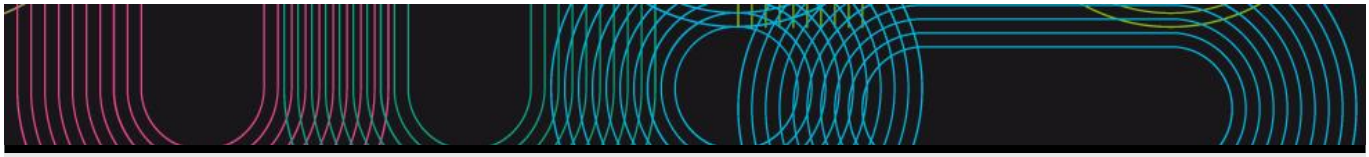

(*)Facultade de Química

Presentation

The studies of Chemistry have a large tradition at the University of Vigo, where it has been taught during more than 30 years. The stablisment of the Universitary System of Galicia in the 90s and the current process of implantation of the European Space of Higher Education (EEES) modified the offer of degrees, but no the pioneering spirit of the chemists in research of in the quest for a better service to the society.

Degrees given in the Faculty

Degree in Chemistry

- Masters And Doctorates:
  - Industry and Chemical Research and Industrial Chemistry
  - Theoretical chemistry and Computational Modelling
- Master:
  - Science and Technology of Conservation of Fishing Products

Web page

Information about the Faculty of Chemistry:

http://quimica.uvigo.es

Grado en Química

Subjects

Year 1st

Code	Name	Quadmester	Total Cr.
V11G201V01101	Biology: Biology	1st	6
V11G201V01102	Physics: Physics I	1st	6
V11G201V01103	Mathematics: Mathematics 1	1st	6
V11G201V01104	Chemistry: Chemistry 1	1st	6
V11G201V01105	Chemistry: Chemistry Lab I	1st	6
V11G201V01106	Geology: Geology	2nd	6
V11G201V01107	Physics: Physics 2	2nd	6
V11G201V01108	Mathematics: Mathematics 2	2nd	6

V11G201V01109	Chemistry: Chemistry 2	2nd	6
V11G201V01110	Chemistry: Chemistry Lab II	2nd	6

IDENTIFYING DATA				
Biology: Biology				
Subject	Biology: Biology			
Code	V11G201V01101			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Arenas Busto, Miguel			
Lecturers	Arenas Busto, Miguel			
E-mail	marenas@uvigo.es			
Web	http://cme.webs.uvigo.es			
General description	The matter of Biology has like aim the preparation of the studens to comprise and explain better the living beings, as they are constituted and as they work, as they study , as they contrast the hypotheses and the experimental facts to elaborate the biological theories.			

Training and Learning Results	
Code	
A2	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
B1	Ability for auronomous learning
B3	Ability to manage information
C20	Know the structure and reactivity of the main classes of biomolecules and the chemistry of important biological processes
D1	Ability to solve problems

Expected results from this subject	Training and Learning Results			
Understand the cell as a fundamental unit in the organisms.	A2	B1 B3	C20	D1
Describe the cellular structure in prokaryotes and eukaryotes.	A2	B1 B3	C20	D1
Differentiate the properties, organisation and function of the distinct cellular organelles.	A2	B1 B3	C20	D1
Associate the cellular structures with the metabolism.	A2	B1 B3	C20	D1
Identify and relate the metabolic routes of the distinct organic molecules.	A2	B1 B3	C20	D1
Recognise the structure and function of the hereditary material and interpret the principles of the central dogma.	A2	B1 B3	C20	D1
Discuss the processes of mutation and their implications for the evolution of organisms.	A2	B1 B3	C20	D1
Understand the methods of recombinant DNA.	A2	B1 B3	C20	D1
Understand the importance of the immune system.	A2	B1 B3	C20	D1

Contents	
Topic	
1. The cell.	Size, form and cellular function. Cell classification. Cell Theory. Procaryotic cell and eukaryotic cell.
2. Biomembranes and systems of cellular transport.	Cell membrane: functions, biochemical composition, physic-chemical properties. Synthesis of the cellular membrane. System of transport through the biological membranes: bombs, protein transporters and channels.

3. The core and the chromosomes. The cellular organelles.	Cell nucleous: structure, composition and functions. Structure and functions of the nucleolus. Structures and functions of chromatin and chromosomes. Structure, composition and functions of: matrix extracellular, cytoskeleton and centrioles, endoplasmatic reticulum, apparatus of Golgi, endosomes and lisosomes, mitochondria, peroxisomes and cloroplasts.
4. Cellular division and cellular cycle.	Definition and characteristics of mitosis. Differences between somatics and germinal cells. Phases of the cellular cycle. Biological meaning ofmitosis. Concept of the apoptosis, cellular proliferation and cancer. Concept and differences between asexual and sexual reproduction. Definition and characteristic of meisosis. Phases of meiosis. Origin of the genetic variability of the meiosis. Differences between mitosis and meiosis.
5. General design of the metabolism: catabolism and anabolism.	Concept of: enzyme, energetic metabolism, metabolic route, catabolism, anabolism. The equivalent of ATP. Extraction of the chemical energy of the organic compounds: glucides, lipids and proteins.
6. Photosynthesis.	Nature of the light. Photosynthetic pigments. Stages of the photosynthesis: luminous phase and dark phase (cycle of Calvin). The problem of the photorespiration: plants C4 and plants CAM.
7. DNA, structure and function.	Composition, structure of the DNA. Function of the DNA. Replication of the DNA. Initiation the technicians of the recombinant DNA.
8. RNA and the expression of the genetic message.	Composition and structure of the RNA. mRNA, tRNA and rRNA. Other types cellular RNAs and its functions. Review of the concepts of transcription and translation. Language of the genic information.
9. Mutation and evolution.	Genic mutations: concept and types. Molecular consequences of the genic mutations. Structural chromosomal mutations. Numerical chromosomal mutations. Origin and consequences of the mutations. Relation of the mutations and cancer. Evolutionary theories. Arguments in favour of wool evolution.
10. The immune system.	Concept of immune system. Components of the immune system. Mechanism of the innate defence of the immune system. Antibodies and interferon. Types of immune response. Alterations of the immune system. Importance of the vaccines.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	26	60	86
Problem solving	10	30	40
Mentored work	3	11	14
Essay questions exam	1	4	5
Essay questions exam	1	4	5

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

Methodologies

	Description

Lecturing	In these classes, the professor will clearly explain and develop the concepts and basic foundations of the contents to facilitate understanding. The contents for each topic will be provided on the online platform with sufficient time so that the students can consult them. It is recommended that the student works on this material, also consulting the bibliography recommended.
Problem solving	These classes include the following appearances. a) Each student will perform exercises to understand the topics. These exercises will be considered for the evaluation. b) Explanations of doubts about the previously explained concepts in Lecture classes. c) The students separately or in groups will make illustrative pictures of the subjects analyzed in the Lecture classes to have an overview of the contents, which will facilitate the understanding and interrelationships. d) In this section, we will work on some concepts that by experience are more difficult to understand and require greater didactic support. e) If necessary these classes will also be used to present works.
Mentored work	Performance (research of information, preparation, and presentation) of a work with an oral presentation in groups. It will be related to the fields of biotechnology, cellular biology, molecular biology, genetics, and immunology and will be proposed by the professor. The professor could contribute part of the necessary information for this execution. The work will be considered for the evaluation.

Personalized assistance

Methodologies	Description
Mentored work	For the activity of oral presentation of a work. Discussion and solving of questions, exercises and problems related with the activity. Each student will ask the professor the explanations that estimate timely to comprise better the activity and develop successfully the tasks that were proposed. These queries will be attended in schedule of personalized sessions.
Problem solving	Discussion and solving of questions, exercises and problems related with the subject. Each student will ask the professor the explanations that estimate timely to comprise better the subject and develop successfully the tasks that were proposed. These queries will be attended in schedule of personalized sessions.

Assessment

	Description	Qualification	Training and Learning Results			
Problem solving	Resolution by the students of a series of problems and/or exercises as academic follow-up of the student (skills CB1, CG1, CG3, CE20 y CT1).	15	A2	B1 B3	C20	D1
Mentored work	The student performs an activity of oral presentation of a work. The evaluation considers the structuring and organization of the contents, the complexity of the work, the presentation of results and the sources consulted (skills CB1, CG1, CG3, CE20 y CT1). These works will be presented in the seminar sessions. Further information in "Other comments on the Evaluation".	10	A2	B1 B3	C20	
Essay questions exam	Mid-course exam (partial) on the contents explained in the lectures and seminars. It will consist mainly of short answer questions, although it could include some long answer questions (skills CB1, CG1, CG3, CE20 y CT1).	35	A2	B1 B3	C20	D1
Essay questions exam	Final exam on the contents explained in the lectures and seminars. It will consist mainly of short answer questions, although it could include some long answer questions (skills CB1, CG1, CG3, CE20 y CT1).	40	A2	B1 B3	C20	D1

Other comments on the Evaluation

The student who perform the final evaluation exam will be considered as presented.
The final mark of the subject will be given by the weighted average of the evaluation in the cited sections. Thus, to pass the subject, the weighted average must be equal or higher than 5.0.

In the second call, the evaluation will be obtained by any of the following two options (selecting that one better for the student):

1. The score reached by the student during the course in the supervised works and seminars is conserved (25% of the final mark). None of them are recoverable. An analogous exam will be done at the end of the semester (skills CB1, CG1, CG3, CE20 y CT1). This exam will provide the 75% of the final mark.

2. An analogous exam will be done at the end of the semester (skills CB1, CG1, CG3, CE20 y CT1). This exam will provide the 100% of the final mark.

Evaluation of the Mentored work

The student (in a team) performs an activity of oral presentation of a work related with the subject (10% of the final mark). The mark will consider the activity, complexity, structuring and organization of the contents, and the sources consulted by the student (skills CB1, CG1, CG3, CE20 y CT1).

Evaluation of students of the Senior Programme

Students from the Senior Programme will be evaluated as follows:
- Mandatory attendance of the 75% of theoretical classes and seminars.
- Preparation and oral presentation of an individual or group work related with the subject that will be used to obtain the evaluation mark (skills CB1, CG1, CG3, CE20 y CT1).

Sources of information

Basic Bibliography

John Kimball, **http://biology-pages.info/**,

Bruce Alberts, Dennis Bray, Karel Hopkin, Alexander Johnson, Julian Lewis, Martin Raff, Keith Robert, **Introducción a la Biología Celular**, Tercera Edición, 2011,

Peter J Rusell, **iGenetics. A molecular approach**, Third Edition, 2010,

Leonardo Fainboin, Jorge Geffner, **Introducción a la Inmunologia Humana**, Sexta Edición, 2011,

James D. Watson, **Biología Molecular del gen**, Séptima edición, 2016,

Christopher Mathews, K. E. van Holde, **Bioquímica**, Segunda edición,

Complementary Bibliography

Helmut Plattner, Joachim Hentschal, **Biología Celular**, Cuarta Edición, 2014,

Recommendations

Subjects that are recommended to be taken simultaneously

Physics: Physics I/V11G201V01102
Mathematics: Mathematics 1/V11G201V01103
Chemistry: Chemistry 1/V11G201V01104

Other comments

It is recommended to have studied the subject "Biology" of the 2º course of Bachillerato.

IDENTIFYING DATA				
Physics: Physics I				
Subject	Physics: Physics I			
Code	V11G201V01102			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Martínez Piñeiro, Manuel			
Lecturers	Martínez Piñeiro, Manuel Pérez Iglesias, María Teresa Salgueiriño Maceira, Verónica Torres Palenzuela, Jesús Manuel Ulla Miguel, Ana María			
E-mail	mmpineiro@uvigo.es			
Web	http://faitic.uvigo.es			
General description	Physics of first course in the Chemistry Degree, with contents of kinematics, Newton laws and waves			

Training and Learning Results	
Code	
A1	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
A2	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
B1	Ability for auronomous learning
C22	Know and apply the foundations of Physics necessary to understand the theoretical and practical aspects of Chemistry that need it
C29	Demonstrate ability for numerical calculations and interpretation of experimental data, with correct use of units and estimation of uncertainty
D3	Ability to communicate in both oral and written form in Spanish and / or Galician and / or English

Expected results from this subject	Training and Learning Results			
1. Describe the frame of validity of Classical mechanics.	A1 A2	B1	C22 C29	D3
2. Calculate, from the initial state of a mechanical system, the values of his distinct dynamic magnitudes (energy, linear and angular moments).	A1 A2	B1	C22 C29	D3
3. Calculate, given a group of strengths that act on a mechanical system, his temporary evolution, obtaining the corresponding paths and the temporary variation of his physical properties.	A1 A2	B1	C22 C29	D3
4. Explain the importance of the theorems of conservation and apply any of them.	A1 A2	B1	C22 C29	D3
5. Calculate the strength of push on an object in a fluid and relate the pressure, the height and the speed in a fluid in movement.	A1 A2	B1	C22 C29	D3
6. Define and calculate the parameters that characterise the harmonic and standing waves.	A1 A2	B1	C22 C29	D3
7. Determine experimentally different physical magnitudes (density of solids and liquids, superficial tension, specific heat, etc.).	A1 A2	B1	C22 C29	D3

Contents	
Topic	
Topic 1. Introduction	1. The nature of Physics 2. Consistency and unit conversion 3. Uncertainty and significant figures 4. Vectors (vector sum, vector components, unit vectors, vector product)

Topic 2. Kinematics of a point particle	1. Motion in one dimension Position, median and instant velocity Median and instant acceleration Motion with constant acceleration 2. Motion in two and three dimensions Position and velocity vectors Acceleration vector Parabolic motion Circular motion
Topic 3. Newton's laws of motion	1. Force and interactions 2. First law of Newton 3. Second law of Newton 4. Third law of Newton 5. Linear and angular momentum
Topic 4. Work and kinetic energy	1. Work done by a force. Power 2. Kinetic energy 3. Conservative and non-conservative forces 4. Potential energy 5. Potential energy in the gravitational field 6. Mechanical energy 7. Force and potential energy 8. Principle of conservation of the mechanical energy
Topic 5. Rigid body kinetics	1. System 2. Rigid body 3. Traslation motion 4. Rotation motion around a fixed axis
Topic 6. Particulate system kinetics	1. Systems of particles 2. Center of mass of the system. Motion of c.m.s 3. Ecuations of motion of a system of particles 4. Linear momentum. Conservation of linear momentum 5. Angular momentum. Conservation of angular momentum 6. Work and power 7. Potential and kinetic energy 8. Total mechanical energy
Topic 7. Rigid body dynamics	1. Rotation of a rigid body 2. Moment of inertia 3. Calculation of moment of inertia 4. Theorem of Steiner 5. Momentum of force and of pair of forces 6. Equations of motion of the rigid body 7. Kinetic energy of the rigid body 8. Work 9. Angular momentum. Conservation
Topic 8. Periodic motion	1. Oscillations 2. Simple harmonic motion (SHM) 3. Energy of SHM 4. Applications of the SHM 5. Pendulum 6. Damped oscillations 7. Driven oscillations. Resonance
Topic 9. Mechanical waves	1. Mechanical waves 2. Periodic waves 3. Mathematical description of a wave 4. Velocity of a transverse wave 5. Energy of the wave motion 6. Interference, superposition 7. Stationary waves 8. Normal modes
Lab. Introduction to error analysis	Lab exercises for the introduction to error analysis: 1. Geometrical dimensions 2. Density of a liquid and a solid 3. Surface tension 4. Viscosity

Planning			
	Class hours	Hours outside the classroom	Total hours
Presentation	1	0	1

Lecturing	26	52	78
Seminars	23	34	57
Laboratory practical	12	0	12
Objective questions exam	1	0	1
Essay questions exam	1	0	1

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

Methodologies	
	Description
Presentation	general description of the subject, including content, methodology, development and evaluation
Lecturing	In the FAITIC platform information and materials concerning the theoretical lessons will be available for students . a) The specific objectives in each subject are detailed, indicating their motivation and possible applications. b) The methods proposed to reach the different objectives are explained. c) Suggested bibliographic references are listed and commented.
Seminars	a) Exercises and problems, available previously in FAITC platform, will be solved b) Doubts and concepts of difficult understanding will be discussed and explained in detail c) Different problems of the bulletins will be proposed for the students to be resolved individually
Laboratory practical	A script is proposed to prepare the experimental setting, intended to obtain a series of experimental measures on a physical magnitude. Then, the statistical analysis of the data is explained, to determine the uncertainty of the measures made, and the propagation of statistical errors from the experimental data until the final values of the magnitudes to be calculated

Personalized assistance	
Methodologies	**Description**
Seminars	Bulletins of questions and problems to be solved by the students will be proposed, and in case of neccessity, students may attend to personal tutories to clarify concepts and help them with their resolutions.
Lecturing	Concepts related with the theory sessions will be asked to the students. In case of need students may attend to personal tutories to clarify concepts and help them with their resolutions.
Tests	**Description**
Objective questions exam	Short questions and problems to be solved by the students
Essay questions exam	

Assessment						
	Description	Qualification	Training and Learning Results			
Lecturing	Answers to concepts proposed during the session	0				
Seminars	Realisation of exercises of individual form or in group and assistance	0				
Laboratory practical	Preparation of a report containing a description of the experimental setting made, experimental data measured, derivative properties calculated, and statistical analysis of errors of each one of the magnitudes analysed	20	A2	B1	C29	D3
Objective questions exam	1 short proof written at half term	40	A1 A2	B1	C22 C29	D3
Essay questions exam	Problen and case study resolution exam at the end of the semester	40	A1 A2	B1	C22 C29	D3

Other comments on the Evaluation

- If the student does not have qualification along the semester in any in the different sections he will be qualified as Non Presented, (NP).

- July. Evaluation of the second call,a) The qualification of the first partial examination will be conserved if it has been passedb) The student will have the opportunity to pass the subject by doing only this final written examination, or alternatively may apply to this call to improve the global qualification

Sources of information

Basic Bibliography

Young H.D., Freedman R.A., **Física universitaria**, 12, Pearson Educación, 2013

Tipler, P.A., Mosca G., **Física para la ciencia y la tecnología (Vol. 2)**, Reverté, 2010

Taylor, J. R., **An introduction to Error Analysis**, 2, University Science Books, 1997

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

Physics: Physics 2/V11G201V01107

Subjects that are recommended to be taken simultaneously

Mathematics: Mathematics 1/V11G201V01103

IDENTIFYING DATA				
Mathematics: Mathematics 1				
Subject	Mathematics: Mathematics 1			
Code	V11G201V01103			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Galician			
Department				
Coordinator	Quinteiro Sandomingo, María del Carmen			
Lecturers	Quinteiro Sandomingo, María del Carmen			
E-mail	quinteir@uvigo.gal			
Web	http://moovi.uvigo.gal/			
General description	"Machine translation into English of the original teaching guide". The course has theoretical contents, as well as practical, of linear algebra, multivariable calculus and integration. Undertaking this course will allow the students to improve his/her capacity to understand and use of mathematical language and let them to acquire certain proficiency in calculus and initiate oneself in the use of related computer applications. English Friendly course. International students may request from the teachers: a) material and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A1	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
B4	Ability for analysis and synthesis
C21	Know mathematical concepts based on previous ones and be able to use them in the different contexts of Chemistry
D1	Ability to solve problems

Expected results from this subject	Training and Learning Results			
To calculate eigenvalues of a square matrix and classify quadratic forms attending to the sign.			C21	D1
To operate with real and complex numbers.			C21	D1
To apply the differential calculus to the local approximation of functions and to the resolution of optimization problems.	A1	B4	C21	D1
Employ integral calculus to determine areas and volumes.			C21	D1
To handle computing programs of calculus and graphic representation.			C21	D1

Contents	
Topic	
Real numbers and complex numbers	The real numbers and the real line. Operations with real numbers. Complex numbers. Operations with complex numbers.
Eigenvalues and symmetric matrices	Computation of eigenvalues of a matrix. Diagonalizable matrices. Quadratic forms. Sign of a quadratic form.
Calculus of several variables	Introduction to the real functions of several variables. Differentiable functions. Higher order derivatives. The chain rule. Implicit differentiation. Computation of extreme points
Integration in one and several variables	Riemann integral. Fundamental Theorem of the Integral Calculus. Calculation of primitives. Integrals of functions of several variables on bounded domains.

Planning	Class hours	Hours outside the classroom	Total hours

Lecturing	22	28	50
Problem solving	26	26	52
Practices through ICT	6	3	9
Problem and/or exercise solving	0	10	10
Problem and/or exercise solving	0	7	7
Essay questions exam	2	20	22

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

Methodologies

	Description
Lecturing	The teaching staff will expose the theoretical bases of the subject. They will present possible applications, formulate problems, questions and exercises. They will propose tasks and activities oriented towards the methods and techniques to employ to carry them out.
Problem solving	Activity in which we will propose problems and/or exercises related with the subject. The student should develop the correct solutions by means of exercice 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 will be employed as a supplement of the lectures.
Practices through ICT	Activities oriented towards learning and handling mathematical computer programs, for calculus and graphical representation of functions and data.

Personalized assistance

Methodologies	Description
Lecturing	Each student will request the teaching staff the clarifications that he/she sees fit for a better understanding of the subject and successfully develop the proposed tasks. These queries will be responded during the tutorials. The tutorial sessions will be able to be realized remotely having made a previous agreement with the professor.
Practices through ICT	Each student will request the teaching staff the clarifications that he/she sees fit for a better understanding of the subject and successfully develop the proposed tasks. These queries will be responded during the tutorials. The tutorial sessions will be able to be realized remotely having made a previous agreement with the professor.
Problem solving	Each student will request the teaching staff the clarifications that he/she sees fit for a better understanding of the subject and successfully develop the proposed tasks. These queries will be responded during the tutorials. The tutorial sessions will be able to be realized remotely having made a previous agreement with the professor.

Assessment

	Description	Qualification	Training and Learning Results			
Problem and/or exercise solving	Each student should resolve given tasks during the time and under the conditions established by the teaching staff. These activities will be related to the first three lessons of the program and will be done during the class hours corresponding to Lecturing or Problem solving.	35	A1			D1
Problem and/or exercise solving	Each student should resolve given tasks during the time and under the conditions established by the teaching staff. These activities will be related to the last lessons of the program and to the handling of computer programs. It will be done during the class hours corresponding to Lecturing, Problem solving or Practices through ICT .	25	A1			D1
Essay questions exam	Final exam. It will include questions and exercises that the students will answer organizing and presenting the knowledge that they have on the subject. It will take place on the official exam dates for each evaluation opportunity.	40	A1	B4	C21	D1

Other comments on the Evaluation

The final qualification of the subject (NF) will be computed by the formula:

NF=A+(10-A)E/10

where A is the sum of the scores obtained by "Problem and/or exercise solving" (up to 6 points) and E is the "Essay questions exam" score (up to 10 points).

To pass the subject the final score has to be greater or equal to 5 points (NF>=5). The students who fail to pass the subject on the first opportunity, and want to do it on the second one, will have to repeat the "Essay questions exam". The score obtained by "Problem and/or exercise solving" will be the same for the second opportunity.

The qualification NOT PRESENTED can not be given to a student who attended at least one of the final exams.

Sources of information

Basic Bibliography

Adams, R. A., **Cálculo**, 6ª, Pearson, 2009

Besada, M.; García, J.; Mirás, M.; Quinteiro, C.; Vázquez, C., **Matemáticas para os graos de Ciencias**, Servicio de Publicacións. Universidade de Vigo, 2016

Larson, R.; Hostetler, R.; Edwards, B., **Cálculo esencial**, Cengage Learning, cop., 2010

Rogawski, J., **Cálculo: una variable**, 2ª, Editorial Reverté, 2016

Rogawski, J., **Cálculo: varias variables**, 2ª, Editorial Reverté, 2012

Steiner, E., **The Chemistry Maths Book**, Oxford University Press, 2008

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

Mathematics: Mathematics 2/V11G201V01108

Subjects that are recommended to be taken simultaneously

Biology: Biology/V11G201V01101
Physics: Physics I/V11G201V01102
Chemistry: Chemistry Lab I/V11G201V01105
Chemistry: Chemistry 1/V11G201V01104

IDENTIFYING DATA				
Química: Química I				
Subject	Química: Química I			
Code	V11G201V01104			
Study programme	Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1	1c
Teaching language	#EnglishFriendly Castelán Galego			
Department	Química inorgánica Química orgánica			
Coordinator	Alonso Gómez, José Lorenzo García Martínez, Emilia			
Lecturers	Alonso Gómez, José Lorenzo García Martínez, Emilia			
E-mail	lorenzo@uvigo.es emgarcia@uvigo.es			
Web	http://moovi.uvigo.gal			
General description	É unha materia de seis créditos que se imparte no primeiro cuadrimestre do primeiro curso e pertence ao módulo de materias básicas do Grao en Química. O obxectivo da materia é proporcionar ao estudante os coñecementos así como as habilidades en química necesarios para que poida continuar con éxito a aprendizaxe das materias Química Analítica, Química Física, Química Inorgánica e Química Orgánica, dos seguintes cursos. Materia do programa English Friendly. Os/ as estudantes internacionais poderán solicitar ao profesorado: a) materiais e referencias bibliografías para o seguimento da materia en inglés, b) atender as titorías en inglés, c) probas e avaliacións en inglés.			

Resultados de Formación e Aprendizaxe	
Code	
A2	Que os estudantes demostren posuír e comprender coñecementos nunha área de estudo que parte da base da educación secundaria xeral e adoita atoparse a un nivel que, malia se apoiar en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vangarda do seu campo de estudo
B1	Capacidade de aprendizaxe autónomo
B2	Capacidade de organización y planificación
C1	Capacidade para coñecer e comprender os feitos esenciais, conceptos, principios e teorías relacionadas coa Química
C2	Empregar correctamente a terminoloxía química, nomenclatura, conversións e unidades
C8	Coñecer as propiedades características dos elementos e os seus compostos, incluíndo as relacións entre grupos e as súas variacións na táboa periódica
C9	Coñecer os aspectos estruturais dos elementos químicos e os seus compostos, incluíndo a estereoquímica
D1	Capacidade para resolver problemas

Resultados previstos na materia				
Expected results from this subject	Training and Learning Results			
Axustar ecuaciones químicas e realizar cálculos estequiométricos.	A2	B1 B2	C2	D1
Describir a estrutura electrónica de calquera átomo ou ion.	A2	B1 B2	C1 C8 C9	D1
Establecer como formanse enlaces entre os átomos dunha molécula segundo as diferentes teorías, así coma orixe das forzas intermoleculares.	A2	B1 B2	C1 C2 C8 C9	D1
CE26. Saber emplegar as habilidades persoais, actitudes e coñecementos adquiridos no contexto académico mediante a simulación de situacións reais dla práctica profisional e a través do contacto coa realidade empresarial que proporcionan as prácticas de empresa.				
Relacionar as teorías de enlace coas características e estruturas dos compostos químicos.	A2	B1 B2	C1 C2 C9	D1
Explicar as propiedades dos gases, os líquidos e os sólidos, así como os cambios de fase.	A2	B1 B2	C1 C2 C9	D1

Recoñecer os principais grupos funcionales dos compostos orgánicos, dominar a nomenclatura e formulación orgánica básica e identificar os aspectos estereoquímicos e a representación tridimensional de moléculas orgánicas.	A2	B1 B2	C1 C2 C8 C9	D1

Contidos	
Topic	
TEMA 1. REACCIÓNS QUÍMICAS.	Ecuacións químicas. Cálculos estequiométricos. Reactivo limitante. Rendemento. Os gases nas reaccións químicas. Propiedades de gases ideais e reais. Teoría cinético-molecular.
TEMA 2. ESTRUTURA ATÓMICA.	Partículas subatómicas. As estruturas electrónicas dos átomos.
TEMA 3. A TABOA PERIÓDICA E A PERIODICIDADE.	Propiedades periódicas dos elementos.
TEMA 4. ENLACE QUÍMICO I.	Conceptos básicos. Enlace iónico e aspectos enerxéticos. Enlace metálico.
TEMA 5. ENLACE QUÍMICO II.	Enlace covalente. Estruturas de Lewis. Xeometría molecular, teorías de enlave-valencia e teoría dos orbitais moleculares.
TEMA 6. ENLACES INTERMOLECULARES vs INTRAMOLECULARES. ESTADOS DE AGREGACIÓN.	Factores que determinan a presenza e natureza de enlaces intermoleculares. Propiedades dos compostos segundo os tipos de enlace presentes no sistema.
TEMA 7. ESTRUTURA E XEOMETRÍA DOS COMPOSTOS ORGÁNICOS.	Grupos funcionales: natureza, representación e nomenclatura.
TEMA 8. ISOMERÍA NOS COMPOSTOS ORGÁNICOS.	Isomería conformacional, isomería estrutural e estereoisomería. Exemplos en compostos acíclicos.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	26	26	52
Resolución de problemas	26	32	58
Exame de preguntas de desenvolvemento	1	19	20
Exame de preguntas de desenvolvemento	1	19	20
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Lección maxistral	Exposición, por parte do profesorado, dos contidos sobre a materia obxecto de estudo, bases teóricas e/ou directrices dun traballo, exercicio ou proxecto a desenvolver polo alumnado.
Resolución de problemas	Actividade na que se formulan problema e/ou exercicios relacionados coa materia. O alumnado debe desenvolver as solucións axeitadas ou correctas mediante a exercitación de rutinas, a aplicación de fórmulas ou algoritmos, a aplicación de procedementos de transformación da información dispoñible e a interpretación dos resultados. Adóitase empregar como complemento da lección maxistral.

Atención personalizada	
Methodologies	**Description**
Resolución de problemas	Cada estudante poderá solicitar ao profesorado as aclaraciones que estime oportunas para unha mellor comprensión da materia e o desenvolvemento con éxito dos exercicios e problemas propostos. Esta consulta pode tamén ser atendida en horario de titorías. O horario e o lugar, no que teñen lugar as titorías de cada docente, está recollido na páxina web do centro.
Lección maxistral	Cada estudante poderá solicitar ao profesorado as aclaracións que estime oportunas para unha mellor comprensión da materia e o desenvolvemento con éxito dos exercicios e problemas propostos. Esta consulta pode tamén ser atendida en horario de titorías. O horario e o lugar, no que teñen lugar as titorías de cada docente, está recollido na páxina web do centro.
Tests	**Description**
Exame de preguntas de desenvolvemento	Cada estudante dispón de titorías co profesorado da materia para resolver de forma individualizada as dúbidas que poidan xurdir ao longo do curso en calquera dos seus aspectos: Clases de teoría, clases de seminario ou resolución de problemas e/ou actividades autónomas que deben realizar os estudantes. O obxectivo destas titorías é contribuír a que o alumnado poida afianzar coñecementos.
Exame de preguntas de desenvolvemento	Cada estudante dispón de titorías co profesorado da materia para resolver de forma individualizada as dúbidas que poidan xurdir ao longo do curso en calquera dos seus aspectos: Clases de teoría, clases de seminario ou resolución de problemas e/ou actividades autónomas que deben realizar os estudantes. O obxectivo destas titorías é contribuír a que o alumnado poida afianzar coñecementos.

Avaliación

	Description	Qualification	Training and Learning Results			
Resolución de problemas	Para cada tema proporanse problemas, exercicios e / ou test autoavaliables, que o alumnado deberá resolver nas clases de seminario e fora da aula. É preciso unha nota mínima de 5 sobre 10 nos exames de preguntas de desenvolvemento para ter en conta este apartado no cómputo da nota final.	36	A2	B1 B2	C1 C2 C8 C9	D1
Exame de preguntas de desenvolvemento	Proba escrita sobre a materia dos temas 1, 2 e 3. É preciso unha nota mínima de 5 sobre 10 para superar a materia.	24	A2	B1 B2	C1 C2 C8 C9	D1
Exame de preguntas de desenvolvemento	Proba escrita sobre a materia dos temas 4, 5, 6, 7 e 8. É preciso unha nota mínima de 5 sobre 10 para superar a materia.	40	A2	B1 B2	C1 C2 C8 C9	D1

Other comments on the Evaluation

Primeira oportunidade (Maio-Xuño)

Avalición continua:

No caso de non acadar a cualificación mínima esixida nalgunha proba para superar a materia, a cualificación final reflectirá o máis fielmente posible a cualificación real obtida ao longo do curso.

Enténdese que un/unha estudante se presentou á avaliación da materia e, por tanto, consignaráselle unha cualificación, nos seguintes supostos:

1. Se se presenta a algún exame de preguntas de desenvolvemento.

2. Se se participa en probas ou actividades de avaliación continua máis alá dos prazos establecidos polo centro para a solicitude de modalidade de avaliación global.

É preciso unha nota mínima de 5 sobre 10 para superar a materia.

Avaliación global:

O alumnado que teña concedido polo decanato a avaliación global terá un exame de preguntas de desenvolvemento (100%) que se realizará na data oficial do exame para cada oportunidade de avaliación dentro do período de probas oficiais marcado no calendario académico de cada curso.

É preciso unha nota mínima de 5 sobre 10 para superar a materia.

Avaliación do alumnado do Ciclo integrado do Programa de Maiores:

- Asistencia obrigatoria ao 80% das clases teóricas e seminarios.

- Realización dos problemas, exercicios ou test autoavaliables.

- Realización dun traballo sobre algún tema relacionado coa asignatura.

Segunda Oportuniade (Xullo): Síguense os mesmos criterios que na primeira convocatoria.

Bibliografía. Fontes de información

Basic Bibliography

Chang, R. y Goldsby, K.A., **Química**, 13ª, McGraw-Hill, 2021

Chang, R. y Goldsby, K.A., **Química. https://www.ingebook.com/ib/NPcd/IB_Escritorio_Visualizar?cod_primaria=1000193&libro=10619**, 13ª, McGraw-Hill, 2021

Petrucci, R.H., et al., **Química General: principios y aplicaciones modernas**, 11ª, Pearson Educación, 2017

Petrucci, R.H., et al., **Química General: principios y aplicaciones modernas. https://www.ingebook.com/ib/NPcd/IB_Escritorio_Visualizar?cod_primaria=1000193&libro=6751**, 11ª, Pearson Educación, 2017

Quiñoá, E. y Riguera, R., **Nomenclatura y representación de los compuestos orgánicos.**, 2ª, McGraw-Hill Interamericana, 2005

Complementary Bibliography

Recomendacións

Subjects that continue the syllabus

Química: Química II/V11G201V01109

Subjects that are recommended to be taken simultaneously

Matemáticas: Matemáticas I/V11G201V01103
Química: Laboratorio de química I/V11G201V01105

IDENTIFYING DATA				
Chemistry: Chemistry Lab I				
Subject	Chemistry: Chemistry Lab I			
Code	V11G201V01105			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Galician			
Department				
Coordinator	Besada Pereira, Pedro Valencia Matarranz, Laura María			
Lecturers	Alonso Gómez, José Lorenzo Besada Pereira, Pedro Pérez Lourido, Paulo Antonio Rodríguez Arguelles, María Carmen Teijeira Bautista, Marta Valencia Matarranz, Laura María			
E-mail	qilaura@uvigo.es pbes@uvigo.es			
Web	http://https://moovi.uvigo.gal/course/view.php?id=9853			
General description	The aim of this subject is that the students learn to work in a chemistry laboratory. Safety regulations must be respected and the suitable material used. Students will also study the chemical behaviour of different compounds as well as the synthesis of some of them. Finally, they will learn to interpret the data obtained and to collect the experiences in the laboratory notebook.			

Training and Learning Results	
Code	
A2	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
B2	Organization and planning capacity
C25	Safely handle chemical substances, considering their physical and chemical properties, evaluating the risks associated with their use and laboratory procedures and including their environmental repercussions
C26	Perform correctly usual procedures in the laboratory, including the use of standard chemical instrumentation for synthetic and analytical work
C27	Demonstrate the ability to observe, monitor and measure chemical processes, by systematically and reliably recording them and presenting reports of the work done
C28	Interpret data derived from laboratory observations and measurements in terms of their meaning and relate them to the appropriate theory
C29	Demonstrate ability for numerical calculations and interpretation of experimental data, with correct use of units and estimation of uncertainty
D2	Capacity for teamwork
D3	Ability to communicate in both oral and written form in Spanish and / or Galician and / or English

Expected results from this subject	Training and Learning Results			
Apply the norms of safety in the laboratory.			C25 C26	
Use properly the basic material of laboratory, included the one of measurement, and manipulate properly the chemical products and waste.			C25 C26	
Employ basic laboratory technics and interpret the data obtained.	A2	B2	C25 C26 C27 C28 C29	D2 D3
Elaborate the laboratory notebook.			C27 C28 C29	D2 D3
Recognise the structure of the main chemical compounds and relate them with their reactivity.	A2			
Apply nomenclature norms for chemical compounds.	A2			D3

Carry out the synthesis of simple chemical compounds.	A2	B2	C25 C26 C27 C28 C29	D2 D3

Contents
Topic
P1. Laboratory safety and laboratory material recognition
P2. Preparation of solutions
P3. Reactions in organic solvents
P4. Separation by crystallization
P5. Distillation of solvents
P6. Liquid-liquid extraction
P7. Separation by liquid-liquid extraction
P8. Molecular models
P9. Separation by thin layer chromatography
P10. Formation of polymers
P11. Reactions in aqueous solutions
P12. Obtaining calcium carbonate
P13. Obtaining double salt
P14. Determination of water content in a salt
P15. Separation of the three components of a mixture
P16. Determining the stoichiometry of a chemical reaction
P17. Obtaining copper(II) oxide
P18. Obtaining a solubility curve

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	0	36	36
Laboratory practical	54	0	54
Problem solving	0	18	18
Laboratory practice	3	18	21
Laboratory practice	3	18	21
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Introductory activities	Each laboratory practice will be associated with a theoretical explanation that facilitates the students` understanding and realisation of it. Students must complete an initial questionnaire related to this experiment previously to the laboratory session, which can be found on Moovi.
Laboratory practical	Experimental practice. The laboratory experiments will be carried out individually, in sessions of 3 hours. The experimental procedure will be available to students on Moovi. It will be necessary the preparation of a laboratory notebook in accordance with the norms that are collected in Moovi.
Problem solving	After completing each practical session, the student will have to solve some questions found on Moovi.

Personalized assistance	
Methodologies	**Description**
Laboratory practical	During the practical sessions, the professor will resolve the questions regarding the experiment as well as the preparation of the laboratory notebook.
Introductory activities	The professor will resolve any doubts related to the introductory questions of each practical session prior to carrying them out. Students can consult and/or request tutorials at the following link: http://quimica.uvigo.es/en/teaching/teaching-staff/
Problem solving	The students will be able to consult the doubts related to the realisation of the final questionnaire for each practice. Students can consult and/or request tutorials at the following link: http://quimica.uvigo.es/en/teaching/teaching-staff/
Tests	**Description**

Laboratory practice	In the schedule of tutorials, students will be able to consult with the professor the questions related to the exam. Students can consult and/or request tutorials at the following link: http://quimica.uvigo.es/en/teaching/teaching-staff/
Laboratory practice	In the schedule of tutorials, students will be able to consult with the professor the questions related to the exam. Students can consult and/or request tutorials at the following link: http://quimica.uvigo.es/en/teaching/teaching-staff/

Assessment

	Description	Qualification	Training and Learning Results			
Introductory activities	A questionnaire carried out in Moovi on the material provided for each practice will be evaluated before the beginning of each session	10	A2		C29	D3
Laboratory practical	The realisation of experiments in the laboratory as well as the preparation of the laboratory notebook will be evaluated.	30	A2	B2	C25 C26 C27 C28 C29	D3
Problem solving	The questions that the student will have to do in Moovi, after the completion of each practice, will be evaluated.	10	A2		C29	D3
Laboratory practice	The student will take a practical laboratory exam in the middle of the semester	25		B2	C25 C26 C27 C28 C29	D3
Laboratory practice	The student will take a practical laboratory exam at the end of the semester	25		B2	C25 C26 C27 C28 C29	D3

Other comments on the Evaluation

A minimum grade of 3.5 out of 10 will be required in each two practical exams, as well as in each other two evaluacion sections (introductory activities, laboratory practices and problem solving). If some of the parts do not exceed this minimum, the final grade will be a weighted grade (50%) of two practical laboratory exams.

Attendance at all laboratory sessions is mandatory. The absences must be justified.

Participation in continuous assessment test or activities or attendance at laboratory sessions after the deadline established by the center for the global evaluation modality request, implies on condition of being presented.

If the student waives the continuous evaluation and opts for a global evaluation, he must take a practical test in the laboratory (qualification 100%). In the global evaluation mode, attendance at all laboratory sessions is also mandatory as they are experimental practices.

In the call for June-July, a practical laboratory test will be carried out (qualification100%).

Sources of information

Basic Bibliography

Brown, T.L.; Lemay, H.E.; Bursten, B.E.; Murphy, C.J.; Woodward, P.M.; Stoltzfus, **Chemistry: The Central Science**, 9781292407623, 15, Pearson Education Limited, 2021

Chang, R.; Overby, J., **Química**, 13, McGrawHill, 2020

Martínez Grau, M. A. y Csákÿ, A. G., **Técnicas experimentales en síntesis orgánica**, Sintesis, 2001

Petrucci, R.; Herring, F.; Madura, J.; Bissonnette, C., **General Chemistry: Principles and Modern Applications**, 9781292726137, 12, Pearson Education Limited, 2023

Whitten, K.W, **Química**, 10, Cengage Learning, 2015

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

Chemistry: Chemistry Lab II/V11G201V01110

Subjects that are recommended to be taken simultaneously

Chemistry: Chemistry 1/V11G201V01104

IDENTIFYING DATA				
Geology: Geology				
Subject	Geology: Geology			
Code	V11G201V01106			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Gago Duport, Luís Carlos			
Lecturers	Gago Duport, Luís Carlos Gil Lozano, Carolina			
E-mail	duport@uvigo.es			
Web	http://moovi.uvigo.gal/login/index.php			
General description	The study of the structure of matter in a crystalline state -objective of Crystallography- is of great relevance for the understanding of the most diverse phenomena in the field of Chemistry, therefore, after a general view of the Earth as a geochemical system, the Approach of the subject Geology corresponding to the first year of the degree in Chemistry is mainly oriented towards the study of crystalline structures and crystallization mechanisms. These topics are approached from the point of view of Crystallography, Mineralogy and Geochemistry. Starting from the thermodynamic and kinetic mechanisms that lead to the formation of crystalline phases, structural aspects, crystallographic notation and diffraction are studied. As a corollary, the importance of these processes is introduced for the study of natural (mineral) crystals and synthetic materials, such as semiconductors, pharmaceuticals, biological macromolecules, and ceramic materials, among others. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A2	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
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
B1	Ability for auronomous learning
B3	Ability to manage information
B4	Ability for analysis and synthesis
C4	Use computer tools properly to obtain information, process data, perform computational calculations and calculate matter properties
C9	Know the structural aspects of chemical elements and their compounds, including stereochemistry
C10	Know the characteristics of the different states of matter and the theories used to describe them
C15	Know the main techniques of structural research, including spectroscopy
C16	Know the relationship between macroscopic properties and properties of individual atoms and molecules, including macromolecules (natural and synthetic), polymers, colloids, crystals and other materials
D3	Ability to communicate in both oral and written form in Spanish and / or Galician and / or English

Expected results from this subject	Training and Learning Results			
Describe and explain the Earth as a system.	A2 A3	B4	C10 C16	D3
Differentiate the processes that generate minerals and rocks in nature.	A3	B3	C9 C10 C15 C16	
Distinguish the stages of nucleation and crystalline growthin in the crystallization process.			C9 C10 C16	
Use concepts as periodicity, symmetry and morphology to describe crystals.	A2		C9 C10 C15 C16	

Use of the crystallographic notation and its application to the structural characterisation of crystalline solids.	A3	B3 B4	C9 C15	D3
Describe and apply the basic principles of diffraction for structural analysis.			C4 C9 C10 C16	
Use isotopic analysis techniques for measuring the geological time and following geochemical processes.	A2	B1 B3 B4	C4 C15	

Contents

Topic	
The Earth as a Geochemical System: Rocks forming minerals	Geochemical evolution of the Earth. Plate Tectonic. The rocks cycle. Comparison of Earth with other planets in the solar system: The case of of Mars.
The crystallization process: thermodynamic and kinetic aspects.	Differences between nucleation and crystal growth.Crystal growth kinetics. Structural aspects.
Characterization of crystalline solids: structure vs. morphology.	Microscopic and macroscopic approaches to crystalline solids
Isotopes in Geology: Measuring the geological time with radiactive isotopes. Analyzing kinetic processes by fractionation of stable isotopes.	Radioactive isotopes and stable isotopes. Isotopic dating techniques. The Isochrone method. Kinetic tracking of processes using stable isotopic techniques. Notation and units. Rayleigh fractionation.
Geometric crystallography: Periodicity and symmetry in the crystals.	Two-dimensional lattices. Point symmetry. Schoenflies and Hermann-Mauguin notations of point symmetry elements and clases. Bravais lattices. Microscopic symmetry Space groups. Miller indices and zone axes. Fractional coordinates
X-ray crystallography: Bragg's Law and the Phase problem	The physical basis of diffraction. Diffraction by crystals lattices and radiation sources. The Bragg Law The reciprocal lattice. Diffraction Patterns. Indexing of diffraction diagrams. powder diagrams and monocrystal diagrams Quantitative Analysis. The Phase problem. Methods of resolution of structures from diffraction datasets.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	26	70	96
Mentored work	1	5	6
Laboratory practical	6	0	6
Problem solving	6	34	40
Objective questions exam	1	0	1
Problem and/or exercise solving	1	0	1

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

Methodologies

	Description
Lecturing	First, the basic principles of crystallization are analyzed from a geological and thermodynamic point of view. Further, we introduce to the student the fundamentals of isotope geochemistry. Next themes are devoted to the structural characterization of crystals, analyzing the concepts of periodicity and symmetry in 2D and 3D crystalline lattices. Finally we introduce the principles and practical aspects of diffraction techniques applied to the estructural analysis
Mentored work	A short paper will be write by groups summarizing the laboratory work. Some guidelines concerning formats and content will be given before the realization. A seminar will be assigned to guide each working group in this task.
Laboratory practical	They will be dedicated to the study of the crystallization process, analyzing three aspects: (1) Crystallization in nature: mineral recognition (2) Optical microscopy with polarized light. (3) Crystal growth from solutions and silica gels in the laboratory.
Problem solving	Seminars will be used to solve practical exercises about nucleation and crystal process and to solve issues related to crystallographic notation and concepts

Personalized assistance

Methodologies	Description

Problem solving	The resolution of exercises will be carried out during the seminars by answering to the questions raised in class.
Mentored work	They will be developed in the computer classroom and in theoretical class as well as through the realization of tutorials or consultations using the Tema platform or the electronic mail.

Assessment

	Description	Qualification	Training and Learning Results
Mentored work	The completion of a report/work whose content will be related to the activity carried out in the laboratory and seminars will be evaluated.	10	
Laboratory practical	The activity carried out in the mineralogy laboratory and in the completion of exercises and questionnaires proposed through the Moovi platform will be evaluated.	30	
Problem solving	The exam will also include exercises and/or problems.	20	
Objective questions exam	Exam with short questions and multiple choice questions, as well as a topic about the content of the theoretical classes and/or seminars.	40	

Other comments on the Evaluation

Sources of information

Basic Bibliography

Andrew Putnis, **Introduction to Mineral Sciences**, 6ª, Cambridge University Press, 2008

Edward Tarbuck y FredericK Lutgens, **Ciencias de la Tierra. Una introducción a la Geología Física**, 10ª, Pearson, 2013

Complementary Bibliography

Christofer Hammond,, **The Basic of Crystallography and Diffraction**, 3ª, Oxford University Press, 2009

Jose Luis Amorós, **La gran aventura del cristal**, 1ª, Ediciones Complutense, 2017

Carmelo Giacovazzo et al., **Fundamentals of Crystallography**, 2ª, Oxford University Press,

Recommendations

Subjects that continue the syllabus

Chemistry: Chemistry 2/V11G201V01109

Subjects that are recommended to be taken simultaneously

Physics: Physics 2/V11G201V01107
Mathematics: Mathematics 2/V11G201V01108
Chemistry: Chemistry Lab II/V11G201V01110
Chemistry: Chemistry 2/V11G201V01109

Subjects that it is recommended to have taken before

Biology: Biology/V11G201V01101
Physics: Physics I/V11G201V01102
Mathematics: Mathematics 1/V11G201V01103
Chemistry: Chemistry Lab I/V11G201V01105

IDENTIFYING DATA

Physics: Physics 2

Subject	Physics: Physics 2			
Code	V11G201V01107			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Pérez Iglesias, María Teresa			
Lecturers	Pérez Iglesias, María Teresa			
E-mail	tpigles@uvigo.es			
Web	http://http://faitic.uvigo.es/			
General description	Broadly Physics is the general scientific analysis of nature, with the goal of understanding how the universe behaves. It is fundamentally an experimental science. The theories that are developed are tested with observations. From such a wide definition, different perspectives or application levels can be adopted, from microscopic phenomena to macroscopic ones. Physics is thus the basis of innumerable scientific and technological applications. In particular for the student of Chemistry, it is a fundamental tool to understand theories and methods belonging to that of domain of science. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results

Code	
A1	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
A2	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
B1	Ability for auronomous learning
C22	Know and apply the foundations of Physics necessary to understand the theoretical and practical aspects of Chemistry that need it
C29	Demonstrate ability for numerical calculations and interpretation of experimental data, with correct use of units and estimation of uncertainty
D3	Ability to communicate in both oral and written form in Spanish and / or Galician and / or English

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Determine the electric field of discrete point charges or a continuous charge distribution. The case of high symmetry is also considered.	A2	B1	C22	D3
Describe the effect of an electrostatic field on dielectrics and conductors.	A1 A2	B1	C22	D3
Describe the physical effects of electrical currents and calculate the power in a circuit.	A2	B1	C22	D3
Calculate the characteristics and type of trajectory of charged particles in electric and/ or magnetic fields.	A1 A2	B1	C22	D3
Distinguish the different material behaviours in a magnetic field.	A1 A2	B1	C22	D3
Explain the difference between conservative and non conservative electric fields.	A2	B1	C22	D3
Describe unified the electromagnectic field by Maxwell's equations.	A1 A2	B1	C22	D3
Deduce the equation of an electromagnetic radiation and characterize it.	A2	B1	C22	D3
Handle different instrumentation which is usual in electromagnetic lab (as polymeter, power supply, oscilloscope, etc.) reproducing basic experiments.	A2	B1	C22 C29	D3

Contents

Topic

1.-BASIC THEORY OF FIELDS.	- Vector functions - Scalar and vector fields - Line integral - Conservative fields. Potential - Central fields - Flux, divergence and curl of a vector field
2. ELECTROSTATICS	- Electric charge. Conductors and dielectrics - Coulomb□s Law - Superposition principle. Electric Potential - Electric field - Potential and field created by an electric dipole. Effect of electric field on a dipole - Gauss´ theorem
3. ELECTRIC FIELDS IN CONDUCTORS AND DIELECTRICS.	- Effect of electric field on a conductor - Charge distributions on electrostatic conductors - Capacitors and capacitance - Effect of a dielectric between the plates of a capacitor - Effect of electric field on a dielectric
4. DIRECT CURRENT	- Direct Current. Current Density - Ohm□s Law. Conductivity - Joule´s Law - Electromotive force - Kirchoff´s Law
5. MAGNETIC FIELD	- Phenomenoly. Causes of magnetism - Biot and Savart´s Law. Examples - Ampère's theoreme - Charged particles in a static magnetic field - Introduction to magnetism in matter
6. ELECTROMAGNETIC INDUCTION	- Magnetic Flux. Ampère's Law - Phenomenology - Faraday´s law. Lenz´s law - Mutual inductance and self-inductance
7. ELECTROMAGNETIC WAVES	- Maxwell□s Equations. Ampère-Maxwell's law - Plane Electromagnetic Waves - Energy of the electromagnetic waves - Electromagnetic spectrum

Planning

	Class hours	Hours outside the classroom	Total hours
Seminars	26	33.2	59.2
Laboratory practical	12	13.2	25.2
Lecturing	26	28.6	54.6
Essay questions exam	1	2	3
Objective questions exam	0	4	4
Problem and/or exercise solving	1	3	4

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

Methodologies

	Description
Seminars	a) The exercises and problems will be solved, by the students or by the teacher. a) Problem sheets will be available with sufficient anticipation, either at the course web page or in printed form. b) The different tasks that the students have to carry out will be programmed. c) The different tasks that students have to carry out, as presentations based on discussions or the first test, will be assessed.
Laboratory practical	a) Laboratory activities will be carried out in groups. b) In order that the students have a clear idea of the objectives to reach and the available material, information about laboratory work will be provided with enough time in advance. c) In the laboratory, students will be assisted by a teacher.
Lecturing	a) In each topic the specific objectives will be analyzed. Its need and the possible applications will be indicated. b) The way to reach objectives will be indicated. Emphasis will be made on those aspects that are more problematic and difficult. Different examples will be solved. c) Bibliographic references will be proposed d) Diverse tasks that students have to carry out will be programmed.

Personalized assistance

Methodologies	Description
Seminars	Doubts will be discussed and clarified individually or during the debates that may arise.
Laboratory practical	The questions that can arise during the conduct of the practices will be clarified .

Assessment						
	Description	Qualification	Training and Learning Results			
Laboratory practical	Practices of laboratory: a) They are compulsory for all the students. b) They are compulsory to pass the subject. c) The minimum mark to pass will be of 5 out of 10. d) The student's laboratory work will be monitored and given a mark. e) The report of the practices, elaborated by the student, will be assessed.	20	A2	B1	C22 C29	D3
Essay questions exam	Continuous evaluation. Three written tests.They will be 35% of the final mark: a) The minimum qualification to pass each one of these tests will be of 5 out of 10. b) The first test will be written during seminar time. c) The third test will be done with the first term final exam. d) The marks of the two first tests will be kept until the second term final exam. e) At the second term's final exam each student will have the opportunity to repeat the test he/ she has failed or those where he/she wishes to improve the mark previously obtained. f) Students who have not passed the three written tests but whose grade is 5, or higher, will appear with a grade of 4.5 in the records. The students who do not wish to follow the continuous evaluation will have one written test, which will contribute 40% of the final mark: a) The exam will have three parts. b) It is neccesary to pass each one of these parts to pass the subject. The minimum qualification to pass each part will be of 5 out of 10.	35/40	A1 A2	B1	C22	D3
Objective questions exam	Intended for students who wish to follow the continuous evaluation: Multiple-choice test, solving questions, problems and carrying out activities related with the contents of the subject.	10	A1 A2		C22	D3
Problem and/or exercise solving	Continuous evaluation. Four written tests.They will be 35% of the final mark: a) The minimum qualification to pass each one of these tests will be of 5 out of 10. b) The first and third test will be written during seminar time. c) The fourth test will be done with the second term final exam. d) The marks of the three first tests will be kept until the second term final exam. e) At the second term's final exam each student will have the opportunity to repeat the tests he/ she has failed or those where he/she wishes to improve the mark previously obtained. f) Students who have not passed the four written tests but whose grade is 5, or higher, will appear with a grade of 4.5 in the records. The students who do not wish to follow the continuous evaluation will have one written test, which will contribute 40% of the final mark: a) The exam will have four parts. b) It is neccesary to pass each one of these parts to pass the subject. The minimum qualification to pass each part will be of 5 out of 10.	35/40	A1 A2	B1	C22	D3

Other comments on the Evaluation

Problems and/or exercise solving 35%	Essey questions exam 35%	Objective questions exam 10%	Laboratory practical 20%
Part_I (seminar room)	Part_I (seminar room)	Part_I	
Part_II (control exam room)	Part_II (control exam room)	Part_II	
Part_III (seminar room)		Part_III	
Part_IV (final exam room)	Part_IV (final exam room)	Part_IV	

Sources of information

Basic Bibliography

José Mª de Juana, **Física General , vol. 2**, 2ª edición, Pearson,

Tipler P.A.; Mosca G., **Física para la Ciencia y la Tecnología , vol. 2**, 6ª edición, Reverté,

Serway & Jewett, **Física para ciencias e ingeniería, vol. 2,**, 9ª edición, Cengage Learning,

Gettys E.; Keller F.; Skove M., **Física para Ingeniería y Ciencias**, 2ª edición, McGraw-Hill Interamericanal,

Young & Freedman, **Física Universitaria vol. 2,**, 12ª edición, Pearson Educación,

Complementary Bibliography

Recommendations

Subjects that are recommended to be taken simultaneously

Mathematics: Mathematics 2/V11G201V01108
Chemistry: Chemistry 2/V11G201V01109

Subjects that it is recommended to have taken before

Physics: Physics I/V11G201V01102
Mathematics: Mathematics 1/V11G201V01103
Chemistry: Chemistry 1/V11G201V01104

IDENTIFYING DATA				
Mathematics: Mathematics 2				
Subject	Mathematics: Mathematics 2			
Code	V11G201V01108			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	#EnglishFriendly Galician			
Department				
Coordinator	Mirás Calvo, Miguel Ángel			
Lecturers	Mirás Calvo, Miguel Ángel			
E-mail	mmiras@uvigo.es			
Web	http://moovi.uvigo.gal			
General description	The subject is a basic introduction to vector calculus, differential equations and statistics. It will be oriented to apply the mathematical models studied to specific problems of the scientific fields.			

Training and Learning Results	
Code	
A1	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
B4	Ability for analysis and synthesis
C21	Know mathematical concepts based on previous ones and be able to use them in the different contexts of Chemistry
D1	Ability to solve problems

Expected results from this subject	Training and Learning Results			
To use vector calculus to compute lengths of curves, areas of surfaces and the curl of a vector field.	A1	B4	C21	D1
To build and solve differential equation models of simple systems from physics or chemistry.	A1	B4	C21	D1
(*)Know *xestionar and apply the *requirementos legal of the mercantile company, knowing the *particularidades *proprias of the distinct types of mercantile societies, *aduirindo capacity to inform and argue envelope the said questions.				
To compute probabilities associated to discreet and continuous random variables that follow well known probability distributions.	A1	B4	C21	D1
To use computer programs for mathematical computations and graphic representation.		B4		D1

Contents	
Topic	
Line and surface integrals	Curves and parametrizations Line integrals Parametric surfaces Surface integrals and flux integrals
Ordinary differential equations	Mathematical models and methods for solving first-order differential equations Linear models of higher order
Basic probability theory	Probability spaces Random variables

Planning	Class hours	Hours outside the classroom	Total hours
Lecturing	22	33	55
Practices through ICT	0	6	6
Problem solving	16	26	42
Problem solving	16	26	42
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
Lecturing	The teachers will present the theoretical foundations of the different topics; showing possible applications; formulating problems, questions and exercises; and proposing tasks and activities with orientations on the methods and techniques to employ to carry them out.
Practices through ICT	Activities oriented to learn how to handle computer programs for the calculation and graphic representation of functions and data.
Problem solving	The students will have to solve the proposed problems and exercises on vector calculus.
Problem solving	The students will have to solve the proposed problems and exercises on differential equations and probability.

Personalized assistance

Methodologies	**Description**
Lecturing	The doubts concerning the theoretical concepts presented in the classes will be attended in tutoring hours.
Problem solving	The doubts relative to vector calculus will be attended during the classes and in the scheduled tutoring hours.
Practices through ICT	The doubts relative to the laboratory classes will be attended in the scheduled tutoring hours.
Problem solving	The doubts relative to differential equations and probability will be attended during the classes and in the scheduled tutoring hours.
Tests	**Description**
Essay questions exam	The doubts relative to the final examinations will be attended in the scheduled tutoring hours.

Assessment

	Description	Qualification	Training and Learning Results	
Problem solving	Tasks (that conform the so called continuous evaluation) in which each student will have to solve applied problems or exercises of vector calculus.	30	A1	D1
Problem solving	Tasks (that conform the so called continuous evaluation) in which each student will have to solve applied problems or exercises of ordinary differential equations and probability.	30	A1	D1
Essay questions exam	Final examination. Individual exam that will take place right after the class period and that will include theoretical questions and exercises.	40	C21	

Other comments on the Evaluation

The final qualification of the subject (NF) will be compute by the formula:

NF=A+(10-A)E/10

where A is the continuous evaluation score and E is the final examination score.

To pass the matter the final score has to be bigger or equal than 5 points (NF>=5). The students who fail to pass the matter at the first opportunity and want to do it in July, will have to repeat the final examination. The continuous evaluation score will be the same for the July evaluation.

The qualification NOT PRESENTED could not be assigned to a student who attended at least one of the final exams.

Sources of information

Basic Bibliography

Besada, M.; García, J.; Mirás, M.; Quinteiro, C.; Vázquez, C., **Un mar de Matemáticas. Matemáticas para os graos de Ciencias**, 1, Servicio de Publicacións Universidade de Vigo, 2016

Mirás Calvo, Miguel Ángel; Sánchez Rodríguez, María Estela, **Técnicas estadísticas con hoja de cálculo y R: azar y variabilidad en las ciencias naturales**, 1, Servicio de Publicacións Universidade de Vigo, 2018

Adams, Robert A., **Cálculo**, 6, Addison Wesley, 2009

Simmons, George F., **Ecuaciones diferenciales: con aplicaciones y notas históricas**, 2, McGraw-Hill, 2002

Complementary Bibliography

Recommendations

Subjects that are recommended to be taken simultaneously

Physics: Physics 2/V11G201V01107

Geology: Geology/V11G201V01106
Chemistry: Chemistry Lab II/V11G201V01110
Chemistry: Chemistry 2/V11G201V01109

Subjects that it is recommended to have taken before

Biology: Biology/V11G201V01101
Physics: Physics I/V11G201V01102
Mathematics: Mathematics 1/V11G201V01103
Chemistry: Chemistry Lab I/V11G201V01105
Chemistry: Chemistry 1/V11G201V01104

IDENTIFYING DATA				
Chemistry: Chemistry 2				
Subject	Chemistry: Chemistry 2			
Code	V11G201V01109			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Pérez Juste, Ignacio			
Lecturers	Losada Barreiro, Sonia Pérez Juste, Ignacio			
E-mail	uviqpipj@uvigo.es			
Web	http://quimica.uvigo.es			
General description	Chemistry 2, taught in the second semester of the first course, belongs to the module of fundamental subjects and pretends to provide to the student the chemical knowledge and skills necessary to successfully continue the learning of Analytical Chemical, Physical Chemistry, Inorganic Chemistry and Organic Chemistry in the following courses. ========== English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English			

Training and Learning Results	
Code	
A2	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
B1	Ability for auronomous learning
B2	Organization and planning capacity
C1	Ability to know and understand essential facts, concepts, principles and theories related to Chemistry
C2	Use correctly chemical terminology, nomenclature, conversions and units
C11	Know the principles of Thermodynamics and its applications in Chemistry
C12	Know the kinetics of chemical change, including catalysis and reaction mechanisms
D1	Ability to solve problems

Expected results from this subject	Training and Learning Results			
Identify the properties of electrolyte and non-electrolyte solutions	A2	B1 B2	C1 C2	D1
Determine the variations of thermodynamic magnitudes in chemical reactions	A2	B1 B2	C2 C11	D1
Interpret and recognise the concepts of chemical equlibrium and, in particular, those corresponding to chemical equilibrium in aqueous solution	A2	B1 B2	C1 C11	D1
Calculate the kinetical parameters of simple reactions	A2	B1 B2	C1 C12	

Contents	
Topic	
1. SOLUTIONS	General properties. Expressing the concentration. Solubility: Henry's Law. Colligative properties.
2. THERMODYNAMICS	First law of thermodynamics. Calorimetry. Standard states. Thermochemistry. Entropy. Second law of thermodynamic Spontaneity of chemical processes.
3. CHEMICAL EQUILIBRIUM	The concept of equilibrium and the equilibrium constant. Factors that affect chemical equilibrium, Variation of the equilibrum constant with temperature.
4. ACIDS AND BASES	Definitions of acids and bases. Acid-base equlibria. Concept of pH. Hydrolysis. Buffer solutions. Indicators. Titrations.

5. SOLUBILITY	Solubillity equilibrium and the solubility product constant. The common ion effect. Effect of pH. Complex ion equilibria.
6. ELECTROCHEMISTRY	Redox reactions. Electrochemical cells. Electrode potential. Nernst equation. Corrosion. Electrolysis.
7. CHEMICAL KINETICS	Rate of a chemical reaction. Rate law. The effect of temperature on reactions rates. Reaction mechanisms. Catalysis. Nuclear chemistry.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	26	0	26
Seminars	26	0	26
Essay questions exam	1	33	34
Essay questions exam	1	33	34
Problem and/or exercise solving	0	20	20
Objective questions exam	0	10	10

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

Methodologies

	Description
Lecturing	Presentation by the teacher of the contents of the subject, their theoretical basis and/or the guidelines of the work that must be developed by the students. This methodology also includes some Introductory Activities: Activities to take contact and gather information about the students and to present them the subject.
Seminars	Students have to solve problems by using routines, application of formulas or algorithms, use of transformation procedures of the available information and the interpretation of the results. This activity is complementary of the theoretical lectures and allows to deepen or complement the contents of the subject.

Personalized assistance

Methodologies	**Description**
Lecturing	During office hours, students can present individually to their teachers the doubts that arise along the course in the theoretical classes, the seminar sessions or during their autonomous activities. The aim of these office hours is to help students to reinforce their knowledge so that they can face in better conditions to evaluation activities proposed (written exams, problems resolution and/or quiz tests).
Seminars	During office hours, students can present individually to their teachers the doubts that arise along the course in the theoretical classes, the seminar sessions or during their autonomous activities. The aim of these office hours is to help students to reinforce their knowledge so that they can face in better conditions to evaluation activities proposed (written exams, problems resolution and/or quiz tests).
Tests	**Description**
Problem and/or exercise solving	During office hours, students can present individually to their teachers the doubts that arise along the course in the theoretical classes, the seminar sessions or during their autonomous activities. The aim of these office hours is to help students to reinforce their knowledge so that they can face in better conditions to evaluation activities proposed (written exams, problems resolution and/or quiz tests).
Objective questions exam	During office hours, students can present individually to their teachers the doubts that arise along the course in the theoretical classes, the seminar sessions or during their autonomous activities. The aim of these office hours is to help students to reinforce their knowledge so that they can face in better conditions to evaluation activities proposed (written exams, problems resolution and/or quiz tests).

Assessment

	Description	Qualification	Training and Learning Results		
Essay questions exam	1.- Around mid-term, there will be a written exam about the contents taught until then. The grade for this exam will suppose the first-half of the grade corresponding to the written exams. Obtaining a minimum grade of 5 out of 10 will exclude these contents in the final exam.	Mínimo 35	A2	C2 C11 C12	D1

Essay questions exam	2.- At the end of the semester, there will be a final written exam with the following conditions: a) If the first written exam is passed, only the second part of the contents will be included in the final written exam. The grade obtained of this exam will suppose the second half of the grade corresponding to the written exams. b) If the first written exam is failed, all the contents of the subject will be included in the final written exam. The grade for this exam will suppose all the grade corresponding to the written exams. To pass the subject, a minimum grade of 5 out of 10 has to be obtained in the final written exam.	Mínimo 35	A2	B1 B2	C2 C11 C12	D1
Problem and/or exercise solving	For each part of the subject, problems will be proposed to the students to be individually solved in seminar classes or as homework. The grade obtained in this section will be considered only if half of these activities are done and if a minimum grade of 4 out of 10 is obtained in the written exams.	Máximo 15	A2	B1 B2	C1 C2 C11 C12	D1
Objective questions exam	For each part of the subject, multiple choice tests (through MOOVI) will be proposed to the students. The grade obtained in this section will be considered only if half of these activities is done and if a minimum grade of 4 out of 10 is obtained in the written exams.	Máximo 15	A2	B1 B2	C2 C11 C12	

Other comments on the Evaluation

- The dates of the written exams are published in the calendar of academical activities of the Faculty of Chemistry.

- Attending at one of the written exams is the mininum condition to be graded.

- In the following examination calls, the students will maintain the grades obtained for individual work, except in the case of a change of professor, who can set new rules for the subject.

Sources of information

Basic Bibliography

Ralph H. Petrucci; F. Geoffrey Herring; Jeffry D. Madura; Carey Bissonnette, **Química General**, 10, Pearson Educación, 2011

Raymond Chang, Kenneth Goldsby, **Química**, 12, McGraw-Hill, 2016

Kenneth W. Whitten, Raymond E. Davis, M. Larry Peck, George G. Stanley, **Química**, 10, Cengage Learning, 2015

Theodore L. Brown, **Química. La ciencia central**, 12, Pearson Educación, 2014

Complementary Bibliography

Peter Atkins, Loretta Jones, **Principios de química. Los caminos del descubrimiento**, 5, Médica Panamericana, 2012

José Antonio López Cancio, **Problemas de química**, 1, Prentice Hall, 2000

Recommendations

Subjects that are recommended to be taken simultaneously

Physics: Physics 2/V11G201V01107
Geology: Geology/V11G201V01106
Mathematics: Mathematics 2/V11G201V01108
Chemistry: Chemistry Lab II/V11G201V01110

Subjects that it is recommended to have taken before

Chemistry: Chemistry Lab I/V11G201V01105
Chemistry: Chemistry 1/V11G201V01104

IDENTIFYING DATA				
Chemistry: Chemistry Lab II				
Subject	Chemistry: Chemistry Lab II			
Code	V11G201V01110			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Bravo Díaz, Carlos Daniel Pena Pereira, Francisco Javier			
Lecturers	Arjones Fernández, Belén Bravo Díaz, Carlos Daniel Calle González, Inmaculada de la Cepero Rodríguez, Elizabeth Graña Rodríguez, Ana María Lavilla Beltrán, María Isela Mosquera Castro, Ricardo Antonio Pena Pereira, Francisco Javier Pérez Barcia, Álvaro Pérez Juste, Jorge Tojo Suárez, María Concepción			
E-mail	cbravo@uvigo.es fjpena@uvigo.es			
Web	http://http://quimica.uvigo.es			
General description	In this subject it is intended that students start in the chemical laboratory and learn criteria and essential manipulations to work properly, safely and respectfully with the environment. The student will become familiar with the glassware, the instrumentation and the basic operations, achieving a learning that will allow him/her to approach other more specialized laboratories. Emphasis will also be placed on the observation and preparation of a laboratory notebook.			

Training and Learning Results	
Code	
A2	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
B2	Organization and planning capacity
C25	Safely handle chemical substances, considering their physical and chemical properties, evaluating the risks associated with their use and laboratory procedures and including their environmental repercussions
C26	Perform correctly usual procedures in the laboratory, including the use of standard chemical instrumentation for synthetic and analytical work
C27	Demonstrate the ability to observe, monitor and measure chemical processes, by systematically and reliably recording them and presenting reports of the work done
C28	Interpret data derived from laboratory observations and measurements in terms of their meaning and relate them to the appropriate theory
C29	Demonstrate ability for numerical calculations and interpretation of experimental data, with correct use of units and estimation of uncertainty
D2	Capacity for teamwork
D3	Ability to communicate in both oral and written form in Spanish and / or Galician and / or English

Expected results from this subject	Training and Learning Results			
Apply safety standards in the laboratory	A2	B2	C25	D2
Use correctly the basic laboratory material, including the measurement material, and properly handle chemicals and their waste	A2	B2	C25 C26	D2
Use basic laboratory techniques and interpret the obtained data	A2	B2	C25 C26 C27 C28 C29	D2

Elaborate a notebook and/or an internship report	A2	B2	C27 C28 C29	D3
Measure chemical properties	A2	B2	C26 C27 C28 C29	D2
Identify chemical substances	A2	B2	C25 C26 C27 C28	D2

Contents	
Topic	
Separation and identification of metals in aqueous solution	- Metals that precipitate as chlorides [Ag(I), Hg(I) and Pb(II)] (1 session) - Metals that precipitate as sulfates [Ca(II), Pb(II) and Ba(II)] (1 session) - Metals that precipitate as hydroxides [Fe(III), Cr(III) and Bi(III)] (1 session) - Metals that form amino complexes [Cu(II), Ni(II), Co(II) and Hg(II)] and alkaline earth metals [(Mg(II)] (1 session) - Identification of the metals present in a sample of unknown composition (1 session)
Titrations	- Acid-base titrations: standardization of a solution of sodium hydroxide with potassium hydrogen phthalate and determination of total acidity in juices (2 sessions) - Redox titrations: standardization of a solution of potassium permanganate with sodium oxalate and determination of iron sulphate in tablets (2 sessions)
Detemination of chemical properties	- Equation of state of ideal gases (1 session) - Colligative properties: Ebullioscopy (1-2 sessions) - Determination of the electromotive force in galvanic cells (1-2 sessions) - Electrolytic cells: Faraday laws (1-2 sessions)
Calorimetry	- Determination of heat of solution (1 session) - Determination of heat of neutralization (2 sessions)
Chemical equilibrium	- Study of a dissociation equilibrium (2-3 sessions)
Chemical kinetics	- Kinetic study of a chemical reaction (2 sessions)

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	4	0	4
Laboratory practical	25	25	50
Laboratory practical	25	25	50
Laboratory practice	3	25	28
Essay questions exam	3	15	18
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Introductory activities	At the beginning of each laboratory session, the teacher will present the contents to be developed by the students.
Laboratory practical	- Laboratory experiments corresponding to separation and identification of metals in aqueous solution and titrations will be carried out in 9 sessions of 3 hours. - Prior to the beginning of each practice, the student will find support material on MOOVI for the preparation of the experiments to be carried out. The student will be provided with questionnaires to be fill in before the start of the first practice session, where key content is collected for carrying out the practices. - During the development of the practices, the student will elaborate a laboratory notebook in which he / she must write down all the observations related to the experiment carried out.

Laboratory practical	- Laboratory experiments corresponding to the determination of chemical properties, calorimetry, chemical equilibrium and chemical kinetics will be carried out in 9 sessions of 3 hours. - Prior to the beginning of each practice, the student will find support material on MOOVI for the preparation of the experiments to be carried out. The student will be provided with questionnaires to be fill in before the start of the first practice session, where key content is collected for carrying out the practices. - During the development of the practices, the student will elaborate a laboratory notebook in which he / she must write down all the observations related to the experiment carried out.

Personalized assistance

Methodologies	Description
Laboratory practical	Each student will be able to request from the teacher the clarifications that it deems appropriate for a better understanding of the subject and the successful development of the proposed tasks. These consultations will be attended during tutorials.
Tests	**Description**
Laboratory practice	Each student will be able to request from the teacher the clarifications that it deems appropriate for a better understanding of the subject and the successful development of the proposed tasks. These consultations will be attended during tutorials.
Essay questions exam	Each student will be able to request from the teacher the clarifications that it deems appropriate for a better understanding of the subject and the successful development of the proposed tasks. These consultations will be attended during tutorials.

Assessment

	Description	Qualification	Training and Learning Results			
Laboratory practical	- The teacher will monitor the experimental work done by the student in the laboratory sessions corresponding to separation and identification of metals in aqueous solution and titrations through observation, questionnaires and / or the laboratory notebook. - Since it is a experimental subject, the ATTENDANCE to the laboratory sessions is COMPULSORY.	30	A2	B2	C25 C26 C27 C28 C29	D2 D3
Laboratory practical	- The teacher will monitor the experimental work done by the student in the laboratory sessions corresponding to the determination of chemical properties, calorimetry, chemical equilibrium and chemical kinetics through observation, questionnaires, tasks and / or the laboratory notebook. - Since it is a experimental subject, the ATTENDANCE to the laboratory sessions is COMPULSORY.	20	A2	B2	C25 C26 C27 C28 C29	D2 D3
Laboratory practice	Two practical laboratory tests will be carried out to assess the competences and skills acquired by the student.	30	A2	B2	C25 C26 C27 C28 C29	D3
Essay questions exam	Once all the practical sessions are finished, two short written tests will be carried out regarding the concrete aspects of the operations carried out in the laboratory.	20	A2	B2	C28 C29	D3

Other comments on the Evaluation

- The absences in laboratory sessions must be duly justified by an official document. These absences will penalize the grade.

- One unexcused absence implies the direct failure of the subject.

- More than 3 excused absences will mean failing the subject.

First ordinary examination call

- Attendance at more than two laboratory sessions implies that the student is already being evaluated, so that his/her qualification in the record can not be "not presented".

- It is necessary to obtain a grade higher than 4 (out of 10) in each of the sections of the evaluation to make an average. This criterion will also be applied in second call.

- The final grade will be the sum of the grades of all the sections provided that the required minimums are exceeded.

- It will be necessary to obtain a mark of more than 3 out of 10 in each of the practical laboratory tests and reach the minimum mark required in the "Laboratory practice" section (mark of more than 4 out of 10) to be able to average the rest of the evaluation elements.

- It will be necessary to obtain a mark of more than 3 out of 10 in each of the short written tests and reach the minimum mark required in the "Essay questions exam" section (mark of more than 4 out of 10) to be able to average the rest of the evaluation elements.

- In the case of not passing the subject, the grade of the record will be the weighted grade of the practical laboratory test and essay question exam.

Second ordinary examination call

In second call, the evaluation will be carried out in the following way: the score obtained by the student during the course will be kept in the section "laboratory practices" (not recoverable). The rest of the sections (laboratory practice, exam) can be recovered. In the event of having passed any of the practical and/or short written tests (marks of 5 out of 10 or more), the marks obtained by the student will be retained so that he/she will only have to repeat those tests that have not been passed in the first ordinary exam call. The final grade will be the sum of the grades of all the sections as long as the required minimums are exceeded. If the subject is not passed, the grade of the record will be the weighted grade of the practical laboratory test and essay question exam.

Sources of information

Basic Bibliography

J. Guiteras, R. Rubio, G. Fonrodona, **Curso Experimental en Química Analítica**, 1, Síntesis, 2003

F. Burriel, F. Lucena, S. Arribas, J. Hernández, **Química Analítica Cualitativa**, 18, Thomson Paraninfo, S.A., 2006

S. Arribas, **Análisis Cualitativo Inorgánico**, 5, Paraninfo, 1993

P. Atkins, L. Jones, **Principios de Química**, 5, Panamérica, 2012

R. Chang, K. A. Goldsby, **Química**, 12, McGraw-Hill, 2016

R. H. Petrucci, F. G. Herring, J. D. Madura, C. Bissonnette, **Química General**, 11, Pearson, 2017

Complementary Bibliography

D. P. Shoemaker, C. W. Garland, J. W. Nibler, **Experiments in Physical Chemistry**, 8, McGraw-Hill, 2008

Recommendations

Subjects that are recommended to be taken simultaneously

Physics: Physics 2/V11G201V01107
Geology: Geology/V11G201V01106
Mathematics: Mathematics 2/V11G201V01108
Chemistry: Chemistry 2/V11G201V01109

Subjects that it is recommended to have taken before

Biology: Biology/V11G201V01101
Physics: Physics I/V11G201V01102
Mathematics: Mathematics 1/V11G201V01103
Chemistry: Chemistry Lab I/V11G201V01105
Chemistry: Chemistry 1/V11G201V01104