



## 1. General information

Course: BIOCHEMISTRY

Type: CORE COURSE

Degree: 409 - CHEMISTRY

Center: 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY

Year: 4

Main language: Spanish

Use of additional  
languages:

Web site:

Code: 57328

ECTS credits: 6

Academic year: 2022-23

Group(s): 20

Duration: First semester

Second language: English

English Friendly: Y

Bilingual: N

Lecturer: MARGARITA VILLAR RAYO - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
Facultad de Ciencias y Tecnologías Químicas/ 3ª planta	QUÍMICA INORG., ORG., Y BIOQ.	926052530	MargaritaM.Villar@uclm.es	Mon, Tues, Wed from 10 a.m. to 12 a.m. Check in advance by email.

## 2. Pre-Requisites

Basic module.

## 3. Justification in the curriculum, relation to other subjects and to the profession

This matter is part of a supplementary module in the degree in chemistry.

It is offered in the fourth year of the degree. It provides a necessary knowledge for chemical studies in relation to living beings and pharmacology. Fields of application of Biochemistry to a graduate in chemistry are clinical tests, pharmaceutical industry, biomedical research, biotechnology and certain applications of nanotechnology, among others.

On the other hand, the subject of Biochemistry requires the foundations acquired in the first course of biology, as well as basic aspects of chemical reactions kinetics and thermodynamics.

## 4. Degree competences achieved in this course

## Course competences

Code	Description
CB03	Be able to gather and process relevant information (usually within their subject area) to give opinions, including reflections on relevant social, scientific or ethical issues.
CB05	Have developed the necessary learning abilities to carry on studying autonomously
E12	Understand the chemistry of the main biological processes
G02	Be able to gather and interpret data, information and relevant results, obtain conclusions and issue reasoned reports on scientific, technological or other problems that require the use of chemical tools
G03	Know how to apply the theoretical-practical knowledge acquired in the different professional contexts of Chemistry
T03	Proper oral and written communication
T05	Organization and planning capacity
T11	Ability to obtain bibliographic information, including Internet resources

## 5. Objectives or Learning Outcomes

## Course learning outcomes

## Description

Be able to make a general scheme of carbohydrate metabolism, locating the main routes involved, as well as their functions

Be able to make a general scheme that relates the tricarboxylic acid cycle with the metabolism of carbohydrates, lipids and amino acids and with the chain of electronic transport and oxidative phosphorylation

Understand the physiological importance of the generation of ketone bodies

Know how the expression of genes is regulated depending on the cellular and body needs

Knowing how to explain the differences between the routes of  $\alpha$ -oxidation and fatty acid synthesis and knowing the main mechanisms involved in its regulation

Be able to describe the Calvin cycle and other alternative CO<sub>2</sub> fixation routes

Be able to describe the nitrogen cycle in the biosphere

Be able to describe the ATP synthesis mechanism coupled to electronic transport

Be able to describe the molecular mechanism of replication, transcription and translation

Be able to describe the photosystems and electronic transporters that participate in the light reactions of photosynthesis

Be able to explain the specific functions of different organs in the whole metabolism

Be able to make a comparative analysis of photophosphorylation and oxidative phosphorylation, indicating the similarities and differences between both processes of ATP synthesis

Be able to interpret a michaelian enzymatic kinetics, calculate the parameters of Km and Vmax, and distinguish these kinetics from allosteric kinetics  
 Know the basic mechanisms of metabolic regulation

Know various alterations of energy metabolism

Know the global scheme of synthesis and degradation of nucleotides

Know the general strategy of protein and amino acid catabolism, as well as the urea cycle

Know the practical applications of DNA technology

#### Additional outcomes

Know the general chart of plasma lipoprotein and cholesterol metabolism.

### 6. Units / Contents

**Unit 1: Introduction to metabolism**

**Unit 2: Enzymatic catalysis and its regulation**

**Unit 3: Carbohydrate metabolism**

**Unit 4: Photosynthesis**

**Unit 5: Lipid metabolism**

**Unit 6: Metabolism of nitrogenous compounds**

**Unit 7: Integration and hormonal regulation of metabolism**

**Unit 8: Expression and transmission of genetic information**

### 7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	CB03 CB05 E12	1.2	30	N	-	The most relevant information on the agenda is presented. To encourage participation, mobile phones may be used as audience response systems.
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	CB03 CB05 E12 G02 G03 T05	0.48	12	Y	Y	Experimental procedures will be carried out in the laboratory directly related to some of the theoretical content. Laboratory practices are mandatory and non-recoverable. If they are not realized, the subject cannot be passed.
Group tutoring sessions [ON-SITE]	Group tutoring sessions	CB03 CB05 E12 G02	0.02	0.5	N	-	The aim of this activity is to clarify doubts related to theoretical contents and laboratory practices.
Workshops or seminars [ON-SITE]	Combination of methods	CB03 CB05 E12 G02 G03 T03 T05 T11	0.5	12.5	Y	N	Different activities are proposed, such as the resolution of problems or cases, which will contribute to completing and consolidating the contents of the subject.
Progress test [ON-SITE]	Assessment tests	CB03 CB05 E12 G02 G03 T03 T05 T11	0.2	5	Y	N	A progress test of the contents taught in the laboratory practices and another with part of the theoretical contents will be carried out. The dates will be available well in advance on the virtual campus. In addition, there will be a final test that will coincide with the date of the ordinary call. A progress test of the contents taught in the laboratory practices and another with part of the theoretical contents will be carried out. The dates will be available well in advance on the virtual campus. In addition, there will be a final test that will coincide with the date of the ordinary call.
Study and Exam Preparation [OFF-SITE]	Self-study	CB03 CB05 E12 G02 G03 T05 T11	3.6	90	N	-	Preparation of the different evaluation tests.
<b>Total:</b>			<b>6</b>	<b>150</b>			
<b>Total credits of in-class work: 2.4</b>			<b>Total class time hours: 60</b>				
<b>Total credits of out of class work: 3.6</b>			<b>Total hours of out of class work: 90</b>				

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

### 8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Test	15.00%	15.00%	Exam on the laboratory practices content
Assessment of problem solving and/or case studies	25.00%	25.00%	The students will solve problems and cases that will be treated in the seminars. Part of the activity and its evaluation will be in

			small groups and part individually.
Final test	60.00%	60.00%	Final test consisting of an exam that includes all the contents taught in the subject
<b>Total:</b>	<b>100.00%</b>	<b>100.00%</b>	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

#### Evaluation criteria for the final exam:

##### Continuous assessment:

Based on minimal knowledge of Biochemistry terminology and on basic concepts, mainly the ability to relate data and processes, reasoning capacity and synthesis capacity will be assessed in all evaluation exercises conducted throughout the course.

To average different tests, a minimum of 4 out of 10 in any of the evaluated items will be required, although to pass the subject, the student must obtain a minimum global grade of 5 out of 10.

##### Non-continuous evaluation:

In the case of choosing the non-continuous evaluation, the students will take a single final test that will evaluate 100% of the skills, including, in addition to the theoretical content, the practice test and the resolution of problems or cases.

To average different tests, a minimum of 4 out of 10 in any of the evaluated items will be required, although to pass the subject, the student must obtain a minimum global grade of 5 out of 10.

#### Specifications for the resit/retake exam:

The evaluation criteria of the final exam will be maintained.

The student who has obtained, at least, a grade of 4 out of 10, in the tests carried out in the final exam, may choose to maintain the grade obtained or re-evaluate its contents, although only it will be understood that the subject has been passed if the student has obtained a minimum average of 5 out of 10 in the global average.

#### Specifications for the second resit / retake exam:

Same as resit exam.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	12
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	.5
Workshops or seminars [PRESENCIAL][Combination of methods]	12.5
Progress test [PRESENCIAL][Assessment tests]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
<b>General comments about the planning:</b> Laboratory practices will be adapted, depending on the restrictions imposed by the regulations related to covid-19 at the time of their completion. In the case of the number of laboratory hours reduced, these will be replaced by other activities.	
Global activity	
Activities	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	12
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	0.5
Workshops or seminars [PRESENCIAL][Combination of methods]	12.5
Progress test [PRESENCIAL][Assessment tests]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
<b>Total horas: 150</b>	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Mathews C.K. , van Holde K.E. y Ahern K.G	Bioquímica	Pearson Educación, S.A.	Madrid	0-80533066-6	2002	
Nelson D.L., Cox M.M.	Lehninger Principios de Bioquímica	Ediciones Omega S.A.		978-84-282-1486-5	2009	
Stryer L., Berg J., y Tymoczko J.	Bioquímica	Editorial Reverté	Barcelona	9788429176025	2013	
Voet D. y Voet J.G.	Bioquímica	Ed. Médica Panamericana	Buenos Aires	950-06-2301-3	2006	
Voet D., Voet J., Pratt C.	Fundamentals of Biochemistry: Life at the Molecular Level, 5th Edition	John Wiley & Sons, Inc.		978-1118918401	2016	
Nelson D.L., Cox M.M.	Lehninger Principles of Biochemistry 7th ed.	W.H. Freeman. MacMillan Learning.	Hamilton, N.J.	9781464126116	2017	
Feduchi E., Romero C., Yáñez E. y García-Hoz, C.	Bioquímica. Conceptos esenciales. 3ª Ed.	Ed. Médica Panamericana		978-84-9110-680-7	2021	