

**COURSE DATA****DATA SUBJECT**

Code: 36851
Name: Clinical Biochemistry
Cycle: Undergraduate Studies
ECTS Credits: 4.5
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1106 - Degree in Biology	Facultat de Ciències Biològiques	4	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1106 - Degree in Biology	Optatividad	ELECTIVES

COORDINATION

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SUMMARY

The Biochemical Clinic subject is part of the fourth course of the plan of studies of Degree in Biology of the Universitat of València. It is an optional subject involving a total of 4,5 credits ECTS that until the course 2025-2026, was part of the intensification of Foundations of Sanitary Biology (FBS), together with the subjects, Pathogens and Illnesses, Endocrinology and Reproduction, Human Genetics, Immunology and Neurobiology.

Clinical Biochemistry focuses in determining those molecular bookmarks and biochemical indicators of a pathological process, that, toother, play a fundamental paper in the elucidation of the factors and underlying mechanisms of the etiology of the illnesses, as well as in the diagnosis, prognosis, control of the evolution, treatment, monitoring of drugs and prevention of the illness.

Clinical Biochemistry is a basic and applied science that has experienced in the last years a vertiginous development, opening all a range of possibilities for a more scientific and molecular development of the Medicine. Besides, Clinical Biochemistry is a specialty of the hospital laboratory, and as such, its work is focused on patient care as clinical support for the physician.

Based on the above, the fundamental objectives of this course are:



- The study of the pathophysiology and etiopathogenesis of diseases
- Knowledge of laboratory tests and analytical methods to apply an appropriate diagnostic strategy
- Proper interpretation of test results to facilitate the diagnosis, monitoring, and prevention of diseases.

This subject will enable students to become familiar with analytical methods and diagnostic procedures, as well as with the interpretation of biochemical parameters for assessing health status, including their applications and limitations.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

COMPETENCES / LEARNING OUTCOMES

1106 - Degree in Biology

(CB4) Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.

(CB5) Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

Design and conduct experiments by using scientific techniques and instruments appropriately and complying with laboratory safety regulations.

Develop the skills needed to carry out a professional activity with a proactive attitude towards the world of work and with an innovative and entrepreneurial spirit. Be able to apply sustainability criteria and to work within the framework of professional ethics.

Know how to evaluate and interpret the structure and dynamics of populations, communities, natural ecosystems and their threats, in order to propose conservation, restoration and management strategies at global, regional and local levels.

Organise, plan and manage information in a manner that allows the individual to analyse, synthesise and develop critical reasoning that can be applied to solve problems, make decisions and carry out work.

Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.

Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.



Use ICTs, apps and other computer tools to manage and disseminate information in both educational and professional environments.

Use scientific language, both oral and written, and be able to adapt the register to the target audience and/or readers. Use the most common foreign languages in each discipline as a vehicle for communication in a globalised system.

DESCRIPTION OF CONTENTS

1. Introduction to Clinical Biochemistry

Concept. Specimens. Analytical quality. Reference values. Assay techniques.

2. Mechanisms of response to stress and harmful stimuli. Biomarkers

Causes and mechanisms of cellular damage. Definition of a biomarker. Role in diagnosis, monitoring, and prognosis.

3. Plasma Proteins. Urinary Proteins

Study of plasma proteins. Biochemical functions and clinical significance. Renal clearance. Proteinuria. Clinical applications

4. Clinical Enzymology

Enzymes as analytical tools. Diagnostic value of serum enzymes and isoenzymes

5. Disorders of Glucose Metabolism

Metabolic Assessment of Glucose. Hyperglycemia. Insulin Resistance. Diabetes Mellitus. Assessment of Hypoglycemia.

6. Disorders of Other Carbohydrate Metabolism

Metabolism of Fructose, Lactose, and Galactose.

7. Abnormalities and Assessment of Plasma Lipoproteins

Lipoprotein metabolism. Biochemical diagnosis of dyslipoproteinemia. Endothelial dysfunction and atherogenesis. Biochemical markers of myocardial infarction.



8. Metabolic Syndrome

Definition of metabolic syndrome. Factors involved in the development of metabolic syndrome.

9. Disorders and Assessment of Nitrogen Metabolism: Amino Acids

Amino acids as precursors of biomolecules. Amino acid catabolism: the urea cycle. Diseases associated with amino acid metabolism.

10. Disorders and Assessment of Nitrogen Metabolism: Purine and Pyrimidine Bases

Clinical study and assessment of the synthesis pathways of purine and pyrimidine bases. Biochemistry of hyperuricemia and other disorders associated with nucleotide metabolism.

11. Heme Metabolism. Iron Homeostasis

Biosynthesis and degradation of the heme group. Biochemical evaluation of porphyrias and jaundice. Iron homeostasis. Biochemical evaluation of hemochromatosis and anemias.

12. Molecular Basis of Celiac Disease.

Definition. Clinical Manifestations. Etiopathogenesis.

13. PRACTICAL SESSIONS

1. Types of specimens, specimen collection, containers, preservation, interferences, and general considerations for working in a clinical biochemistry laboratory

2. Study of nitrogen metabolism, carbohydrate metabolism, lipid metabolism, and other minor components such as iron, through the determination of metabolites in serum and urine, including: glucose, triglycerides, lipoproteins, total protein, urea, uric acid, and iron, among others.

3.- Measurement of enzymes and isoenzymes of clinical interest, such as lactate dehydrogenase (LDH), transaminases (ALT, AST), gamma-glutamyl transpeptidase (GGT), and alkaline phosphatase (ALP).

4.- Discussion and interpretation of results. Simulation of clinical cases and preparation of reports.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
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Tutorials	1,00
Theory	30,00
Laboratory	14,00
Total hours	45,00

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	57,50
Preparation of lessons	0,00
Preparation for assessment activities	10,00
Resolution of case studies	0,00
Total hours	67,50

TEACHING METHODOLOGY

The teaching methodologies used for this subject will include:

1. Lectures: These will consist of 1-hour sessions using the lecture format for in-person classes, as well as recorded presentations for online classes or videoconferencing, if presential classes cannot be held.
- 2.- Practical Classes: These will be based on both hands-on laboratory activities and the simulation of clinical cases, as well as the preparation of reports. Practical classes will be presential.
- 3.- Tutorials and Seminars: Topics of interest for student training in the field of Clinical Biochemistry will be reviewed, such as specialized topics, clinical cases, and the presentation of research papers. Tutorials and seminars will be held in person, and, in exceptional cases, online.

Summary of teaching methodology:

- Lectures and practical classes
- Field trips or guided visits
- Participatory classes and/or discussions
- Analysis and case studies

EVALUATION

1. Assessment of Theoretical Knowledge:



Theory Exam: 65% of the student's final grade (65 points)

The concepts covered in the theory sessions will be assessed through an exam consisting of multiple-choice questions, with the possibility of short-answer and essay questions.

2. Practical Assessment: 25% of the final grade (25 points)

Attendance at practical sessions is mandatory.

Practical theory exam, consisting of short-answer questions and calculation problems involving some of the biochemical parameters measured in the laboratory, as well as the interpretation of these results (20 points).

The assessment of the laboratory practical sessions—covering attitude, skills, and reports—will account for a maximum of 5 points (5%) of the final grade.

3.- Completion of continuous assessment assignments: 10% of the final grade (10 points) Throughout the semester, students will complete assignments covering aspects of the syllabus, current topics in clinical biochemistry, and the analysis, resolution, and presentation of clinical cases, among others.

4.- Final evaluation.

To pass the subject, students must pass each of the theory and practical exams separately; alternatively, they must obtain a minimum of 26 points on the theory exam and 8 points on the practical exam, provided that the final grade—which includes all assessable components—meets the passing requirement (50 points out of 100). Any student who does not pass the course during the first exam session may carry over the portion they have already passed to the second exam session.

REFERENCES

- Rifai Et al. Tietz textbook of clinical chemistry and Molecular diagnostics. 77th ed. Elsevier/ Saunders (2023).
- Kumar, V. Et al. Robbins & Cothran Pathologic Basis of Disease. 10th ed. Elsevier (2021).
- McPherson, R.To. and Matthew R. Pincus. Henry's clinical diagnosis and management by laboratory methods. 24th d. Elsevier (2022).
- González Hernández, Álvaro. Principles of Clinical Biochemistry and Molecular Pathology. 2ª Ed Publisher Elsevier (2016).
- Harvey, R and Ferrier, D. Lippincott's Illustrated Reviews: Biochemistry. 5th ed. Lippincott Williams &



Wilkins (2011).

- Baynes, J.W. and Dominiczak, M.H. Medical Biochemistry. 5th ed. Elsevier (2019).
- Da Poian, A.T. and Castanho, M.A.R.B. Integrative Human Biochemistry. A Textbook for Medical Biochemistry. 2nd ed. Springer (2021).