UAB
Universitat Autònoma de Barcelona

Integrated Laboratory Class 4

Code: 100883
ECTS Credits: 3

2024/2025

Degree	Type	Year
2500252 Biochemistry	OB	2

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

It is compulsory to be attending simultaneously or have taken the theory subjects corresponding to the contents of the practices of the subject, which are taught during the same semester.

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

In order to be able to attend the practices, the student must justify having passed the biosafety and laboratory security tests. The tests are answered in the corresponding space of the Virtual Campus and the information to be consulted is in the area of communication of the Degree in Biochemistry. The student must acknowledge and accept the rules of operation of the laboratories of the Faculty of Biosciences.

Objectives and Contextualisation

The subject "Laboratori integrat 4" is part of a set of practical subjects, which are distributed throughout the first six semesters of the Degree in Biochemistry. The objective of these subjects is the training and acquisition of practical skills by the students. The complexity of the contents increase gradually, associated to the needs of the subjects of the semester and to the acquisition of new theoretical knowledge.

During the subject "Laboratori integrat 4" the student acquires practical skills in the following subjects:

- Virology

- Animal Physiology

- Molecular Biology

- Biocatalysis

- Scientific documentation

The laboratory sessions focus on learning specific and basic techniques in each field, as well as on the development of the necessary competences for laboratory work.

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Apply general laboratory security and operational standards and specific regulations for the manipulation of different biological systems.
- Apply the principal techniques used in biological systems: methods of separation and characterisation of biomolecules, cell cultures, DNA and recombinant protein techniques, immunological techniques, microscopy techniques, etc.
- Collaborate with other work colleagues.
- Design and prepare laboratory protocols, including health and safety aspects.
- Design experiments and understand the limitations of experimental approaches.
- Interpret experimental results and identify consistent and inconsistent elements.
- Manage bibliographies and interpret the information in the main biological databases, and also know how to use basic ICT tools.
- Process cells and tissues to obtain purified sub-cellular organelle preparations, and characterise them biochemically and structurally.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Think in an integrated manner and approach problems from different perspectives.

Learning Outcomes

1. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
2. Apply the basic safety regulations for the growth of microorganisms.
3. Apply the methodology of cellular subfractionation.
4. Apply the techniques for cultivating microorganisms and viruses that are useful in biochemistry and molecular biology studies.
5. Assess experimental data in relation to the values published in the scientific literature.
6. Characterise the physiology of the different organs and the different metabolic states of an organism, using specific techniques.
7. Collaborate with other work colleagues.
8. Describe strategies for purifying complex mixture biomolecules.
9. Design experiments and understand the limitations of experimental approaches.
10. Identify the cell systems that are useful for studying biochemistry and molecular biology.
11. Interpret experimental results and identify consistent and inconsistent elements.
12. Monitor and interpret experiment protocols from a critical perspective.
13. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
14. Think in an integrated manner and approach problems from different perspectives.
15. Use ICT tools to compare sequences and calculate kinetic parameters.
16. Use the appropriate methodology for studying the different types of biological samples.

17. Use the basic techniques for analysing enzyme activity.
18. Use the basic techniques for handling and analysing proteins and nucleic acids.
19. Use the established methods for eliminating the different types of waste products from a biochemistry and molecular biology laboratory.

Content

Laboratory integrat 4 is divided in 5 different modules:

Virology

The Virology module is organized into 4 sessions of 3 hours, the contents of which are detailed below:

1.-Preparation of viral lysates from liquid crops: infection and amplification.

2.-Quantification of viral lysates.

3.-Detection of viruses in wastewater.

4.-Viral neutralization with antibodies.

5.-Observation of viruses by electronic transmission microscopy.

6.-Exposure of results and general discussion. The groups of practices will be organized around the different experimental sections presented previously to collect all the results obtained and to make a brief presentation of slides in which the objectives, methodology, results and discussion are explained.

Animal Physiology

3 sessions of 4 hours

1.- Cardiovascular adaptations to exercise

Measures of the heart rate, systolic and diastolic blood pressure and hemoglobin saturation in the following situations: rest, after exercise and 5 minutes of recovery.

2.- Obtaining and studying the electrocardiogram (ECG)

3.- Anatomy-physiology of the mouse: males and females

4.- The potential for nerve action. Simulation using the labAxon program

Molecular Biology

3 sessions of 4 hours

1.- Nuclei isolation from rat liver by differential centrifugation.

2.- Chromatin preparation by digestion with micrococcal nuclease (MNase)

3- Analysis of chromatin digested with (MNase). Purification of the DNA fragments and observation of the digestion pattern by agarose electrophoresis.

4.- Purification of plasmid DNA. Relaxation of the super-coiled form by topoisomerases. Electrophoretic analysis.

5.- Spectrophotometric analysis of double stranded DNA.

6.- Epigenetic analysis of chromatin regions byquantitative PCR (qPCR).

Biocatalysis

3 sessions of 4 hours

1. Determination of Bdh1p enzyme activity in yeast extracts overexpressing this enzyme.

2- Determination of the kinetic parameters by the enzyme Bdh1p against different substrates.

3- Separation of substrates and products of the reaction mixtures by extraction with ethyl acetate. Characterization of the substrates and products of the Bdh1p reaction by separating them in a chiral column placed in a gas chromatograph.

4- Bioinformatics determination of the kinetic parameters of Bdh1p and analysis of different inhibition patterns of other enzymes with the GraFit 5 program.

5- Introduction to the PyMOL program for the visualization and analysis of protein structures.

Scientific Documentation

2 sessions of 2 hours

1.- Techniques for searching and retrieving bibliographic information, in specialized databases, of controlled indexing: PubMed, Biological Sciences, SciFinder.

2.- Techniques for searching and retrieving bibliographic information in free indexing databases: Scopus, Web of Science.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory sessions	50	2	1, 2, 3, 4, 6, 8, 10, 13, 15, 16, 17, 18, 19
Practical sessions	4	0.16	1, 5, 7, 9, 11, 12, 14
Type: Supervised			
Tutoring	3	0.12	5, 9, 11, 12
Type: Autonomous			
Laboratory reports	7	0.28	5, 7, 9, 11, 12, 14
Study	5	0.2	5, 7, 9, 11, 12, 14

The subject will be taught in small groups of students in the laboratory or in the computer room.

Students will have a Laboratory Manual for each module before the start of the practical sessions and, when appropriate, a questionnaire. The documents will be available on the Moodle classroom.

In order to be able to attend the laboratory sessions, the student must justify having passed the Biosafety and Laboratory Safety tests. The student must be knowledgeable of the rules of operation of the laboratories of the Faculty of Biosciences and accept them.

For each laboratory session is mandatory that the student brings: his own lab coat, lab glasses and the Laboratory Manual. They also have to bring a notebook to write down the results or observations and a permanent marker.

In the laboratory sessions the students will work in pairs, under the supervision of the professor. At the beginning of each session, the teacher will make a brief theoretical explanation of the content of the practice and the experiments to be carried out by the students.

In order to achieve a good performance and acquire the competencies corresponding to this subject, it is essential that the student perform a full reading of the Laboratory Manual, familiarizing with the experiments that will be carried out in each session as well as with the methodology that will be applied in each case.

In order to be able to acquire the specific competences of the subject, attendance to the laboratory sessions is mandatory. In the event that a student for a justified and unpredictable cause is not able to attend to a laboratory session, he / she must notify the professor responsible for the subject and submit the corresponding justification as soon as possible. Health problems are deemed justified (the corresponding medical justification must be attached) or serious personal problems.

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
Laboratory reports	39.5%	3	0.12	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19
Performance in the laboratory	13%	0	0	1, 2, 5, 7, 9, 11, 12, 13, 14, 16, 19
Written tests (Virology, Animal Physiology and Scientific Documentation)	47.5%	3	0.12	5, 8, 9, 10, 11, 12, 18

General considerations:

Attendance at the laboratory/bioinformatics sessions is mandatory. The students will obtain the "Non-Evaluable" qualification when the absence exceeds 20% of the programmed sessions.

Students who do not obtain the required minimum qualification, higher or equal to 5.0 in each module, will not approve the subject. In this case, the final maximum grade of the subject will be 4.

In the case of not passing the subject, the students, during the second enrollment, will only have to pass those specific modules that have not been approved. This exemption will be maintained for a period of two additional enrollments.

Virology (23%)

The evaluation of the virology module will be carried out in the following way:

Individual assessment of the contents: an individual written test will be carried out on the last day of laboratory, consisting of test questions with four possible answers (70% of the final grade).

Group work evaluation: an oral presentation of an experimental section will be held on the last day of laboratory sessions. The content and organization of the presentation, the quality of the presentation and the quality of the communication will be evaluated (30% of the final note of the module).

In order to pass this module, a mark of 5 or higher will be required in the two assessment activities.

Students who do not pass the assessments will be able to recover them, in a single written test on the scheduled date.

Animal Physiology (23%)

The evaluation of the practices of this module will consist on a single individual written exam, which will be carried out after all practices have ended. Students who do not pass this exam will be able to sit a retake test, which will take place on the same day and at the same time as the retake exam for the theoretical subject of Animal Physiology.

Molecular Biology (23%)

The student's attitude inthe laboratory will be evaluated, punctuality, wearing the appropriate material such as a lab coat, goggles and laboratory guides, previously worked at home by the student, as well as his performance in the laboratory. The student will be given will give a questionnaire that he will have to answer outside the laboratory in a form of laboratory report. The assessment of the attitude will account for 25% of the module's grade, and the evaluation of the questionnaire will account for the remaining 75% of the module's grade.

Biocatalysis (23%)

The student's attitude in the laboratory will be evaluated, punctuality, wearing the appropriate material such as lab coat, goggles and laboratory guides, previously worked at home by the student, as well as his performance in the laboratory. The student will be given will give a questionnaire that he will have to answer outside the laboratory in a form of laboratory report. The assessment of the attitude will account for 25% of the module's grade, and the evaluation of the questionnaire will account for the remaining 75% of the module's grade.

Scientific Documentation (8%)

The evaluation contemplates the following aspects:

- Individual test (75%): it will take place on the date set by the Faculty. It may include test-type and/or short-answer questions related to the theoretical and practical content covered in the module.

- Follow-up (25%): includes attendance at classes, as well as the completion and delivery according to the set deadline of the practical activities proposed in each session. Non-compliance by the students will be penalized with 1 point within the qualification of this concept.

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 72% of the final grade of the subject. The attitude during the practices and attendance willbe the remaining 28%.

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

Bibliography

Specific bibliography can be found in the syllabus of the corresponding theory subject.

Software

The following software is used in this laboratory:

- GraFit 5 for the determination of enzyme kinetic parameters
- PyMol for visualization and analysis of protein structures

Language list

Name	Group	Language	Semester	Turn
(PLAB) Practical laboratories	321	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	322	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	323	Catalan/Spanish	second semester	morning-mixed