



## Information about the subject

**Degree:** Bachelor of Science Degree in Dentistry

**Faculty:** Faculty of Medicine and Health Sciences

**Code:** 481103 **Name:** Biochemistry

**Credits:** 6,00 **ECTS Year:** 1 **Semester:** 1

**Module:** Module 1: Relevant Basic Biomedical Sciences in Dentistry

**Subject Matter:** Biochemistry **Type:** Basic Formation

**Field of knowledge:** Health sciences

**Department:** Biomedical Sciences

**Type of learning:** Classroom-based learning

**Languages in which it is taught:** English, Spanish

### Lecturer/-s:

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## Module organization

### Module 1: Relevant Basic Biomedical Sciences in Dentistry

Subject Matter	ECTS	Subject	ECTS	Year/semester
HUMAN ANATOMY	12,00	Embryology and General Anatomy I	6,00	1/1
		General Anatomy II and Oral Anatomy	6,00	1/2
Biology	18,00	Biology	6,00	1/1
		Histology	6,00	1/2
		Microbiology	6,00	1/2
Physiology	6,00	Human and Oral Physiology	6,00	1/2
Biochemistry	6,00	Biochemistry	6,00	1/1
MODERN LANGUAGE	12,00	Modern Language: English	6,00	2/2
		Modern language: Spanish	6,00	2/2

## Recommended knowledge

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## Learning outcomes

At the end of the course, the student must be able to prove that he/she has acquired the following learning outcomes:

- R1 Knows the types and functions of biomolecules.
- R2 Identifies metabolic pathways and know how to integrate them.
- R3 Knows the applications of biochemical knowledge in the field of dentistry.
- R4 Knows how to use different work techniques in the laboratory.
- R5 Interprets the results obtained in the practices.
- R6 The student is able to prepare documents on biochemistry and work in a team.
- R7 The student is able to search for information in bibliographic sources, and know how to analyse them.



## Competencies

Depending on the learning outcomes, the competencies to which the subject contributes are (please score from 1 to 4, being 4 the highest score):

GENERAL	Weighting			
	1	2	3	4
CG1 I aCapacity for analysis and synthesis			X	
CG2 I bOrganizational and planning skills		X		
CG12 FInterpersonal skills		X		
CG3 I cOral and written communication in the native language		X		
CG23 SMotivation for quality	X			
CG4 I dKnowledge of a foreign language		X		
CG14 FCritical Reasoning		X		
CG5 I eComputer skills related to the field of study	X			
CG15 FEthical commitment		X		
CG6 I fInformation management capacity		X		
CG16 SAutonomous learning		X		
CG17 SAdaptation to new situations	X			
CG8 I hDecision making	X			
CG9 P iTeamwork		X		
CG19 SLeadership	X			



SPECIFIC	Weighting			
	1	2	3	4
CE A 1 Know the essential elements of the dental profession, including ethical principles and legal responsibilities.	X			
CE A 2 Understand the importance of such principles for the benefit of the patient, society and the profession, with special attention to professional secrecy.	X			
CE A 3 Identify the patient's concerns and expectations, as well as to communicate effectively and clearly, both orally and in writing, with patients, relatives, the media and other professionals.	X			
CE A 4 Understand and recognize the social and psychological aspects relevant to the treatment of patients.	X			
CE A 5 Know how to apply the principles of anxiety and stress management to oneself, to patients and to other members of the dental team.	X			
CE A 6 Understand the importance of developing a professional practice with respect to patient autonomy, beliefs and culture.	X			
CE A 7 Promote autonomous learning of new knowledge and techniques, as well as motivation for quality.		X		
CE A 8 Know how to share information with other health professionals and to work as a team.	X			
CE A 9 Understand the importance of maintaining and using records with patient information for subsequent analysis, preserving the confidentiality of the data.	X			
CE A 10 Know and identify the psychological and physical problems derived from gender violence in order to train students in the prevention, early detection, assistance, and rehabilitation of the victims of this form of violence.	X			
CE B 1 Understand the basic biomedical sciences on which dentistry is based to ensure proper oral care.				X
CE B 1 Understand and recognize the normal structure and function of the stomatognathic system, at the molecular, cellular, tissue and organic level, in the different stages of life.				X
CE B 1 Understand and recognize the science of biomaterials essential for dental practice as well as the immediate management of possible allergies to them.	X			



CE B 14 Know about general disease processes, including infection, inflammation, immune system disorders, degeneration, neoplasm, metabolic disorders and genetic disorders.				X
CE B 15 Be familiar with the general pathological features of diseases and disorders affecting organ systems, specifically those with oral impact.		X		
CE B 16 Understand the fundamentals of action, indications and efficacy of drugs and other therapeutic interventions, knowing their contraindications, interactions, systemic effects and interactions on other organs, based on available scientific evidence.		X		
CE B 17 Understand and recognize the principles of ergonomics and safety at work (including control of cross-infection, radiation protection and occupational and biological diseases).	X			
CE B 18 Know, critically evaluate and know how to use clinical and biomedical information sources to obtain, organize, interpret and communicate scientific and health information.		X		
CE B 19 Know the scientific method and have the critical capacity to value the established knowledge and the new information. Be able to formulate hypotheses, collect and critically evaluate information for the resolution of problems, following the scientific method.		X		

TRANSVERSAL	Weighting			
	1	2	3	4
1. a. Analysis and synthesis skills			X	
1. b. Organizational and planning capacity		X		
1. c. Oral and written communication in the native language.		X		
1. d. Knowledge of a foreign language		X		
1. e. Computer skills	X			
1. f. Information management capacity		X		
1. g. Problem solving		X		



1. h.	Decision making	x		
2. i.	Teamwork		x	
2. j.	Multidisciplinary teamwork	x		
2. k.	Work in an international context	x		
2. l.	Interpersonal skills		x	
2. m.	Recognition of diversity and multiculturalism	x		
2. n.	Critical Reasoning		x	
2. o.	Ethical commitment		x	
3. p.	Autonomous learning		x	
3. q.	Adaptation to new situations	x		
3. r.	Creativity		x	
3. s.	Leadership	x		
3. t.	Knowledge of other cultures and customs	x		
3. u.	Initiative and entrepreneurship		x	
3. v.	Motivation for quality		x	
3. w.	Sensitivity to environmental and socio-health issues			x



## Assessment system for the acquisition of competencies and grading system

Assessed learning outcomes	Granted percentage	Assessment method
	0,00%	OPEN QUESTIONS: Written exam in which basic theory knowledge and the ability to relate, integrate and coherently express it in writing is assessed.
R1, R2, R3	60,00%	MULTIPLE CHOICE TEST: Multiple choice test with one correct answer. This shows to greater extent the contents acquired by the student.
	0,00%	ORAL TEST: Oral exam in which the student answers the questions the teacher asks, verbally explaining the contents acquired, allowing for interaction with the teacher.
	0,00%	PRESENTATION: The student develops by means of an oral presentation, supported with audio-visual materials, a theme or topic given by the teacher. At the end of the presentation, the teacher or audience may ask questions.
R4, R5	10,00%	PRACTICAL: Written test in which the student is asked to solve practical exercises, clinical cases or problems about the contents of different subjects.
R1, R2, R3, R6, R7	25,00%	ASSIGNMENTS: The student, either individually or in a group, develops a theme which reviews or researches, and he/she presents it, in writing, for assessment by the teacher.
R1, R2, R3	5,00%	CLASS PARTICIPATION: The teacher assesses the participation, involvement and progress the student makes in acquiring knowledge and skills in theory and practical classes and seminars. This is never more than 5% of the final grade.





0,00% PRACTICAL EXAM: The student carries out a test in which he/she must show by means of practical application the acquisition of certain knowledge. For example, histological or anatomopathological diagnoses, interpretation of images or diagnostic tests.

## Observations

The section "Tests" refers to the final exam. **To pass the subject you will need to obtain a minimum grade of 4 out of 10 in the final exam.** In the "Works" section, the activities carried out on the UCVNet platform throughout the course will be evaluated. In the "Participation in class" section, attendance, attitude and participation will be considered. In the "Practices" section, the grade of the report/exercises proposed after the practice as well as the attitude and participation in them will be taken into account. **MENTION OF DISTINCTION:** According to Article 22 of the Regulations governing the Evaluation and Qualification of UCV Courses, the mention of "Distinction of Honor" may be awarded by the professor responsible for the course to students who have obtained, at least, the qualification of 9 over 10 ("Sobresaliente"). The number of "Distinction of Honor" mentions that may be awarded may not exceed five percent of the number of students included in the same official record, unless this number is lower than 20, in which case only one "Distinction of Honor" may be awarded.

## MENTION OF DISTINCTION:

In accordance with the regulations governing the assessment and grading of subjects in force at UCV, the distinction of "Matrícula de Honor" (Honours with Distinction) may be awarded to students who have achieved a grade of 9.0 or higher. The number of "Matrículas de Honor" (Honours with Distinction) may not exceed five percent of the students enrolled in the group for the corresponding academic year, unless the number of enrolled students is fewer than 20, in which case a single "Matrícula de Honor" (Honours with Distinction) may be awarded. Exceptionally, these distinctions may be assigned globally across different groups of the same subject. Nevertheless, the total number of distinctions awarded will be the same as if they were assigned by group, but they may be distributed among all students based on a common criterion, regardless of the group to which they belong. The criteria for awarding "Matrícula de Honor" (Honours with Distinction) will be determined according to the guidelines stipulated by the professor responsible for the course, as detailed in the "Observations" section of the evaluation system in the course guide.

## Learning activities

The following methodologies will be used so that the students can achieve the learning outcomes of the subject:



- M1      Lecture.  
          Problem Solving.  
          Explanation of contents by the teacher.  
          Explanation of knowledge and skills.
- M2      Practical basic sciences laboratory sessions, practical  
          simulation laboratory sessions, virtual hospital and  
          dissecting room.
- M10     Carrying out bibliographic reviews and practical work experience dissertations.
- M13     Personal preparation of written texts, essays, problem solving, seminars.
- M15     Personalised Attention. Period of instruction and/or guidance carried out by a tutor with  
          the aim of analysing with the student his/her work, activities and evolution in learning of  
          subjects.



## IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
<b>THEORY CLASS</b> M1, M10, M13	R1, R2, R3, R7	50,00	2,00
<b>SEMINAR</b> M2, M10, M13, M15	R1, R2, R3, R4, R5, R6, R7	2,00	0,08
<b>TUTORING</b> M15	R1, R2, R3, R4, R5, R6, R7	2,00	0,08
<b>EVALUATION</b> M15	R1, R2, R3, R4, R5, R6, R7	2,00	0,08
<b>PRACTICAL CLASS</b> M2, M10, M13, M15	R4, R5, R6	4,00	0,16
<b>TOTAL</b>		<b>60,00</b>	<b>2,40</b>

## LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
<b>INDIVIDUAL WORK</b> M10, M13	R1, R2, R3, R5, R6, R7	90,00	3,60
<b>TOTAL</b>		<b>90,00</b>	<b>3,60</b>



## Description of the contents

Description of the necessary contents to acquire the learning outcomes.

Theoretical contents:

Content block	Contents
BLOCK I. STRUCTURAL BIOCHEMISTRY	<p>Unit 1. Introduction to the chemistry of life. Cellular fundamentals. Chemical fundamentals. Genetic Foundations. Evolutionary foundations.</p> <p>Unit 2. Water. Structure. Water as a solvent. The hydrophobic effect. Ionization of water. Weak acids and bases. Water as a reagent. Buffer solutions.</p> <p>Unit 3. Amino acids, peptides and proteins. Protein characterization. The covalent structure of proteins. Protein sequences and evolution.</p> <p>Unit 4. The three-dimensional structure of proteins. Primary, secondary, tertiary and quaternary structure. Denaturation and protein folding.</p> <p>Unit 5. Functions of proteins. Oxygen-binding proteins. Interactions between proteins and ligands: immune system. Interactions between proteins modulated by chemical energy: actin, myosin and molecular motors.</p> <p>Unit 6. Collagen. Structure. Composition of Tropocollagen. Synthesis of Collagen. Types of bonds in mature Collagen. Importance in the structure of the teeth.</p> <p>Unit 7. Enzymes. Introduction to enzymes. Kinetic enzyme. Mechanisms. Regulatory enzymes.</p> <p>Unit 8. Carbohydrates and glycobiology. Monosaccharides and disaccharides. Polysaccharides. Glycoconjugates: proteoglycans, glycoproteins and glycolipids.</p> <p>Unit 9. Nucleotides and nucleic acids. Structure and functions.</p> <p>Unit 10. Lipids. Storage lipids. Lipids in membranes. Lipids as pigments, cofactors and signals.</p> <p>Unit 11. Recombinant DNA technology. Cloned. From gene to genomes. From genomes to proteomes. Alteration of genomes and new products of biotechnology.</p> <p>Unit 12. Biological membranes and transport. Composition and architecture of the membranes. Dynamics of the membranes. Solute transport through membranes. Biosignalization. Molecular mechanisms of signal transduction.</p>



## BLOCK II: BIOENERGY AND METABOLISM

Topic 13. Principles of bioenergetics. Bioenergetics and thermodynamics. Topic 14 Glycolysis, gluconeogenesis and the pentose phosphate pathway. Glycolysis. Routes of entry to glycolysis. Fermentation. Gluconeogenesis. The pentose phosphate pathway. Topic 15 Principles of metabolic regulation: glucose and glycogen. Glycogen metabolism in animals. Regulation of metabolic pathways. Coordinated regulation of glycolysis and gluconeogenesis. Coordinated regulation of glycogen synthesis and degradation. Unit 16 The citric acid cycle. Acetyl-CoA production. Reactions and regulation of the citric acid cycle. Unit 17 Catabolism of fatty acids. Digestion, mobilization and transport of fats. Fatty acid oxidation. Ketone bodies. Unit 18 Amino acid oxidation and urea production. Metabolic destinations of amino groups. Nitrogen excretion and the urea cycle. Pathways of degradation of amino acids. Topic 19 Oxidative phosphorylation. Electron transfer reactions in the mitochondria. ATP synthesis. Regulation of oxidative phosphorylation. Topic 20 Lipid biosynthesis. Biosynthesis of fatty acids and eicosanoids. Triglyceride biosynthesis. Membrane phospholipid biosynthesis. Cholesterol, steroid, and isoprenoid biosynthesis. Unit 21 Biosynthesis of amino acids and nucleotides. Nitrogen metabolism. Amino Acid Biosynthesis. Molecules derived from amino acids. Nucleotide biosynthesis and degradation. Topic 22 Hormonal regulation and integration of metabolism. Structure and function of hormones. Tissues with specific metabolism. Hormonal regulation of metabolism

### Temporary organization of learning:

Block of content	Number of sessions	Hours
BLOCK I. STRUCTURAL BIOCHEMISTRY	15,00	30,00
BLOCK II: BIOENERGY AND METABOLISM	15,00	30,00



## References

- Lehninger. Principios de Bioquímica. Cox, M.M. - Nelson, D.L. Editorial Omega, 2014 Sexta edición.- Netter Bioquímica esencial. Peter Ronner. Ed: Elsevier. 1ª edición, 8/2019.