

Degree programme	Type	Course
Biochemistry	OB	1

Contact lecturer

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Group languages

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

Prerequisites

Students must be simultaneously enrolled in, or have previously completed, the theory courses corresponding to the contents of the practical sessions of this course, which are taught during the same semester.

In order to attend the laboratory classes, students must provide proof that they have successfully completed the biosafety and safety tests available on the Virtual Campus, both those corresponding to the Faculty of Biosciences and those corresponding to the Faculty of Sciences, and must be aware of and accept the operating regulations of the laboratories of the Faculties of Biosciences and Sciences.

The test must be completed in the corresponding section of the Virtual Campus, and the information that must be consulted is available in the communication area of the faculties.

Students are advised to review the theoretical contents on which this course is based.

Objectives

The subject of Integrated Laboratory 1 is part of a set of six subjects that are distributed throughout the first six semesters of the Degree in Biochemistry.

The educational objective of these subjects is the acquisition of practical skills of the student.

The contents are organized in increasing order of complexity, associated with the needs and acquisition of the theoretical contents.

During the Integrated Laboratory 1 the student acquires practical skills in the contents:

- Cell Biology
- Biochemistry
- Histology
- Fundamentals of Chemistry
- Mathematics.

Laboratory practices focus on learning basic techniques specific to each field and on the characteristics of working in the laboratory.

Learning outcomes

- CM22 (Clearly and concisely describe experimental results in the field of biochemistry, considering options for improvement.) Clearly and concisely describe experimental results in the field of biochemistry, considering options for improvement.
- CM23 (Work as a team when performing experiments and analysing their results.) Work as a team when performing experiments and analysing their results.
- CM24 (Understand disposal methods for the different types of waste generated in a biochemistry or molecular biology laboratory.) Understand disposal methods for the different types of waste generated in a biochemistry or molecular biology laboratory.
- KM26 (Identify cell systems useful for experimentation in biochemistry and molecular biology.) Identify cell systems useful for experimentation in biochemistry and molecular biology.
- KM27 (Describe the theoretical foundations and instrumentation used in basic and advanced biochemistry.) Describe the theoretical foundations and instrumentation used in basic and advanced biochemistry.
- SM25 (Use digital resources to search for information, study biomolecules and calculate key parameters.) Use digital resources to search for information, study biomolecules and calculate key parameters.
- SM26 (Interpret experimental results obtained using the main techniques of biochemistry.) Interpret experimental results obtained using the main techniques of biochemistry.
- SM27 (Apply the techniques and methods for addressing cell culture techniques, classical genetics, immunological detection, recombinant DNA, separation, purification and analysis of biomolecules in the

biochemical field.) Apply the techniques and methods for addressing cell culture techniques, classical genetics, immunological detection, recombinant DNA, separation, purification and analysis of biomolecules in the biochemical field.

Contents

The subject is structured into 5 types of content.

Cell Biology

The internships are organized in 6 sessions of 2 hours that are carried out in the laboratory.

Practice 1 (2h). Introduction to the light microscope and observation of plant cells. Description of the elements of the optical microscope and fundamentals of using the microscope. Obtaining temporary preparations of different samples of plant tissues (potato, pepper, *Elodea*) and observation of the morphology of plant cells and their main components: cell wall, nucleus, chloroplasts, amyloplasts, chromoplasts, plasmodesmata.

Practice 2 (2h). Observation of animal cells under the light microscope. Observation of the morphology of different types of animal cells: oral mucosal cells, fibroblasts and spermatozoa.

Practice 3 (2h). Osmosis and simple diffusion. Study of the phenomenon of osmosis in cells of an *Elodea* leaf exposed to different concentrations of NaCl. Study of the simple diffusion of alcohols through the cell membrane of an *Elodea* leaf.

Practice 4 (2h). Introduction to electron microscopy. Fundamentals of electron microscopy. Recognition and measurement of different cell structures and organelles in SEM and TEM micrographs.

Practice 5 (2h). Mitotic cell division. Obtaining temporary preparations of plant tissues to observe and recognize the different phases of mitosis and calculate their duration.

Practice 6 (2h). Meiotic cell division. Observation of the different phases of the meiotic cycle of spermatogenesis in insects.

Histology Module

Practice 1: Introduction to histological techniques for the processing of animal material. Microscopic identification of epithelial, connective and adipose tissues.

Practice 2: Preparation and staining of sheep blood smears. Microscopic identification of blood elements and cartilage and bone tissues.

Practice 3: Microscopic identification of muscle and nerve tissues

Module . Biochemistry

Practice sessions of 4 hours each

Practice 1: Expression and purification of heterologous proteins (this practice covers all three sessions): transformation with the expression vector. Preparation of buffering solutions

Practice 2: Expression and purification of heterologous proteins: inoculum of the transformants in the culture medium. Amplification of a gene by polymerase chain reaction (PCR): PCR reaction.

Practice 3: Expression and purification of heterologous proteins: lysis and purification by hydrophobic chromatography. Amplification of a gene by polymerase chain reaction (PCR): analysis by agarose gel electrophoresis

Fundamentals of Chemistry

Practice 1 (4h): Determination of the degree of acidity of a commercial vinegar.

Concept: Assessment of a weak acid.

Practice 2 (4h): Separation of a Mixture of Benzoic Acid, 1,3-Dinitrobenzene and Aniline

Simple extraction concept: Extraction with a basic and acidic aqueous phase

Mathematics

We will learn to use an algebraic manipulator to perform calculations and represent graphs of functions of a variable. We will work on mathematical models of physical, chemical and biological phenomena.

Practice 1 (2h): Introduction. The manipulator syntax.

Practice 2 (2h): Functions of a variable.

Practice 3 (2h): Applications of the derivative and the integral.

Practice 4 (2h): Differential equations and applications.

Practice 5 (2h): Content consolidation test.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
questions resolution	5.25	0.21	CM22, CM23, CM24, KM26, KM27, SM25, SM26, SM27
tutor sessions	2.5	0.1	CM22, CM23, CM24, KM26, KM27, SM25, SM26, SM27
Study	5	0.2	CM22, CM23, CM24, KM26, KM27, SM25, SM26, SM27
practice sessions in the laboratory	55	2.2	CM22, CM23, CM24, KM26, KM27, SM25, SM26, SM27

The subject will be taught in the laboratory and in small groups of students

Attendance at the classes of this subject is mandatory since they imply the acquisition of skills based on practical work.

Practical laboratory and data analysis classes.

Students carry out the experimental work in groups of 2 and under the supervision of the teacher in charge.

The practice protocols and, if applicable, the response questionnaires, will be available on the Virtual Campus of the subject.

Before starting an internship session, the student must have read the protocol and therefore know the objectives of the internship, the fundamentals and the procedures to be carried out.

If this is the case, they must be aware of the specific safety and waste treatment measures.

To the practical sessions it is necessary to bring:

- Protocol and, if applicable, the questionnaire.

- A notebook to collect the information of the experimental work.
- Lab coat.
- Protective glasses.
- Permanent marker.

Note: 15 minutes of a class will be reserved, within the calendar established by the centre/degree, for students to complete the surveys for the evaluation of the performance of the teaching staff and the evaluation of the subject/module.

Biochemistry Module:

The student will print the practice script before the practical session and will prepare the practice beforehand, inquiring in the Bibliography about what has not been clear. In the laboratory, only the experimental procedure will be carried out directly, and any doubts that may have arisen may be raised with the practice teacher. Subsequently, on the date signed by the teacher, the student will deliver a questionnaire (also available in the CV) where they will answer questions posed based on the results obtained and the methodology used in the laboratory sessions

Histology Module

The internships involve the preparation of microscopic preparations, microscopic diagnosis and individual delivery of questionnaires.

Students will have a detailed practice manual at the beginning of the course. In order to achieve performance and acquire the corresponding competencies of this subject, a comprehensive reading of the proposed practice is essential before its completion. The follow-up of the practical class will also involve the individual compilation of the microscopic observations in an activity dossier. At the end of each session, a questionnaire will have to be answered individually and in a limited time.

Attendance at practical classes is mandatory

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

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Biochemistry	20	2	0.08	CM22, CM23, CM24, KM26, KM27, SM25, SM26, SM27
Cellular biology. Question resolutions	24	0.25	0.01	CM22, CM23, CM24, KM26, KM27, SM25, SM26, SM27
Basic Chemistry. Question solution	17	1	0.04	CM22, CM23, CM24, KM27, SM25, SM26, SM27
Mathematics	20	3	0.12	CM22, CM23, KM27, SM25, SM26

Histology. Questions solving	19	1	0.04	CM22, CM23, CM24, KM26, KM27, SM25, SM26, SM27
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Assessment

Cell Biology

The lab work will be evaluated by questionnaires in which students will have to answer, at the end of each of the practical sessions. The final qualification of the module will be obtained from the average grade of all questionnaires. The minimum grade required to pass this practical module is 4 out of 10.

Students with two or more unjustified absences will receive a maximum score of 3.5 points and will not be able to take any recovery tests, implying that they cannot exceed the theme of the integrated lab 1.

Biochemistry

The student's attitude in the laboratory, punctuality, wearing the appropriate material such as a gown, protective goggles and practice script, previously worked on at home by the student, as well as their work in the laboratory, will be evaluated. On the day booked by the teacher, the student will deliver a questionnaire that will be answered outside the laboratory. The evaluation of attitude will account for 25% of the grade of the module, and the evaluation of its degree of achievement through the questionnaire presented will account for the other 75% of the total grade of the module).

Animal Histology

The evaluation system is organized in the following sections:

1) Evaluation of the contents at the end of each practice (50% of the grade). This test consists of a questionnaire and the recognition of microscopic structures.

The grade in this section is obtained from the average of the grades obtained in each practice. In case of not attending any of the sessions, without justified cause, the corresponding grade of the practice will be considered as zero.

2) Global microscopic diagnostic test (50% of the grade). This test consists of the recognition of microscopic structures. This test will be carried out at the end of the course.

In order to be able to weight the grades obtained in each section, it will be essential that the student obtains a grade equal to or greater than 3.5 points (out of 10) in each of them. Students who have obtained a final grade of less than 5 (out of 10) will have to take a recovery exam, which will consist of a microscopic diagnostic test and a questionnaire.

Fundamentals of Chemistry

The assessment will be carried out by carrying out a brief questionnaire at the beginning of each practice on the content that must be known by the students to carry it out (15% of the total)

The delivery of a final report on the practice carried out at the end of each session in the laboratory.

Maths:

30% of the note of this module will be given by the correct realization of the practices. The remaining 70% will be obtained with a problem-solving test with a computer.

The final evaluation of the subject will be obtained from the weighted average of the evaluation of the different contents.

Single assessment

For those students who take the single assessment is compulsory to do the laboratory practices (PLAB) in the scheduled sessions with the rest of the group.

The single assessment consists of a single synthesis test with questions from all the integrated laboratory modules on the day scheduled in the academic calendar. The grade obtained in the synthesis test is 70% of the final grade of the subject. Attitude during the laboratory sessions, attendance, and the non-recoverable assessment activities will account for the remaining 30% of the final grade.

The same retake system will be applied as for the continuous assessment.

General considerations

Since attendance to the activities programmed in these subjects is mandatory, the absence of any of them must be justified. In order to be able to pass the subject, it is required a global attendance of at least 80% of the scheduled sessions and obtain the minimum qualification set for each module.

It will be considered that a student obtains the Non-Appraising Qualification when he has attended less than 20% of the scheduled sessions.

Students who do not obtain the minimum qualification required to be able to pass each of the modules of the integrated laboratory will not pass the subject. In this case, the final maximum grade of the subject will be 4

From the second enrollment, repeat students will only have to evaluate the specific modules that have not been exceeded.

This exemption will be maintained for a period of three additional license enrollments.

Use of Artificial Intelligence (AI) Technologies

In this course, the use of Artificial Intelligence (AI) technologies is not permitted at any stage. Any work that includes content generated by AI will be considered a breach of academic integrity and may result in a partial or total penalty in the grade for the activity, or more severe disciplinary measures in serious cases.

In the event of academic fraud:

Any deliberate behaviour aimed at altering the grade of an examination through copying or the use of tools not authorized by the teaching staff will result in a grade of 0 for the examination. This incident will be reported to the degree programme coordinator.

Bibliography

Cell Biology

Alberts B, Johnson A, Lewis J, Morgan D, Raff M, Roberts K, Walter P. Biología Molecular de la Célula. 6ª Edición. Ediciones Omega S.A. 2016. ISBN: 978-84-282-1638-8.

Lodish H, Berk A, Kaiser CA, Krieger M, Bretscher A, Ploegh H, Martin KC, Yaffe MB, Amon A. Biología Celular y Molecular. 9ª Edición. Editorial Médica Panamericana. 2023. ISBN: 9788411061896.

https://bibcercador.uab.cat/discovery/fulldisplay?context=L&vid=34CSUC_UAB:VU1&search_scope=MyInst_and

Math

The laboratory practicals are self-contained and there is no specific bibliography.

Software

Biochemistry

GelAnalyzer 19.1 (www.gelanalyzer.com) by Istvan Lazar Jr., PhD and Istvan Lazar Sr., PhD, CSc

Schneider, C. A., Rasband, W. S., & Eliceiri, K. W. (2012). NIH Image to ImageJ: 25 years of image analysis. *Nature Methods*, 9(7), 671-675. [doi:10.1038/nmeth.2089](https://doi.org/10.1038/nmeth.2089)

Excel: microsoft.com

Math

wxmaxima: <https://wxmaxima-developers.github.io/wxmaxima/help.html>

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(PLAB) Practical laboratories	311	Catalan/Spanish	first semester	morning-mixed
(PLABs) Suport a les pràctiques de laboratori	311	Catalan/Spanish	first semester	morning-mixed
(PLAB40) Pràctiques de laboratori (40 estudiants per grup)	311	Catalan/Spanish	first semester	morning-mixed
(PLAB40s)	311	Catalan/Spanish	first	morning-mixed

Suport a les pràctiques de laboratori (40 estudiants per grup)		semester		
(PLAB) Practical laboratories	312	Catalan/Spanish	first semester	morning-mixed
(PLABs) Suport a les pràctiques de laboratori	312	Catalan/Spanish	first semester	morning-mixed
(PLAB40) Pràctiques de laboratori (40 estudiants per grup)	312	Catalan/Spanish	first semester	morning-mixed
(PLAB40s) Suport a les pràctiques de laboratori (40 estudiants per grup)	312	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	313	Catalan/Spanish	first semester	morning-mixed
(PLABs) Suport a les pràctiques de laboratori	313	Catalan/Spanish	first semester	morning-mixed