



## IDENTIFYING DATA

### Chemistry: Chemistry applied to biology

Subject	Chemistry: Chemistry applied to biology			
Code	V02G030V01104			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish English			
Department				
Coordinator	Domínguez Seoane, Marta			
Lecturers	Alonso Gómez, José Lorenzo Domínguez Seoane, Marta Gómez Pacios, María Generosa Otero Calleiras, Daniel Silva López, Carlos Tojo Suárez, Emilia Vaz Araújo, Belén			
E-mail	mseane@uvigo.es			
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	
A1	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.
A2	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.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
A4	Students should be able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
B2	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.
B3	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.
B4	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.
B7	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.
B10	Development of analytic and abstraction skills, the intuition and the logical and rigorous thought through the study of biology and its uses.
B11	Ability to communicate in detail and clearly: knowledge, methodology, ideas, issues and solutions to all audiences (not only qualified but unskilled in Biology).
B12	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.
C17	Identifying and obtaining natural biological products

C25 Gathering background information, develop experimental work and analysing data results

C31 Knowing and handling technical and scientific apparatus.

C32 Knowing and handling basic or specific key concepts and terminology

C33 Understanding the social projection of Biology.

D1 Development of capacity of analysis and synthesis

D2 Acquisition of the organization and planning capacity for tasks and time

D4 Acquisition of foreign language knowledge related to the study field

D6 Research and interpreting of information from different sources

D7 Resolution of issues and decision making in an effective way

D8 Development of the ability of independent learning

D9 Ability to work in collaboration or creating groups with an interdisciplinary character

D11 Adquisition of an ethical agreement with the society and the profession

D13 Sensitivity for environmental issues

D14 Adquisition of abilities in the interpersonal relationships

D17 Development of the self-criticism ability

### Learning outcomes

Expected results from this subject	Training and Learning Results			
To know and understand the molecular structure of the biological compounds and the importance of the intermolecular and intramolecular bonds.	A1	B3	C32	D1 D2 D7 D8
To know the different types of chemical bond, as well as its relation with the structure of molecules and the macroscopic properties of substances.	A1	B3 B10	C32	D1 D2 D7
To know general concepts about chemical reactions and their kinetic aspects.	A1	B3 B10	C31	D1 D2 D7
To specially know the acid-base and oxidation-reduction reactions, as well as their application to biological processes.	A1	B3 B7 B10	C31 C32	D1 D6 D7 D13 D17
To obtain a general vision of the chemical compounds present in nature and their stereochemical study.	A2	B7 B10	C17 C25 C31 C32	D4 D6 D7 D11
To know the regulation and the security and cleanliness techniques in a chemical laboratory	A3	B2 B3 B4	C31 C32	D2 D6 D9 D13 D14
To know the basic material and instrumentation in a chemical laboratory.	A1	B4	C31 C32	D8 D9 D13 D14
To know and understand the basic techniques in a chemical laboratory.	A1	B3 B4	C25 C31 C32	D9 D11 D13 D14
To know the labelled, packing and storage of chemical reagents and solvents.	A3	B4	C31 C32	D4 D8 D9 D11 D13
To apply knowledge related to chemistry in the area of biology.	A2	B3 B7 B12	C17 C33	D11 D13
To obtain and handle information, develop experiments and interpret results.	A3	B2 B7 B10	C25	D1 D6 D7 D8
To understand the social projection of chemistry and its repercussion in the biologist professional world.	A4	B11 B12	C33	D11 D13

<b>Contents</b>	
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.
PRACTICAL SESSIONS	1. SECURITY RULES IN THE CHEMICAL LABORATORY. 2. PREPARATION OF SOLUTIONS.
PRACTICE 1	
PRACTICE 2	1. COLLOIDAL MIXTURES. CALCULATION OF CRITICAL MICELLAR CONCENTRATION.
PRACTICE 3	1. BUFFER SOLUTIONS. DIHYDROGEN PHOSPHATE/MONO-HYDROGENATE PHOSPHATE.
PRACTICE 4	1. OXIDATION-REDUCTION REACTIONS. EVALUATIONS WITH A PERMANGANATE POTASSIUM SOLUTION.
PRACTICE 5	1. LIQUID-LIQUID EXTRACTION: SEPARATION OF BENZOIC ACID AND CAFFEINE.

<b>Planning</b>			
	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.

<b>Methodologies</b>	
	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.

<b>Personalized assistance</b>	
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.

<b>Assessment</b>	
Description	Qualification Training and Learning Results
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 A1 B3 C17 D2 A2 B4 C25 D7 A3 C31 D8 C33 D9 D11 D13 D14

Seminars	The teacher will value the participation and students knowledge of the subject.	2	A1 A2 A3 A4	B2 B7 B10 B11	C32	D1 D7 D9 D17
Problem solving	To track the student's progress, some questions or short problems will be collected in the classroom during the teaching period.	8	A1 A2 A3	B2 B7 B10 B12	C32 C33	D1 D2 D4 D6 D7 D8 D9 D14 D17
Essay questions exam	A long answer test will be carried out at the end of the quadmester.	50	A1 A2	B2	C17	D1 D2 D7 D13
Problem and/or exercise solving	A midterm short answer test will be carried out during the quadmester.	30	A1 A2	B2	C17	D1 D2 D7 D13

### 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