



## IDENTIFYING DATA

### Biological chemistry

Subject	Biological chemistry			
Code	V11G200V01602			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	9	Mandatory	3rd	2nd
Teaching language	Spanish			
Department	Biochemistry, Genetics and Immunology Analytical and Food Chemistry Organic Chemistry			
Coordinator	Teijeira Bautista, Marta			
Lecturers	Calle González, Inmaculada de la Martínez Pérez, Amparo Pérez Cid, Benita Simón Vázquez, Rosana Teijeira Bautista, Marta			
E-mail	qomaca@uvigo.es			
Web				
General description	Introductory course of Biochemistry, global and integrated knowledge of the molecular mechanisms responsible of biological processes.			

## Competencies

Code	
A1	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
A2	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
A3	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
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C4	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Basics and tools for solving analytical problems and characterization of chemical substances
C15	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories in: chemistry of biological molecules and their processes
C19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
C21	Recognize and implement good scientific practices for measurement and experimentation
C23	Present oral and written scientific material and scientific arguments to a specialized audience
C25	Handle chemicals safely, considering their physical and chemical properties, including the evaluation of any specific risks associated with its use
C26	Perform common laboratory procedures and use instrumentation in synthetic and analytical work
C27	Monitor, by observation and measurement of physical and chemical properties, events or changes, and document and record them in a consistent and reliable way
C28	Interpret data derived from laboratory observations and measurements in terms of their significance and relate them to the appropriate theory
D1	Communicate orally and in writing in at least one of the official languages of the University
D3	Learn independently
D4	Search and manage information from different sources
D5	Use information and communication technologies and manage basic computer tools
D7	Apply theoretical knowledge in practice

D8 Teamwork

D9 Work independently

D12 Plan and manage time properly

D13 Make decisions

D14 Analyze and synthesize information and draw conclusions

D15 Evaluate critically and constructively the environment and oneself

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**Learning outcomes**

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Expected results from this subject	Training and Learning Results		
Identify and recognise the structure of the distinct types of *biomoléculas and represent them properly, recognise his properties and his chemical reactivity.	A1 A3	C15	D1 D3 D4 D5 D7 D8 D9 D12 D13 D14 D15
Recognise the distinct biological activities of the diverse types of *biomoléculas	A1 A3	C15	D1 D3 D4 D5 D7 D8 D9 D12 D13 D14 D15
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	A1 A3	C4 C15	D1 D3 D4 D5 D7 D8 D9 D12 D13 D14 D15
Relate the vitamins with the corresponding *coenzimas of enzymatic reactions	A1 A3	C15	D1 D3 D4 D5 D7 D8 D9 D12 D13 D14 D15
Explain he concept of *Bioenergética. Reason conceptually the importance of him attachment of the processes *endergónicos and *exergónicos in the biological systems	A1 A3	C15	D1 D3 D4 D5 D7 D8 D9 D12 D13 D14 D15

Enumerate the main structural appearances of the ATP that determine his paper in the transfer of energy. Describe the cycle of the ATP.	A1 A3	C15	D1 D3 D4 D5 D7 D8 D9 D12 D13 D14 D15
Distinguish the metabolic roads of the *biomoléculas, as well as his interrelationships and regulation	A1 A3	C15	D1 D3 D4 D5 D7 D8 D9 D12 D13 D14 D15
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	A1 A2 A3	C4 C15	D1 D3 D4 D5 D7 D8 D9 D12 D13 D14 D15
Apply experimentally some basic technicians in Biochemistry. Justify the application of the distinct instrumental technicians in the analysis of *biomoléculas	A1 A2 A3	C4 C15 C19 C21 C23 C25 C26 C27 C28	D1 D3 D4 D5 D7 D8 D9 D12 D13 D14 D15
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	A1 A2 A3 A5	C15 C21 C23 C25 C26 C27 C28	D1 D3 D4 D5 D7 D8 D9 D12 D13 D14 D15
Distinguish and pose analytical protocols of application of the previously mentioned technicians to the analysis of *biomoléculas in diverse areas (clinical, pharmaceutical, *biomédica, etc.)	A1 A2 A3 A5	C4 C15 C19 C21 C23 C25 C26 C27 C28	D1 D3 D4 D5 D7 D8 D9 D12 D13 D14 D15

## 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 practices	45.5	68.25	113.75
Problem solving	3	3	6
Lecturing	26	26	52
Short answer tests	6	9	15
Laboratory practice	2.3	3.45	5.75

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

### Methodologies

	Description
Seminars	They formulate , they argue and they resolve questions, related with the matter.
Laboratory practices	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. It is used to employ as I complement of the magistral lesson.
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 attention

Methodologies	Description
Seminars	The professor will resolve the doubts of the students for the good development of the activities proposed
Laboratory practices	The professor will resolve the doubts of the students for the good development of the activities proposed
Problem solving	The professor will resolve the doubts of the students for the good development of the activities proposed

### Assessment

Description	Qualification	Training and Learning Results

Seminars	Class participation and resolution of proposed problems will be evaluated.	10		C4 C15 C19 C23	D3 D4 D8 D12 D14 D15
Laboratory practices	Assistance to practical classes will be evaluated. Application of instrumental techniques learned in the laboratory sessions and resolution of the proposed problems will be evaluated.	30	A1 A2 A3 A5	C15 C19 C21 C25 C26 C27 C28	D3 D7 D9 D12 D13 D14 D14
Short answer tests	Two short tests (with 25% and 15% values respectively) and one long test will be evaluated.	60	A1 A3	C4 C15	D1 D3 D4 D9 D12 D14

### Other comments on the Evaluation

The final grade will be calculated taking into account: seminars (10%), laboratory practices (30%) and tests (60%). The short tests will have eliminatory character, as long as they reach the minimum value each of 5, subtracting its percentage corresponding to the value of the long test.

Attendance at laboratory sessions is mandatory. The lack of assistance, even if justified, will penalize the final grade. An attendance lower than 75% of the laboratory sessions supposes the qualification of suspense.

The non-performance of any test throughout the academic course and the failure to attend the long test will be considered as not presented.

For the evaluation of July, a global test will be carried out, with a value of 70% in the final grade, maintaining the remaining 30% for the qualification obtained in the laboratory practices, if they are approved. If 75% of the laboratory sessions have been completed and the minimum mark has not been achieved, an examination of recovery of the laboratory practices 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

Wade, L.G., **Química Orgánica**, 9ª, Pearson-Educación, 2017

#### Complementary Bibliography

Yurkanis Bruice, P., **Química Orgánica**, 5ª, PRENTICE HALL MEXICO, 2007

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

Analytical chemistry I/V11G200V01302

Organic chemistry I/V11G200V01304

Organic chemistry II/V11G200V01504