



## BIOCHEMISTRY I (2015-16)

### GENERAL INFORMATION

Code 26514

ECTS Credits 6

#### Departments and areas

Department	Area	Area	Report R.
Agrochemistry and Biochemistry	BIOCHEMISTRY AND MOLECULAR BIOLOGY	YES	YES

#### Studies

DEGREE IN BIOLOGY

#### Context of subject

Biochemistry I is a basic training course of the Degree in Biology which has a main aim that is to provide a general view of the most important biomolecules found in nature, as well as to establish the chemical, molecular and genetic basis of the biological processes. Through the history of this scientific discipline, the biochemists have worked to reveal the chemical and physical principles that support the biological processes. Therefore, Biochemistry establishes the knowledge basis to be able to identify these processes. This course provides the basis both for the comprehension of other courses of the Degree as well as for the development of the future career of the graduate in Biology.

## OBJECTIVES

### Subject objectives/competences (2015-16)

#### LEARNING OBJECTIVES:

- To know the structure and function of the different biomolecules and to understand their function in the biological processes.
- To know the fundamentals of the replication, transcription and translation of the genetic material.
- To interpret, evaluate process and synthesise information of biochemistry and molecular biology data.
- To acquire basic skills to experiment and to interpret the information proceeding from observation and measurement in biochemistry and molecular biology, using the biological material, reagents, instruments and application devices in a safe way.
- To be able to seek, to analyse and to understand scientific texts of Biochemistry and molecular biology.
- To use correctly inductive and deductive methods in the field of biochemistry and molecular biology.
- To recognise and value the biochemical processes in the daily life.
- To relate biochemistry and molecular biology to other subjects.

#### SPECIFIC OBJECTIVES:

- To offer a view of the concept of biochemistry and to set up the axioms of the molecular logic of the cells.
- To describe the physical and chemical properties of water, as the most abundant compound within the cell.
- To state the laws of thermodynamic and to set up the relations among the different state functions.
- To know the role that ATP plays in the energetic metabolism.
- To solve acid - base problems involving amino acids, to estimate the isoelectric points and net charges, and to draw and to understand their pH titration curves.
- To apply the basic essentials about the determination of the primary structure of polypeptides.
- To distinguish the structural levels of proteins, and analyse the three-dimensional structure and folding of these biomolecules.
- To set up the relation structure-function of the proteins as essential molecular machines to carry out cellular and intercellular physiological functions.
- To know the characteristics of a biological catalyst.
- To describe the progress curve for an enzymatic reaction and to calculate the specific activity of an enzyme preparation.
- To state the meaning of the kinetic parameters for an enzyme.
- To identify the chiral centres of the monosaccharides and to define the concepts of enantiomer, epimer and anomer.
- To describe the composition and properties of the cellular membrane.
- To set up the nature of the different transport mechanisms through the membrane.
- To explain the phenomenon of denaturation and renaturation of nucleic acids.
- To know the characteristics of the telomeres in linear eukaryotic chromosomes.
- To describe the concept of mutation and to enumerate the mechanisms of DNA repair.
- To explain the concepts of general recombination, specific site recombination and transposition and to mention the main characteristics of their mechanisms.
- To describe the splicing process related to RNA maturation.
- To know the enzymatic activity of the reverse transcriptase and to describe its role in the viral infection process.
- To explain the characteristics of the genetic code.
- To define the concepts of a regulator gene, a repressor, a promoter and an operator (operon), and to describe the control mechanisms in the expression of the lac and trp operons.
- To explain the notion of DNA cloning and to describe the main cloning vectors.

## CONTENTS

### Theoretical and practical contents (2015-16)

#### BRIEF DESCRIPTION:

Introduction. Molecular stage of life. Structure and function of proteins. Enzymes. Catalysis and enzyme kinetics. Carbohydrates. Lipids, biomembranes and membrane transport. Structure and function of nucleic acids. DNA Replication, repair and recombination. DNA Transcription and RNA maturation. Translation. Regulation of gene expression

#### THEORETICAL AND PRACTICAL CONTENTS:

##### THEORY:

##### B 1. INTRODUCTION.

T 1. Introduction. The Basis of Biochemistry.

1.1. Introduction to Biochemistry. 1.2. Water as a sustaining life medium. 1.3. Bioenergetics.

##### B 2. BIOMOLECULES.

T 2. Structure and function of proteins.

2.1. Amino acids. 2.2. Peptides. Primary structure determination. 2.3. Three-Dimensional structure and function of proteins.

T 3. Enzymes. Catalysis and enzyme kinetics.

3.1. Characteristics of biological catalysts. 3.2. Enzyme catalysis. 3.3. Enzyme kinetics. 3.4. Enzyme regulation.

T 4. Carbohydrates.

4.1. Monosaccharides. 4.2. Oligosaccharides. 4.3. Polysaccharides. 4.4. Glycoconjugates.

T 5. Lipids.

5.1. Chemical nature of lipids. 5.2. Types and functions of lipids

T 6. Biomembranes and transport.

6.1. Structure of cell membranes. 6.2. Solute transport across cell membranes.

##### B 3. MOLECULAR BIOLOGY.

T 7. Structure and function of nucleic acids.

7.1. Nucleotides. 7.2. Structure and function of DNA. 7.3. Structure and function of RNA. 7.4. Genetic information.

T 8. DNA replication, recombination and repair.

8.1. DNA replication mechanisms. 8.2. DNA damage and repair.

T 9. DNA transcription and RNA maturation.

9.1. RNA synthesis. 9.2. RNA maturation mechanisms. 9.3. Regulation of transcription.

T 10. Translation.

10.1. Genetic code. 10.2. Protein synthesis.

PRACTICAL WORK: P 1. Reagents preparation. P 2. Catalase enzymatic activity. P 3. Quantitative estimation of proteins. P 4. Enzyme activity measurement of polyphenol oxidase. P 5. DNA isolation from halophilic Archaea. Agarose gel electrophoresis. P 6. Gel-filtration chromatography. P 7. Isolation of casein and lactose from milk.

## EVALUATION

### Instruments and criteria of Evaluation 2015-16

Laboratory practical exercises (Practical Work) are mandatory.

In case of, after the accomplishment of the proposed activities in the continuous assessment and the final test, the obtained qualification was not enough to overcome the course with 50 % of the total, a new theoretical test will be programmed in the extraordinary examinations (period) of July, adding, in this case, the marks obtained in the continuous assessment. There will not be the possibility of resit the continuous assessment, except in the case of failing the reports of the laboratory work. In addition, the weighting will be the same that in the ordinary exams of June.

None of the qualifications obtained in any of the activities of the continuous assessment will be kept for the next academic year, except the laboratory practical exercises, if passed. Moreover, students who have not passed the laboratory practical exercises the previous year, are not required to carry-out them again in the laboratory, but they must do the test.

For students applying for Extraordinary Examination to Finish Studies, the continuous assessment will be kept of the course immediately prior, and a new theoretical test will be programmed with the same characteristics as the final test, both theory and practice. The weights of continuous assessment activities and the final test will be the same as ordinary course.

Type	Criterion	Description	Ponderation
FINAL TEST	<p>Good command of the theoretical knowledge of the course. Test will consist on questions (60%) and short response questions (arguing or numerical resolution) (40%). A minimum mark of 4 is required to mediate the continuous assessment. Marks between 4 and 5 could be considered in the extraordinary examinations in July.</p> <p>For the ARA group, test questions will be in English.</p>	Final test	50
ACTIVITIES OF EVALUATION DURING THE SEMESTER	<p>Short and objective written tests will be done in theory class. Similarly, in the group tutorials small controls could be done. The duration of control will vary depending on the number of questions, and it will be communicated in the Campus Virtual in advance. The weighting of this section will be the arithmetic mean of all the proposed tests.</p> <p>For the ARA group, the test will be in English.</p>	Written theoretical-practical tests	25



ACTIVITIES OF EVALUATION DURING THE SEMESTER	<p>Short questions final exam. A minimum mark of 4 is required to pass the practices. In the case of not having achieved this mark, there will be a theoretical test of practical exercises in the extraordinary examinations in July.</p> <p>In the ARA group the script of practical exercises will be handed in English.</p>	Exam	25
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