison Wesley), Madrid, 2002.

Reference c5: McKEE, T.y McKEE, J.R. Bioquímica. Las bases moleculares de la vida. 4ª ed. McGraw-Hill/Interamericana,

Madrid, 2009.

Reference c6: STRYER, L.; BERG, J.M.; TYMOCZKO, J.L. Bioquímica. 6ª ed., Ed. Reverté, Barcelona, 2013 (versión en catalán). Reference c7: PERETÓ, J., SENDRA, R., PAMBLANCO, M. i BAÑÓ, C.: Fonaments de bioquímica. Servei de Publicacions de la Universitat de València, Valencia, 2005.