

## 1. BASIC INFORMATION

<b>Course</b>	Biochemistry
<b>Degree program</b>	Degree in Dentistry
<b>School</b>	Faculty of Biomedical and Health Sciences
<b>Year</b>	First year
<b>ECTS</b>	6 ECTS
<b>Credit type</b>	Mandatory
<b>Language(s)</b>	English
<b>Delivery mode</b>	Face-to-face
<b>Semester</b>	First semester
<b>Academic year</b>	2010-2021
<b>Coordinating professor</b>	Sandra Atiénzar Aroca

## 2. PRESENTATION

As a natural science, biochemistry is the study of the chemical processes that drive biological systems. This course explores the basic principles of biochemistry and develops the student's appreciation and understanding of biological networks. Understanding biology at a molecular level is crucial in Biomedical Sciences.

This subject introduces the student to the main concepts of general biochemistry. Currently, biochemistry is considered to be, and therefore taught as, an essential component of the dental curriculum in almost all universities worldwide due to its connections with other subjects such as biology, biomaterials, pharmacology, physiology or pathophysiology.

The course provides basic foundational knowledge of the main biomolecules as well as the major metabolic pathways.

## 3. COMPETENCIES AND LEARNING OUTCOMES

**Basic competencies:**

- BC1: Students must demonstrate to have gained a better knowledge in the studied field. The basis for these studies come from general secondary education and reach levels that, whilst supported by advanced textbooks, includes some aspects that imply knowledge of the forefront of their field of study.
- BC2: Students must use their knowledge in their work or vocation in a professional manner. Must be able to sustain arguments and solve problems within their field of study.
- BC3: Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection of relevant social, scientific, or ethical nature topics.
- BC5: Students have developed those learning skills needed to undertake further studies with a high degree of autonomy.

**General competencies:**

- GC11 - Ability to understand the basic biomedical sciences on which Dentistry is based to ensure correct oral and dental care.
- GC7 - Ability to promote autonomous learning of new knowledge and techniques, as well as motivation for quality.

**Cross-curricular competencies:**

- CC1: Responsibility. Students can assume the consequences of their actions taken as well as must be held accountable for them.
- CC4: Communication skills: Students should be able to efficiently express concepts and ideas, including the capacity to concise and clear written communication, as well as efficiently speaking in public.
- CC7: Teamwork: Students will be able to participate actively in the achievement of a common goal, listening, respecting and valuing the ideas and proposals of the other members of their team.
- CC9: Planning: The student will be able to determine effectively his/her goals and priorities, defining actions, deadlines and optimal resources required to achieve those goals.

**Specific competencies:**

- SC01: Know the biomedical sciences on which dentistry is based to ensure correct oral and dental care. These sciences should include appropriate contents of embryology, anatomy, histology and physiology of the human body, genetics, biochemistry, cell and molecular biology and microbiology and immunology.
- SC02: Know the morphology and function of the stomatognathic system, including appropriate contents of specific embryology, anatomy, histology, and physiology.

#### Learning outcomes:

- LO1: To recognize and classify the different types of biomolecules, relating their chemical composition with their biological function.
- LO2: To know the basic chemical reactions which occur in the human body.
- LO3: To understand the importance of biochemistry in dentistry.
- LO4: To interpret and analyse usual physical and chemical phenomena to understand the physiology of the human body in health and disease, as well as to understand the physical and chemical principles of some therapeutic and diagnostic applications.
- LO5: To develop some general key competences for the developing training of future dentists.

The following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

Competencies	Learning outcomes
BC1, BC2, BC3, BC5	LO1
BC1, BC2, BC3, BC5	LO2
BC1, BC2, BC3, BC5, CC1, CC4, CC7, CC9, CE07, CE11	LO3
BC1, BC2, BC3, BC5, CC1, CC4, CC7, CC9, CE07, CE11	LO4
CC1, CC4, CC7, CC9, CE07, CE11	LO5

## 4. CONTENT

### Topic 1

#### Unit 1. The chemical basis of life.

Introduction. Classifications of matter. Essential elements of life. Atomic and molecular structure. Intermolecular forces. Chemistry of carbon compounds. Biomolecules. Chemical reactions. Thermodynamics.

### **Unit 2. Water.**

Introduction. Solutions. Physicochemical properties. Diffusion. Osmosis. Chemical equilibrium. Acids and bases.

### **Topic 2**

### **Unit 3. Carbohydrates.**

General properties and functions. Monosaccharides. Isomerism. Molecular structure. Glycosidic bond. Oligosaccharides. Polysaccharides.

### **Unit 4. Lipids.**

General properties and functions. Categories. Fatty acids. Simple lipids. Fats. Complex lipids. Nonsaponifiable lipids.

### **Unit 5. Proteins.**

General properties and functions. Amino acids. Peptide bond. Levels of protein structure. Chemical kinetics. Enzymes. Enzyme kinetics. Applications of enzymes.

### **Unit 6. Nucleic acids.**

Introduction. Nucleotides. Phosphodiester bond. DNA. RNA. The flow of genetic information. The genetic code.

### **Topic 3**

### **Unit 7. Important molecules in the human body.**

Haemoglobin. Cell membranes. Biosignaling. Hormones. Vitamins.

### **Topic 4**

### **Unit 8: Metabolism.**

Introduction. Metabolic reactions. General overview. Oxidation-Reduction reactions. Regulation. Chemistry of foodstuffs.

### **Unit 9: Carbohydrate metabolism.**

Introduction. Catabolism of carbohydrates. Phosphorylation. Glycolysis. Cellular respiration. Fermentation. Glycogenolysis. Anabolism of carbohydrates. Gluconeogenesis. Pentose phosphate pathway.

**Unit 10: Lipid metabolism.**

Introduction. Catabolism of triacylglycerols. Fatty acid catabolism. Anabolism of triacylglycerols. Metabolism of ketone bodies.

**Unit 11: Nitrogen metabolism.**

Introduction. Protein catabolism. Amino acid catabolism. Amino acid anabolism. Catabolism of nucleic acids. Catabolism of nucleotides. Anabolism of nucleotides.

**Topic 5****Unit 12: Molecular genetics.**

Introduction. Protein and nucleic acid anabolism. DNA replication: main features. DNA replication: mechanism. Gene transcription: main features. Gene transcription: mechanism. Translation: main features. Translation: mechanism.

**Unit 13: Biochemistry of saliva.**

What is saliva? Chemical composition. Functions. Biochemical activity. Scientific importance of saliva.

## 5. TEACHING-LEARNING METHODOLOGIES

The types of teaching-learning methodologies used are indicated below:

- Masterclass
- Cooperative Learning
- Problem-based Learning

## 6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the number of hours the student will spend on each one:

**Campus-based mode:**

Learning activity	Number of hours
Master Classes	96 h
Problem solving	12 h
Formative assessment	6 h
Laboratory practices	16 h
Tutorials	20 h
<b>Total</b>	<b>150 h</b>

## 7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

Assessment system	Weight
Knowledge test	60 %
Laboratory practices	10 %
Oral exposition	10 %
Questionnaires	10 %
Problems	10 %

When you access the course on the *Campus Virtual*, you'll find a description of the assessment activities you have to complete, as well as the delivery deadline and assessment procedure for each one.

### 7.1. First exam period

The subject will be evaluated continuously by 2 partials during the academic year of the subject.

First Partial: Topic 1 and Topic 2 (20%).

Second Partial: Topic 3, Topic 4, and Topic 5 (40%).

To pass the course in the first exam period, you must obtain a grade of at least 5 out of 10 (weighted average) in the following activities:

- Knowledge tests: A grade greater than or equal to 5 should be obtained in each of the partials.
- Laboratory sessions

***"Attendance at laboratory practices is MANDATORY in person. Non-attendance of these practices involves suspending them. It is necessary to have laboratory practices independently approved in order to average with the other evaluable activities"***

### 7.2. Second exam period

To pass the course in the second exam period, you must obtain a grade of at least 5 out of 10 (weighted average) in the following activities:

- Knowledge tests: The student will retake only the suspended partial.
- Laboratory sessions

## 8. SCHEDULE

This table shows the delivery deadline for each assessable activity in the course:

Assessable activities	Deadline
First partial	Week 6
Second partial	June, First period exam
Questionnaires	During the sessions
Oral exposition	Check in Blackboard
Laboratory practices	Check in Blackboard
Problems	Check in Blackboard

This schedule may be subject to changes for logistical reasons relating to the activities. The student will be notified of any change as and when appropriate.

## 9. BIBLIOGRAPHY

Here is the recommended bibliography:

- Berg JM, Tymoczko JL, Stryer L. Bioquímica (6a edición) [versión española de José M. Macarulla] Barcelona: Reverté 2008 ISBN: 9788429176001
- McKee J, McKee JR. Bioquímica: las bases moleculares de la vida (5ª edición) México: McGraw-Hill 2014 ISBN: 9786071511270
- Feduchi Canosa E, Romero Magdalena C, Yáñez Conde E, Blasco Castiñeyra I, García-Hoz Jiménez C Bioquímica. Conceptos esenciales (2ª edición) Buenos Aires: Médica Panamericana, 2014 ISBN: 9788498358759
- Nelson DL, Cox MM Principios de bioquímica: Lehninger (7a edición) [traducción Claudi M. Cuchillo] Barcelona: Omega, 2018 ISBN: 9788428216678

## 10. DIVERSITY MANAGEMENT UNIT

Students with specific learning support needs:

Curricular adaptations and adjustments for students with specific learning support needs, in order to guarantee equal opportunities, will be overseen by the Diversity Management Unit (UAD: Unidad de Atención a la Diversidad).

It is compulsory for this Unit to issue a curricular adaptation/adjustment report, and therefore students with specific learning support needs should contact the Unit at [unidad.diversidad@universidadeuropea.es](mailto:unidad.diversidad@universidadeuropea.es) at the beginning of each semester.

## **11. ONLINE SURVEYS**

Your opinion matters!

The Universidad Europea encourages you to participate in several surveys which help identify the strengths and areas we need to improve regarding professors, degree programs and the teaching-learning process.

The surveys will be made available in the “surveys” section in virtual campus or via e-mail.

Your assessment is necessary for us to improve.

Thank you very much for your participation.