

**Basic Molecular and Cell Biology**

Code: 102493

ECTS Credits: 6

**2025/2026**

Degree	Type	Year
Chemistry	FB	1

## Contact

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## Teachers

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## Teaching groups languages

You can view this information at the [end](#) of this document.

## Prerequisites

Although there are no prerequisites to attend it, it is recommended that the student have previous knowledge of:

1. Biomolecules and their functions
2. The structure and the basic functions of cell organelles

Moreover, taking into account that most up-to-date sources of information in the field of Molecular and Cell Biology are in English, it is highly recommended that the students who study this subject have a basic knowledge of this language.

## Objectives and Contextualisation

The subject Fundamentals of Molecular and Cell Biology, is a subject of the 1st semester of the 1st year of the Chemistry Degree .

Objectives of the subject:

- 1) To understand the basic structural features of biomolecules.
- 2) To know the mechanisms of expression and transmission of genetic information.

- 3) To know the methods of analysis and manipulation of biomolecules, as well as the basic techniques in biochemistry and molecular biology.
- 4) To explain the cell structure and ultrastructure.
- 5) To describe the functions of cell organelles and other cellular structures and to understand that their coordinated functioning is essential for the cell tasks' development .
- 6) To understand the processes of differentiation, specialization and cell death, their importance for the correct functioning of an organism and to identify the cellular bases of certain pathologies associated with cell functioning errors.

## Learning Outcomes

1. CM08 (Competence) Interpret data resulting from experiments to solve problems in the field of cell biology.
2. CM09 (Competence) Work together as a team during practical sessions in cell biology laboratories.
3. KM11 (Knowledge) Describe the structure and function of the different parts of a cell.
4. KM12 (Knowledge) Identify the mechanisms that occur in a cell, in terms of energy transfer, signal transmission, and description of its metabolism.
5. KM13 (Knowledge) Identify the fundamental biological processes of living organisms at their different levels of organisation.
6. SM11 (Skill) Accurately analyse qualitative and quantitative data and experimental observations in cell biology.
7. SM11 (Skill) Accurately analyse qualitative and quantitative data and experimental observations in cell biology.
8. SM12 (Skill) Work safely with the techniques, materials, and instruments used in a biology laboratory .
9. SM12 (Skill) Work safely with the techniques, materials, and instruments used in a biology laboratory .

## Content

### THEORETICAL LESSONS

#### BIOCHEMISTRY AND MOLECULAR BIOLOGY

Unit 1. Molecular organization of living beings: General concept of Biochemistry. Chemical elements in living matter. Structural hierarchy of biomolecules. Biological importance of water. Non-covalent interactions in aqueous medium.

Unit 2. Proteins: Primary structure and biological functions. Protein types and functions. Chemical structure, properties and classification of amino acids. Peptides and peptide bond.

Unit 3. Three-dimensional structure of proteins: Structural levels of proteins. Description of the  $\alpha$ -helix and  $\beta$ -sheets. Fibrous proteins. Globular proteins. Quaternary structure.

Unit 4. Biological catalysts: Nature and function. Bases of enzymatic action. Regulation of enzyme activity.

Unit 5. Carbohydrates: Types of carbohydrates and their functions. Monosaccharides: description and properties. Glycosidic bond. Oligosaccharides. Structural and reserve polysaccharides. Glycoproteins: glycoproteins, proteoglycans and glycolipids.

Unit 6. Lipids: Types of lipids and functions. Storage lipids. Structural membrane lipids. Other lipid structures.

Unit 7. Nucleic acids: Types of nucleic acids and functions. Nucleotides. Primary structure of nucleic acids.

Unit 8. Basic Concepts of Molecular Biology: DNA replication, transcription and translation.

## CELL BIOLOGY

Unit 9. Introduction to Cell Biology. Organization of prokaryotic and eukaryotic cells.

Unit 10. Plasma membrane. Structure, composition, and functions of biological membranes. Transport of molecules across membranes.

Unit 11. Nucleus. Nuclear structure and nucleus-cytoplasm transport. Structure of the nucleolus and synthesis of ribosomal RNA. Organization and structure of chromatin.

Unit 12. Cytosol. Composition, organization, and functions of the cytosol.

Unit 13. The internal membranous system. Intracellular compartments. Fundamentals of vesicular transport. Endoplasmic reticulum, synthesis and modification of lipids and proteins. Golgi apparatus, structure and modifications of proteins. Lysosomes and Endosomes.

Unit 14. Mitochondria. Structure and functions.

Unit 15. Cytoskeletal elements. Role in cell functioning and tissue maintenance. Actin microfilaments, structure and function. Microtubules, structure and function. Intermediate filaments, structure and function. Cell junctions.

Unit 16. Cell Cycle. Mitotic and meiotic cell division.

## CLASSROOM PRACTICES - PROBLEMS

## BIOCHEMISTRY AND MOLECULAR BIOLOGY

The content of this section consists of three parts. The first part focuses on the characteristics of biomolecules: pH, buffer systems, isomerism, and optical properties. The second part covers the most relevant aspects of protein purification and characterization. The third part addresses basic concepts of molecular biology (complementary DNA strands, transcription into RNA, and translation into proteins). The problem statements will be delivered in the form of a dossier at the beginning of the semester.

## CELL BIOLOGY

The classroom practice sessions will focus on solving experimental problems related to the content covered in the Theory program. Before the sessions, a dossier will be provided to students through the Moodle platform of the Virtual Campus. Students are expected to work through the problems in the dossier, autonomously, before attending the classroom practicals, where they will be corrected.

## LABORATORY PRACTICES

To attend the laboratory practical sessions, *students must provide proof of having passed the biosafety and safety tests available on the Virtual Campus, and they must be aware of and accept the laboratory regulations of the Faculty of Science and the Faculty of Biosciences.*

*Attendance at laboratory practical sessions is mandatory. Unjustified absence from laboratory sessions will result in the student NOT being able to pass the subject.*

## BIOCHEMISTRY AND MOLECULAR BIOLOGY

A four-hour laboratory session will be held:

- Separation of proteins by gelfiltration and by electrophoresis.

## CELL BIOLOGY

There will be two sessions of two hours each:

- Introduction to the use of the optical microscope. Study of the plant cell.
- Study of the animal cell.

**WARNING ON LAB SAFETY:** If a student is involved in an incident that may have serious security consequences may be expelled from the laboratory and may not pass this subject.

## Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Classroom practices	8	0.32	CM08, SM11, CM08
Laboratory practices	8	0.32	CM09, SM12, CM09
Theoretical classes	36	1.44	KM11, KM12, KM13, KM11
Type: Autonomous			
Individual study	78.5	3.14	KM11, KM12, KM13, KM11
Problems resolution	12	0.48	CM08, SM11, CM08

The subject of Fundamentals of Molecular and Cellular Biology consists of Theoretical classes, Classroom Practice classes, and Laboratory Practice classes. The teaching methodology that will be followed in these training activities is described below:

### THEORETICAL LESSONS

The basic theoretical knowledge of the Biochemistry and Molecular Biology block will be taught in 18 face-to-face hours and those of the Cell Biology block in a further 18 hours.

The theoretical lectures will be accompanied by visual support material in PowerPoint format prepared by the teaching staff. This support material will be available to students in the Moodle classroom of the Virtual Campus of this subject so that it can be downloaded and used as a basis for taking notes during classes. In some topics, videos or animations will also be projected to facilitate the understanding of certain processes.

NOTE: 15 minutes of a class will be reserved, within the calendar established by the centre/degree, so that students can answer the surveys for the evaluation of the teaching performance of the teaching staff and the evaluation of the subject.

### CLASSROOM PRACTICES - PROBLEMS

In the practical classroom classes, experimental problems related to the contents of the theory classes will be solved. Students will have 6 sessions of Biochemistry and Molecular Biology problems and 2 sessions of Cell Biology.

The classroom practice classes are designed for students to work in small groups, and acquire group work and critical reasoning skills.

In the part corresponding to Biochemistry and Molecular Biology, the methodology for the purification and characterization of proteins and problems of buffer systems and enzymatic kinetics will be discussed.

In the Cell Biology part, students will have to solve, prior to each session, problems related to theory topics, delving into the molecular components and mechanisms responsible for the functions of the eukaryotic cell. These problems will later be corrected in the problem sessions.

### PRACTICES IN THE LABORATORY

The practical classes in the laboratory are designed for students to learn to use laboratory instruments and complement their theoretical training. Students will carry out a total of 3 practice sessions. In the first practice, corresponding to Biochemistry and Molecular Biology, the separation of proteins by gel filtration and by electrophoresis in SDS will be performed, and it will have a total duration of 4 hours. The following two practices, corresponding to Cell Biology, will last 2 hours each. In these sessions, an Introduction to the use of the optical microscope will be carried out and The plant cell and The animal cell will be studied.

**ATTENTION:** In order to attend the laboratory practices, students must justify having passed the biosafety and safety tests that they will find on the Virtual Campus and be aware of and accept the operating rules of the laboratories of the Faculty of Sciences and the Faculty of Biosciences.

**Annotation:** Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

## **Assessment**

### **Continous Assessment Activities**

Title	Weighting	Hours	ECTS	Learning Outcomes
Biochemistry and Molecular Biology PROBLEMS exam.	10% of the global score	0.5	0.02	CM08, SM11
Cell Biology PROBLEMS exam.	10% of the global score	0.5	0.02	CM08, SM11
Laboratory practices.	10% of the global score	1.5	0.06	CM09, SM12
1st partial exam (THEORY). Biochemistry and Molecular Biology contents.	35% of the global score	2.5	0.1	KM12, KM13
2nd partial exam (THEORY). Cell Biology contents.	35% of the global score	2.5	0.1	KM11, KM12, KM13

## EVALUATION

To pass the subject, the final weighted average grade of theory, problems and practices equals or exceeds 5 points out of 10 possible.

**ATTENTION:** Attendance at laboratory practices is mandatory. Failure to attend laboratory practices without justification will imply that students can NOT pass the subject.

### 1- CONTINUOUS ASSESSMENT

The programmed continuous assessment activities are:

## 1.1- THEORETICAL LESSONS and PROBLEMS

· First midterm exam: The theoretical content and problems corresponding to the Biochemistry and Molecular Biology part of the course will be assessed. This midterm will include a theory exam, which will account for 35% of the subject's global score, and a problems exam, which will account for 10% of the subject's global score. The exams may include multiple-choice questions, short-answer questions, and problem-solving exercises. At the discretion of the teaching staff, optional continuous assessment activities may be scheduled to complement the evaluation of theory and/or problems.

· Second midterm exam: The theoretical content and problems corresponding to the Cell Biology part of the course will be assessed. This midterm will include a theory exam, which will account for 35% of the subject's global score, and a problems exam, which will account for 10% of the subject's global score. The exams may include multiple-choice and/or short-answer questions on theory and problems.

Considerations: For the 2 midterm exams to average, the minimum grade for each theory exam must be greater than or equal to 3.5. If a student obtains a grade lower than 3.5 in either of the theory midterms, they must take the resit exam (retake exam).

· Resit exam for theory and problems: This exam will be used to retake the midterms that are necessary, whether in theory (Biochemistry and Molecular Biology and/or Cell Biology) and/or in problems (Biochemistry and Molecular Biology and/or Cell Biology).

Considerations: To be able to access the retake, students must have been evaluated in a set of activities whose weight is equivalent to a minimum of two-thirds of the total evaluation activities of the subject.

## 1.2- LABORATORY PRACTICES

Laboratory practices represent 10% of the final grade of the subject and will be evaluated as described below.

Biochemistry and Molecular Biology Internships: They will represent 5% of the subject's final grade. To grade the practices, the attitude of the students in the laboratory will be taken into account, as well as the assessment of the questionnaires that they will have to complete at the end of the practice.

Cell Biology Internships: They will represent 5% of the subject's final grade. The practice grade will be obtained from the arithmetic average of the short questionnaires that will be carried out at the end of each practice.

Summary table of the weight of each of the parts:

Biochemistry and Molecular Biology Internship	5%
Cell Biology Internship	5%
Biochemistry and Molecular Biology Theory and Problems	45% (35% Theory + 10% problems)
Cell Biology Theory and Problems	45% (35% Theory + 10% problems)

## 1.3- OTHER CONSIDERATIONS

- NOT ASSESSED: Students who, not having adhered to the single assessment, carry out less than 50% of the assessment activities described above will be considered as not assessed.
- Continuous assessment students who do not pass the theoretical part + problems of the subject, but pass the practical Biochemistry and Molecular Biology part and/or the practical Cell Biology part

(obtaining a minimum of 5 points out of 10), can request that the grade for the practical part(s) passed be kept for a period of three additional enrolments (but they will have to enrol again for ALL the subject).

- Under no circumstances will the Theory and/or the problem score be saved.
- Students who are unable to attend an individual assessment test for a justified reason (such as a health problem, death of a relative up to the second degree, accident, elite athlete status and having a competition or sports activity that is mandatory, etc.) and provide the corresponding official documentation to the teaching staff and the coordination of the degree (official medical certificate explicitly stating the inability to take an exam, police report, justification from the competent sports body, etc.), will have the right to take the test on another date. The coordination of the degree will ensure that this test is carried out, after consultation with the teaching staff of the subject.
- Students who have passed the theory, problems and practices may also take the retake exam to IMPROVE GRADE, and theory and/or problems will be examined. To be able to sit, you must renounce in writing (email) the grade obtained, notifying the teaching staff responsible for the subject at least three days before the retake exam. The grade that will be taken into account will be that of the last exam that the students have taken.

## 2- SINGLE ASSESSMENT

Students who opt for a single assessment must request it within the deadline and in the manner indicated by the Faculty.

### 2.1- THEORY AND PROBLEMS

This part represents 90% of the final grade of the subject, and will be evaluated by:

Single exam of theory and problems: The single evaluation of the theory and problems will consist of an exam that will be held on the day of the second partial of the subject and that will consist of multiple-choice questions and/or short questions or exercises referring to all the contents of theory and problems of Biochemistry and Molecular Biology and the contents of theory and problems of Cell Biology.

Theory and problem resit exam: The retake of the single assessment will be on the same day and time as the continuous assessment resit test.

### 2.2- PRACTICES IN THE LABORATORY

**ATTENTION:** Students who take the single assessment must carry out the practices of this subject in face-to-face sessions with the rest of their classmates. At the end of each practice session, students will take the corresponding practice evaluation questionnaire. Attendance at the practices is MANDATORY and ESSENTIAL to be able to take the single theory and problems exam.

Laboratory practices represent 10% of the final grade of the subject and will be evaluated by:

Biochemistry and Molecular Biology Internships: They will represent 5% of the subject's final grade. To grade the practices, the attitude of the students in the laboratory will be taken into account, as well as the assessment of the questionnaires that they will have to complete at the end of the practice.

Cell Biology Internships: They will represent 5% of the subject's final grade. The practice grade will be obtained from the arithmetic average of the short questionnaires that will be carried out at the end of each practice.

### 2.3- OTHER CONSIDERATIONS

- Single assessment students who do not pass the theoretical part + problems of the subject, but pass the practical Biochemistry and Molecular Biology part and/or the practical Cell Biology part (obtaining a minimum of 5 points out of 10), may request that the grade for the practical part(s) passed be kept for a period of three additional enrolments (but they will have to re-enrol for the ENTIRE subject).
- Under no circumstances will the theory and/or problem score be kept.
- Single assessment students who cannot attend the individual assessment tests for a justified reason (such as a health problem, death of a family member up to the second degree, accident, elite athlete

status and having a competition or sports activity that is mandatory, etc.) and provide the corresponding official documentation. You will have the right to take the test on another date. The coordination of the degree will ensure that this test is carried out, after consultation with the teaching staff of the subject.

- Students who have passed the theory, problems and practices may also take the retake exam to IMPROVE GRADE, and theory and/or problems will be examined. To be able to sit, you must renounce in writing (email) the grade obtained, notifying the teaching staff responsible for the subject at least three days before the retake exam. The grade that will be taken into account will be that of the last exam that the students have taken.

## Bibliography

### BIOCHEMISTRY AND MOLECULAR BIOLOGY BIBLIOGRAPHY

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### CELL BIOLOGY BIBLIOGRAPHY

Alberts B, Johnson A, Lewis J, Raff M, Roberts K, Walter P. 2016. *Biología Molecular de la Célula*. 6<sup>a</sup> Edición. Editorial Omega.

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Cooper: <http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=cooper>

Alberts: <http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=mboc4>

## Software

No specific software will be used

## Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	1	Catalan	first semester	morning-mixed
(PAUL) Classroom practices	2	Catalan	first semester	morning-mixed
(PAUL) Classroom practices	3	Catalan	first semester	afternoon
(PAUL) Classroom practices	4	Catalan	first semester	afternoon
(PLAB) Practical laboratories	1	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	2	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	3	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	4	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	5	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	6	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	7	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	8	Catalan/Spanish	first semester	morning-mixed
(TE) Theory	1	Catalan	first semester	morning-mixed
(TE) Theory	2	Catalan	first semester	afternoon