COURSE DATA

DATA SUBJECT

Code: 33937
Name: Biochemistry I
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1205 - Degree in Human Nutrition and Dietetics	Facultat de Farmácia i Ciències de L'alimentació	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1205 - Degree in Human Nutrition and Dietetics	Biochemistry	BASIC

COORDINATION

ANIENTO COMPANY FERNANDO

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SUMMARY

Biochemistry I is a first year (second semester) basic subject of the Degree in Human Nutrition and Dietetics (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 and the characteristics of living matter from a molecular point of view, including the structure and function of biomolecules, enzymology, 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

It is recommended to have studied the subjects of General Chemistry, Organic Chemistry and General Biology. Basic knowledge of general chemistry: basic thermodynamics, chemical equilibrium, acid-base and redox reactions, functional groups, major interactions in aqueous solution and structure of biomolecules. Basic knowledge of cell biology: main organelles of eukaryotic cells

COMPETENCES / LEARNING OUTCOMES

1205 - Degree in Human Nutrition and Dietetics

Adquirir la formación básica para la actividad investigadora, siendo capaces de aplicar el método científico a la resolución de un problema, comprendiendo su importancia y sus limitaciones en materia sanitaria y nutricional.

Capacidad de integrar los contenidos estudiados en las diferentes materias cursadas en un conocimiento interdisciplinar aplicable al ámbito académico y profesional.

Capacidad de obtener, procesar e interpretar datos e información relevantes en el ámbito de la alimentación y la nutrición humana, haciendo uso de las tecnologías de la información y la comunicación.

Capacidad para transmitir ideas, analizar problemas y resolverlos con espíritu crítico, adquiriendo habilidades de trabajo en equipo y asumiendo el liderazgo cuando sea apropiado.

Conocer los nutrientes, estableciendo así la base del equilibrio nutricional e integrando nutrición y alimentación en situaciones fisiológicas y patológicas, siendo capaces de planificar y protocolizar dietas y evaluar el estado nutricional de individuos y colectividades.

Desarrollar habilidades para emprender estudios posteriores y actividades de formación continuada.

Know about the major metabolic pathways and obtain an integrated view of metabolism and its regulation.

Know and understand essential processes in the transmission of genetic information from DNA to protein.

Know how to apply the scientific method and acquire skills for managing the main bibliographic sources.

Know the biochemical and biological principles applicable to human nutrition and dietetics.

Know the mechanisms of production and transformation of energy.

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

Understand and use basic scientific terminology related to the subject area.

Understand the molecular origin of the basic functions of living beings and the main biotechnological and medical implications.

Understand the operation of enzymes and their regulation.

DESCRIPTION OF CONTENTS

1. Introduction.

Concept and historical perspective. Biochemical research today

2. Amino acids and primary structure of proteins

Amino acids: structure, properties and classification. Peptide bond: characteristics and properties. Primary structure: sequence determination and evolutionary relationships

3. Three-dimensional structure of proteins

Secondary structure: ¿ helix and ß sheet. Supersecondary structures. Tertiary structure. Domains. Quaternary structure. Folding and stabilization of proteins. Denaturation and renaturation of proteins. Structural classification of proteins: fibrous proteins and globular proteins

4. Isolation, purification and characterization of proteins

Concept. Physicochemical properties of proteins. Chromatographic methods. Dialysis and ultrafiltration. Electrophoresis. Isoelectric focusing. Electrophoresis.

5. Enzymes: Basic Concepts and enzyme kinetics

Nomenclature and classification of enzymes. Enzyme Kinetics: Factors affecting the rate of an enzymatic reaction. Effect of substrate concentration. Concept of steady state. Michaelis-Menten equation. KM Concept. Turnover number. Catalytic efficiency. Transformations of the Michaelis-Menten equation. Effect of enzyme concentration, pH and temperature. Kinetics and mechanism of bisubstrate reactions

6. Enzymes: catalytic mechanisms

Active center: concept and general characteristics. Identification of functional groups essential for enzymatic catalysis. Factors contributing to the catalytic efficiency of enzymes. Factor proximity and orientation. Distortion and destabilization factor: Preferential transition state binding. Metal-ions catalysis. Covalent catalysis. General acid-base catalysis. Coenzymes: an overview

7. Regulation of enzyme activity

Reversible and irreversible enzyme inhibition. Different types of reversible inhibition: competitive, uncompetitive, and mixed inhibition. Enzymatic regulation by covalent modification. Activation of zymogens. Isoenzymes: concept, features and clinical applications. Allosteric enzymes. Concept of cooperativity. Hill equation. Models of cooperativity

8. Carbohydrates

General classification of carbohydrates and their function. Major monosaccharides and their derivatives. Disaccharides and homopolysaccharides. Complex carbohydrates

9. Lipids

Importance, functions and general characteristics. Classification. Storage Lipids. Membrane lipids

10. Nucleotides and Nucleic Acids

Chemical structures of the nucleotides. Chemical composition of nucleic acids

11. Introduction to metabolism

Basic concepts of metabolism. Thermodynamic principles applied to living systems. Potential transfer of phosphate groups. Reducing potential.

12. Organization and control of metabolic pathways

Characteristics of the metabolic pathways. Overview of the metabolic pathways. Intertissue relationships.

13. Hormonal regulation of metabolism: basic concepts

Role of hormones in metabolism. Hormone receptors. Hormonal Mechanisms of action

14. Glycolysis

Introduction to the metabolism of carbohydrates. Glucose transporters. React sequence: preparatory phase and phase of benefits. Some glycolytic enzyme reaction mechanisms. Key regulatory enzymes and their control. Metabolism of other hexoses: fructose, galactose and Mannose

15. Metabolic fates of Pyruvate

Lactic and alcoholic fermentations. Entry of pyruvate into aerobic metabolism: conversion to acetyl-CoA

16. The citric acid cycle

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

17. Electronic transport and oxidative phosphorylation

Overview. Mitochondrial electron transport chain. Chemiosmotic theory and mechanisms of electrochemical proton gradient generation. Oxidative phosphorylation. Inhibitors and uncouplers. Mitochondrial transport systems. Energy efficiency of oxidative phosphorylation. Integrated control of the ATP synthesis. Free radicals

18. Practicals

Isolation and purification of the enzyme invertase. Determination of enzymatic activity and protein concentration. Evaluation of the purification process. Effect of pH and temperature on enzymatic activity.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	2,00
Theory	38,00
Seminar	2,00
Laboratory	15,00
Total hours	**57,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	2,00
Independent study and work	55,00
Preparation of lessons	20,00
Preparation for assessment activities	13,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

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

Group tutorials. They will be held in groups of 16 students, according to the established time-table. These sessions the lectures and should encourage the active participation of students. To do this, the teacher will propose quest well as questionnaires to be carried out online through the Virtual classroom. Also, it is the ideal means for student during the course. This will reveal how students assimilate concepts, identify any gaps or failures in the learning work.

Practicals. They will be held in groups of 16 students. They should allow students to become familiar with s molecular biology, to acquire some skills in lab work and to critically analyze the results, as well as to compleme Attendance will be compulsory. There will be 3 laboratory sessions in groups of 2 students. Once finished, each w written results report.

Seminars. All students should prepare and give a seminar, which should focus on issues raised by the teacher r objectives of the same. Each group must hand in a written report on the proposed topic, including references use the artwork used in the presentation. The exhibition theme will be proposed in public session and it will use 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. **70 points**.

2. Practicals: 20 points.

- Practicals exam: problems and short questions or multiple choice questions. **15 points**.

- Assessment of laboratory work and Results Report. **5 points**.

3. Seminar. 10 points.

The questionnaires and activities proposed for the tutoring sessions will be valued over **5 points** and will serve to raise the final grade as long as the student reaches the minimum required in the theory and practical exams, as detailed below.

To pass the course, a total score of **50 POINTS** is required, with a **MINIMUM** of **30 points in the theory exam** and **6 points in the practicals exam**. In the case these minimal requirements are not met, the final qualification will be "Fail", and the final score (which cannot reach 5 points out of 10) will be the addition of the scores of the theory and practicals written exams, without considering the remaining issues (results report, questionnaries or activities and seminar).

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 35 points. They may also keep the score of the practicals written exam if they reach 7.5 points, both for the second call and also for the folowing academic course (just one course). In addition, they will keep the score of the seminar and the Practicals Results Report in the remaining calls.

Attendance to group tutorials, seminars and practicals is mandatory the first year in order to pass the subject.

Note: Evidence of copying or plagiarism in any of the assessable tasks will result in failure to pass the subject and in appropriate disciplinary action being taken. Please note that, in accordance with article 13. d) of the Statute of the University Student (RD 1791/2010, of 30 December), it is the duty of students to refrain from using or participating in dishonest means in assessment tests, assignments, or university official documents. In the event of fraudulent practices, the "Action Protocol for fraudulent practices at the University of Valencia" will be applied (ACGUV 123/2020): https://www.uv.es/sgeneral/Protocols/C83sp.pdf

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