UAB
Universitat Autònoma de Barcelona

Integrated Laboratory Class 2

2026/2027

Code: 100885
Credits: 3

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 practical sessions, students must provide proof that they have successfully completed the biosafety and safety tests available on the Virtual Campus in the corresponding sections of the Faculties of Biosciences and Sciences, and be aware of and accept the operating regulations of the laboratories of these faculties.

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

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

Objectives

The Integrated Laboratory 2 course is part of a set of six courses distributed throughout the first six semesters of the Bachelor's Degree in Biochemistry.

The educational objective of these courses is the acquisition of practical competencies by the student.

The contents are organized in increasing order of complexity, according to the needs and the acquisition of the corresponding theoretical contents.

During Integrated Laboratory 2, the student acquires practical competencies in the following areas:

- Basic Instrumental Techniques.

- Organic Chemistry of Biochemical Processes.

- Physics.

- Microbiology.

- Thermodynamics and Kinetics.

The laboratory practical sessions focus on learning the basic techniques specific to each area and on acquiring the skills required for laboratory work. In particular, the following aspects will be addressed:

Basic Instrumental Techniques Module

-To be able to select and prepare the appropriate pH buffer system.

-To be able to determine the concentration of substances using colorimetric techniques.

-To be able to use chromatography for protein purification.

-To be able to perform polyacrylamide gel electrophoresis as a routine tool for the separation and identification of proteins.

Organic Chemistry of Biochemical Processes Module

-To master the experimental techniques used in organic chemistry laboratories, including reflux, liquid-liquid extraction, vacuum filtration, purification by recrystallization, and oxidation-reduction (redox) reactions.

Physics Module

-To apply basic experimental techniques to determine physical parameters, as well as to analyse and interpret experimental results.

Microbiology Module

-To understand and know how to apply basic laboratory techniques for experimental work with microorganisms.

-To be able to perform basic calculations to determine microbiological parameters.

-To evaluate the presence of microorganisms, their diversity, and their capacity for propagation in all types of environments.

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 course is structured as follows:

Basic Instrumental Techniques

Practical 1: Determination of glucose concentration by a colorimetric method. Analysis of an absorption spectrum. Preparation of the gel for SDS electrophoresis (which will be run the following day).

Practical 2: (i) Gel filtration chromatography: separation of hemoglobin from vitamin B12 and dextran blue; (ii) Separation of proteins by SDS electrophoresis.

Organic Chemistry of Biochemical Processes Module

Practical 1: SN1: Synthesis of 2-chloro-2-methylbutane from 2-methyl-2-butanol.

Objectives: Mastery of the experimental techniques of crystallization, recrystallization, suction filtration, determination of the melting point, and thin-layer chromatography.

Practical 2: Oxidation of a methyl group to a carboxyl group and preparation of *p*-nitrobenzoic acid from *p* -nitrotoluene.

Physics

Four laboratory practical sessions will be carried out, each lasting approximately 3 hours. Before the first session, a brief introduction will be given to error analysis in experimental measurements and to the basic treatment of experimental data.

Practical 1: Determination of the viscosity coefficient of liquids using Stokes' method.

Practical 2: Study of Hooke's law and the properties of oscillatory motion. Determination of the resonance frequency of an oscillatory system.

Practical 3: Determination of the charge-to-mass ratio of the electron.

Practical 4: Experimental study of the wave nature of light by means of diffraction phenomena.

Microbiology Module

Daily laboratory practical sessions of 3 hours each:

Practical 1: Isolation, observation, characterization, and identification of microorganisms.

Practical 2: Methods for the enumeration of microorganisms.

Practical 3: Ubiquity and microbial diversity.

Practical 4: Growth kinetics of a microorganism.

Thermodynamics and Kinetics

Practical 1: Use of the calorimeter to determine phase-change and reaction enthalpies.

Determine the heat capacity of the calorimeter using the method of mixtures.

Measure the latent heat of fusion of ice and the enthalpy of an acid-base neutralization reaction.

Practical 2: Kinetics of the methyl violet reaction in a basic medium.

Determine the pseudo-rate constant for the methyl violet reaction in a basic medium with excess hydroxide ion at room temperature.

Determine the reaction order with respect to hydroxide and methyl violet, and the rate constant.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Study	7	0.28	CM22, CM23, CM24, KM26, KM27, SM25, SM26, SM27
practice sessions in the laboratory	56	2.24	CM22, CM23, CM24, KM26, KM27, SM25, SM26, SM27

Tutor sessions	2	0.08	KM27, SM25, SM26, SM27

General

The practical sessions will be taught in small groups of students (approximately 20 students per session) in the laboratory. They are designed to learn how to use technical instrumentation and to complement the theoretical training.

Attendance at the classes of this course is compulsory since they involve the acquisition of competencies based on practical work.

Before starting a practical session, the student must have read the protocol and therefore be familiar with the objectives of the practical, its theoretical basis and the procedures to be carried out. If any calculations are required in order to perform the practical session, the student must have completed them before entering the laboratory.

Where applicable, the student must be familiar with the specific safety measures and waste management procedures.

For the practical sessions, students must bring:

The protocol and, where applicable, the questionnaire.

- A notebook to record the information obtained during the experimental work.

- A laboratory coat.

- Safety goggles.

- A 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.

Microbiology Module

At the beginning of the course, the student will receive a Manual containing the practical work to be carried out. This will be available on the course Virtual Campus or wherever indicated by the teaching staff.

These practical sessions will be taught in three small groups of students and include four sessions of three hours each, at a rate of one session per day during the same week. Attendance at the practical classes is compulsory in order to acquire the competencies of the module. If a student, for justified and unforeseen reasons, is unable to attend one of the practical sessions, they must speak with the lecturer responsible and submit the corresponding supporting documentation as soon as possible. Justified reasons include health problems (the corresponding medical certificate must be provided) or serious personal circumstances.

In order to attend the laboratory practical classes, the student must have passed the safety test available in the Laboratory Safety section of the Faculty's Virtual Campus. In addition, the student must comply with the regulations for working in a Microbiology laboratory, which are described in the Manual itself. For each practical session, students are required to bring their own laboratory coat, safety goggles, lighter, permanent marker, calculator, a notebook for recording their observations, and the Practical Manual.

For the practical sessions, students will work in pairs under the supervision of the lecturer. At the beginning of,

or during, each daily session, the lecturer will give a brief theoretical explanation of the contents of the practical session and of the experiments to be carried out by the students, as well as of the specific safety measures and the procedures for handling the different chemical and biological waste generated. In order to achieve good performance and acquire the competencies corresponding to this activity, it is essential that the student carefully reads and understands the protocols included in the Manual before carrying out the practical session.

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
Basic instrumental technics. Question answers	13	1	0.04	CM22, CM23, CM24, KM26, KM27, SM25, SM26, SM27
Organic Chemistry of Biochemical Processes. Test	22	3	0.12	CM22, CM23, CM24, KM27, SM25, SM26, SM27
Thermodinamics and Kinetics	15	2	0.08	CM23, CM24, KM26, KM27, SM25, SM26, SM27
Physics	25	2	0.08	CM23, CM24, KM26, KM27, SM25, SM26, SM27
Microbiology	25	2	0.08	CM22, CM23, CM24, KM26, KM27, SM25, SM26, SM27

Basic Instrumental Techniques

The practical sessions will be assessed taking into account the completion of questionnaires, accounting for 70% of the module grade, in which the following will be evaluated: i) understanding of the principles underlying the experimental methods; ii) the ability to process and analyse experimental data; iii) the ability to interpret experimental results; and the monitoring of the experimental work in the laboratory, accounting for 30% of the module grade, in which the following will be evaluated: i) prior preparation work, especially for those practical sessions requiring previous calculations; ii) the application of the general laboratory safety and operating regulations; iii) the correct application of waste disposal procedures; iv) the ability to work as part of a team.

Physics

The assessment of the Physics component will be based on the submission of the report for Practical 1, which will constitute the grade for this part of the course.

Thermodynamics and Kinetics

The assessment of this module will be carried out through: i) behaviour and attitude (20%); ii) grading of the reports (80%).

Organic Chemistry of Biochemical Processes

The final grade for the course will be the result of 60% of the examination grade and 40% of the continuous assessment by the practical session instructors.

The minimum examination grade required to pass the course will be 3.5 out of 10.

The theoretical examination will be held on the last day of the practical sessions.

To pass the course, students may not be absent from the laboratory for more than one day, provided that a valid supporting document is submitted.

Microbiology Module

In this module there will be two types of assessment activities:

1- Continuous assessment of pair work.

Students must submit a report of the results obtained, consisting of completing a dossier previously distributed by the lecturer.

This report will be collected during the last practical session.

2- Individual assessment of the contents.

A questionnaire will be held on the last day of the practical sessions, consisting of answering 15 multiple-choice questions and solving one practical exercise.

These assessment activities will account for 3 and 7 points, out of 10, respectively.

In addition, the student's attitude and work in the laboratory will be taken into account (punctuality, correct use of laboratory equipment, mainly the laboratory coat, compliance with safety regulations, and understanding and following the Course Manual). This assessment does not increase the grade but may result in a reduction of up to 20% of the final grade obtained in this module.

To pass the Microbiology Module, a minimum grade of 3.5 must be obtained. Otherwise, the maximum final grade for the course will be 3.5.

Since attendance at the practical sessions is compulsory, any absence must be justified and may not exceed 20%. If this percentage is exceeded, the module will be graded as Not Assessable.

Final grade

The final grade for the course will be obtained from the weighted average of the grades for the different contents.

To pass the course, students must attend at least 80% of the scheduled sessions, obtain a final grade equal to or higher than 5, and obtain a minimum grade of 3.5 in each group of contents. Students who do not achieve the minimum grade of 3.5 in one or more groups of contents will receive a maximum final course grade of 3.5.

The student will receive the grade of Not Assessable when they have attended less than 20% of the scheduled sessions.

Single assessment

Students opting for the single assessment must complete the laboratory practical sessions (PLAB) in the face-to-face sessions scheduled in the academic calendar.

The single assessment consists of a single comprehensive examination with questions covering all the integrated laboratory modules on the day scheduled in the academic calendar. The grade obtained in this comprehensive examination will account for 75% of the final course grade. Attitude during the practical sessions and attendance will account for the remaining 25%.

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

Use of Artificial Intelligence (AI) Technologies

In this course, the use of AI tools is permitted exclusively as support in the preparation of laboratory reports, such as for literature or information searches, text correction, or translations. In any case, the final work must always reflect a significant contribution from the student in data processing, analysis, and interpretation of the results. The student must indicate whether AI tools have been used, specify which tools were used and for what purpose. Lack of transparency in the use of AI will be considered a breach of the principles of academic integrity and may result in a penalty in the grade for the activity.

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

Organic Chemistry Module of Biochemical Processes

- D. L. Pavia, G. M. Lampman I G. S. Kriz Jr. Introduction to Organic Laboratory Techniques (3ª Ed.), Saunders, Philadelphia, 1988.

- M. P. Cava, M. J. Mitchell. Selected Experiments in Organic Chemistry, Benjamin, New York, 1966.

- J. W. McFarland. Organic Laboratory Chemistry, Mosby, St. Louis, 1969.

- L. M. Harwood, C. J. Moody. Experimental Organic Chemistry: Principles and Practice, Blackwell Scientific Publ., Oxford, 1989.

- Vogel Text Book of Practical Organic Chemistry, Vogel's (5ª Ed.) revisada per B. S. Furniss, A. J. Hannaford, P. W. G. Smith, A. R. Tatchell, Lognman, Essex, 1989.

The bibliography required for the other modules is included in the practical session handbook.

Web links: Available on the course Virtual Campus.

Software

Basic Instrumental Techniques

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

Excel: microsoft.com

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	second semester	morning-mixed
(PLABs) Suport a les pràctiques de laboratori	311	Catalan/Spanish	second semester	morning-mixed
(PLAB40) Pràctiques de laboratori (40 estudiants per grup)	311	Catalan/Spanish	second semester	morning-mixed
(PLAB40s) Suport a les pràctiques de laboratori (40 estudiants per grup)	311	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	312	Catalan/Spanish	second semester	morning-mixed
(PLABs) Suport a les pràctiques de laboratori	312	Catalan/Spanish	second semester	morning-mixed
(PLAB40) Pràctiques de laboratori (40 estudiants per grup)	312	Catalan/Spanish	second semester	morning-mixed
(PLAB40s) Suport a les pràctiques de laboratori (40 estudiants per grup)	312	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	313	Catalan/Spanish	second semester	morning-mixed
(PLABs) Suport a les pràctiques de laboratori	313	Catalan/Spanish	second semester	morning-mixed