



## Teaching Guide

Identifying Data					2024/25
Subject (*)	Biochemistry and Molecular Biology	Code	610G02013		
Study programme	Grao en Bioloxía				
Descriptors					
Cycle	Period	Year	Type	Credits	
Graduate	2nd four-month period	Third	Obligatory	6	
Language	SpanishEnglish				
Teaching method	Face-to-face				
Prerequisites					
Department	Bioloxía				
Coordinador	Freire Picos, María Ángeles	E-mail	maria.freirep@udc.es		
Lecturers	Barreiro Alonso, Aida Inés Freire Picos, María Ángeles Rodríguez Belmonte, Esther Saavedra Bouza, Almudena	E-mail	aida.barreiro@udc.es maria.freirep@udc.es esther.belmonte@udc.es almudena.saavedra@udc.es		
Web	ciencias.udc.es/bcm				
General description	<p>Biochemistry and Molecular Biology include the study of the life to the level of the molecules involved in it and the interactions between them. Now a days, those studies are the base of a lot of investigations (from the biomedical area to the molecular aspects applied to the study of natural populations, agricultural applications, environmental, etc). This course will cover the basic molecular aspects of life as mRNA and protein synthesis or the gene expression regulation mediated by signal transduction systems. This course, at the 3rd level of the Biology Degree, aims to increase the student's knowledges in this area as to develop his capacity to relate information and apply it in the resolution of different practical cases as well as experiment proposals or small research projects.</p>				

## Study programme competences / results

Code	Study programme competences / results
A8	Illar, analizar e identificar biomoléculas.
A12	Manipular material xenético, realizar análises xenéticas e levar a cabo asesoramento xenético.
A17	Realizar bioensaios e diagnósticos biolóxicos.
A27	Dirixir, redactar e executar proxectos en Bioloxía.
A29	Impartir coñecementos de Bioloxía.
A30	Manexar adecuadamente instrumentación científica.
A31	Desenvolverse con seguridade nun laboratorio.
B1	Aprender a aprender.
B2	Resolver problemas de forma efectiva.
B3	Aplicar un pensamento crítico, lóxico e creativo.
B4	Traballar de forma autónoma con iniciativa.
B5	Traballar en colaboración.
B7	Comunicarse de maneira efectiva nunha contorna de traballo.
B10	Exercer a crítica científica.
B11	Debater en público.
B13	Comportarse con ética e responsabilidade social como cidadán e como profesional.

## Learning outcomes

Learning outcomes	Study programme competences / results



<p>The approach of the Master Classes is to improve the knowledge and the ability of reflection on a discipline that also, once in the professional field, will demand a good praxis and adhere to ethical principles. The Laboratory Classes are more focused on the expertise on know how to do and how to be, related to the field of the Biochemistry and Molecular Biology.</p>	A8	B1
	A12	B2
	A17	B3
	A27	B4
	A29	B5
	A30	B7
	A31	B10
		B11
		B13

Contents	
Topic	Sub-topic
1.-Basal Transcription	RNA polymerases, core promoter and general transcription factors. Transcription mechanism: initiation, elongation and termination. Methodology to study: transcription start site selection, transcriptional termination and interactions nucleic acids-proteins.
2.-Regulated transcription and chromatin involvement in transcriptional regulation	Activators and repressors. DNA binding domains: DNA-proteins interactions. Chromatin remodeling complexes. Acetylation, deacetylation and other histones modifications in the regulation of gene expression. Techniques to study transcriptional regulation. Regulation examples of specific genes
3.-RNA processing and coordination of co-transcriptional events in eukaryotes	RNA cleavage and polyadenylation. RNA splicing. Processing of ribosomic and transferent RNA
4.-RNA as regulator of gene expression	RNA edition. Control of mRNA quality. Function of snRNA and transcriptional regulation. sncRNAs and the gene silencing mechanism. Antisense RNA in the translational regulation and applications of RNA. RNomics aspects
5.-Protein Translation	General aspects. Ribosomes. Translation mechanism: Initiation, elongation and termination. Differences in eukaryotes. Translation in mitochondria. Translational inhibitors.
6.-Protein Processing	Postranslational modifications of proteins. Folding: Chaperones and Prions. Ubiquitination and SUMOylation. Programed degradation: Proteasome
7.-Protein Transport	Cotranslational and postranslational translocation. Classification and distribution of new synthesized proteins. Traffic nucleo-cytoplasm. Transport regulation and final destiny of proteins in the cell.
8.-Basics of Cell Signaling	Classification of intercellular communication. Stages of intracellular signaling. Organization of signaling and pathways. Signaling molecules: types and functions.
9.- Reception of external signals and intracellular transduction	Membrane and intracellular receptors: types and mechanisms of activation. Intercellular Messenger substances or Second Messengers, protein kinase cascades and signal transduction to nucleus.
10.- Examples of control mechanisms and coordination of cell physiological activities	Cell Growth and Proliferation: regulation of cell cycle, apoptosis and cancer. Cell Senescence Signaling.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours



Laboratory practice	A8 A12 A17 A27 A30 A31 B1 B2 B3 B4 B5 B7 B10 B13	15	22.5	37.5
Problem solving	A29 B1 B2 B3 B4 B5 B7 B10 B11 B13	7	17.5	24.5
Guest lecture / keynote speech	A29 B2 B3 B4 B7 B10 B11 B13	28	0	28
Document analysis	A29 B1 B3 B5 B7 B10 B11 B13	1	3	4
Mixed objective/subjective test	A29 B2 B3 B7 B10 B13	2.5	50	52.5
Personalized attention		3.5	0	3.5

(\*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
Methodologies	Description
Laboratory practice	Focused on the study of gene expression, with the use of databases, with the analysis of reporter genes expression and/or with the study of protein expression.
Problem solving	This section will include the approach and resolution of problems of different aspects in small groups of students, combining the methodologies of problem-based learning and collaborative work.
Guest lecture / keynote speech	Oral Presentation complemented with audiovisual media to transmit knowledges and provide the learning. Besides it will improve the participation of the students.
Document analysis	Read and comprehension of research papers. Searches of information, analysis, discussion, participation of all group components documents elaboration and conclusions. Defense in seminars.
Mixed objective/subjective test	It will be used for the evaluation of the knowledge, skills, attitudes, and so, acquired by the student along the course, and will include different types of questions: multiple answer, short, etc.

Personalized attention	
Methodologies	Description
Laboratory practice Problem solving Guest lecture / keynote speech Document analysis	The tasks to perform by the student will be guided by the Professor. It is important the regular attendance to Tutorials with the Professor, who will help to monitor the progress of the students.  The specific tutorial Schedule for students will be given at the beginning of the course. Apart from that, students can e-mail the professors to solve specific questions or (with the teacher's agreement) to make tutorial appointments or by Teams.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Laboratory practice	A8 A12 A17 A27 A30 A31 B1 B2 B3 B4 B5 B7 B10 B13	LABORATORY CLASSES: The assistance is mandatory. The students will interpret the obtained results. Besides they will present a work that will include a small research project based on the results in the practical course and an exam.	25
Mixed objective/subjective test	A29 B2 B3 B7 B10 B13	FINAL EXAMINATION: The knowledges obtained by the students in the Master and Small Group Classes will be evaluated in a final exam.	40
Problem solving	A29 B1 B2 B3 B4 B5 B7 B10 B11 B13	Resolution of problems, student's work in Reduced Groups: exercises, seminars (as indicated in document analyses) and possibility of small exams.	20



Document analysis	A29 B1 B3 B5 B7 B10 B11 B13	Small group activity: Activity of searching and handling of scientific information that will be used to elaborate activities of science dissemination, with a class exposition in small groups, and with an ending debate. The scientific rigor of information (group work), the quality of visual presentation (group work), the fluidity and clarity of oral exposure (individual work) and responsiveness (individual work) will be evaluated.	15
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## Assessment comments

.- In order to add all the qualifications and pass this subject it will be mandatory to acquire the minimum scores in the three evaluable parts **INDEPENDENTLY**: Activities (Problem solving / Document analysis), Practical Classes in the Laboratory and Objective Probe (or Final Examination). The official final exams in June and in July will be presentially, unless in case of pandemic situation in which will use the Moodle platform only.

The continuous assessments, previous to the official opportunities, will also be on line. Two partial exams will be issued.- For Final Qualifications or ACTAS (on any of the 2 opportunities, JUNE or JULY): The marks of the Objective Probe, Laboratory Practices, and Seminars will be added only if all of them reach 45% of their value. If this percentage is not reached, the final grade that will appear in ACTAS will be 4.

.-In the Final Exam of the 2nd Opportunity\_(July), the student will be able to recover only the theoretical. It will not be an exam for the Practical Part in this 2º Opportunity.

.-The attendance to Practical Laboratory Classes is a mandatory condition to be evaluated. Failure to attend classes without a properly justified reason means failing the subject. The students who had passed the Practical Part in the two previous academic years may apply for a request for his validation as overcome (PASS).

Voluntarily, students will be able to participate in a gamification activity that will be provided on the first day of class: Students enrolled in this subject will be able to voluntarily participate in a gamified learning environment, obtaining up to one extra point in their grade.

.- The students that do not show up in any of the two official examination dates will obtain a NOT PRESENTED in the Final Grades (ACTAS).

.-According to the rule of qualifications and records in Degrees and Masters, the Quality Committee of the Faculty of Sciences agreed to the recommendation to concede the "Honors Qualification" to those students who obtained the highest marks in the 1st Opportunity.

.-For students with part-time dedication or with an exemption of class assistance, in June and July, there will be a specific exam for overall assessment.

.- Exceptionally, in the case of those students that, for duly justified reasons, are not able to perform all continuous assessment tests or evaluable activities, the professors will take their deems for appropriate measures.

All aspects

related to "academic dispensation", "dedication to study",

"permanence" and "academic fraud" will be ruled in

accordance with the current academic regulations of the UDC

.-Students with recognition of part-time dedication and academic exemption for attendance both in the end-of-term opportunity and in the second opportunity will take into account, for the calculation of the overall grade, the grade obtained in the theoretical exam and the corresponding practical part (see above format of both exams), representing these 75% and 25% of the final grade, respectively.

In

exceptional cases, the possibility of teaching the subject in a tutorial regime will be considered.

## Sources of information



<b>Basic</b>	<ul style="list-style-type: none"><li>- Meister G. (2011). RNA Biology. Wiley-VHH</li><li>- Lodish, Berk, Krieger, Kaiser et al., (2013). Molecular Cell Biology. WhFreeman</li><li>- Lodish et al., (2021). Molecular and Cellular Biology 9th Ed. Mcmillan learning</li><li>- Herráez, A. (2012). Texto ilustrado de Biología Molecular e ingeniería genética. Elsevier</li><li>- Lodish, Berk, Matsudaria, Kaiser et al., (2008). Biología Celular y Molecular. Ed. Médica Panamericana</li><li>- Lewin B. (2011). Genes X. Jones and Bartlett Publishers, LLC</li><li>- Elliot, W.H. &amp; Elliot, D.C. (2002). Bioquímica y Biología Molecular. Ariel, S.A.</li><li>- Whitford, D. (2005). Proteins: Structure and Function. John Wiley &amp; Sons, Ltd.</li><li>- Bruce, Alberts [et al.]. (2008). Molecular biology of the cell. New York : Garland Science, 5th ed.</li><li>- Karp G. (2011). Biología Celular y Molecular. Conceptos y experimentos. McGraw-Hill Interamericana Eds., S.A. de C.V., traducción de la 6ª ed. de Cell and Molecular Biology</li><li>- Stryer, L., Berg, J.M. and Tymoczko, J.L. (2013). Bioquímica: con aplicaciones clínicas. Ed. Reverté, 7ª Ed.</li><li>- ( ) . .</li></ul> <p>.-Na plataforma Moodle incluíránse enlaces a páxinas web relacionadas cos diferentes contidos dos temas. Plan de continxencia: Non haberá cambios porque todo estará disponible no Moodle.</p>
<b>Complementary</b>	<ul style="list-style-type: none"><li>- Rhoads R. (2010). miRNA Regulation of the translational machinery. Springer</li><li>- Dalbey, R.E. &amp; von Heijne, G. (2002). Protein targeting, transport &amp; translocation. Academic Press</li><li>- Meyers, R.A. (2007). Proteins: from analytical to structural genomics (Volume I and II). Wiley-VCH Verlag GmbH &amp; Co.</li><li>- Krauss, Gerhard. (2008). Biochemistry of signal transduction and regulation.. Weinheim : Wiley-VCH. 2nd ed.</li></ul>

## Recommendations

### Subjects that it is recommended to have taken before

Bioquímica I/610212101

Bioquímica II/610212202

Molecular Genetics/610G02020

### Subjects that are recommended to be taken simultaneously

### Subjects that continue the syllabus

Fundamentos Bioquímicos de Biotecnoloxía/610212620

### Other comments



.-It is recommended to attend both group and individual tutoring to get best results.

Green

Campus Science Faculty Program

To

contribute to achieving an immediate sustainable environment and comply with point 6 of the "Environmental Declaration of the Faculty of Sciences (2020)", the documentary work carried out in this area:

a. They

will be requested mainly in virtual format and computer support.

b. To do on

paper:

- Plastics will  
not be used.

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Double-sided prints will be made.

- Recycled  
paper will be used.

- Drafts will be avoided.

(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.