COURSE DATA

DATA SUBJECT

Code: 36456
Name: Biochemistry
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1110 - Degree in Chemistry	Facultat de Química	4	First quarter
1929 - Double Degree Program in Physics and Chemistry	Facultat de Física	5	First quarter
1934 - Double Degree Program in Chemistry-Chemical Engineering	Facultat de Química	4	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1110 - Degree in Chemistry	Biochemistry	COMPULSORY
1929 - Double Degree Program in Physics and Chemistry	Quinto Curso (Obligatorio)	COMPULSORY
1934 - Double Degree Program in Chemistry-Chemical Engineering	Cuarto curso	COMPULSORY

COORDINATION

CASINO FERRANDO PATRICIA

SUMMARY

The course "Biochemistry" is included within the module "Basic Chemistry" and is compulsory. It has 6 ECTS taught in the fourth year. The main objective of the course is to provide students with basic knowledge about the functioning of living beings at the molecular level. For this, the structure and function of biological macromolecules will be studied, to get to understand their capabilities of specific interaction, catalysis, signaling and maintenance and transfer of information. The molecular basis of development and transformation of energy by living organisms will also be discussed, and the main routes of metabolism and its regulation will be addressed with an integrated perspective. In the context of the Sustainable Development Goals (SDGs), students in this course are expected to design, select and/or develop efficient chemical products and processes (SDG 7) that minimize their impact on the environment (SDG 14 and 15), take advantage of alternative raw materials and generate less waste (SDG 11).

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

1110 - Degree in Chemistry
Obligation to have previously passed the subject(s) 34191 - Biology

OTHER REQUIREMENTS

COMPETENCES / LEARNING OUTCOMES

1110 - Degree in Chemistry

Act autonomously in learning, making informed decisions in different contexts, forming judgements based on experimentation and analysis, and transferring knowledge to new situations.

At the end of the course, the student will be able to address new problems and develop strategies to solve them.

At the end of the course, the student will be able to assess risks in the use of chemical substances and laboratory procedures.

At the end of the course, the student will be able to distinguish between qualitative and quantitative aspects of chemical problems.

At the end of the course, the student will be able to distinguish the principles, procedures and techniques used for the determination, separation, identification and characterisation of chemical compounds.

At the end of the course, the student will be able to identify chemical elements and compounds, including their production, structure, reactivity, properties and applications.

At the end of the course, the student will be able to identify chemical processes in everyday life.

At the end of the course, the student will be able to identify the structure and reactivity of the main classes of biomolecules and the chemistry of key biological processes.

At the end of the course, the student will be able to implement sustainable and environmentally friendly methodologies.

At the end of the course, the student will be able to relate theory and experimentation.

At the end of the course, the student will be able to state the principles of thermodynamics and kinetics and apply them in chemistry.

At the end of the course, the student will correctly use chemical terminology, nomenclature, conventions and units.

At the end of the course, the student will demonstrate inductive and deductive reasoning skills.

At the end of the course, the student will demonstrate the ability to analyse, synthesise and apply critical reasoning.

At the end of the course, the student will relate chemistry to other disciplines.

Collaborate effectively in teams, assuming responsibilities and leadership roles and contributing to collective improvement and development.

Communicate effectively, both orally and in writing, adapting to the characteristics of the situation and the audience.

Demonstrate critical and self-critical reasoning within the field of study, considering aspects such as professional ethics, moral values and the social implications of the different activities undertaken.

Express oneself correctly, both orally and in writing, in any of the official languages of the Valencian Community.

Propose creative and innovative solutions to complex situations or problems within the field of study, in order to respond to diverse professional and social needs.

Understand and recognise, from within the discipline, inequalities based on sex and gender in society; integrate different needs and preferences related to sex and gender into problem-solving and solution design.

DESCRIPTION OF CONTENTS

1. Part I. Structure and function of biomacromolecules.

1. Introduction to Biochemistry. Structure and properties of water. Weak interactions in aqueous medium: Importance for solubility, structure, dynamics and interactions between biological macromolecules.

2. Aminoacids. Peptide bond. Primary and secondary structures of proteins.

3. Three-dimensional structure of proteins. Protein folding and protein denaturation.

4. Physico-chemical properties of proteins. Isolation, purification and characterization of proteins.

5. Protein-ligand interactions. Cooperativity and allosterism: the case of hemoglobin.

6. Enzymatic catalysis. Transition state theory. Kinetics of enzymatic reactions: Michaelis-Menten model. Enzyme inhibition.

7. Molecular mechanisms of enzymatic regulation. Industrial applications of enzymes.

8. Biological membranes. Structure and properties of the lipid bilayer. Membrane proteins. Signal transduction.

2. Part II. Structure and function of nucleic acids

9. Structures of DNA and RNA. Organization of genes and genomes.

10. DNA replication.

11. Transcript. Post-transcriptional processing.

12. The genetic code. Translation. Maturation, localization and degradation of proteins.

13. Analysis and manipulation of nucleic acids. Biotechnological applications

3. Part III. Bioenergetics and Metabolism

14. Biochemistry of ATP. Energy sources and strategies for generating ATP. Chemiosmotic theory and ATP synthase.

15. Respiratory chain. Oxidative phosphorylation.

16. Photoelectron transport chain. Photophosphorylation.

17. Panorama and organization of intermediary metabolism.

18. Origin and destination of acetyl-CoA. Citric acid cycle.

19. Carbohydrate metabolism, as an example metabolic pathway.

20. Integration and regulation of metabolism.

4. Lab classes

1. Structural databases. Modeling, interpretation and analysis of protein structures.

2. Assay of the enzymatic activity of alkaline phosphatase. Determination of kinetic parameters. Effects of inhibition on the kinetic parameters.

3. Preparation and analysis of plasmidic and genomic DNA.

4. Metabolism of carbohydrates. Alcoholic fermentation. Quantification of liver glycogen.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	7,00
Theory	41,00
Laboratory	12,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

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

TEACHING METHODOLOGY

Master classes
40 one-hour classes will be taught plus 1 additional hour for the laboratory practice exam, in which the Professor presents the most relevant content of the course using audiovisual media. The presentations will be published on Virtual Classroom.

Tutorials
7 sessions will be held throughout the course, intercepted with lectures, usually at the end of each of the parts of the program. In these sessions the student participation through the resolution of questions and problems will be stimulated. Before the sessions, the Professor may request delivery of solved problems. Self-assessment tests will also be performed.

Practicals
Assistance to the four practical sessions is mandatory. They will be held in 4 sessions of 3 hours (3 in laboratory and 1 in a computer classroom). Students are given in advance a booklet containing the script of the sessions, with a small theoretical introduction and a detailed protocol. The alumni should prepare each practical in advance and answer a short questionnaire before each session. After each practice, the students will present the results by filling a second questionnaire.

EVALUATION

Evaluation Method.

Attendance at the laboratory sessions is mandatory for the evaluation of the subject

First call:
The grade needed to pass the course will have to be equal or larger than 5 (overall rating of 10). Furthermore, each of the two parts of the course: Theory and Practice, needs also to be passed independently, in accordance with the following criteria.

Evaluation of the theoretical contents:

The theory component of the course is worth 8 out of 10 points. It is assessed in two parts:

(a) Throughout the course (1 point), through a series of tests that are normally carried out at the end of each of the three parts of the programme.

(b) Through a final exam (7 points), for which there will be two possible exam dates in each academic year.

In general, the theory is passed when the sum of the final exam and continuous assessment marks reaches at least 4 points (out of a possible 8).

If the theory part of the subject is passed in the first sitting but not the subject as a whole (see conditions for passing), the theory mark will be retained until the second sitting, but in no case for subsequent academic years.

Assessment of practical classes and computer lab:

Practical work will be assessed with a maximum of 2 points out of the 10 points for the overall grade for the subject. The following will be taken into account for the assessment:

(a) The preliminary work, performance and results of each practical session, with a maximum value of 1 point

(b) The grade for a written test on all the practical sessions, with a maximum value of 1 point.

Practical classes are passed when the mark for each of the two parts mentioned above is at least 0.4 points and the total for Practical Classes is at least 1 point.

If the laboratory practical classes are passed but not the course as a whole (see conditions for passing), the practical class mark will be retained for the two exam sessions of the academic year and for the following academic year.

Conditions for passing

To pass the course, the overall grade (sum of the practicals and theory) must be at least 5 points. In addition, to count this grade as "passed," any of the following conditions must be met:

(a) Theory and practicals must both be passing grades (minimum 4 in theory, minimum 1 in practicals).

(b) Or, the theory grade must be at least compensable (3.6 points), provided that the practical grade is sufficient for theory and practicals to add up to at least 5 points

Evaluation of second call
It will be the result of single test, in which the theoretical (maximum 8 points) and practical contents (1 point maximum) will be evaluated. In the event that any of these two parts (Theory or Practicals) was passed in the first call, it will not be mandatory to repeat it in the second call, since the corresponding passed note can be applied automatically. The minimum conditions necessary to pass on second call are the same as those set up for the first call.

Final warning

Copying or plagiarism of any assignment that is part of the evaluation will make it impossible to pass the course, and the student will be subject to the appropriate disciplinary procedures.

Please note that, according to Article 13 d) of the University Student Statute (RD 1791/2010, December 30), "*it is the duty of a student to refrain from using or cooperating in fraudulent procedures in evaluation tests, in the work performed or in official University documents*".

REFERENCES

- PERETÓ, J., SENDRA, R., PAMBLANCO, M. y BAÑÓ, C. Fonaments de bioquimica. 5ª ed. Valencia: Servei de Publicacions de la Universitat de València, 2005 (traducción al castellano, 2007). ISBN: 9788437062686.

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- NELSON, D.L. y COX, M.M. Lehninger. Principios de Bioquímica. 6ª ed. Barcelona: Ed. Omega, 2014. ISBN: 978-84-282-1603-6.

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