



## IDENTIFYING DATA

### Chemistry: Chemistry applied to biology

Subject	Chemistry: Chemistry applied to biology			
Code	V02G030V01104			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish English			
Department				
Coordinator	Tojo Suárez, Emilia Domínguez Seoane, Marta			
Lecturers	Domínguez Seoane, Marta Marín Luna, Marta Silva López, Carlos Souto Salgado, José Antonio Tojo Suárez, Emilia			
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Web				
General description	General chemistry oriented to Biology. Terms of English Friendly program. International students may apply to teachers: (a) materials and bibliography for the study of the subject in English, b) attending tutorials in English, c) tests and evaluations in English.			

## Competencies

Code		Typology
CB1	Students should prove understanding and knowledge in this study field that starts in the Secondary Education and with a level that, even though it is supported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.	• know
CB2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.	• Know How
CB3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.	• Know How • Know be
CB4	Students should be able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).	• Know How • Know be
CG2	Ability of reading and analyzing scientific papers and having critical assessment skills to understand data collection, deducing the main idea from the least relevant ones and basing on the corresponding conclusions.	• know • Know How
CG3	Acquisition of general knowledge about the basic subjects of biology, both at theory and experimental level, without dismissing a higher specialization in subjects that are oriented to a concrete professional area.	• know
CG4	Ability in handling experimental tools, both scientific and computer technology equipment that support the search for solutions to problems related to the basic knowledge of biology and with those of a concrete labour context.	• Know How
CG7	Collection of information about issues of biologic interest, analysis and emission of critical opinions and reason them including the reflection about social and/or ethical aspects related to the issue.	• Know How • Know be
CG10	Development of analytic and abstraction skills, the intuition and the logical and rigorous thought through the study of biology and its uses.	• Know How
CG11	Ability to communicate in detail and clearly: knowledge, methodology, ideas, issues and solutions to all audiences (not only qualified but unskilled in Biology).	• know • Know How

CG12 Ability to identify their own educational necessities in the biology field and in concrete labour areas and to organize their learning with a high grade of autonomy in any context.	• know • Know How
CE17 Identifying and obtaining natural biological products	• know • Know How
CE25 Gathering background information, develop experimental work and analysing data results	• know • Know How
CE31 Knowing and handling technical and scientific apparatus.	• Know How
CE32 Knowing and handling basic or specific key concepts and terminology	• Know How
CE33 Understanding the social projection of Biology.	• Know be
CT1 Development of capacity of analysis and synthesis	• Know How
CT2 Acquisition of the organization and planning capacity for tasks and time	• Know How
CT4 Acquisition of foreign language knowledge related to the study field	• know
CT6 Research and interpreting of information from different sources	• Know How
CT7 Resolution of issues and decision making in an effective way	• Know How
CT8 Development of the ability of independent learning	• Know How
CT9 Ability to work in collaboration or creating groups with an interdisciplinary character	• Know How • Know be
CT11 Adquisition of an ethical agreement with the society and the profession	• Know be
CT13 Sensitivity for environmental issues	• Know be
CT14 Adquisition of abilities in the interpersonal relationships	• Know be
CT17 Development of the self-criticism ability	• Know How • Know be

### Learning outcomes

Learning outcomes	Competences
To know and understand the molecular structure of the biological compounds and the importance of the intermolecular and intramolecular bonds.	CB1 CG3 CE32 CT1 CT2 CT7 CT8
To know the different types of chemical bond, as well as its relation with the structure of molecules and the macroscopic properties of substances.	CB1 CG3 CG10 CE32 CT1 CT2 CT7
To know general concepts about chemical reactions and their kinetic aspects.	CB1 CG3 CG10 CE31 CT1 CT2 CT7
To specially know the acid-base and oxidation-reduction reactions, as well as their application to biological processes.	CB1 CG3 CG7 CG10 CE31 CE32 CT1 CT6 CT7 CT13 CT17

To obtain a general vision of the chemical compounds present in nature and their stereochemical study.	CB2 CG7 CG10 CE17 CE25 CE31 CE32 CT4 CT6 CT7 CT11
To know the regulation and the security and cleanliness techniques in a chemical laboratory	CB3 CG2 CG3 CG4 CE31 CE32 CT2 CT6 CT9 CT13 CT14
To know the basic material and instrumentation in a chemical laboratory.	CB1 CG4 CE31 CE32 CT8 CT9 CT13 CT14
To know and understand the basic techniques in a chemical laboratory.	CB1 CG3 CG4 CE25 CE31 CE32 CT9 CT11 CT13 CT14
To know the labelled, packing and storage of chemical reagents and solvents.	CB3 CG4 CE31 CE32 CT4 CT8 CT9 CT11 CT13
To apply knowledge related to chemistry in the area of biology.	CB2 CG3 CG7 CG12 CE17 CE33 CT11 CT13
To obtain and handle information, develop experiments and interpret results.	CB3 CG2 CG7 CG10 CE25 CT1 CT6 CT7 CT8

To understand the social projection of chemistry and its repercussion in the biologist professional world.	CB4 CG11 CG12 CE33 CT11 CT13
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## Contents

Topic	
Structure of matter and chemical bond.	1. Classification of matter. Distribution of the elements in Earth and chemical composition of living matter. Molecular structure. 2. Chemical bond. Intermolecular forces in biomolecules.
Solution process. Colloids.	1. Types of solutions. Units of concentration. Colligative properties. Osmosis in biological processes. 2. Colloids. Structure and properties of colloidal systems.
Reactions and acid-base equilibrium. Redox.	1. Chemical reactions in biological environments. 2. Acids and bases. The pH. Buffer solutions. Regulation of pH in body fluids. 3. Redox reactions. Redox processes in the cellular metabolism.
Chemical compounds in nature. Stereochemistry.	1. Main families of chemical compounds in natural environment. 2. Chirality, stereogenic centers. Enantiomers and diastereoisomers. Tridimensional representation of the chemical structures.
<b>PRACTICAL SESSIONS</b>	<b>1. SECURITY RULES IN THE CHEMICAL LABORATORY.</b>
<b>PRACTICE 1</b>	<b>2. PREPARATION OF SOLUTIONS.</b>
<b>PRACTICE 2</b>	<b>1. COLLOIDAL MIXTURES. CALCULATION OF CRITICAL MICELLAR CONCENTRATION.</b>
<b>PRACTICE 3</b>	<b>1. BUFFER SOLUTIONS. DIHYDROGEN PHOSPHATE/MONO-HYDROGENATE PHOSPHATE.</b>
<b>PRACTICE 4</b>	<b>1. OXIDATION-REDUCTION REACTIONS. EVALUATIONS WITH A PERMANGANATE POTASSIUM SOLUTION.</b>
<b>PRACTICE 5</b>	<b>1. LIQUID-LIQUID EXTRACTION: SEPARATION OF BENZOIC ACID AND CAFFEINE.</b>

## Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	20	10	30
Seminars	3	6	9
Problem solving	0	8	8
Lecturing	27	54	81
Essay questions exam	2	9	11
Problem and/or exercise solving	2	9	11

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

## Methodologies

	Description
Laboratory practical	Application of laboratory techniques in practical problems related to the subject.
Seminars	Students will previously solve a series of exercises and proposed questions. The teacher will solve the doubts and will comment the specific aspects that were not explained in lectures.
Problem solving	A series of proposed exercises by the teacher will be solved.
Lecturing	Explanation of the units.

## Personalized assistance

Methodologies	Description
Seminars	The tutoring schedules to have a personal teacher help are available on the web page of the Faculty ( <a href="http://bioloxia.uvigo.es/en">http://bioloxia.uvigo.es/en</a> ). Besides the face-to-face hours, students can ask their teachers through email.

## Assessment

Description	Qualification	Evaluated	Competences
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Laboratory practical	The teacher will evaluate through observation of the correct application of the learned instrumental techniques. The solutions of laboratory questions will be also considered.	10	CB1 CB2 CB3 CG3 CG4 CE17 CE25 CE31 CE33 CT2 CT7 CT8 CT9 CT11 CT13 CT14
Seminars	The teacher will value the participation and students knowledge of the subject.	2	CB1 CB2 CB3 CB4 CG2 CG7 CG10 CG11 CE32 CT1 CT7 CT9 CT17
Problem solving	To track the student's progress, some questions or short problems will be collected in the classroom during the teaching period.	8	CB1 CB2 CB3 CG2 CG7 CG10 CG12 CE32 CE33 CT1 CT2 CT4 CT6 CT7 CT8 CT9 CT14 CT17

Essay questions exam	A long answer test will be carried out at the end of the quadmester.	50	CB1 CB2 CG2 CE17 CT1 CT2 CT7 CT13
Problem and/or exercise solving	A midterm short answer test will be carried out during the quadmester.	30	CB1 CB2 CG2 CE17 CT1 CT2 CT7 CT13

### Other comments on the Evaluation

The definitive qualification of the subject will be the highest obtained when comparing the mark of the long final test with the weighted marks in the continuous evaluation explained above. Grades will not be averaged to obtain a final grade when the long test is graded below 4 points.

The students who make more than one test during the year or those who attend a lab session will be graded in the January call even if they decline to participate in all the remaining activities.

The evaluation in July call will follow the same criteria than in January.

The schedules of the subject, office hours and dates of exams will be published in:

<http://bioloxia.uvigo.es/en/teaching/schedules>

<http://bioloxia.uvigo.es/en/teaching/exams>

### Sources of information

#### Basic Bibliography

R. Chang, Química General, 12ª Ed McGraw-Hill, Madrid 2017,

R. H. Petrucci, Química General, 11ª Ed Person Educación, S. A. Madrid 2017,

Kenneth W. Whitten et al, Química, 10ª Ed México D.F. : Cengage Learning 2015,

R. Chang, Chemistry, 7ª ed New York : McGraw Hill Education 2002,

#### Complementary Bibliography

3D structures of biological molecules, <http://www.biotopics.co.uk/JmolApplet/jcontentstable.html>,

### Recommendations

#### Subjects that continue the syllabus

Biochemistry I/V02G030V01301

#### Subjects that are recommended to be taken simultaneously

Biology: Basic laboratory techniques/V02G030V01203

Physics: Physics of biological processes/V02G030V01102

Mathematics: Mathematics applied to Biology/V02G030V01103