



FACULTAD DE
CIENCIAS QUÍMICAS

BIOLOGY

COURSE GUIDE

BSc Chemistry

Academic Year 2023-2024



UNIVERSIDAD
COMPLUTENSE
MADRID



I.- IDENTIFICATION

COURSE NAME:	Biology
CREDITS (ECTS):	6
CHARACTER:	Mandatory
SUBJECT/ TOPIC:	Biology
MODULE	Basic
DEGREE:	Bachelor in Chemistry
SEMESTER/ TERM:	1st (1st Year)
DEPARTAMENT:	Biochemistry and Molecular Biology

LECTURERS:

Group E	
Lectures Seminars Tutorials	Lecturer: CRISTINA SÁNCHEZ GARCÍA Departament: Biochemistry and Molecular Biology Office: Facultad de CC Biológicas, 1 st Floor L1/L2 e-mail: macsanch@ucm.es
Lectures Seminars Tutorials	Lecturer: JAVIER PALAZUELOS DIEGO Departament: Biochemistry and Molecular Biology Office: Facultad de CC Biológicas, 1 st Floor L1/L2 e-mail: j.palazuelos@ucm.es

II.- OBJECTIVES

■ GENERAL OBJECTIVE

Introductory course focused on the study of biological chemistry. The main objective of this course is to establish the basic knowledge about the nature of living organisms.

■ SPECIFIC OBJECTIVES

To provide the basic knowledge on biological systems and to introduce the molecular and cellular fundamentals of living organisms.

To understand the different types of living organisms and the basic differences in their development and organization.

To provide insights into the basic cellular and tissue functions.

To understand the basics of molecular and classic genetics.

To interpret the relationship between living organisms and the environment.



III.- PREVIOUS KNOWLEDGE AND RECOMMENDATIONS

- **PREVIOUS KNOWLEDGE:**
- **RECOMMENDATIONS:**

Completed studies in Biology and Chemistry are recommended.

IV.- CONTENTS

- **BRIEF DESCRIPTION**

Structure and function of chemical molecules on biological systems. Basic cellular structures. Physiological activities of membranes. Metabolic pathways and mechanisms of energy production. Basics in molecular and classic genetics. Molecular processes of evolution. Multicellular organization. Biogeochemical cycles and its relation to the environment.

- **SYLLABUS:**

UNIT 1: Structure and function of biological molecules

Relevance of water in life. Structure and function of carbohydrates, proteins, lipids, and nucleic acids.

UNIT 2: Structure and metabolism of the cell

Structure and function of subcellular organelles. Main metabolic pathways. Mechanisms of energy production. Regulatory mechanisms. Cytoskeleton's function.

UNIT 3: Molecular basis of genetic information

Cellular mechanisms of genetic transmission. Nucleic acids replication and transcription. Fundamental concepts of Mendelian genetics.

UNIT 4: Reproduction, development, and evolution mechanisms

Reproduction in the different living organisms: prokaryotes, eukaryotes, and viruses. Evolution of physical systems of complex structures.

UNIT 5: Biogeochemical cycles and environmental relationships

Biogeochemical cycles and environmental mutagenesis. Molecular processes of evolution.



V.- COMPETENCES

■ GENERAL:

- **CG1:** To recognize the biological processes in the daily life.
- **CG2:** To recognize the relevance of Biology in several contexts, and its relation to other areas of knowledge.

■ SPECIFIC:

- **CE19-B1:** To describe the main types of living organisms and the basic differences associated with its formation, organization, functions, and level of complexity.
- **CE19-B2:** To formulate the basic biological concepts and to develop an integrated vision of the cell from a morphologic and functional perspective.
- **CE19-B3:** To recognize and explain the basic cellular and tissue functions of living organisms, and the molecular organization of the cell from an energetic and functional point of view.
- **CE19-B4:** To interpret images of tissues, cells, and cellular organelles.

■ GENERIC:

- **CT1:** To elaborate and write scientific and technical reports.
- **CT2:** To cooperate with other students through teamwork.
- **CT3:** To demonstrate critical reasoning.
- **CT4:** To be able to adapt to new situations.
- **CT11:** To develop work autonomously.
- **CT12:** To develop sensitivity to energetic and environmental topics.

VI. – LEARNING OUTCOMES

Check the Spanish version. **Guía Docente, Biología. Grado en Química.**



VII. – WORKING HOURS DISTRIBUTED BY ACTIVITIES

Activity	Attendance (hours)	Self Study (hours)	Credits (Hours)
Lectures	38	62	4 (100)
Seminars	7	13	0.8 (20)
Tutorials / Guided work	2	6	0.3 (8)
Exam Preparation	5	17	0.9 (22)
Total	52	98	6

VIII.- METHODOLOGY

The theoretical classes will be taught to the entire group. During these classes the student will be informed about the content of the subject. At the beginning of each subject the basic concepts and main objectives will be explained in a reasoned manner. At the end of the topic a brief summary of the most relevant aspects will be carried out, and new objectives will be proposed that will allow to interrelate contents already studied with those of the rest of the subject and other related subjects. To facilitate the follow-up work of the student in the classroom, the teaching material used by the teacher will be provided, either in paper or through the Virtual Campus.

Periodically, the student will be provided with a list of exercises and cases to be solved before the seminars. In some cases, the student will present the results of those exercises or cases to the class for discussion of his interpretation and biological significance. In other cases, the results obtained by the students will be discussed in the classroom and, subsequently, they will make a final presentation to the class. Finally, some exercises will be collected by the teacher for evaluation.

Short exams can be made, or questions raised to assess the evolution of students and the degree of achievement of knowledge they acquire.

To control in an objective way the personal work carried out by the student, and to promote the development of autonomous work, a series of directed activities will be proposed. Each group of students will prepare and present in class short works on selected contents of the Biology subject. All this will allow the student to put into practice their skills in obtaining information.

The lecturer will schedule directed tutoring with individual students or small groups of students, on questions raised by the students or by the lecturer. These tutoring activities can be done face-to-face or virtually.



IX.- BIBLIOGRAPHY

■ BASIC:

- Campbell, N., Urry, L., Cain, M., Wasserman, S., Minorsky, P., Orr, R. “*Biology. A global approach*”, 12 ed. Ed. Pearson, 2021.
- Curtis, H., Barnes Schnek y Massarini: “*Invitación a la Biología en contexto social*” 7^a ed., Panamericana, 2015.
- Solomon, E.P.; Berg, L.R.; Martin, D.W.: “*Biology*”, 10th ed., McGraw-Hill, 2014.
- Freeman, S.; Quillin, K; Allison, L.: “*Biological Science*”. Editorial Pearson (6th ed.), 2018.

■ COMPLEMENTARY:

- Appling, D., Anthony-Cahill, S., Mathews, C. “*Biochemistry. Concepts and connections*”, 2nd ed., Ed. Pearson, 2021.
- Tymoczko, M. Berg y L. Stryer: “*Biochemistry*”. Editorial Reverté (8th ed.), 2015.
- Alberts, B.: “*Essential cell biology*”, Editorial Médica Panamericana (3rd ed.), 2011.
- Lodish, H y col. “*Biología Celular y Molecular*” Editorial Médica Panamericana (7^a ed., 2016
- E. Feduchi, I. Blasco, C.S.Romero y E. Yáñez: “*Bioquímica. Conceptos esenciales*” Editorial Médica Panamericana (2^a ed., 2014.

X.- ASSESSMENT PROCEDURE

The final evaluation requires the participation in at least 70% of the personal work and directed activities, and to obtain a minimum mark of 4/10 in the exam. This evaluation procedure will be used in June and July calls. The final mark will be calculated according to the following percentages:

■ WRITTEN EXAM:

75%

The assessment of the acquired competences in the theoretical part will be carried out by a single final exam. The exam will account for 75% of the final mark. It is mandatory to obtain a minimum mark of 4/10 in the exam to have access to the final mark.

■ PERSONAL WORK:

10%

The assessment of the personal work will be carried out through tutoring. The assessment of the learning work carried out by the student will consider the student's ability to solve the problems and exercises proposed, in the preparation of a report, and potential writing tests of the explained topics.

**■ DIRECTED ACTIVITIES:****10%**

The students will organize in a small groups and will present to the classroom a work among those proposed by the teacher. After the presentation, each group will reply to the questions asked by their classmates and teacher. The teacher will evaluate the clarity in the presentation and in the answers.

■ ATTENDANCE AND PARTICIPATION:**5%**

The attendance and participation in all activities will be evaluated in the final mark. The continuous failure in attendance could be penalize.

The qualifications of the activities planned for the evaluation of the Biology subject (controls, tutoring, presentations, etc.) will be communicated to the students sufficiently in advance of the final exam, so that they can plan the study properly.

The minimum period of seven days between the publication of the marks and the date of the final exam of the subject will be respected.



ACTIVITIES SCHEDULE

UNIT	ACTIVITY	HOURS	START	END
1. Structure and function of biological molecules	Lectures	9	1 st week	3 rd week
	Seminars	1	1 st week	3 rd week
2. Structure and metabolism of the cell	Lectures	10.5	4 th week	7 th week
	Seminars	2.5	4 th week	7 th week
	Tutorials	1	5 th week	5 th week
3. Molecular basis of genetic information	Lectures	8.5	8 th week	10 th week
	Seminars	1.5	8 th week	10 th week
	Tutorials	1	12 th week	12 th week
4. Reproduction, development and evolution mechanisms	Lectures	5	11 th week	12 th week
	Seminars	1	11 th week	12 th week
5. Biogeochemical cycles and environmental relationships	Lectures	5	13 th week	14 th week
	Seminars	1	13 th week	14 th week
OTHER ACTIVITIES		HOURS		
Exam		3	Determined by the School	



SUMMARY OF ACTIVITIES

Teaching activity	Associated competences	Lecturer activity	Student activity	Assessment procedure	P	NP	Total	C
Lectures	CG1, CG2, CG3, CE19-B1, CE19B2, CE19-B3, CT3, CT5, CT11, CT12.	Presentation of theoretical concepts and approach of questions and new proposals	Taking notes. Resolution of questions. Development of the new proposals. Formulation of questions and doubts.	Assessment of the answers given to questions related to theoretical concepts.	38	62	100	15%
Seminars	CG1, CG2, CG3, CE19-B1, CE19B2, CE19-B3, CE22-B1, CT3, CT5, CT11, CT12.	Application of the theory to the resolution of exercises and problems. Presentation of relevant and current topics	Taking notes. Resolution of exercises and questions. Formulation of questions and doubts.	Assessment of the answers (approach and result) given for the resolution of practical exercises and numerical problems.	7	13	20	
Tutorials	CG1, CG2, CG3, CE19-B1, CE19B2, CE19-B3, CE22-B1, CT3, CT5, CT11, CT12.	Direction and supervision of the study and activities of the students. Raise questions.	Discussing with the lecturer concept and methodological difficulties. Answering the proposed questions.		2	6	8	
Guided activities	CG1, CG2, CG3, CE19-B1, CE19B2, CE19-B3, CE22-B1, CT3, CT5, CT11, CT12.	Proposal and critical evaluation of assignments.	Team work. Critical opinion of the oral presentations of other students.	Assessment of the in-group written assignment, the analyses carried out.	2	7	9	10%
Examinations	CG1, CG2, CG3, CG9, CG12, CE19-B1, CE19B2, CE19-B3, CE22-B1, CT3, CT5, CT11, CT12.	Exam design, surveillance and correction. Evaluation of the student.	Exam preparation and examination	Exam marking.	3	10	13	75%

P: In-class; NP: Self-study; C: Evaluation