

## COURSE DESCRIPTION

### COURSE DETAILS

Title (of the course): **BIOQUÍMICA**

Code: 100002

Degree/Master: **GRADUADO EN ENFERMERÍA**

Year: 1

Field: MORFOLOGÍA, ESTRUCTURA Y FUNCIÓN DEL CUERPO HUMANO

Character: BASICA

Duration: FIRST TERM

ECTS Credits: 6.0

Classroom hours: 56

Face-to-face classroom percentage: 37.33%

Study hours: 94

Online platform:

### LECTURER INFORMATION

Name: LLAMAS AZUA, ÁNGEL (Coordinador)

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### PREREQUISITES AND RECOMMENDATIONS

#### Prerequisites established in the study plan

None

#### Recommendations

None specified

### INTENDED LEARNING OUTCOMES

- |       |  |
|-------|--|
| CB1   | To possess and understand knowledge in an area of study that is based on general secondary education, and that is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply knowledge coming from the vanguard of the field of study. |
| CB3   | To be able to collect and interpret relevant data (normally within the student's area of study) to make judgements that include a reflection on relevant issues of a social, scientific or ethical nature.   |
| CB5   | To develop the the skills necessary to undertake further studies with a high degree of autonomy.   |
| CU2   | To know and improve the user's level in the field of ICT.  |
| CET3  | To know and apply the fundamentals and theoretical and methodological principles of nursing.   |
| CET6  | To base nursing interventions on scientific evidence and on available resources.   |
| CET11 | To establish an effective communication with patients, family, social groups and colleagues and promote health education.  |
| CEM1  | To know and identify the structure and function of the human body. To understand the molecular and physiological bases of cells and tissues.   |

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### OBJECTIVES

The knowledge of the biomolecules that constitute living beings, their structure, their function, their metabolism and their regulation and metabolic integration. The study of the molecular mechanisms that lead to the manifestation of vital activities and why the defects in these processes can give rise to various diseases. The management of basic work techniques in laboratories of Biochemistry.

### CONTENT

#### 1. Theory contents

**1-Amino acids and peptides.** General characteristics of proteins. Amino acids: structure, classification and properties. Essential and modified amino acids. Peptide bond: planar character. Peptides of biological interest.

**2-Proteins.** Structural levels: primary, secondary, tertiary and quaternary structure. Forces and interactions that maintain the structure of proteins. Structure and function relationship: globular (myoglobin and hemoglobin), fibrous (collagen and keratin), membrane proteins.

**3-Enzymes.** Basic concepts: nature, properties and classification. Coenzymes and prosthetic groups. Relationship with vitamins. Mode of action of enzymes: bioenergetics of catalysis. Specificity of the enzyme-substrate complex. Effect of temperature and pH. Kinetics.

**4.-Nucleic acids.** Nucleosides and nucleotides. Composition of DNA. Structure and characteristics of DNA and RNA. Types of DNA and RNA. Organization of genetic material. Centromeres and telomeres. Repetitive DNA and non-coding DNA.

**5.-Replication of DNA.** Semiconservative replication of DNA. DNA polymerases: classification and mechanisms of action. Replication complex. Fragments of Okazaki. Events in the replication hairpin. Replication of telomeres.

#### 6.-Genetic expression:

**6.1-Transcription.** Transcription and replication differences. RNA polymerases. Promoters: consensus boxes and activating and inhibiting sequences. Termination of transcription. Post-transcriptional processes. Processing of mRNA.

**6.2-Translation.** The genetic code. Protein biosynthesis: activation, initiation, elongation and termination stages. Ribosomes. Post-translational processes. Folding Modifications of specific amino acids. Protein trafficking.

**7. Mutation and repair.** Types and causes of mutations. Mutagens. Ames test. Repair of incorrect matings. Repair by base cutting. Repair by cutting nucleotides. Direct repair.

**8.-Sugars and glucidic metabolism.** Structure and function of monosaccharides, disaccharides and polysaccharides. Glucolysis and gluconeogenesis: meaning, regulation, enzymes and characteristics. Cycle of Cori. Lactic and alcoholic fermentation.

**9. Lipids and lipid metabolism.** Characteristics and functions of lipids. Classification of lipids. Physical properties of fatty acids and lipids. Structure of the reserve and membrane lipids: triglycerides, glycerophospholipids, sphingolipids, sterols. Structure of the membranes. Digestion, mobilization and transport of fats. Oxidation of saturated and unsaturated fatty acids. Synthesis of ketone bodies. Biosynthesis of fatty acids and derivatives. Regulation of fatty acid metabolism. Lipoproteins carry lipids and cholesterol.

**10.-Nitrogenated metabolism.** Introduction: digestion of essential proteins and amino acids. General view of the metabolism of nitrogenous molecules. Nitrogen excretion. Urea cycle. Glutamine: where the urea cycle does not reach. Destination of carbon skeletons: Degradative families of amino acids. Destination of nitrogen and carbon skeletons. Reactions of the urea-Krebs cycle. Biosynthesis of amino acids. Synthesis and degradation of nucleotides.

**11.-Bioenergetics.** Bioenergetics of redox reactions and transport. Redox cycle of the biosphere. Energy coupling. Food as a source of energy. Oxide-reduction reactions. Free energy of a redox reaction. High energy compounds. Transport through membranes: types and mechanisms. Krebs cycle and respiratory chain. The ATP,

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cellular energy currency. The central energy mitochondria. Central role of the Krebs cycle in metabolism. Global vision of the cycle and amphibolic character. Electron transport chain and oxidative phosphorylation. Structure and functioning of the ATP synthase. Respiratory control and uncoupling. Energy balance.

**12.-Metabolic integration.** Basic principles of metabolism. Fuel reserves and uses in different tissues. Metabolic interrelations in food/fasting. Metabolic interrelations in obesity/diet. Hormonal control. Metabolic interrelations in exercise, diabetes, pregnancy and lactation. Metabolic interrelations in alcohol consumption. Metabolic interrelations in cancer.

### 2. Practical contents

1-Biological tampons: hemoglobin as a buffer

2-Proteins in clinical biochemistry: quantification by spectrophotometry and visualization by electrophoretic techniques.

3-Enzymes in clinic: in the detection of diseases through their enzymatic activity; as an analytical tool; in enzyme therapy; in detection of diseases due to enzyme deficiency; use of enzymatic inhibitors.

4-Dissolutions and calculation of concentrations. Mol concept. Molarity, Molality Molar fraction. How to make dilutions.

5-Bioenergetics. Problems and questions about basic thermodynamic concepts, potential difference between two pairs networks. Calculation of G of the biological reactions.

## METHODOLOGY

### Methodological adaptations for part-time students and students with disabilities and special educational needs

All materials used in class will be available to students through Moodle, which will also be used for the realization and correction of activities and assessments. This will allow part-time students to participate actively in all activities (except exams, necessarily face-to-face activities) and solve their doubts through the forums provided for this purpose.

### Face-to-face activities

Activity	Large group	Medium group	Total
<i>Assessment activities</i>	4	2	6
<i>Lectures</i>	39	7	46
<i>Tutorials</i>	1	3	4
<b>Total hours:</b>	<b>44</b>	<b>12</b>	<b>56</b>

### Off-site activities

Activity	Total
<i>Activities</i>	10
<i>Analysis</i>	10
<i>Information search</i>	5
<i>Reference search</i>	5

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Activity	Total
<i>Self-study</i>	64
<b><i>Total hours</i></b>	<b><i>94</i></b>

## WORK MATERIALS FOR STUDENTS

Case studies - *Plataform e-learnig Universidad de Córdoba* (<http://www3.uco.es/moodle/>)

Coursebook - *Plataform e-learnig Universidad de Córdoba* (<http://www3.uco.es/moodle/>)

Exercises and activities - *Plataform e-learnig Universidad de Córdoba* (<http://www3.uco.es/moodle/>)

## EVALUATION

Intended learnig	Case Studies	Exams	Problem solving
<i>CB1</i>	X	X	X
<i>CB3</i>		X	X
<i>CB5</i>	X		X
<i>CEM1</i>	X		X
<i>CET11</i>	X	X	X
<i>CET3</i>			X
<i>CET6</i>	X	X	X
<i>CU2</i>	X	X	
<b><i>Total (100%)</i></b>	<b><i>10%</i></b>	<b><i>80%</i></b>	<b><i>10%</i></b>
<b><i>Minimum grade</i></b>	<b><i>0</i></b>	<b><i>0</i></b>	<b><i>0</i></b>

(\*)Minimum grade necessary to pass the course

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### ¿Valora la asistencia?:

No

### General clarifications on instruments for evaluation:

There will be a continuous evaluation and a final exam. The final exam may consist of multiple choice questions, problems, short and long answer questions; and they will be done on the day the faculty sets.

In the opinion of the professors, non-obligatory partial exams may be carried out, which may include test questions, short and long answer questions. The partial exams will eliminate, from the final exam, the subject that they cover, if they surpass or equal a score of 5 out of 10.

The continuous evaluation (20%) will be carried out through the completion of various questionnaires through the moodle, or in class, about the knowledge acquired during the realization of classroom practices. These questionnaires will consist of problems and questions of the different cases analyzed in the classroom practices.

Teachers can decide to examine certain students exclusively orally, and even perform a second oral examination to confirm the results of written examinations, when there is suspicion of fraud.

### Clarifications on the methodology for part-time students and students with disabilities and special educational needs:

Those students who are part-time or who, due to overdue and duly justified reasons, can not complete the partial tests, their final exam will have a value of 100% of their grade.

The particular considerations of the students who study the part-time degree will also be taken into account.

### Qualifying criteria for obtaining honors:

*The allocation of Honors Enrollment will be made based on the grade, being awarded to the highest numerical grades obtained and as long as they are higher than 9.00.*

## BIBLIOGRAPHY

### 1. Basic Bibliography

- Devlin, T.M. (2004). Bioquímica, Libro de Texto con Aplicaciones Clínicas. (4ª Ed), Editorial Reverté, Barcelona.
- Voet, D., Voet, J.G., Pratt, C.W. (2007). Fundamentos de Bioquímica. La vida a nivel molecular. (2ª Ed), Editorial Médica Panamericana, Madrid.
- Luque J y Herráez A. Texto Ilustrado de Biología Molecular e Ingeniería Genética. Concepto, Técnicas y aplicaciones en Ciencias de la Salud. Ed. Harcourt, 2001
- Nelson DL, Cox MM (2014). Lehninger Principios de Bioquímica (6a Ed.), Ediciones Omega, Barcelona.
- Tymoczko JL, Berg JM, Stryer L (2014) Bioquímica: Curso básico (2a Ed.), Editorial Reverté, Barcelona.
- Berg JM. Tymoczko JL, Stryer L (2013). Bioquímica (7a Ed.), Editorial Reverté, Barcelona.

### 2. Further reading

None

## COORDINATION CRITERIA

Common evaluation criteria

Tasks deadlines

Tasks performance

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## SCHEDULE

Period	Assessment activities	Lectures	Tutorials
1# Fortnight	0.0	6.0	0.0
2# Fortnight	1.0	6.0	0.0
3# Fortnight	0.0	6.0	1.0
4# Fortnight	1.0	6.0	0.0
5# Fortnight	0.0	6.0	1.0
6# Fortnight	1.0	6.0	0.0
7# Fortnight	1.0	6.0	1.0
8# Fortnight	2.0	4.0	1.0
<b>Total hours:</b>	<b>6.0</b>	<b>46.0</b>	<b>4.0</b>

The methodological strategies and the evaluation system contemplated in this Course Description will be adapted according to the needs presented by students with disabilities and special educational needs in the cases that are required.