Universitat Autònoma de Barcelona

2020/2021

Integrated Laboratory Class 2

Code: 100885
ECTS Credits: 3

Degree	Type	Year	Semester
2500252 Biochemistry	OB	1	2

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

Name: Maria Plana Coll
Email: Maria.Plana@uab.cat

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: Yes

Teachers

José Luis Bourdelande Fernández
Andromeda Celeste Gomez Camacho
Xavier Solans Monfort
Ignasi Roig Navarro

Prerequisites

The student must attend simultaneously or have taken the theory subjects, which are taught during the same semester, corresponding to the contents of the practices of this subject,

In order to attend the laboratory classes it is necessary for the student to justify having passed the biosecurity and security tests that you will find in the Virtual Campus and be knowledgeable and accept the operating rules of the Bioscience Laboratories.

The test is answered in the corresponding space of the Virtual Campus and the information that must be consulted is in the communication space of the Degree in Biochemistry.

It is advisable for students to review the theoretical contents on which this subject is based

Objectives and Contextualisation

The subject of Integrated Laboratory 2 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 a growing order of complexity, associated to the needs and to the acquisition of

the theoretical contents.

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

- Thermodynamics and Kinetic

- Histology

- Microbiology

- Organic Chemistry of Biochemical Processes

- Biochemistry I.

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

Biochemistry module I

-To be able to choose and prepare the appropriate pH buffering system.

-To be capable of performing a heterologous protein production process, identifying the different stages of the process, and the parameters to be controlled.

-To be able to use hydrophobic chromatography in protein purification.

-To be able to perform amplifications of specific fragments of nucleic acid with the polymerase chain reaction (PCR) technique, knowing the parameters that are critical in the design of the encephalon, and in the realization of the reaction of the PCR.

-To be able to perform electrophoresis in agarose gels as a common tool in the separation and identification of nucleic acid fragments.

Organic Chemistry Module of Biochemical Processes

Objectives: Domain of experimental reflux techniques, acid vapor trap, extraction, distillation at atmospheric pressure and determination of purity according to the boiling point.

Module Histology

To know how to apply basic histological techniques for microscopic diagnosis.

To Identify to the microscope various animal tissues and their cellular and extracellular components.

Module Microbiology

- Understand and know how to apply basic laboratory techniques to work experimentally with microorganisms.

- Know how to perform basic calculations to determine microbiological parameters.

- Evaluate the presence of microorganisms, their diversity and their ability to spread in all types of environments.

Competences

- 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.
- Interpret experimental results and identify consistent and inconsistent elements.

Learning Outcomes

1. Apply the basic safety regulations for the growth of microorganisms.
2. Apply the techniques for cultivating microorganisms and viruses that are useful in biochemistry and molecular biology studies.
3. Collaborate with other work colleagues.
4. Determine the genetic characteristics (allele composition) of different organisms by using classical genetic techniques.
5. Identify the cell systems that are useful for studying biochemistry and molecular biology.
6. Interpret experimental results and identify consistent and inconsistent elements.
7. Monitor and interpret experiment protocols from a critical perspective.
8. Use the appropriate methodology for studying the different types of biological samples.
9. Use the basic techniques for handling and analysing proteins and nucleic acids.
10. Use the basic techniques for studying biomolecules in a chemistry laboratory.
11. Use the established methods for eliminating the different types of waste products from a biochemistry and molecular biology laboratory.

Content

The subject is structured in:

Histology module

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

Practice 2: Elaboration and staining of smear of blood of sheep. Microscopic identification of the blood and cartilage and bone tissues.

Practice 3: Microscopic identification of the muscular and nervous tissues

Biochemistry module

Practical sessions of 4 hours each

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

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

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

Thermodynamics and Kinetics

Contents

1. Thermodynamics Practices:

1st. Use of the calorimeter to study phase change processes. Determine the calorific capacity of the calorimeter, using the method of mixes, since it is a data that we need to know to complete this practice and the following. Determine the latent heat of gel melting.

1b. Determination of reaction calories. Determine the reaction heat (reaction enthalpy) of different chemical processes (acid / base) in dissolution by using a constant pressure calorimeter.
Analyze the factors that depend on the measured dentiation changes.

2. Kinetics Practice:

Kinetics of the hydrolysis reaction of an ester in a basic environment.

Determine the velocity constant k for thehydrolysis reaction of acetylsalicylic acid in commercial tablet at room temperature.
Determine the speed constant k for hydrolysis reaction of acetylsalicylic acid in commercial tablet at 40 ° C.
Determine the energy of the experimental activation Eade the same reaction, through the values of k obtained at different temperatures.

Organic Chemistry Module of Biochemical Processes

Contents

PRACTICE 1.-Reduction of an alcohol ketone: obtaining benzhydrol from benzophenone.

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

PRACTICE 2.-Substitution reaction of the hydroxyl group by a halogen: preparation of n-butyl bromide from n-butanol.

Objectives: Domain of experimental reflux techniques, acid vapor trap, extraction, distillation at atmospheric pressure and determination of purity according to the boiling point.

Microbiology module

Daily practical sessions of 3 hours each

Practice 1. Isolation, observation, characterization and identification of microorganisms

Practice 2. Methods of counting microorganisms

Practice 3. Ubiquity and microbial diversity

Practice 4. Kinetic growth of a microorganism

Methodology

The practical sessions will be given in small groups of students (of about 20 per session) in the laboratory. They are designed to learn how to use the technical instrument and complement the theoretical training. The attendance to the classes of this subject is obligatory since they imply an acquisition of competitions based on the practical work.
Before beginning a practical session the student must have read the protocol and know therefore the

objectives of the practice, the foundations and the procedures that must be carried out. In the event that any calculation is required to do the practice in question, the student will have done them previously at the entrance to the laboratory.
If so, you must know the specific safety and waste treatment measures.
In the practical sessions you have to take:
- Protocol and, if applicable, the questionnaire.
- A notebook to collect the information of the experimental work.
- Laboratory baton.
- Safety glasses.
- Permanent marker
Module Histology
The practices 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 good 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 collection of microscopic observations in a dossier of activities. At the end of each session you will have to respond individually and in a limited time to a questionnaire.
Attendance at the practical classes is mandatory
Module of Biochemistry:
The student will print the practice guideline prior to the practical session and prepare the practice in advance, investigating in the Bibliography on what has notbeen clear. In the laboratory, only the experimental procedurewill be carried out directly, and the questions that may have arisen from the practice lecturer may be raised. Subsequently, on the date signed by the teacher, the student will submit a questionnaire (also available in the CV) where he will answer questions raised based on the results obtained and the methodology used in the laboratory sessions

Microbiology module:
At the beginning of the subject the student will receive a Manual with the practical work that he will have to develop. This will be available on the Virtual Campus of the subject or where the teacher indicates.
These practices will be taught in three small groups of students, and they include 5 sessions of three hours each at the rate of one session per day during the whole week.

Attendance at the practical classes is mandatory in order to be able to acquire the competencies of the module. If a student, due to justified and unpredictable cause, has not been able to attend a practical session, he must speak with the responsible professor and present the corresponding supporting evidence as soon as possible. Health problems are deemed justified (the corresponding medical justification must be attached) or serious personal problems.

In order to be able to attend the practical classes of the laboratory, the student must pass the security test that will be found in the section Security in the Laboratories of the Virtual Campus of the faculty. In addition, you must comply with the regulations of work in a Microbiology laboratory that you will find indicated in the Manual itself. In each practical session, students must wear their own coat, protective goggles, lighter, permanent pen, calculator, a notebook to write down the observations made and the Practices Manual.
To carry out the practices the students will work in pairs and under the supervision of the teacher. At the beginning or during each daily session theteacher will make a brief theoretical explanation of the content of the practice and theexperiences to be carried out by the students, as well as the specific security measures and the treatment of 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 read a comprehensive reading of the Manual protocols before their completion.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
practice sessions in the laboratory	56	2.24	2, 1, 3, 7, 4, 5, 6, 11, 8, 10, 9

Type: Supervised			
Tutor sessions	2	0.08	2, 7, 4, 5, 6, 8, 10, 9
Type: Autonomous			
Study	7	0.28	2, 1, 7, 4, 5, 6, 11, 8, 10, 9

Assessment

Animal Histology
The evaluation system is organized in the following sections:
1) Assessment of the contents at the end of each practice (50% of the mark). This test consists of a questionnaire and the recognition of microscopic structures.
The note in this section is obtained from the average of the grades obtained in each practice. If you do not attend any of the sessions, without just cause, the corresponding note of the practice will be considered as zero.
2) Global microscopic diagnostic test (50% of the note). This test consists in the recognition of microscopic structures. This test will be done at the end of the course.
In order to be able to gauge the notes 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.

Biochemistry
The student's attitude in the laboratory will be evaluated, punctuality, wearing the appropriate material such as a dressing gown, goggles and practice guides, previously worked at home for the student, as well as his work in the laboratory. The student on the day appointed by the teacher will submit a questionnaire that will answer outside the laboratory. The assessment of the attitude will mean 25% of the module's note, and the evaluation of its degree by using the questionnaire presented the other 75% of the total of the module's note).

Thermodynamics and Kinetics
The attitude in the laboratory and the results obtained will be evaluated. With the results obtained, it will be necessary to complete a laboratory report which will also raise questions about the two practices of Thermodynamics and Kinetics carried out

Organic Chemistry of Biochemical Processes

The final grade of the subject will be the result of 60% of the mark of the 40% exam of the continuous assessment of the practice professors.
The minimum mark of the exam to be able to pass the subject will be 3,5 out of 10.
The theoretical exam will be held on the last day of internships.
In order to pass the course, it is not possible to miss more than one day in the laboratory, as long as a receipt is received.

Microbiology module:
In this module there will be two types of evaluation activities:
1- Continuous assessment of work as a couple.
The students must submit a report of the results obtained that will consist of filling out a dossier that the professor will have distributed previously.
This report will be included in the last practice session.
2- Individual evaluation of the contents.
A questionnaire will be conducted on the last day of practice, which will consist of answering 15 questions test and solving a practical exercise.
These assessment activities will have a weight of 3 and 7 points, out of 10, respectively.
In addition, the attitude and work of the student in the laboratory will be taken into account (punctuality, correct use of the laboratory equipment (mainly the robe), compliance with the safety regulations and understanding and follow-up of the Manual of the subject). This assessment does not entail an increase in the note, but it can

mean the reduction of up to 20% of the final grade obtained in this module.
To pass the Microbiology Module, a minimum score of 3.5 must be obtained. Otherwise, the final maximum grade of the subject will be 3.5.
Since attendance at the practical sessions is mandatory, the absence of any of the sessions must be justified and may not exceed 20%. In case this value is exceeded, the module will be qualified with a Non-Valuable.

Final grade

The final qualification of the subject will be obtained from the weighted average of the qualification of the different ones
Contents: 16% Animal Histology, 21.5% Biochemistry, 14% Thermodynamic and Kinetic, 21.5% Organic Chemistry of Biochemical Processes and 27% Microbiology.
To pass the subject, at least 80% of the programmed sessions must be attended, obtain a final grade of 5 or more and obtain a minimum qualification of 3.5 in each group of contents. Students who do not achieve the minimum qualification of 3.5 in one or more of the groups of contents will receive a maximum final grade of the subject of 3.5 points.
The student will obtain the non-valuable qualification when he has attended less than 20% of the programmed sessions.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Biochemistry	21,5	2	0.08	3, 7, 6, 11, 8, 9
Histology. Questions solving	16%	1	0.04	3, 7, 4, 5, 6, 8
Microbiology	27%	2	0.08	2, 1, 3, 7, 4, 6, 8
Organic Chemistry of Biochemical Processes. Test	21,5%	3	0.12	7, 6, 10
Thermodinamics and Kinetics	14%	2	0.08	7, 6, 10

Bibliography

Bibliography and web links are indicated in the practices protocols or, where appropriate, in the Teaching Guide of the corresponding theory subject.

Web links:
Available on the Virtual Campus of the subject