Universitat Autònoma de Barcelona

2019/2020

Integrated Laboratory Class 6

Code: 100881
ECTS Credits: 3

Degree	Type	Year	Semester
2500252 Biochemistry	OB	3	2

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Alicia Roque Cordova

Prerequisites

It's compulsory to have passed the laboratory safety test. All the required information is available at the Degree Moodle Classroom.

The students are adviced to study the specific contents of the subjects and to read carefully the laboratory protocol before startting each module.

Objectives and Contextualisation

Integrated Laboratory VI 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 Integrated Laboratory VI the student acquires practical skills associated with the following areas:

• Subcellular fractionation.

• Oximetry.

• Determination of cell viability and death.

• Cell Signaling.

• Bioinformatics.

• Clinical Biochemistry.

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

- Apply general laboratory security and operational standards and specific regulations for the manipulation of different biological systems.
- 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.
- Think in an integrated manner and approach problems from different perspectives.

Learning Outcomes

1. Apply techniques for culturing eukaryotic cells.
2. Apply the methodology of cellular subfractionation.
3. Assess experimental data in relation to the values published in the scientific literature.
4. Collaborate with other work colleagues.
5. Design experiments and understand the limitations of experimental approaches.
6. Determine the parameters for assessing cellular subfractionation.
7. Interpret experimental results and identify consistent and inconsistent elements.
8. Monitor and interpret experiment protocols from a critical perspective.
9. Think in an integrated manner and approach problems from different perspectives.
10. Use ICT tools to compare sequences and calculate kinetic parameters.
11. Use immunological techniques for the localization of biomolecules in cells and tissues.
12. Use the appropriate methodology for studying the different types of biological samples.
13. Use the different ICT tools to ascertain the properties and structures of proteins.

Content

The sessions include the following contents, which can be carried out in simultaneous sessions.

Subcellular fractionation and oximetry assay.

2 sessions of 4 hours:

a) Extraction and homogenization of rat liver.

b) Subcellular fractionation by differential centrifugation.

c) Evaluation of the fractionation by determination of the enzymatic activity of different enzymatic markers specific of a subcellular location.

d) Determination of oxygen consumption by the mitochondrial fraction.

Genotyping. Determination of cell viability and type of cell death. Cell signaling.

5 sessions of 4 hours:

a) Extraction and purification of genomic DNA.

b) Genotyping by PCR. Electrophoretic analysis.

c) Determination of the lethal dose 50 of a therapeutic drug on a human cell line.

d) Study of the type of cell death.

e) Hormone treatment of a human cell line.

f) Determination of the activation of a signaling pathway by western-blot.

Bioinformatics

3 sessions of 2 hours and a fourth session of 4 hours. All the sessions are held in the computer room.

The student will carry out a miniproject that will consist of discovering a new gene, and characterizing it, using bioinformatics tools. As a "new gene", we understand one that has not been previously annotated.

The student will have to put into practice the knowledge acquired in the subject of Bioinformatics, for example: study of the characteristics of the starting protein, database searches, and advanced BLAST searches, multi-alignments and phylogenetic trees, and prediction of Three-dimensional structure, study of domains, comparison and structural classification.

Clinical Biochemistry

3 sessions of 4 hoursand a fourth session in which the results obtained will be evaluated.

a) Measure the concentration of different analytes (urea, cholesterol, bilirubin ...) in serum by molecular absorption spectrometry in an automatic analyzer, using chemical and enzymatic reactions.

b) Determination of the limit of detection and of the linearity limit of the measurement of the concentration of urea.

c) Measurement of the catalytic activity of L-lactate dehydrogenase in serum using two continuous spectrometric methods recommended by the SEQC and by the ICCAT. Comparison of results.

d) Determination of hemoglobin A1c in blood by absorption spectrometry by means of an immunoturbidimetric method with latex.

e) Study of the effect of interfering substances (hemoglobin, bilirubin and lipids) in the measurement of the concentration of uric acid.

f) Application of an inter-laboratory quality external evaluation program to evaluate the results.

The subject will be taught in small groups of students in the laboratory and in the computer room (Bioinformatics).

Methodology

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 the case of the bioinformatic sessions, a case study will be carried out, where the student will have to apply the tools studied in the subject of Bioinformatics to the study of a problem protein chosen from a list made by the professor of the subject. In the resolution of this case, the student is expected to be able to use computer tools correctly and ask questions that can be resolved through bioinformatics, reaching the appropriate conclusions.

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.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory sessions	52	2.08	2, 1, 4, 6, 5, 12, 13, 10, 11
Type: Supervised			
Tutoring	2.5	0.1	4, 5, 7, 9
Type: Autonomous			
Laboratory reports and exams	12.5	0.5	3, 4, 8, 5, 7, 9
Study	5	0.2	3, 4, 8, 5, 7, 9

Assessment

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.

The assessment will be based not only on different tests (written tests, laboratory reports) but also on the attitude and aptitude of the student during the sessions.
The assessment will be divided into different modules that will serve to establish the degree of fulfillment in the acquisition of knowledge about the contents proposed.
Students who do not obtain the required minimum qualification higher or equal to 4.0 in each block, 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.

Subcellular fractionation and oximetry assay.

The student will have to write a report, where the results obtained during the practical sessions will be presented and discussed. This report will represent 80% of the note in this module. The date of the delivery will

be fixed by the teacher.
The remaining 20% of the note will correspond to the student's attitude during the sessions.

The mark of this module will represent 25% of the overall mark of the subject.

Genotyping. Determination of cell viability and type of cell death. Cell signaling.

The student will have to write a report, where the results obtained during the practical sessions will be presented and discussed. This work will represent 75% of the note in this module. The date of the delivery will be fixed by the teacher.
In addition, the practical ability of each group of students will be evaluated, taking into account theresults obtained in thegenotyping test, which will represent 25% of the note in this section.

The note in this module will represent 25% of the overall mark of the subject.

Bioinformatics.

The note in this module will be 25% of the overall mark of the subject.

The student will have to deliver a recopilatory presentation by the Moodle classroom which will acount for 12.5% of the grade. This information will be presented as a short oral presentation in the last session (5-10 min), which will amount 10% of the grade. The remaining 2.5% will correspond to peer-evaluation.

Clinical Biochemistry.

The student will have to answer a written test about the practices, which will represent 75% of the mark of the module. The remaining 25% will be determined by an evaluation of the practical results.

The note in this block will be 25% of the overall mark of the subject.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Atittude and aptitude	10%	0	0	2, 1, 3, 4, 8, 6, 5, 7, 9, 12, 13, 10, 11
Oral presentation and classroom performance (Bioinformatics)	25%	0	0	4, 5, 9, 13, 10
Results of the practical sessions	12.5	0	0	4, 8, 6, 5, 7, 9
Work in group	33.75	0	0	3, 4, 8, 6, 5, 7, 9
Written test (Clinical Biochemistry)	18.75	3	0.12	8, 5, 7, 9

Bibliography

The bibliography and webpages are indicated in the Laboratory manuals of each module, or in the syllabus of the corresponding theoretical subject