UAB
Universitat Autònoma de Barcelona

Integrated Laboratory Class 5

Code: 100882
ECTS Credits: 3

2024/2025

Degree	Type	Year
2500252 Biochemistry	OB	3

Contact

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Teaching groups languages

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

Prerequisites

Student must be attending simultaneously or have taken the theory subjects corresponding to the contents of the laboratory practices.

In order to be able to attend the practices, the student must justify having passed the biosafety and security tests that he will find on the Virtual Campus and be knowledgeable and accept the rules of operation of the laboratories of the Faculty of Biosciences.

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

Objectives and Contextualisation

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

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

The contents are organized in an increasing order of complexity, associated with the needs and acquisition of theoretical contents.
During the Integrated Laboratory V the student acquires practical competences in the following contents:
- Recombinant DNA
- Immunology
- Cell signaling
- Industrial Biochemistry
- Proteomics

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

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 methodology of cellular subfractionation.
3. Assess experimental data in relation to the values published in the scientific literature.
4. Characterise the physiology of the different organs and the different metabolic states of an organism, using specific techniques.
5. Collaborate with other work colleagues.
6. Design experiments and understand the limitations of experimental approaches.
7. Identify the cell systems that are useful for studying biochemistry and molecular biology.
8. Interpret experimental results and identify consistent and inconsistent elements.
9. Monitor and interpret experiment protocols from a critical perspective.
10. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
11. Think in an integrated manner and approach problems from different perspectives.
12. Use ICT tools to compare sequences and calculate kinetic parameters.
13. Use immunological techniques for the detection, identification and quantification of antigen compounds.
14. Use immunological techniques for the localization of biomolecules in cells and tissues.
15. Use the appropriate methodology for studying the different types of biological samples.
16. Use the basic techniques for analysing enzyme activity.
17. Use the basic techniques for handling and analysing proteins and nucleic acids.
18. Use the different ICT tools to ascertain the properties and structures of proteins.
19. Use the established methods for eliminating the different types of waste products from a biochemistry and molecular biology laboratory.

Content

- Module of Recombinant DNA and Proteomics: 8 sessions of 4 hours

  A) Design of primers and PCR.

  B) Purification and digestion of PCR product. Insertion by ligation in a vector of expression and transformation of *E.coli* competent cells.

  C) Extraction by Minipreparation of plasmid DNA and analysis by electrophoresis of the products of

digestion of cloning.

D) Obtaining of the cell extract and purification of the dhfr protein by column of affinity to the histidines tagged protein.

E) Electrophoresis on PAGE-SDS. Determination of the amount of protein and enzymatic activities. Evaluation by calculation of the yield and the purification factor of the purification process.

F) Visit to the proteomics service. Characterization of the purified dhfr by mass spectrometry. Analysis and sequencing of the peptides purified by mass spectrometry through the MS / MS technique and identification of unknown proteins present in the sample by peptide mass fingerprinting. Use of similarity databases and search programs

G) Obtaining of lysozyme crystals by hanging drop method. Visualization and manipulation of crystals obtained.

I) Oral presentation of the results obtained and open turn of questions.

- Module of Bioreactors Biochemistry: 2 sessions of 4 hours

  A) Learning the operation and the main characteristics of a bioreactor.

  B) Application of this knowledge in the bioreactor expression process of the dHFR protein in *E. coli*.

  C) Monitoring the growth of the crop in fermenter.

- Module of Immunology: 3 sessions of 4 hours

  A) Separation of splenocytes and cell count

  B) Precipitation of human Igs and dialysis. Quantification of Igs in human serum (ELISA)

  C)Analysis of the functional level of the complement in a sample of human serum. Calculation of the CH50

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Practical classes of laboratory	52	2.08	3, 5, 9, 6, 7, 8, 11, 19, 15, 18, 16, 17, 13, 14
Type: Supervised			
Tutorials	3	0.12	3, 9, 6, 8
Type: Autonomous			
Completion of work, questionnaires and oral presentation	12.5	0.5	3, 5, 9, 6, 8, 11
Self study and autonomous activities	6.5	0.26	3, 5, 9, 6, 8, 11

General considerations

The subject will be given to the laboratory in small groups of students.

Students will have a Practices Manual before the start of the practical sessions and, in the case of a questionnaire they will find available on the Virtual Campus.

Each student's practice session is mandatory: his own gown, lab glasses and the Practices Manual. You also must bring a notebook, where each student will write down the observations made and a permanent marker.

To carry out the practices the students will work in groups of two and under the supervision of the responsible professor, in the module of industrial biochemistry the number of students per group will depend on the number of fermenters available.

To achieve good performance and acquire the competences corresponding to this subject, it is essential that the student make a comprehensive reading of the Practices Manual, familiarizing with the practices that will be carried out in each session as well as with the methodology that will be required. apply in each case. At the beginning of each session the teacher will make a brief theoretical explanation of the content of the practice and the experiences to be carried out by the students.

To be able to acquire the specific competences of the subject, attendance at the practical classes is mandatory. If a student, for justified and unpredictable cause, does not attend a practice 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

Teachers will dedicate approximately 15 minutes of a class to allow their students to answer the evaluation surveys of the teaching performance and evaluation of the subject or module.

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
Evaluation of the oral presentation of the results (DNA recombinant and proteomic module)	40%	0	0	2, 3, 4, 5, 9, 6, 7, 8, 11, 19, 18, 12, 16, 17, 13
Monitoring of work in the laboratory and attitude (Imm)	5,75%	0	0	1, 10, 3, 5, 9, 6, 8, 11, 19, 15
Monitoring of work in the laboratory and attitude (TDR)	10%	0	0	1, 10, 3, 5, 9, 6, 8, 11, 19, 15
Monitoring of work in the laboratory and attitude (bioreactors module)	4,25%	0	0	1, 10, 3, 5, 9, 6, 8, 11, 19, 15
Redaction of questionnaires or works (module of Bioreactors)	11,15%	0.5	0.02	3, 5, 9, 6, 8, 11
Redaction of works or tests (immunology module)	17.25%	0	0	5, 9, 6, 15, 13, 14

Writing of questionnaires and calculations (recombinant DNA)	11,6	0.5	0.02	3, 5, 9, 6, 8, 11, 12, 16

General considerations

Since attendance to the activities programmed in this subject is mandatory, the absence of any of them must be justified. To be able to pass the subject, a global attendance of at least 80% of the scheduled sessions is required and the minimum grade set for each module is obtained.

It will be considered that a student obtains the non-evaluable qualification when he has attended less than 20% of the programmed 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 minimum final grade of the subject will be 4.

In the case that the Integrated Laboratory is differentiated in modules, from the second enrollment, the repeating students will only have to evaluate the specific modules that have not been exceeded.

This exemption will be maintained for a period of two additional license plates.

The final evaluation of the subject will be obtained from the weighted average of the evaluation of the different modules:

- Module of recombinant and proteomic DNA (61.6%)

- Bioreactors Biochemistry Module (15.4%)

- Immunology module (23%)

Module of recombinant and proteomic DNA (61.5%)

Two different aspects will be taken into account:

* Evaluation of the oral presentation (40%)

An oral presentation of the results obtained through the practices and a question of the teacher's turn on the results presented.

* Evaluation of works and calculations requested by the teacher (11.6%)

The oral presentation will be accompanied by the previous delivery of a work that collects those of the calculations and graphs from the part of the practice that requires calculations. The mark corresponding to the work will be the same for both students who have formed a partner during the work in the laboratory.

The note corresponding to this module contemplates globally the oral presentation and the work of support to the presentation. In the evaluation we can distinguish a part of the note that will be common for both students who have formed a pair and that will include the work of support for the presentation as well as the evaluation of the oral presentation (how the oral presentation was organized, built-in calculations, aesthetics of the presentation, etc ...). And on the other hand, there will be a part of the note that is individual and that will be obtained from the teacher's assessment of the student's attitude to the laboratory and how it has been carried out by the student. The student presents the results and also defends the results in the open turn of questions.

A practical session will be devoted to the oral presentations of the results of all the groups, which will be done once the rest of the practical sessions have been completed (see the module's calendar).

* Attitude and follow-up of work in the laboratory (10%)

Module of Industrial Biochemistry (15.4%)

* Delivery of written work or evidence (11.15%)

The teacher may carry out written tests or request work delivery

* Attitude and follow-up of work in the laboratory (4.25%)

The attitude of the student in the laboratory. The punctuality will be evaluated, the appropriate material such as a dressing gown, opt-out glasses and practice guides, previously worked at home for the student, as well as their work in the laboratory.

Immunology module (23%)

The following aspects will be taken into account:

* Delivery of written work or evidence (17.25%)

* Attitude and follow-up of work in the laboratory (5.75%)

B/ Single assessment

This subject does not include single assessment system.

Bibliography

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- Glazer, AN, H Nikaido. 2007. Microbial Biotechnology: Fundamentals of Applied Microbiology. 2ond edition. Cambridge University Press. ISBN: 9780521842105 (cart.)

* FERMENTORS

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- Van't Riet, Tramper, J. "Basic Bioreactor Design", 1991, Marcel Dekker, New York.

- Blanch, H.W., Clark, D.S. "Biochemical Engineering", 1996, Marcel Dekker, New York.

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Software

No specific software will be used in this course.

Language list

Name	Group	Language	Semester	Turn
(PLAB) Practical laboratories	331	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	332	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	333	Catalan/Spanish	first semester	afternoon