



1. General information

Course: REGULATION OF METABOLISM

Type: CORE COURSE

Degree: 341 - UNDERGRADUATE DEGREE PROGRAMME IN BIOCHEMISTRY

Center: 501 - FACULTY OF ENVIRONMENTAL SCIENCES AND BIOCHEMISTRY

Year: 3

Main language: Spanish

Use of additional
languages:

Web site:

Code: 13326

ECTS credits: 6

Academic year: 2021-22

Group(s): 40

Duration: C2

Second language: Spanish

English Friendly: Y

Bilingual: N

Lecturer: BLANCA MARÍA RUBIO MUÑOZ - Group(s): 40

| Building/Office | Department | Phone number | Email | Office hours |
|-----------------|------------|--------------|----------------------|--------------|
| | | | blanca.rubio@uclm.es | |

Lecturer: ROSARIO SERRANO VARGAS - Group(s): 40

| Building/Office | Department | Phone number | Email | Office hours |
|--------------------|-------------------------------|--------------|-------------------------|-------------------------------------|
| Room 28/Building 6 | QUÍMICA INORG., ORG., Y BIOQ. | 5484 | rosario.serrano@uclm.es | monday, wednesday, friday 12-14h pm |

2. Pre-Requisites

Not established

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

The subject "**Metabolism and its Regulation**", addresses the study of the main metabolic pathways involved in the metabolism of the main classes of Biomolecules: carbohydrates, lipids, nucleic acids and proteins, as well as the main mechanisms involved in their regulation. Its study is approached from an integrated point of view, implying metabolic regulation as main responsible for the maintenance of the homeostasis of the organism in different physiopathological situations.

The teaching of this subject is based on previous knowledge acquired in the subjects of Fundamentals of Biochemistry, 1st year of the Degree, Enzymology, 2nd year, Signaling, control and cellular homeostasis, 2nd year and Human Physiology taught in the first semester of 3rd course. Also, different concepts acquired in the course of this subject will help the better understanding of others that are taught in the same temporality, such as Clinical Biochemistry, Immunology and Molecular Biology of Systems.

From a professional point of view, the subject provides theoretical and practical knowledge of Metabolic Regulation that will be necessary for the development of some professional facets of a graduate in Biochemistry.

4. Degree competences achieved in this course

Course competences

| Code | Description |
|------|--|
| E01 | Express themselves correctly in basic biological, physical, chemical, mathematical and computer terms. |
| E06 | To know how to obtain and process, according to its properties, different animal tissues for metabolic study |
| E11 | To have an integrated vision of the cellular functioning of both the metabolism and the gene expression, being able to relate the activity of the different cellular compartments. |
| E13 | Correct handling of different computer tools |
| E15 | Experimentally determine the concentrations of metabolites, the kinetic and thermodynamic parameters and the control coefficients of the reactions of the intermediate metabolism. |
| E21 | Understand the chemical and thermodynamic principles of biocatalysis and the role of enzymes and other biocatalysts in the functioning of cells and organisms. |
| E22 | Have an integrated view of the intercellular communication and intracellular signalling systems that regulate the proliferation, differentiation, development and function of animal and plant tissues and organs. |
| E23 | To know the components, functioning and regulation mechanisms of plant and animal organisms, with special emphasis on the human species. |
| E32 | Know how to design and carry out a study and/or project in the area of Biochemistry and Molecular Biology, be able to critically analyse the results obtained and write a report containing these results. |
| G01 | To possess and understand the knowledge in the area of Biochemistry and Molecular Biology at a level that, based on advanced textbooks, also includes cutting-edge aspects of relevance in the discipline |
| G03 | Be able to collect and interpret relevant data, information and results, draw conclusions and issue reasoned reports on relevant social, scientific or ethical issues in connection with advances in Biochemistry and Molecular Biology. |
| T03 | A correct oral and written communication |
| T05 | Organizational and planning skills |
| T10 | Ability to self-learn and to obtain and manage bibliographic information, including Internet resources |

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Understand the involvement of each organ/tissue in the physiological control of metabolism.

To know the different elements of metabolic control at the molecular, cellular and organismal levels and their interrelationships.

To know the experimental methods commonly used for the study of metabolism both at the cellular level, at the organ and/or tissue level and at the body level.

Understand the cellular compartmentalization of the different metabolic pathways.

Correctly describe the different pathways of the intermediate metabolism and the mechanisms of control and integration of the different metabolic pathways.

To be able to predict the metabolic adaptations that will occur under different physiological and physiopathological conditions.

Acquisition of an integrated view of the control of gene expression and metabolism through the study of the mode of action of hormones, neurotransmitters, growth factors, nutrients, etc.

6. Units / Contents

Unit 1: Introduction to Metabolism. Main regulatory mechanisms.

Unit 2: Bioenergetics and oxidative metabolism

Unit 3: Functions and Metabolism of nutrients: carbohydrates, lipids and proteins

Unit 4: Metabolic tissue specialization

Unit 4.1 Anaerobic metabolism of glucose in the erythrocyte

Unit 4.2 Metabolism of tumor cells

Unit 4.3 Storage and synthesis of carbohydrates in liver and muscle

Unit 4.4 Oxidative metabolism of lipids in liver and muscle

Unit 4.5 Obtaining energy through oxidative metabolism

Unit 4.6 Synthesis of fatty acids and storage of lipids in adipose tissue

Unit 4.7 Biosynthesis and use of amino acids in the energetic metabolism

Unit 5: Regulation of glucose homeostasis and energy metabolism

Unit 6: Laboratory Sessions

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 | | 1.28 | 32 | N | - | Theoretical classes |
| Class Attendance (practical) [ON-SITE] | Practical or hands-on activities | E06 E13 E15 E23 G03 | 0.8 | 20 | Y | Y | Study of adaptation to fasting and re-feeding. Attendance is mandatory and not recoverable. The evaluation of practical classes will be recoverable. |
| Final test [ON-SITE] | Assessment tests | E01 E13 E22 G03 T03 T05 | 0.08 | 2 | Y | Y | Practical activities |
| Problem solving and/or case studies [ON-SITE] | Project/Problem Based Learning (PBL) | E01 E06 E11 E22 E23 T03 | 0.08 | 2 | Y | N | Practical cases on metabolic situations. Non-recoverable activity |
| Problem solving and/or case studies [ON-SITE] | Problem solving and exercises | E21 G01 G03 T10 | 0.08 | 2 | Y | N | Bioenergetics problems. Energy needs and caloric intake. Non-recoverable activity |
| Study and Exam Preparation [OFF-SITE] | Self-study | E11 E21 E22 E23 G01 T05 T10 | 3.6 | 90 | N | - | |
| Final test [ON-SITE] | Assessment tests | E01 E21 E22 E23 G01 T03 | 0.08 | 2 | Y | Y | Theoretical activities |
| Total: | | | 6 | 150 | | | |
| Total credits of in-class work: 2.4 | | | Total class time hours: 60 | | | | |
| Total credits of out of class work: 3.6 | | | Total hours of out of class work: 90 | | | | |

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 |
|---|-----------------------|----------------------------|--------------------------------|
| Final test | 15.00% | 15.00% | Laboratory sessions evaluation |
| Assessment of problem solving and/or case studies | 10.00% | 0.00% | Workshops sessions evaluation |
| Final test | 75.00% | 85.00% | Topics evaluation |
| Total: | 100.00% | 100.00% | |

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:

It is compulsory to obtain a score >4 over 10 in the laboratory sessions (compulsory attendance + final test) to pass the course

It is mandatory to obtain a score > 4 over 10 in the final test to add all other evaluable parts (labs and seminars)

It is necessary to obtain a final mark > 5 to pass the subject

Non-continuous evaluation:

It is compulsory to obtain a score >4 over 10 in the laboratory sessions (compulsory attendance + final test) to pass the course

It is mandatory to obtain a score >4 over 10 in the final test to add all other evaluable parts (labs)

It is necessary to obtain a final mark > 5 to pass the subject

Specifications for the resit/retake exam:

The marks from the laboratory sessions and seminars are maintained until the Make-up Exam.

It is compulsory to obtain a score > 4 over 10 in the laboratory sessions (compulsory attendance + final test) to pass the course

It is mandatory to obtain a score > 4 over 10 in the final test to add all other evaluable parts (labs and seminars)

It is necessary to obtain a final mark > 5 to pass the subject

Specifications for the second resit / retake exam:

It is mandatory to have completed the laboratory practices. The final test will mean 100% of the evaluation

It is necessary to obtain a final mark > 5 to pass the subject

| 9. Assignments, course calendar and important dates | |
|---|-------|
| Not related to the syllabus/contents | |
| Hours | hours |

| 10. Bibliography and Sources | | | | | | |
|-----------------------------------|-------------------------------------|-------------------------------|------|-------------------|------|-------------|
| Author(s) | Title/Link | Publishing house | Citv | ISBN | Year | Description |
| John Hancock | Cell Signaling | Oxford University Press | | 9780199232109. | 2010 | |
| John W Baynes, Marek H Dominiczak | Bioquímica médica | Elsevier | | 978-84-8086-730-6 | 2011 | |
| Koolman. Rohm | Bioquímica Humana | Editorial Médica Panamericana | | 978-84-9835-215-3 | 2011 | |
| Mathews, Van Holde & Ahern | Bioquímica | Addison Wesley | | 978478290536 | 2003 | |
| Nelson & Cox | Lehninger: Principios de Bioquímica | Omega | | 9788428214865 | 2009 | |
| Stryer, Berg & Tymoczko, | Bioquímica | Reverte-6ª edición | | 9788429176001 | 2008 | |