



IDENTIFYING DATA

Biological chemistry

Subject	Biological chemistry			
Code	V11G200V01602			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Mandatory	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Teijeira Bautista, Marta Simón Vázquez, Rosana			
Lecturers	Calle González, Inmaculada de la Diego González, Lara Lavilla Beltrán, María Isela Silva López, Carlos Simón Vázquez, Rosana Teijeira Bautista, Marta			
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Web				
General description	Introductory course of Biochemistry, global and integrated knowledge of the molecular mechanisms responsible of biological processes.			

Competencies

Code	
CB1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE4	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Basics and tools for solving analytical problems and characterization of chemical substances
CE15	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories in: chemistry of biological molecules and their processes
CE19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
CE21	Recognize and implement good scientific practices for measurement and experimentation
CE23	Present oral and written scientific material and scientific arguments to a specialized audience
CE25	Handle chemicals safely, considering their physical and chemical properties, including the evaluation of any specific risks associated with its use
CE26	Perform common laboratory procedures and use instrumentation in synthetic and analytical work
CE27	Monitor, by observation and measurement of physical and chemical properties, events or changes, and document and record them in a consistent and reliable way
CE28	Interpret data derived from laboratory observations and measurements in terms of their significance and relate them to the appropriate theory
CT1	Communicate orally and in writing in at least one of the official languages of the University
CT3	Learn independently
CT4	Search and manage information from different sources

CT5 Use information and communication technologies and manage basic computer tools

CT7 Apply theoretical knowledge in practice

CT8 Teamwork

CT9 Work independently

CT12 Plan and manage time properly

CT13 Make decisions

CT14 Analyze and synthesize information and draw conclusions

CT15 Evaluate critically and constructively the environment and oneself

Learning outcomes

Learning outcomes	Competences		
Identify and recognise the structure of the distinct types of *biomoléculas and represent them properly, recognise his properties and his chemical reactivity.	CB1 CB3	CE15	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Recognise the distinct biological activities of the diverse types of *biomoléculas	CB1 CB3	CE15	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Define the kinetical enzymatic of reactions *catalizadas by enzymes as well as his general mechanisms. Recognise the distinct types of inhibition of the enzymatic activity and his quantification	CB1 CB3	CE4 CE15	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Relate the vitamins with the corresponding *coenzimas of enzymatic reactions	CB1 CB3	CE15	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Explain he concept of *Bioenergética. Reason conceptually the importance of him attachment of the processes *endergónicos and *exergónicos in the biological systems	CB1 CB3	CE15	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15

Enumerate the main structural appearances of the ATP that determine his paper in the transfer of energy. Describe the cycle of the ATP.	CB1 CB3	CE15	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Distinguish the metabolic roads of the *biomoléculas, as well as his interrelationships and regulation	CB1 CB3	CE15	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Explain the foundations of the current technicians of *proteómica and molecular biology in relation with the isolation, separation, purification, determination, identification and manipulation of proteins and nucleic acids	CB1 CB2 CB3	CE4 CE15	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Apply experimentally some basic technicians in Biochemistry. Justify the application of the distinct instrumental technicians in the analysis of *biomoléculas	CB1 CB2 CB3	CE4 CE15 CE19 CE21 CE23 CE25 CE26 CE27 CE28	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Distinguish the main operations involved in the commercial production of *biomoléculas, as well as his foundations. Recognise the possible practical applications of *biomoléculas, with special emphasis in the characteristic operational conditions	CB1 CB2 CB3 CB5	CE15 CE21 CE23 CE25 CE26 CE27 CE28	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Distinguish and pose analytical protocols of application of the previously mentioned technicians to the analysis of *biomoléculas in diverse areas (clinical, pharmaceutical, *biomédica, etc.)	CB1 CB2 CB3 CB5	CE4 CE15 CE19 CE21 CE23 CE25 CE26 CE27 CE28	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15

Contents

Topic	
1. Biomolecules	Structure and structure-function relationship of biomolecules: proteins, carbohydrates, lipids and nucleic acids.
2. Biocatalysis	Structure and function of enzymes. Enzymatic reactions. Enzymatic kinetics.
3. Vitamins and coenzymes	Structure and function of vitamins and coenzymes in metabolic reactions.
4. Metabolism of glucides	Degradative Metabolism of glucides: glycolysis. Metabolic crossroad of pyruvate. Degradative Oxidation of acetyl-CoA. Respiratory chain and oxidative phosphorylation. Oxidative Route of the pentoses phosphate. Gluconeogenesis. Metabolism of glycogen.
5. Metabolism of lipids	Degradation of lipids: oxidation of fatty acids. Biosynthesis of fatty acids.
6. Metabolism of proteins	Proteolysis. Degradation of amino acids. Destination of the ion ammonium. Biosynthesis of amino acids.
7. Metabolism of nucleotides	Degradation of nucleic acids and nucleotides. Biosynthesis of nucleotides.
8. Experimental methods in Biochemistry	Techniques for synthesis and isolation of biomolecules. Separation, determination and identification of proteins. Determination and quantification of lipids. Determination and quantification of glycogen. Evaluation of the enzymatic activity. Effect of the temperature and inhibition. Polymerase chain reaction. Use of restriction enzymes.

Planning

	Class hours	Hours outside the classroom	Total hours
Seminars	13	19.5	32.5
Laboratory practical	45.5	68.25	113.75
Problem solving	3	3	6
Lecturing	26	26	52
Essay questions exam	4	6	10
Laboratory practice	2.3	3.45	5.75
Essay questions exam	2	3	5

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

Methodologies

	Description
Seminars	This teaching activity will be dedicated to the resolution of some problems or proposed exercises related to the subject. In these classes you can collect questions or short problems to track the progress of the students.
Laboratory practical	They will propose questions practise, to resolve in the laboratory.
Problem solving	Activity in which they formulate problems and/or exercises related with the matter. The student has to develop the suitable or correct solutions by means of the realisation of routines, the application of formulas or algorithms, the application of procedures of transformation of the available information and the interpretation of the results.
Lecturing	Exhibition by the professor of the contents on the matter object of study, theoretical bases and/or guidelines of a work, exercise or project to develop by the student.

Personalized assistance

Methodologies	Description
Lecturing	Throughout the teaching period students can consult all kinds of questions related to the subject. These consultations will be addressed both in tutorials and seminars.
Seminars	Throughout the teaching period students can consult all kinds of questions related to the subject. These consultations will be addressed both in tutorials and seminars.
Laboratory practical	The professor will resolve the doubts of the students for the good development of the activities proposed

Assessment

Description		Qualification	Evaluated Competences	
Seminars	Students attitude and participation in seminar classes will be valued. Short questions and hand-made problems will be also proposed to track students' progress. Grading in this section will be only considered if students reach a mark equal or above 5/10 in the written exams.	10		CE4 CT3 CE15 CT4 CE19 CT8 CE23 CT12 CT14 CT15
Laboratory practical	The attendance to the practices and the application of the instrumental techniques learned will be valued by means of the resolution of proposed questions as well as the delivery of a practice report. Grading in this section will be only considered if students reach a mark equal or above 5/10 in the written exams.	30	CB1 CB2 CB3 CB5	CE15 CT3 CE19 CT7 CE21 CT9 CE25 CT12 CE26 CT13 CE27 CT14 CE28
Essay questions exam	There will be two written tests during the semester on the subject taught until then in the lectures and seminars. This exam will be eliminatory of matter in the final test if students reach a mark equal or above 5/10. Those students not reaching this mark will have to repeat this part of the examination in the final written test.	hasta el 30	CB1 CB3	CE4 CT1 CE15 CT3 CT4 CT9 CT12 CT14
Essay questions exam	A final written test will be proposed to evaluate the adquired competences.	hasta el 60	CB1 CB3	CE4 CT1 CE15 CT3 CT4 CT9 CT12 CT14

Other comments on the Evaluation

The final grade of the matter will be calculated taking into account the evaluation of the seminars (10%), the laboratory practices (30%) and the written tests (60%), for those students that reach an equal or upper punctuation to 5 points on 10 in the written tests. If that score is not reached, the grade of the matter will correspond to the value of the final written test. The short written tests may have eliminatory character, as long as they reach the minimum value each of 5/10, subtracting its percentage corresponding to the value of the final written test.

Attendance at laboratory practices is mandatory. The lack of assistance, even if justified, will penalize the evaluation of the same. An attendance lower than 75% of the practical sessions supposes the qualification of suspense in the matter.

The participation in the evaluation activities throughout the semester or in some of the assessment tests involve the condition of presented and therefore the student will be graded.

Assessment in July: The same rules are applied. If 75% of the laboratory sessions have been completed, the minimum grade has not been obtained, a laboratory exam may be carried out in July.

Sources of information

Basic Bibliography

Stryer L., Berg J. M. & Tymoczko J. L., **Bioquímica**, 7ª, Editorial Reverté, 2013

Lehninger, Nelson D. L. & Cox M. M., **Principios de Bioquímica**, 7ª, Macmillan Higher Education, cop. 2017, 2017

Susan R. Mikkelsen, Eduardo Cortón, **Bioanalytical Chemistry**, 1ª, Wiley-Interscience, 2004

Complementary Bibliography

McKee and McKee, **Bioquímica**, 5ª, Ediciones McGraw Hill, 2014

Andreas Manz, Nicole Pamme, Dimitri Lossifidis, **Bioanalytical Chemistry**, 2ª, Imperial College Press, 2015

Victor A. Gault and Neville H. McClenaghan, **Understanding Bioanalytical Chemistry: principles and Applications**, 1ª, Wiley Blackwell, 2009

Feduchi, Blasco, Romero, Yañez, **Bioquímica**, 2ª, Panamericana, 2015

John Kuriyan, Boyana Konforti, David Wemmer, **The Molecules of Life**, 1ª, Garland Science, 2013

Schlick, Tamar, **Molecular modeling and simulation : an interdisciplinary guide**, 1ª, Springer Science+Business Media, 2010

Recommendations

Subjects that it is recommended to have taken before

Organic chemistry II/V11G200V01504

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

- * Teaching methodologies maintained
- * Teaching methodologies modified
- * Non-attendance mechanisms for student attention (tutoring)
- * Modifications (if applicable) of the contents
- * Additional bibliography to facilitate self-learning
- * Other modifications

=== ADAPTATION OF THE TESTS ===

- * Tests already carried out
Test XX: [Previous Weight 00%] [Proposed Weight 00%]
...
- * Pending tests that are maintained
Test XX: [Previous Weight 00%] [Proposed Weight 00%]
...
- * Tests that are modified
[Previous test] => [New test]
- * New tests

- * Additional Information
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