(*)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

(*)Grao en Química

Subjects

Year 1st

Code	Name	Quadmester	Total Cr.
V11G200V01101	Biology: Biology	1st	6
V11G200V01102	Physics: Physics I	1st	6
V11G200V01103	Chemistry, physics and biology: Integrated laboratory I	1st	6
V11G200V01104	Mathematics: Mathematics I	1st	6
V11G200V01105	Chemistry: Chemistry I	1st	6
V11G200V01201	Physics: Physics II	2nd	6

V11G200V01202	Chemistry, physics and geology: Integrated laboratory II	2nd	6
V11G200V01203	Mathematics: Mathematics II	2nd	6
V11G200V01204	Chemistry: Chemistry 2	2nd	6
V11G200V01205	Geology: Geology	2nd	6

IDENTIFYING DATA				
Biology: Biology				
Subject	Biology: Biology			
Code	V11G200V01101			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Castro Tubio, José M.			
Lecturers	Castro Tubio, José M.			
E-mail	jmctubio@gmail.com			
Web	http://http://darwin.uvigo.es/mobgenomes/			
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.			

Competencies	
Code	
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C15	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories in: chemistry of biological molecules and their processes
D1	Communicate orally and in writing in at least one of the official languages of the University
D3	Learn independently
D4	Search and manage information from different sources
D7	Apply theoretical knowledge in practice
D8	Teamwork
D9	Work independently
D12	Plan and manage time properly
D13	Make decisions
D14	Analyze and synthesize information and draw conclusions
D15	Evaluate critically and constructively the environment and oneself

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Understand the cell like fundamental unit of the be alive.	A5	C15	D1 D3 D4 D7 D9 D12 D14
Understand the properties and organisation of the distinct *cellular organelles.	A5	C15	D1 D3 D4 D7 D9 D12 D14
Know the cellular structure in **procariotas and *eukaryotic.	A5	C15	D1 D3 D4 D7 D9 D12 D14

Relate the cellular structures with the metabolism.	A5	C15	D1 D3 D4 D7 D9 D12 D14
Understand the distinct metabolic *roads of the distinct organic molecules.	A5	C15	D1 D3 D4 D7 D9 D12 D14
Describe the hereditary material and know the principles of the central dogma.	A5	C15	D1 D3 D4 D7 D8 D12 D13 D14 D15
Define the process of mutation and his implication in the evolutionary processes.	A5	C15	D1 D3 D4 D7 D9 D12 D14
Know the technicians of DNA **recombinante.	A5	C15	D1 D3 D4 D7 D8 D9 D12 D13 D14 D15
Comprise the importance of the immune *system.	A5	C15	D1 D3 D4 D7 D8 D12 D13 D14 D15

Contents	
Topic	
1. The cell	Size, form and cellular function cellular classification Cellular Theory Procaryotic cell eukaryotic Cell
2. *Biomembranas And systems of cellular transport.	Cellular 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.	Nuclei Cellular: 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: 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, structure of the RNA RNAm, RNAt and RNAr 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
Master Session	26	48	74
Seminars	13	26	39
Troubleshooting and / or exercises	0	17	17
Tutored works	2	13	15
Short answer tests	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
Master Session	In these classes the professor will explain and will develop the concepts and basic foundations of the *temario of clear form and *amena to facilitate his understanding. The contents of each subject will be exposed in the platform FEAR with sufficient time so that the students can consult them. It recommends that the student work on this material, consulting besides the bibliography recommended.

Seminars	In these classes will be oriented to: to) explanations of all type of doubts of the previously explained concepts in the masterclasses. *b) The students of individual way or in group will realise pictures *sinópticos of the subjects analysed in the masterclasses with the end to have an overview of the *temario, what will facilitate them his understanding and interrelationship. *c) In this section also will work some contents of the *temario of Biology, that by experience of the *profesorado are of more difficult understanding and that therefore require a greater didactic support.
Troubleshooting and / or exercises	Each student of individual way will have to realise realise a series of corresponding exercises to each subject to strengthen his study and understanding. These bulletins of exercises will be exposed in the platform FEAR as well as his date of delivery for his evaluation.
Tutored works	To develop the competition *CT8, the students will realise two works in group. The works will be related with the fields of the biotechnology, molecular biology and immunology and will be proposed by the professor. Part of the necessary information for his execution will be contributed by the professor and the rest by the students.

Personalized attention

Methodologies	Description
Tutored works	They formulate, argue and resolve questions, exercises and problems related with the subject. Each student will sue to the teaching staff the clarifications that estimate opportune to comprise better to subject and develop successfully the tasks that went him proposals. These queries will attend in schedule of *titorías.
Seminars	They formulate, argue and resolve questions, exercises and problems related with the subject. Each student will sue to the teaching staff the clarifications that estimate opportune to comprise better to subject and develop successfully the tasks that went him proposals. These queries will attend in schedule of *titorías.
Troubleshooting and / or exercises	They formulate, argue and resolve questions, exercises and problems related with the subject. Each student will sue to the teaching staff the clarifications that estimate opportune to comprise better to subject and develop successfully the tasks that went him proposals. These queries will attend in schedule of *titorías.

Assessment

	Description	Qualification	Training and Learning Results		
Troubleshooting and / or exercises	It will value the assistance (compulsory) to the seminars, the participation us same and the resolution by part of the *alumnado of a series of problems and/or exercises like academic follow-up of the student. The final qualification of these exercises will be of 20% of the final note.	20	A5	C15	D1 D3 D7 D9 D12 D13 D14 D15
Tutored works	It will evaluate the structuring and organisation of the contents, the oral exhibition and the sources consulted. These works will be exposed in the sessions of seminars to the rest of mates. The final qualification of these works will be of 10% of the final note.	10	A5	C15	D1 D3 D4 D7 D8 D9 D12 D13 D14 D15
Short answer tests	It will realise an only proof at the end of the course on the matter explained in the sessions *magistrales and in the seminars. It will consist in questions of short answer. Said proof will represent 70% of the final note.	70	A5	C15	D1 D3 D4 D7 D9 D12 D13 D14 D15

Other comments on the Evaluation

The student that realise the final proof of evaluation will be considered like presented.Is indispensable to obtain a minimum

note of 5 on 10 in the short proof final (include all the matter) to be able to approve the matter. The final note of the matter will come given by the average of the three sections of the evaluation. Of this way, to approve the matter, said average has to be equal or upper to 5.0In the case of not surpassing the matter,
the qualification in the record will be only the note of the final proof of all the matter (will not do average).In the second announcement, the evaluation will carry out of the following way:1. It will conserve the punctuation reached by the student during the course in the works *tutelados and the seminars. Any of these sections is recoverable.2. It will realise an analogous proof to the one of the end of the *cuatrimestre. This proof *equivaldrá to 70% of the final note.

Sources of information

Basic Bibliography

Complementary 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,

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

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,

Recommendations

Subjects that continue the syllabus

Chemistry, physics and biology: Integrated laboratory I/V11G200V01103

Subjects that are recommended to be taken simultaneously

Physics: Physics I/V11G200V01102
Mathematics: Mathematics I/V11G200V01104
Chemistry, physics and biology: Integrated laboratory I/V11G200V01103
Chemistry: Chemistry I/V11G200V01105

Other comments

It recommends have *cursada the matter Biology that gives in the 2º course of *Bachillerato so much in the modality of Sciences of the Health as in the one of Sciences (double option).

IDENTIFYING DATA				
Physics: Physics I				
Subject	Physics: Physics I			
Code	V11G200V01102			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Pérez Iglesias, María Teresa			
Lecturers	Legido Soto, José Luís Pérez Iglesias, María Teresa			
E-mail	tpigles@uvigo.es			
Web	http://faitic.uvigo.es/			
General description	General 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.			

Competencies	
Code	
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C23	Present oral and written scientific material and scientific arguments to a specialized audience
D1	Communicate orally and in writing in at least one of the official languages of the University
D3	Learn independently
D4	Search and manage information from different sources
D6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
D7	Apply theoretical knowledge in practice
D8	Teamwork
D9	Work independently
D12	Plan and manage time properly
D13	Make decisions
D14	Analyze and synthesize information and draw conclusions
D15	Evaluate critically and constructively the environment and oneself

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Calculate the values of different kinematic magnitudes of a mechanical system when it starts from initial different conditions.	A5	C23	D1 D3 D6 D8 D9 D14
Describe the framework of classical mechanics and calculate for a mechanical system the values of its different magnitudes.	A5	C23	D1 D3 D4 D6 D8 D9 D12 D13 D14 D15
Explain the importance of the conservation theorems and apply some of them.	A5	C23	D1 D3 D4 D6 D7 D14

Describe and calculate the kinematic and dynamic magnitudes of a system that undergoes a simple harmonic motion.	A5	C23	D3 D6 D7
Enunciate the postulates and principles of thermodynamics.	A5	C23	D1 D3 D4 D12 D13 D14
Explain the concept of thermodynamic system and its description using the corresponding variables and thermodynamic potentials.	A5	C23	D1 D3 D4 D12 D13 D14
Define the different temperature scales. Convert temperature values from one scale to another.	A5	C23	D1 D3 D6 D7 D12 D13 D14 D15
Calculate the work carried out by a thermodynamic system and the heat exchanged with the environment, as well as the variation of internal energy, enthalpy and entropy in quasiestatic processes.	A5	C23	D1 D3 D4 D6 D12 D13 D14
Distinguish between reversible and irreversible processes from the behaviour of the entropy variation.	A5	C23	D1 D3 D4 D6 D12 D13 D14

Contents	
Topic	
1. DESCRIPTION OF THE PHYSICAL REALITY	Introduction - Physical magnitudes and units - Dimensional analysis Errors.
2. KINEMATICS OF THE POINT AND RIGID BODY	Material point - Vector position, velocity and acceleration - Tangent and normal components of the acceleration - Study of some movements: rectilinear and plane - Rigid body.
3. PRINCIPLES OF THE DYNAMICS	Concept of force - Newton Laws - Newton´s theory of gravitation.
4. DYNAMICS OF THE PARTICLE	Equations of motion - Momentum and angular momentum - Radial Forces: Conservation of the angular momentum - Work and power - Kinetic Energy - Conservation of the mechanical energy - Non conservative forces. The conservation of energy. - Energy diagrams.
5. OSCILLATING MOTION	Simple harmonic Motion: Kinematics, Dynamics and Energy.
6. DYNAMICS OF SYSTEMS OF PARTICLES	Internal and external forces - Equation of motion for the center of mass - Work of external and internal forces Collisions.
7. THE RIGID BODY	Rigid Body: Rotational motion: Moment of inertia, angular momentum, Kinetic Energy.
8. FLUIDS	Pressure and density. Pressure in a fluid at rest. Measurement of pressure Surface Tension Capillarity. Jurin´s Law Tate´s Law.
9. INTRODUCTION TO THE THERMODYNAMICS. THERMOMETRY	Macroscopic and microscopic description - Thermal equilibrium - Zero´th law of Thermodynamics. Temperature Measure of temperature. Thermometers - Ideal Gas. Ideal gas temperature scale.
10. HEAT AND WORK	Thermodynamic Equilibrium. Equations of state. Quasiestatic Processes - Thermodynamic work - Heat capacity and specific heat. Latent heat.
11. THE FIRST LAW OF THERMODYNAMICS	The First Law of Thermodynamics - Internal Energy, enthalpy and heat capacities of the ideal gases. Mayer´s Law -Adiabatic changes of an ideal gas.

12. THE SECOND LAW OF THERMODYNAMICS	Introduction - Second Law: Clausius and Kelvin-Planck Statements - Cycle of Carnot. Theorem of Carnot- Thermodynamic Scale of Temperatures - Inequality of Clausius- Entropy.

Planning

	Class hours	Hours outside the classroom	Total hours
Seminars	26	28.6	54.6
Master Session	26	28.6	54.6
Presentations / exhibitions	0	15	15
Short answer tests	1.5	4.5	6
Troubleshooting and / or exercises	4.5	15.3	19.8

*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) Exercises and problems will be solved, by the students or the teacher. Problems sheets will be available with sufficient anticipation. b) Doubts and difficult concepts will be discussed and clarified by group tutoring. c) Diverse tasks that students have to carry out will be programmed. d) Diverse tasks that students have to carry out will be tested.
Master Session	The student can find information on lectures at the web platform Thema. a) In each topic the specific objectives will be analyzed. Its need and the possible applications will be indicated. b) The way to get objectives will be indicated. Emphasis will be made on those aspects that are more problematic and difficult. Different examples will be solved. c) In necessary case, it would be proposed some bibliographic references.
Presentations / exhibitions	The students will work in group. They will solve and they will debate problems, questions, summaries of readings, etc. that they will present or will explain to their classmates.

Personalized attention

Methodologies	Description
Presentations / exhibitions	Guided activities could need personalized attention. Voluntary Tutorials allows the clarification of doubts on an individual basis.
Seminars	The activities that will carry out in Seminars could need personalized attention. Voluntary Tutorials allows the clarification of doubts on an individual basis.

Assessment

	Description	Qualification	Training and Learning Results		
Seminars	Solving problems and other assignments that have been carried out in seminars.	25	A5	C23	D1 D3 D4 D6 D7 D8 D9 D12 D13 D14 D15
Presentations / exhibitions	The students will work in group and will solve and/ or will debate problems, questions etc.	10		C23	D1 D4 D8 D12
Short answer tests	Three tests written: a) The mínimum mark to pass each exam will be 5 out of 10. b) The third test will be done with the first term final exam. c) The marks of the two first tests will be maintained until the extraordinary exam (june). d) In first term 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.	15	A5	C23	D3 D6 D7 D9 D13

Troubleshooting and / or exercises	Three tests written: a) The mínimum mark to pass each exam will be 5 out of 10. b) The third test will be done with the first term final exam. c) The marks of the two first tests will be maintained until the extraordinary exam (june). d) In first term 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.	50	A5	C23	D3 D6 D7 D9 D13

Other comments on the Evaluation

Extraordinary exam (june) assessment: a) Written test to recover the written tests that were failed in the first term final exam. The criteria of evaluation in the second call will be the same as in the first term final exam assessment.

Sources of information

Basic Bibliography

Complementary Bibliography

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

Gettys E., **Física para ingeniería y ciencias**, 2005,

Serway R.A., **Física**, 2009,

José Mª de Juana, **Física General (2 tomos)**, 2003,

Young; Freedman, **Física universitaria I**, 2013,

Recommendations

Subjects that continue the syllabus

Physics: Physics II/V11G200V01201
Chemistry, physics and geology: Integrated laboratory II/V11G200V01202
Physics III/V11G200V01301

Subjects that are recommended to be taken simultaneously

Mathematics: Mathematics I/V11G200V01104
Chemistry, physics and biology: Integrated laboratory I/V11G200V01103

Other comments

It is recommended that students had studied Physics and Mathematics in 2nd level of high school.

In particular students should be familiar with:

- Vector algebra.
- Matrix algebra.
- Polynomial algebra.
- Graphic representation of polynomial, trigonometrical, logarithmic and exponential functions.
- Differential and integral calculus.

IDENTIFYING DATA				
Chemistry, physics and biology: Integrated laboratory I				
Subject	Chemistry, physics and biology: Integrated laboratory I			
Code	V11G200V01103			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Lavilla Beltrán, María Isela Pérez Cid, Benita			
Lecturers	Estévez Martínez, Olivia Faro Rivas, Jose Manuel Lavilla Beltrán, María Isela Lorenzo Fernández, Paula Pena Pereira, Francisco Javier Pérez Cid, Benita Rodríguez Arguelles, María Carmen Salgueiriño Maceira, Verónica			
E-mail	isela@uvigo.es benita@uvigo.es			
Web				
General description	"Machine translation into english of the original teaching guide" In this matter pretends that students initiate and learn the criteria and indispensable manipulations to work in a chemical laboratory ia correct way, safe and respectful with the enviroment. Student will learn to use glass materials, instrumentation and basic operations, reaching skills that will allow them to work in specialized laboratories. There will be a focus on the observation and preparation of a laboratory notebook as well as in the realisation of a final report of the work carried out.			

Competencies	
Code	
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C25	Handle chemicals safely, considering their physical and chemical properties, including the evaluation of any specific risks associated with its use
C27	Monitor, by observation and measurement of physical and chemical properties, events or changes, and document and record them in a consistent and reliable way
C28	Interpret data derived from laboratory observations and measurements in terms of their significance and relate them to the appropriate theory
C29	Demonstrate skills for numerical calculations and interpretation of experimental data, with special emphasis on precision and accuracy
D1	Communicate orally and in writing in at least one of the official languages of the University
D3	Learn independently
D4	Search and manage information from different sources
D5	Use information and communication technologies and manage basic computer tools
D6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
D7	Apply theoretical knowledge in practice
D8	Teamwork
D9	Work independently
D12	Plan and manage time properly
D13	Make decisions
D14	Analyze and synthesize information and draw conclusions
D15	Evaluate critically and constructively the environment and oneself

Learning outcomes	
Expected results from this subject	Training and Learning Results

Interpret the results of the work of laboratory and relate them with the appropriate theories.	A5	C28	D7 D9 D12 D14
Handle properly the common material in the chemical laboratory.	A5		D7 D9
Calibrate the experimental teams and use patterns when it was necessary.	A5	C28	D7 D9 D12 D13
Determine some properties of the chemicals: melting-point, boiling-point, *viscosidad, density, superficial tension, specific heat.	A5	C27	D6
Prepare dissolutions.	A5	C25	D7 D9 D12
Separate the components of mixes, so much *homogéneas like heterogeneous.	A5	C25	D7 D9 D12
*Predecir And check how a balance alters by addition or elimination of reagents, changes of volume, pressure or temperature.		C25 C27	D7 D9
Realise the necessary mathematical operations to quantify the processes carried out in the laboratory.	A5	C29	D3 D6 D7 D9 D12
Look for information on the properties (physical, chemical, dangerousness, etc.) of the chemicals.	A5		D4 D5 D9 D12
Apply the norms of security and hygiene in the chemical laboratory	A5	C25	D7 D9 D13 D15
Delete the waste generated in the laboratory of suitable form.	A5	C25	D7 D13 D15
Handle solids and liquids of safe way to temperature acclimatise in the atmosphere of the laboratory.	A5	C25	D7 D9 D15
Interpret the data derived of the measures realised in the laboratory.		C29	D3 D8 D9 D14
Elaborate a fascicle of laboratory that register of systematic way all the events and changes observed in the development of the work of laboratory.	A5	C27	D1 D4 D9 D12
Handle the techniques and the scientific instrumentation-technical of the inmunochemistry	A5		D7 D8 D9 D12 D15
Separate, isolate, identify and quantify the distinct *biomoléculas.	A5	C25	D14
Realise an assessment of the risks associated to the use of chemicals.		C25	D7 D9 D15

Contents
Topic
1) Norms of hygiene and security in the laboratory (1 session).
2) basic Concepts of the calculation of errors in the measures: I handle of the calibrate and analysis of distribution of populations (1 session).
3) Recognition and utilisation of the basic material of laboratory. Design of a fascicle of laboratory (1 session).

4) Determination of densities of liquids and solid (1 session).
5) Preparation of dissolutions (2 sessions): to) From a solid solute (exact and approximate concentration). *b) From a liquid solute (*Ej.: *HCl, *H2SO4, etc.). *c) Prepare dissolutions diluted of the ready previously.
6) Measure of the superficial tension (1 session).
7) Measure of the *viscosidad (1 session).
8) Establishment of a chemical equation: stoichiometry (1 session).
9) Separation of the components of a mix by means of sublimation and leak (1 session).
10) Reactions of precipitation (1 session).
11) Heat of reaction. (1 session).
12) Isolation of organic compounds: liquid extraction-liquid. (1 session).
13) Purification of liquids: distillation (1 session).
14) Purification of solids: crystallisation. Measure of melting-points. (1 session).
15) Study of the chemical balance. Principle of Him *Chatelier (1 session): to) Effect of the temperature. *b) Effect of the concentration.
16) Specific heat of liquids and solid (1 session).
17) Determination semi-quantitative by the technical of Dot-Blot of the presence of a protein in a proteins mixture inmobilized in a membrane of nitrocelulosa (1 session).
18) Determination semi-quantitative of the presence of an antigen in a proteins mixture by the method of Ouchterlony of double difusión in agarose gel (1 session).
19) Specific detection and *semi-quantitative of antibodies of high molecular weight in phase *soluble @perante it technical of *aglutinación of particles of *látex *recubertas with the *antíxeno (1 session).
20) ELISA *sandwich, technical *inmunoenzimática stop the specific and quantitative detection of *antíxenos and antibodies in solid phase (2 sessions).
21) *Volumetrías acid-base (2 sessions): it) Assessment of hydroxyde of sodium with hydrogen *ftalato of *potasio. *b) Assessment of sour *clorhídrico with hydroxyde of sodium prepared in (it).
22) *Volumetrías *redox (1 session): it) Assessment of *oxalato of sodium with *permanganato of *potasio.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practises	70	40	110
Master Session	5	0	5
Short answer tests	2	8	10
Practical tests, real task execution and / or simulated.	3	7	10
Reports / memories of practice	0	15	15

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

Methodologies

	Description

Laboratory practises	They Will realize experiments of laboratory, of individual form, in sessions of 3 hours #each. The student will have of the scripts of practices and questionnaires related as well as of material of support, in the platform *Tem@, so as to that can have a previous knowledge of the same that allow him prepare the experiments to realize. During the development of the practices the student will elaborate a fascicle of laboratory in the that will owe to note all the relative observations to the experiment realized. In any cases, will owe also elaborate a report of practices and/or questionnaire to petition of the professor that require it.
Master Session	To the start of each session of laboratory, the professor will do an exhibition of the contents to develop by the students.

Personalized attention

Methodologies	Description
Laboratory practises	Each student will ask to the professor the explanations that estimate timely for a better understanding of the matter and to develop successfully the tasks that were him proposed. These queries will do in *horado of *tutorías.
Tests	**Description**
Reports / memories of practice	Each student will ask to the professor the explanations that estimate timely for a better understanding of the matter and to develop successfully the tasks that were him proposed. These queries will do in *horado of *tutorías.

Assessment

	Description	Qualification	Training and Learning Results		
Laboratory practises	The professor will realize a tracking, through questionnaires and/or of the fascicle elaborated, of the experimental work realized pole student in the sessions of laboratory. Since it is a subject of experimental type, is mandatory the assistance to the sessions of laboratory. The foul of assistance, still being justified, *penalizará the note (pole that always that it was possible, and treating of fouls justified, recommends to recover the practice in another group). If the number of absences is upper to 6 will suppose to suspend the subject.	40	A5	C25 C27 C28 C29	D1 D3 D4 D5 D6 D7 D8 D9 D12 D13 D14 D15
Short answer tests	Once finished all the practical sessions, will realise a proof written (of brief answer) relative to concrete appearances of the operations realised in the laboratory. The date of the proof will publish with previously.	20		C28 C29	D1 D3 D6
Practical tests, real task execution and / or simulated.	It will realise a practical proof (a session of laboratory) that will allow to evaluate the competitions and skills purchased by the student. Said proof will be realised of independent form for each group of practices. This proof will carry out the day established in the official calendar of evaluations.	30	A5	C25 C27 C28 C29	D1 D3 D6 D7 D9 D12 D13 D14 D15
Reports / memories of practice	By request of the professor, the student will elaborate reports of practices that reflect the work developed in the laboratory.	10	A5	C28 C29	D1 D4 D5 D6 D14

Other comments on the Evaluation

To The assistance to more of two sessions of laboratory involves that the student already is being evaluated, pole that, his qualification in the proceedings will not be able to be no presented.

It IS necessary to obtain a minimum note of 4 on 10 in each of the *apartados of the evaluation for power do average; in the *apartado "reports" will be necessary, *asimesmo, obtain a minimum note of 4 on 10 inform us of the subjects of #each of the areas that evaluate them; all the previous *aplicaráse also the second announcement. In the case of not surpassing the subject, the qualification in the proceedings will be the note pondered of the practical proof of laboratory.

In the second announcement to evaluation *levaráse to cape of the following way:

*Conservaráse The punctuation achieved pole student during it study in the *apartado "practical of laboratory" (40%), no recoverable.

In the case of not having obtained the minimum note demanded in any of the remaining *apartados *poderánse recover the following:

1) "Proof of short answer" (20%); the date of the *examen will be the one who fix the official calendar.

2) "practical Proof" (30%); the date of the *examen will be the one who fix the official calendar.

3) "Reports of practical" (10%); *entregaránse in advance the official date of the *examen *dacordo *cas indications of the teaching staff.

The final qualification will be the sum of the notes of all the *apartados always that they surpass the minima demanded. Of not being the case, the qualification that will figure in the proceedings will be the note pondered of the practical proof (dictate sense will not be able to be inferior it of the first announcement).

Sources of information

Basic Bibliography

M.A. Martinez Grau, A.G. Csasky, **Técnicas Experimentales en Síntesis Orgánica**, 2ª Ed., Síntesis, 2012

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

C.K. Mathews, K.E. Van Holde, D.R. Appling, S.J. Anthony-Cahill, **Bioquímica**, 4ª Ed., Pearson Educación, 2013

J. R. Taylor, **Introducción al análisis de errores: estudio de las incertidumbres en las mediciones físicas**, Reverté, 2014

A. de Carlos Villamarín, J.M. Faro Rivas, **Manual de técnicas experimentais en bioloxía molecular e celular**, Servizo de Publicacións da Universidade de Vigo, 2014

R. Chang, **Química**, 12ª Ed., McGraw-Hill Education, 2017

Complementary Bibliography

D.R. Palleros, **Experimental Organic Chemistry**, John Wiley, 2000

P.A.Tipler, G. Mosca, **Física para la Ciencia y la Tecnología (2 volúmenes)**, 6ª Ed., Reverté, 2010

I. Lefkovits, **Immunology methods manual: the comprehensive sourcebook of techniques**, Academic Press, 1997

D. Voet, J.G. Voet, **Bioquímica**, 3ª Ed., Editorial Médica Panamericana, 2006

R.H. Petrucci, W.S. Harwood, F.G. Herring, **Química General: principios y aplicaciones modernas**, 11ª Ed., Pearson Educación, 2017

Recommendations

Subjects that continue the syllabus

Chemistry, physics and geology: Integrated laboratory II/V11G200V01202

Subjects that are recommended to be taken simultaneously

Biology: Biology/V11G200V01101
Physics: Physics I/V11G200V01102
Mathematics: Mathematics I/V11G200V01104
Chemistry: Chemistry I/V11G200V01105

IDENTIFYING DATA				
Mathematics: Mathematics I				
Subject	Mathematics: Mathematics I			
Code	V11G200V01104			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Galician			
Department				
Coordinator	Quinteiro Sandomingo, María del Carmen			
Lecturers	Quinteiro Sandomingo, María del Carmen			
E-mail	quinteir@uvigo.es			
Web	http://faitic.uvigo.es/			
General description	"Machine translation into english of the original teaching guide" The matter collects contents, theoretical and practical of algebra linear and calculus (in a variable). The follow-up of the same will improve the capacity of compression and employment of the mathematical language. It will allow to the students purchase skills of calculation and initiate in the use of computer applications.			

Competencies	
Code	
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
C22	Process and perform computational calculations with chemical information and chemical data
C23	Present oral and written scientific material and scientific arguments to a specialized audience
C29	Demonstrate skills for numerical calculations and interpretation of experimental data, with special emphasis on precision and accuracy
D1	Communicate orally and in writing in at least one of the official languages of the University
D3	Learn independently
D4	Search and manage information from different sources
D5	Use information and communication technologies and manage basic computer tools
D6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
D7	Apply theoretical knowledge in practice
D8	Teamwork
D9	Work independently
D12	Plan and manage time properly
D13	Make decisions
D14	Analyze and synthesize information and draw conclusions
D15	Evaluate critically and constructively the environment and oneself

Learning outcomes		
Expected results from this subject	Training and Learning Results	
Operate with vectors, distances and angles.	C22 C29	D6 D7 D9
Formulate matrix models to tackle problems of distinct branches of the Science.	C22 C29	D5 D6 D9
Dominate the properties of the matrices and of his application for the approach and resolution of systems of linear equations.	C29	D7 D9
Resolve systems of linear equations using packages of symbolic and numerical calculation.	C22 C29	D5 D7
Operate properly with real numbers and complexes.	C22 C29	D6 D7
Realise calculations of limits, continuity, derivative and integrals of real functions of real variable and of partial derivatives of functions of several variables.	C22 C29	D7
Identify real problems that can be tackled by means of the differential calculation and integral and resolve them with these technicians.	C22 C29	D6 D7 D9 D14
Analyse and represent functions, knowing deduce properties of the same from his graphic.	C29	D7

Formulate and resolve problems of optimisation.		C29	D7 D9 D14
Calculate integrals of line of scalar and vectorial fields and know his connection with concepts of the Physics.		C29	D7
Handle some computer package of symbolic calculation to resolve problems of differential calculation and integral.		C22	D5 D7
Express of oral form and writing, mathematical concepts.	A4	C23	D1 D3 D4 D5 D8 D12 D13 D14 D15

Contents	
Topic	
Introduction to the real functions of real variable	The real numbers and the straight real. Operations with real numbers. Real functions of real variable. Command and rank. Graphic of a real function of real variable. Elementary functions.
Differential calculation in a variable	Limits and continuity of real functions of real variable. Derived of a function in a point. Calculation of derivatives. Consequences of the *derivación. Relative extremes. Graphic representation of real functions of real variable.
Integration of real functions of real variable.	Integral of Riemann. Fundamental theorem of the integral calculation. Calculation of primitive.
Real vectorial spaces	Operations with vectors in the plane and in the space. Scalar product. Angle formed by two vectors. Vectorial product in *R3. Mixed product. Vectorial spaces. *Subespacios. Bases.
Systems of linear equations	Matrices. *Determinantes. Basic operations with matrices and *determinantes. Discussion and resolution of systems of equations *lineares. Method of Gauss.
Scalar functions and vectorial functions	Scalar functions and vectorial functions. Partial derivatives of scalar functions. Vector gradient. Ways and integrals of line. Fields *conservativos.
Complex numbers	Complex numbers. Operations with complex numbers.

Planning			
	Class hours	Hours outside the classroom	Total hours
Master Session	20	30	50
Practice in computer rooms	6	3	9
Troubleshooting and / or exercises	26	39	65
Long answer tests and development	3	22	25
Practical tests, real task execution and / or simulated.	0	1	1
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Master Session	The *profesorado will expose the theoretical foundations of the matter; it will present possible applications; it will formulate problems, questions and exercises; it will propose tasks and activities with orientations on the methods and technical to employ to carry out them.
Practice in computer rooms	Activities oriented to the learning and handle of computer programs of Mathematics, for the calculation and the graphic representation of functions and data.
Troubleshooting and / or exercises	In this activity, each student, well of individual way or in group, will have to resolve exercises and *probemas related with the matter. It will have to be able to formulate the mathematical model more convenient, apply the most appropriate technician to resolve each case and interpret and present, of oral way or written, the results.

Personalized attention	
Methodologies	**Description**

Troubleshooting and / or exercises	Each student will sue to the *profesorado the explanations that estimate timely for better comprise the matter and develop successfully the tasks that were him proposed. These queries will attend in the schedule of *tutorías.
Practice in computer rooms	Each student will sue to the *profesorado the explanations that estimate timely for better comprise the matter and develop successfully the tasks that were him proposed. These queries will attend in the schedule of *tutorías.

Assessment

	Description	Qualification	Training and Learning Results		
Troubleshooting and / or exercises	Each student will have to resolve a series of exercises or problems in the term of time and under the conditions established by the *profesorado. The works sued will be able to be of distinct types: presentation of a document written, exit to the *encerado, oral exhibition of any subject related with the matter,... These activities will allow to evaluate of way continued the learning of each student.	15	A4	C23 C29	D1 D3 D4 D6 D7 D8 D9 D12 D13 D14 D15
Long answer tests and development	Final examination. Proof for the evaluation of the competitions purchased. It will realise when finishing the period *lectivo and will include questions and exercises to which the students and the students will answer organising and presenting, of extensive way, the knowledges that have on the matter.	80		C29	D1 D6 D7 D12
Practical tests, real task execution and / or simulated.	Proof to evaluate the skill in the handle and application of the computer resources learnt during the practices of laboratory. It will take place during the sessions of practices of computing	5		C22	D5 D6

Other comments on the Evaluation

To surpass the matter, the note obtained will have to be equal or upper
to 50% of the total punctuation.The students and the students that do not surpass the matter in January, and pretend to do it in the announcement of July, will have to repeat *obligatoriamente the final examination. The note obtained during the course in the others proofs
(Resolution of problems and/or exercises; practical Proofs, of execution of real tasks and/or mock) will keep for the announcement
of July.Any student that participate in one of the two proofs of long answer realised when finishing the period *lectivo (in January or, to be the case, in July) will not be able to, in no case,
obtain the qualification of NO PRESENTED.

Sources of information

Basic Bibliography

Complementary Bibliography

A.S. Ackleh, E.J. Allen, R.B. Kearfott e P. Seshaiyer, **Classical and Modern Numerical Analysis**, 1ª ed., CRC Press, 2009

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

M. Besada, F. J. García, M. A. Mirás, C. Quinteiro, C. Vázquez, **Matemáticas á Boloñesa**, 1ª ed., Servizo de Publicacións da Universidade de Vigo, 2014

R. Larson, R. Hostetler, **Precálculo**, 8ª ed., Cengage Learning, 2012

J. Medina Moreno, **Álgebra lineal y cálculo para estudios de químicas con problemas resueltos**, 1ª ed., Paraninfo, 2015

G. Pota, **Mathematical Problems for Chemistry Students**, 1ª ed., Elsevier, 2006

J. Rogawski, **Cálculo: una variable**, 2ª ed., Editorial Reverté, 2012

E. Steiner, **The Chemistry Maths Book**, 1ª ed., Oxford University Press, 2008

Centro virtual de divulgación de las Matemáticas, **http://www.divulgamat.net/**,

Recommendations

Subjects that continue the syllabus

Mathematics: Mathematics II/V11G200V01203
Numerical methods in chemistry/V11G200V01402

Subjects that are recommended to be taken simultaneously

Biology: Biology/V11G200V01101

Physics: Physics I/V11G200V01102
Chemistry, physics and biology: Integrated laboratory I/V11G200V01103
Chemistry: Chemistry I/V11G200V01105

Other comments

It recommends have *cursado the matter of Mathematics of the last course of *Bachillerato.

IDENTIFYING DATA				
Chemistry: Chemistry I				
Subject	Chemistry: Chemistry I			
Code	V11G200V01105			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Galician			
Department				
Coordinator	Bravo Bernárdez, Jorge			
Lecturers	Bravo Bernárdez, Jorge Tojo Suárez, María Concepción			
E-mail	jbravo@uvigo.es			
Web				
General description	Subject in the that impart contents of General Chemistry.			

Competencies	
Code	
A1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
C1	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Major aspects of chemical terminology, nomenclature, units and unit conversions.
C2	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: types of chemical reactions and its main characteristics
C19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
D1	Communicate orally and in writing in at least one of the official languages of the University
D3	Learn independently
D6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
D7	Apply theoretical knowledge in practice
D9	Work independently
D12	Plan and manage time properly
D13	Make decisions
D14	Analyze and synthesize information and draw conclusions
D15	Evaluate critically and constructively the environment and oneself

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Use mol, empirical and molecular formula. Name binary compounds.	A1	C1 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15
Describe the general structure of the atom and the main models. Use the periodic table.	A1	C1 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15

Explain the covalent bond and Lewis structures. Predict the bond polarity. Name and formulate poliatomic ions. Describe the properties of ionic compounds.	A1	C1 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15
Use the RPECV model. Determine the orbitals hybridization in one central atom and the corresponding molecular geometry. Identify sigma and pi bonds. Predict the polarity of molecules. Describe the different types of intermolecular interactions and used them to explain the melting and boiling points.	A1	C1 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15
Adjust simple chemical equations and do stoichiometric calculations. Recognize types of general reactions. Explain neutralization reactions and oxidation-reduction reactions.	A1	C2 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15
Explain the properties of gases. Calculate the quantities of gas reactants and products that take part in chemical reactions. Describe the ideal gases model and compare it with real gases.	A1	C1 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15
Explain the properties of liquids, and the phase transitions that take place between solids, liquid and gases. Perform calculations on the basis of simple unitary cells and the dimensions of atoms and ions. Explain the metallic bonding and interprete the properties of metals, semiconductors and insulating materials.	A1	C1 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15
Describe the different forms of energy. Recognise and use the thermodynamic language. Apply the Hess law. Calculate the variations of the different thermodynamic functions in a chemical reaction.	A1	C1 C2 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15
Describe the properties of a system in chemical equilibrium. Calculate the equilibrium constant and the concentrations of reactants and products in system in chemical equilibrium. Use the Le Chatelier principle.	A1	C1 C2 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15

Explain the properties of water. Predict the solubility. Describe the role of water in the acid-base reactions. Identify the conjugate base and the conjugate acid. Calculate the pH. Identify the oxidizing and reducing agents in a redox reaction and balance redox reactions.	A1	C1 C2 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15
Define the main concepts of Chemical Kinetics. Determine the rate laws and the rate constants. Calculate the activation energy and the frequency factor. Explain the catalytic action.	A1	C1 C2 C19	D1 D3 D6 D7 D9 D12 D13 D14 D15

Contents

Topic	
Subject 1. Nature of Chemistry	The matter and its properties. Classification of the matter. Atoms and elements. Concept of mol. Chemical compounds. Formulation. Classification. Molecular mass and mol of a compound. Determination of empirical and molecular formula.
Subject 2. Chemical reactions	Classification. Chemical equations. Stoichiometric calculations. Limiting reactant. Yield.
Subject 3. Gases	Properties of gases. The atmosphere. Ideal gases law. Density and molar mass of gases. Partial pressures. Real gases.
Subject 4. Thermochemistry and the spontaneity of a chemical processes.	Thermochemistry and the spontaneity of chemical processes. Units of energy. Transfer of energy and phase transition. Thermochemical equations. Hess´s law. Entropy and second law of thermodynamics. Gibbs energy.
Subject 5. Chemical equilibrium	Equilibrium constant: determination and meaning. Calculation of equilibrium concentrations. Le Chatelier's principle. Gibbs energy and equilibrium constant.
Subject 6. Water and chemistry of solutions	Water as a solvent. How substances are solved. Temperature and solubility. Solubility equilibrium. Concept of Brönsted acid-base. Water autoionization. Ionization constants. Acid-base reactions. Hydrolysis. Buffer solutions. Redox reactions. Balance of redox reactions.
Subject 7. Condensed phases	Liquid state. Order in liquids. Solid state. Melting point. Boiling point. Phase equilibria. Phase diagram.
Subject 8. Chemical kinetics	Reaction rate. Effect of concentration. Rate lawand order of reaction. Mechanisms of reaction. Catalysis. Thermodynamic and kinetic stability.
Subject 9. The atom	Subatomic particles. Nuclear atom. Chemical elements. Isotopes. Electronic structure of atoms. Electronic configuration. Periodic table. Periodic properties.
Subject 10. Chemical bonding	Simple covalent bonds and Lewis structures. Multiple covalent bond. Lewis structures and resonance. Polarity of a bond and electronegativity. Coordinated covalent bonds. Ions and ionic compounds.
Subject 11. Molecular structure	Prediction of molecular forms: RPECV. Hybridization. Molecular polarity. Condensed phases formation. Intermolecular interactions.

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	26	26	52
Seminars	26	26	52
Troubleshooting and / or exercises	0	19	19
Long answer tests and development	4	14	18
Short answer tests	2	7	9

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

Methodologies

	Description

Master Session	In this kind of sessions the general aspects of the program will be introduced in an structured way. The basics and the more important or difficult to understand aspects will be emphasized. The required material to study the next week will be available through the Tem@ platform. In this case, students are advised to study previously the available material and to consult the recommended bibliography to complete the information. In this way the explanations of the program contents will result in a better academic progress.
Seminars	Two classes a week will be devoted to students solve some of the problems or proposed exercises related with the subject. Some of these exercises or any other proposed by the teacher can be ordered to be qualified. As well as the correct exercises resolution, the suitable use of the language and handle mathematics (including error analysis, correct estimate of magnitude orders, use of units and ways of data presentation) will be valued.
Troubleshooting and / or exercises	The list of problems must be solved by students, with the help, if necessary, of the teacher during seminars or tutorial timetable. These list of problems can be requested in the established date if teacher ask for them. As well as the correct exercises resolution, the suitable use of the language and handle mathematics (including error analysis, correct estimate of magnitude orders, use of units and ways of data presentation) will be valued.

Personalized attention

Methodologies	Description
Troubleshooting and / or exercises	The students can consult all type of questions about the subject during the tutorial timetable.
Seminars	The students can consult all type of questions about the subject during the tutorial timetable.

Assessment

	Description	Qualification	Training and Learning Results		
Troubleshooting and / or exercises	The attendance (mandatory) to seminars, the involvement of students and the resolution by students of a serie of problems and/or exercises can be valued to monitor the student progress.	25	A1	C1 C2 C19	D1 D6 D7 D13 D14 D15
Long answer tests and development	Exams to evaluate the competences that students have acquired. After the lessons and trainning sessions finish, an exam will take place. A minimum score of 4 out of 10 in this exam is needed to take into account the rest of marks in the evaluation.	45	A1	C1 C2 C19	D1 D3 D6 D7 D9 D12 D13 D14
Short answer tests	Students must pass two tests of the contents explained in the magistral sessions and seminars.	30	A1	C1 C2 C19	D1 D3 D6 D7 D9 D12 D13 D14

Other comments on the Evaluation

The final mark in Chemistry I may be the highest mark between the final exam mark and the weighted averaged mark (which is obtained including continuous evaluation).

Call on July:
The mark obtained during the course in the section Troubleshooting and/or exercises is mantained.
The exam includes the whole list of topics of the training course. A minimum score of 4,5 out of 10 in this exam is needed to pass the subject.

Sources of information

Basic Bibliography

Chang, R. y Goldsby, K.A., **Química**, 12, McGraw-Hill, 2017

Complementary Bibliography

Atkins, P y Jones, L, **Principios de Química. Los caminos del descubrimiento**, 5, Médica Panamericana, 2012
Petrucci, R.H., et al., **Química General: principios y aplicaciones modernas**, 11, Pearson Educación, 2017
Whitten, K.W. et al., **Química**, 10, Cengage Learning, 2015
López Cancio, J.A., **Problemas de Química. Cuestiones y ejercicios**, 1, Prentice-Hall, 2000
Orozco Barrenetxea, C et al., **Problemas Resueltos de Química Aplicada**, 1, Paraninfo, 2011

Recommendations

Subjects that continue the syllabus

Chemistry: Chemistry 2/V11G200V01204

Subjects that are recommended to be taken simultaneously

Biology: Biology/V11G200V01101
Physics: Physics I/V11G200V01102
Mathematics: Mathematics I/V11G200V01104
Chemistry, physics and biology: Integrated laboratory I/V11G200V01103

IDENTIFYING DATA				
Physics: Physics II				
Subject	Physics: Physics II			
Code	V11G200V01201			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Galician			
Department				
Coordinator	Salgueiriño Maceira, Verónica			
Lecturers	Garcia Sanchez, Josefa Legido Soto, José Luís Pérez Iglesias, María Teresa			
E-mail	vsalgue@uvigo.es			
Web	http://faitic.uvigo.es			
General description	"Machine translation into english of the original teaching guide" Physics, like scientific discipline, occupies, in general, of the description of the components of the matter and of his mutual interactions, developing theories that, in a formal and consistent way, have an agreement with the empirical knowledge of the reality. From a so wide definition, can adopt distinct perspectives or levels of application, from the microscopic phenomena (at atomic scale) to the macroscopic ones, that give place to his distinct branches. Physics, in this way, is basic precursor of countless scientific and technological applications and, in particular for the student of Chemistry, is indispensable like base and tool to understand developments and theories that will be treated specifically in other matters of the plan of studies of the degree.			

Competencies	
Code	
C23	Present oral and written scientific material and scientific arguments to a specialized audience
D1	Communicate orally and in writing in at least one of the official languages of the University
D3	Learn independently
D4	Search and manage information from different sources
D5	Use information and communication technologies and manage basic computer tools
D6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
D7	Apply theoretical knowledge in practice
D8	Teamwork
D9	Work independently
D12	Plan and manage time properly
D14	Analyze and synthesize information and draw conclusions

Learning outcomes		
Expected results from this subject		Training and Learning Results
2. Explain the utility of the electrostatic potential and calculate it for a distribution of particles loaded so much discreet like continuous.	C23	D1 D3 D4 D5 D6 D9 D12 D14
3. Calculate the polarisation and the dipolar moment in simple cases.	C23	D1 D3 D5 D6 D12 D14
4. Explain the electrostatic properties of a driver.	C23	D1 D3 D4 D5 D6 D7 D12 D14

5. Describe cualitatively from the atomic point of view the effect of an electrical field on a dielectric.	C23	D1 D3 D4 D5 D6 D12 D14
6. Determine the physical effects of the electrical current.	C23	D1 D3 D4 D5 D6 D7 D12 D14
7. Calculate the characteristics and type of path of loaded particles in an electrical or magnetic field.	C23	D1 D3 D5 D6 D8 D12 D14
8. Distinguish the materials by his behaviour in a magnetic field.	C23	D1 D3 D5 D6 D12 D14
9. Calculate the magnetisation and the magnetic moment in simple cases.	C23	D1 D3 D4 D5 D6 D12 D14
10. Explain the difference between conservatives and non conservative electrical fields.	C23	D1 D3 D5 D12 D14
11. Explain of qualitative form basic appearances of the interaction of the electromagnetic radiation with the matter.	C23	D1 D3 D5 D12 D14
12. Determine the limit of resolution of a network of diffraction.	C23	D1 D3 D4 D5 D6 D12 D14

Contents	
Topic	
Subject 1. ELECTROSTATIC FIELD	Introduction. Electrical load. Law of Coulomb. Electrical field. Continuous distribution of Load. Lines of Electrical Field. Scalar sources of Electrical Field. Law of Gauss. Electrical Potential energy. Electrical potential. Equipotential Surfaces. Electrical dipole. Capacity and Combination of Condensers.
Subject 2. CONTINUOUS CURRENT	Introduction. Electrical current and density of current. Law of Ohm. Resistance. Electromotive Strength. Law of Joule. Calorific Power loss. Circuits of continuous current:-Association of resistances, -Rules of Kirchhoff.

Subject 3. MAGNETIC FIELD	Introduction. Magnetic strength. Strength of Lorentz. Magnetic strength on a driver by which circulates current. Magnetic field of a load in movement. Magnetic field of an element of current. Law of *Biot-*Savart. Magnetic strength between two parallel drivers. Lines of magnetic field and magnetic flow. Law of Gauss. Law of *Ampère. Magnetic materials.
Subject 4. ELECTROMAGNETIC INDUCTION	Phenomena of electromagnetic induction: experiences of Faraday, magnetic flow, laws of Faraday and of *Lenz, experience of Henry. Applications: generators and electrical receptors, mutual induction and slef-induction. Magnetic energy.
Subject 5. WAVES	Introduction. Simple Harmonic movement. Superposition Of BUT. Swings cushioned. Swings forced. Resonance. Waves in material means. Equation of wave. Harmonic waves. Interference of waves. Superposition.
Subject 6. COMMON PROPERTIES To THE DIFFERENT WAVES.	Reflection and refraction. Superposition: Interference, pulses, stationary waves. Diffraction. Doppler Effect.
Subject 7. PHYSICAL OPTICS	Nature of the light: electromagnetic waves, luminous ray, speed of propagation. Wave phenomena: dispersion, interference, diffraction of *Fraunhofer: by a slit, by a pair of equal parallel slits, networks of diffraction. Polarisation. Optical activity.

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	24	43.2	67.2
Seminars	26	46.8	72.8
Short answer tests	3	0	3
Troubleshooting and / or exercises	3	0	3

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

Methodologies

	Description
Master Session	In the TEMA platform, at disposal of the students, there will be information on the teaching sessions. a) the specific aims pursued in each subject will be analysed, indicating needs and possible applications. b) the way to reach the aims will be shown. Those aspects result more problematic or difficult will be treated in more detail and distinct examples will be solved. c) Diferent bibliographic references will be proposed.
Seminars	a) exercises and problems that will be previously at disposal of the students in the page web will be solved. b) Doubts and concepts of difficult understanding will be clarified. c) Problems of the bulletins that student have to solve by themselves may be proposed.

Personalized attention

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.
Master Session	Concepts related with the master session will be asked to the students. In case to need it students may attend to personal tutories to clarify concepts and help them with their resolutions.
Tests	**Description**
Short answer tests	Questions will be asked to the students and in case to need it, students may attend to personal tutories to clarify concepts and help them with the resolutions.
Troubleshooting and / or exercises	Problems will be asked to the students and in case to need it, students may attend to personal tutories to clarify concepts and help them with the resolutions.

Assessment

	Description	Qualification	Training and Learning Results
Master Session	Answers to concepts seen in the master session	0	

Seminars	Realisation of exercises of individual form or in group and assistance	10	C23	D1 D4 D5 D6 D7 D9 D12 D14
Short answer tests	1ª announcement. a) Three short written proofs (will eliminate matter until the 2ª announcement). b) In June a final examination to recover the matter or to raise qualifications will be done in a complete examination.	30	C23	D1 D3 D6 D7 D9 D12 D14
Troubleshooting and / or exercises	1ª announcement: a) Three short written proofs (will eliminate matter until the 2ª announcement). b) In June a final examination to recover the matter or to raise qualifications will be done.	60	C23	D1 D3 D6 D7 D9 D12 D14

Other comments on the Evaluation

- If the student does not have note any in the different sections will consider No Presented, NP.

- July: Evaluation of the second announcement.

a) It will keep the note of the first corresponding announcement to the seminars and master session.

b) The student will be able to do an only proof written on the contents of the complete matter

Sources of information

Basic Bibliography

Young H.D., Freedman R.A., **Física universitaria, con física moderna, Vol.2**, Pearson Educación, 2013

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

Gettys, E.; Kéller, F.J. y Skove, M.J., **Física Clásica y Moderna.**, McGraw-Hill, 2010

Complementary Bibliography

Serway, R.A; Beichner R. J., **Física para Ciencias e Ingeniería**, McGraw-Hill, 2010

Lea S.M.; Burke J.R., **Física. La naturaleza de las cosas**, Paraninfo, 2010

Fleisch, D., **A student's guide to Maxwell's equations**, Cambridge University Press, 2008

Recommendations

Subjects that continue the syllabus

Chemistry, physics and geology: Integrated laboratory II/V11G200V01202
Physics III/V11G200V01301

Subjects that are recommended to be taken simultaneously

Mathematics: Mathematics II/V11G200V01203
Chemistry, physics and geology: Integrated laboratory II/V11G200V01202

Subjects that it is recommended to have taken before

Physics: Physics I/V11G200V01102
Mathematics: Mathematics I/V11G200V01104
Chemistry, physics and biology: Integrated laboratory I/V11G200V01103

IDENTIFYING DATA				
Chemistry, physics and geology: Integrated laboratory II				
Subject	Chemistry, physics and geology: Integrated laboratory II			
Code	V11G200V01202			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	García Martínez, Emilia			
Lecturers	Alejo Flores, Irene Besada Pereira, Pedro Bravo Bernárdez, Jorge Francés Pedraz, Guillermo Gago Duport, Luís Carlos García Domínguez, Patricia García Martínez, Emilia Lugo Latas, Luis Méndez Martínez, Gonzalo Benito Prieto Jiménez, Inmaculada Rodríguez Arguelles, María Carmen Salgueiriño Maceira, Verónica Testa Anta, Martín			
E-mail	emgarcia@uvigo.es			
Web	http://faitic.uvigo.es			
General description	"Machine translation into english of the original teaching guide" In this matter students will apply in a more specific way the criteria and practical skills learnt in the matter Integrated Laboratory I. Students will carry out diverse experiments that will allow them to work in more specialized laboratories. There will be a focus on the observation and preparation of a laboratory notebook as well as in the realisation of a final report of the work carried out.			

Competencies	
Code	
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C25	Handle chemicals safely, considering their physical and chemical properties, including the evaluation of any specific risks associated with its use
C26	Perform common laboratory procedures and use instrumentation in synthetic and analytical work
C27	Monitor, by observation and measurement of physical and chemical properties, events or changes, and document and record them in a consistent and reliable way
C28	Interpret data derived from laboratory observations and measurements in terms of their significance and relate them to the appropriate theory
C29	Demonstrate skills for numerical calculations and interpretation of experimental data, with special emphasis on precision and accuracy
D1	Communicate orally and in writing in at least one of the official languages of the University
D3	Learn independently
D4	Search and manage information from different sources
D5	Use information and communication technologies and manage basic computer tools
D6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
D7	Apply theoretical knowledge in practice
D8	Teamwork
D9	Work independently
D12	Plan and manage time properly
D13	Make decisions
D14	Analyze and synthesize information and draw conclusions
D15	Evaluate critically and constructively the environment and oneself

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Analyse as they affect the speed of distinct reaction factors, as for example the nature of the reagents, the concentration of the same, the presence of a catalyst or the temperature.	A5	C28	D3 D7 D9 D13 D14
Distinguish a galvanic in a electrolytic cell and learn to build both types of cells.	A5	C25 C28	D1 D3 D4 D7 D8 D12 D13 D14 D15
Reproduce basic experiences in physics with the aim to show or apply some of the basic laws.	A5	C27 C28 C29	D4 D6 D7 D8 D9 D13 D14 D15
Apply the knowledge and the skills purchased the resolution of simple problems of separation, purification and characterisation of chemical compounds.	A5	C25 C26 C27 C28	D1 D3 D4 D7 D9 D12 D13 D14
Handle different *equipación *comun in the laboratory of Physics and Chemical: *polímetro, sources of feeding, oscilloscope, etc	A5	C26 C27 C29	D6 D14
Adjust the experimental conditions for a chemical process (temperature, agitation, etc.).	A5	C26 C27 C28	D3 D7 D8 D13
Handle properly the molecular models for the representation of organic and inorganic compounds	A5	C28	D1 D3 D7 D9 D12 D13 D14
Carry out the *sintesis of organic and inorganic substances simple	A5	C25 C26 C27 C28	D1 D3 D4 D9 D12 D13 D14 D15
Use programs of diffraction and interpret images of electronic microscopy differentiating the structural information (*HREM, *SAED) and the morphological (SEM)	A5	C28	D1 D3 D4 D5 D7 D8 D14

Contents
Topic

- Voltaic and electrolytic cells. The Nernst equation. (2 sessions)
- Separation techniques: solid- liquid extraction and thin layer chromatography. (1 session)
- Separation techniques: thin layer chromatography and column chromatography. (1 session)
- Chemical Equilibrium: Study of equilibrium of dissociation of a chemical reaction. (1,5 sessions)
- Chemical kinetics: kinetic study of a chemical reaction. (1,5 sessions)
- Equation of state of the ideal gases. (1 session)
- Representation of simple inorganic molecules: molecular models. (1 session)
- Representation of organic molecules: molecular models. (1 session)
- Synthesis of simple inorganic compounds. (2 sessions)
- Synthesis of simple organic compounds. (1 sessions)
- Synthesis of organic polymers. (1 session)
- Introduction to morphological and microestructural characterization of crystals with optical microscopy with polarised light.(2 sessions)
- Introduction to crystall growth techniques in the laboratory: crystallization from solutions ways of generation of the supersaturation. Formation of large crystals. Crystal growth in gels: the diffusion-reaction technique. (1 session)
- Determination of the specific resistance of a conductor. (1 session)
- Ohm´s law: DC circuits. (1 session)
- Calibration of a thermistor. (1 session)
- Electromagnetic induction phenomena: induced currents , Faraday and Lenz laws. Transformer. (1 session)
- Theorem of transfer of maximum power in a circuit. (1 session)

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practises	72	40	112
Outdoor study / field practices	8	10	18
Short answer tests	2	6	8
Practical tests, real task execution and / or simulated.	3	9	12

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

Methodologies

	Description
Laboratory practises	They will be conducted laboratory practice sessions of 3 hours each. Students have practice scripts the supporting material in the FAITIC platform, so you may have prior knowledge of the experiments.
Outdoor study / field practices	There will be a report on the subject of field practice. Attendance is mandatory to be able to be evaluated.

Personalized attention

Methodologies	Description
Laboratory practises	Time spent by the teacher to address all concerns and issues raised by the student along the course. The student will consult with faculty clarifications deemed appropiate in order to better understand the subject and successfull develop tasks that were prposed to him/her. These queries will be handled in the titorias schedule.
Outdoor study / field practices	The student will consult with faculty clarifications deemed appropiate in order to better understand the subject and successfull develop tasks that were prposed to him/her.

Assessment					
	Description	Qualification	Training and Learning Results		
Laboratory practises	The teacher will track the experimental work done by students in laboratory, as well as elaborate notebook sessions. Since it is experimental matter, attendance at laboratory sessions is mandatory. It is important to indicate that the non-attendance will be penalized in the final grade. If the number of absences is greater than 3, it will mean suspended matter. The days that are missing will be considered zeros in the laboratory note. In this section scored charged special relevance the following points: -As the student in the laboratory, including its degree of autonomy developed is. -As it solves the problems that arise when making practice. -Which is his/her mastery of the knowledges necessary to carry out the practice. -Cleaning and treatment of the material. -Domain of the calculations for the internship. -Development of laboratory notebook/reports.	40	A5	C25 C26 C27 C28 C29	D1 D3 D4 D5 D6 D7 D8 D9 D12 D13 D14 D15
Outdoor study / field practices	It will realise a memory on the subject of the practice of field. The assistance is compulsory to be able to be evaluated.	10	A5	C27 C28	D1 D7 D14 D15
Short answer tests	It will realise a proof written (of brief answer) relative to concrete appearances of the operations realised in the laboratory.	25	A5	C28 C29	D1 D6 D7 D14
Practical tests, real task execution and / or simulated.	It will realise a practical proof (session of laboratory) that will allow to evaluate the competitions and skills purchased by the student/the. Said proofs will be realised of independent form for each group of practices.	25	A5	C25 C26 C28	D1 D7 D9 D12 D13 D14

Other comments on the Evaluation

To be evaluated the student has to obtain a minimum note in some of the distinct sections that comprises the evaluation, this minimum note is of 3.5 in the theoretical and practical proofs and in the outdoor study/field practices, and of 4 in the assessment of the practices of laboratory.

The assistance to more than two practical sessions will involve that the student already is being evaluated, therefore, his/her qualification will not be able to be ¨No Presented¨.

Requires a honest and responsible conduct of the students who curse this matter. Fraudulent conduct may be suspend the matter during full course.

In the second announcement the evaluation will carry out of the following way:

A theoretical proof-practical in which they will evaluate the results of the learning of the student: 50 %.

Will conserve the punctuation reached by the student during the course;in the following sections: follow-up of the work of laboratory (40%) and outdoor study/field practices (10%).

Sources of information

Basic Bibliography

Complementary Bibliography

Atkins, P.; Jones, L., **Principios de Química**, 5ª, Panamericana, 2012

Atkins, P.; de Paula, J., **Química Física**, 8ª, Panamericana, 2008

Beckmann, W., **Crystallization: Basic Concepts and Industrial Application**, John Wiley & Sons, 2013

Chang, R.; Goldsby, K.A., **Química**, 12ª, McGraw-Hill, 2017
Martínez Grau,M.A.; Csákÿ, A.G., **Técnicas Experimentales en Síntesis Orgánica**, 2ª, Sintesis, 2012
Petrucci, R.; Herring, F.G.; Madura, J.D.; Bissonnette, C., **Química General**, 11ª, Pearson, 2017
Shoemaker, D. P.; Garland, C.W.; Nibler, J.W., **Experiments in Physical Chemistry**, 8ª, McGraw-Hill, 2008
Tipler, P.A.; Mosca, G., **Física para la Ciencia y la Tecnología**, 6ª, Reverte, 2010
Wade, L.G., **Química Orgánica**, 7ª, Pearson Educación, 2012

Recommendations

Subjects that are recommended to be taken simultaneously

Physics: Physics II/V11G200V01201
Geology: Geology/V11G200V01205
Mathematics: Mathematics II/V11G200V01203
Chemistry: Chemistry 2/V11G200V01204

Subjects that it is recommended to have taken before

Biology: Biology/V11G200V01101
Physics: Physics I/V11G200V01102
Mathematics: Mathematics I/V11G200V01104
Chemistry, physics and biology: Integrated laboratory I/V11G200V01103
Chemistry: Chemistry I/V11G200V01105

IDENTIFYING DATA				
Mathematics: Mathematics II				
Subject	Mathematics: Mathematics II			
Code	V11G200V01203			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Mirás Calvo, Miguel Ángel Verdejo Rodríguez, Amelia			
Lecturers	Mirás Calvo, Miguel Ángel Verdejo Rodríguez, Amelia			
E-mail	mmiras@uvigo.es averdejo@uvigo.es			
Web	http://http://faitic.uvigo.es/			
General description	This course covers theoretical and practical topics of Calculus (several variables), optimization e statistics. It is intended to improve the student's abilities in comprehension and use of mathematical language. It will also give the student the necessary general computation skills and the basic knowledge of mathematics-oriented software.			

Competencies	
Code	
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
C22	Process and perform computational calculations with chemical information and chemical data
C23	Present oral and written scientific material and scientific arguments to a specialized audience
C29	Demonstrate skills for numerical calculations and interpretation of experimental data, with special emphasis on precision and accuracy
D1	Communicate orally and in writing in at least one of the official languages of the University
D3	Learn independently
D4	Search and manage information from different sources
D5	Use information and communication technologies and manage basic computer tools
D6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
D7	Apply theoretical knowledge in practice
D8	Teamwork
D9	Work independently
D12	Plan and manage time properly
D13	Make decisions
D14	Analyze and synthesize information and draw conclusions
D15	Evaluate critically and constructively the environment and oneself

Learning outcomes		
Expected results from this subject	Training and Learning Results	
To relate curves and surfaces with geometrical objects and functions of several variables.	C29	D6 D9
To compute the volume of three-dimensional domains and basic surface integrals as well as using polar, spherical and cylindrical coordinates.	C29	D6
To apply the basic notions and rules of the calculus of several variables.	C29	D3 D6 D9
Differentiating implicitly	C23	D3 D9
To express and solve optimization problems without constraints	C23 C29	D1 D3 D4 D6 D7 D14

To model and solve practical problems using differentiable and integral calculus techniques.		C22 C23 C29	D3 D6 D7 D9 D12 D13 D14
To use an appropriate graphic, numerical and symbolical software to solve practical problems of calculus of several variables.		C22 C29	D4 D5 D6 D7 D13 D14
To compute eigenvalues and check whether a matrix is diagonalizable.		C29	D3 D6 D9
To stablish the definiteness of a quadratic form.		C29	D3 D6 D9
To use adequate software to solve linear algebra problems.		C22 C29	D3 D4 D5 D6 D7 D9 D12 D13 D14
To perform a descriptive statistical data analysis		C22 C29	D4 D5 D6 D7 D9 D12 D13 D14
To compute probabilities in different spaces and apply the concept of random variable to model real situations.		C23 C29	D3 D6 D9
To use basic statistical software.		C22 C23 C29	D1 D4 D5 D6 D7 D14
To write or make and oral presentation of mathematical concepts.	A4	C23	D1 D3 D4 D5 D8 D12 D13 D14 D15

Contents	
Topic	
Chapter 1: Eigenvalues and symmetric matrices	Computation of eigenvalues. Diagonalizable matrices. Sign of a quadratic form
Chapter 2: Calculus of several variables	Intoduction to real funcions of several variables. Continuous and differentiable functions. Higher order derivatives. The chain rule. Implicit differentiation. Computation of extreme points
Chapter 3: Multiple integration	Integrals of functions of two and three variables on bounded domains. Polar, spherical and cylindrical coordinates. Surface Integrals

Planning			
	Class hours	Hours outside the classroom	Total hours
Master Session	20	30	50
Troubleshooting and / or exercises	26	36	62
Practice in computer rooms	6	3	9
Long answer tests and development	3	20	23
Practical tests, real task execution and / or simulated.	0	6	6

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

Methodologies	
	Description
Master Session	The teachers will lecture on the theoretical foundations of the topics cover in the course; they will present possible applications; they will formulate problems, questions and exercises; and they will propose tasks and activities with orientations on the methods and techniques needed.
Troubleshooting and / or exercises	In this activity, the students, individually or in group, must solve problems and exercises. The students must be able to find a convincing mathematical model, use the appropriate technique according to the available information and give a sound interpretation of the results.
Practice in computer rooms	Activities designed to learn how to use mathematical software to make numerical computations and plotting of functions and data.

Personalized attention	
Methodologies	**Description**
Troubleshooting and / or exercises	Each student can ask the teachers for advise and guidance related to the contents and activities of the course. They will be attended during tutorial hours.
Practice in computer rooms	Questions and doubts related to the computer classes will be attended during tutorial hours.

Assessment					
	Description	Qualification	Training and Learning Results		
Troubleshooting and / or exercises	The student must solve some given problems and exercises within the time and under the conditions specified by the teacher. The activities can be of very different types: go out to the blackboard, written assingment, oral presentation, puzzle,...	15	A4	C23	D1 D3 D4 D6 D7 D8 D9 D12 D13 D14 D15
Long answer tests and development	Final exam. A formal individual examination consisting on theoretical and practical questions that will take place right after the classes period.	80		C22 C29	D3 D6 D7 D9 D12 D13 D14
Practical tests, real task execution and / or simulated.	Practical exercise to evaluate the student degree of knowledge and application of the mathematical software used in the lab clasess.	5		C22 C29	D4 D5 D6 D7 D14

Other comments on the Evaluation

Second call (failed subject):

To pass the subject the student must obtained a global score greater or equal than 50% of the possible highest score.

The student who fail the subject in the first call must repeat the final exam in July. The other marks will be maintained.

A final mark or qualification will be assigned to those students who attend any of the final exams.

Sources of information

Basic Bibliography

Complementary Bibliography

Robert G. Mortimer, **Mathematics for physical chemistry**, Elsevier, 2013

Besada, M.; García, J.; Mirás, M.; Vázquez, C., **Cálculo diferencial en varias variables**, Garceta, 2011

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

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

Real Sociedad Matemática Española, **Centro virtual de divulgación de las Matemáticas**,

Proxecto Innovación Educativa. Universidade de Vig, **Matemáticas a través do teatro**,

R. Larson, R. Hostetler; B. H. Edwards, **Cálculo esencial**, Itemex, 2010

Robert A. Adams; Christopker Essex, **Calculus. A complete course**, Pearson, 2013

William Bober, Chi-Tay Tsai; Oren Masory, **Numerical and analytical methods with MATLAB**, CRC Press, 2013

Dingyu Xue; Yangquan Chen, **Solving applied mathematical problems with MATLAB**, CRC Press, 2009

Recommendations

Subjects that continue the syllabus

Numerical methods in chemistry/V11G200V01402

Subjects that are recommended to be taken simultaneously

Physics: Physics II/V11G200V01201
Geology: Geology/V11G200V01205
Chemistry, physics and geology: Integrated laboratory II/V11G200V01202
Chemistry: Chemistry 2/V11G200V01204

Subjects that it is recommended to have taken before

Biology: Biology/V11G200V01101
Physics: Physics I/V11G200V01102
Mathematics: Mathematics I/V11G200V01104
Chemistry, physics and biology: Integrated laboratory I/V11G200V01103
Chemistry: Chemistry I/V11G200V01105

IDENTIFYING DATA				
Chemistry: Chemistry 2				
Subject	Chemistry: Chemistry 2			
Code	V11G200V01204			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Losada Barreiro, Sonia			
Lecturers	García Domínguez, Patricia Losada Barreiro, Sonia Rodríguez Arguelles, María Carmen			
E-mail	sonia@uvigo.es			
Web	http://faitic.uvigo.es			
General description	Chemistry II pretends to provide to students the basis for the understanding of disciplines more specific, that will give in future courses.			

Competencies	
Code	
C1	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Major aspects of chemical terminology, nomenclature, units and unit conversions.
C2	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: types of chemical reactions and its main characteristics
C5	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Characteristics of the different states of matter and the theories used to describe them
C9	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: characteristic properties of the elements and their compounds, including group relationships and variations in the periodic table
C12	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: structural features of chemical elements and their compounds, including stereochemistry
C19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
D1	Communicate orally and in writing in at least one of the official languages of the University
D3	Learn independently
D4	Search and manage information from different sources
D6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
D7	Apply theoretical knowledge in practice
D8	Teamwork
D9	Work independently
D12	Plan and manage time properly
D13	Make decisions
D14	Analyze and synthesize information and draw conclusions
D15	Evaluate critically and constructively the environment and oneself

Learning outcomes		
Expected results from this subject	Training and Learning Results	
Interpret the functions of radial distribution and the angular representations of the s, p, d and f orbitals. Describe the configuration in the fundamental state of atoms and ions. Justify the variations of different atomic parameters along the Periodic Table. Interpret the electronegativity and the polarizability of an atom.	C5 C9 C19	D1 D3 D4 D6 D7 D8 D9 D12 D13 D14 D15

Recognize the atomic orbitals involved in a bonding. Build diagrams of OM for diatomic molecules and deduce properties of the bonding. Define overlap integral. Apply the method of hybridization to explain the bonding in simple molecules.	C5 C19	D1 D3 D4 D7 D8 D9 D12 D13 D14
Describe the state of aggregation of the elements and his behaviour in front of oxygen and water. Describe the natural resources of the elements and some methods of obtaining.	C5 C9	D1 D3 D4 D7 D8 D9 D12 D14
Use the models of bonding to explain the structure of the main functional groups. Relate its structure with its macroscopic properties.	C1 C9	D1 D3 D4 D7 D8 D9 D12 D14
Identify the acidic protons in an Brönsted acid. Classify the Brönsted acids. Predict the acidity and basicity of organic compounds. Identify acids and bases of Lewis and types of acid-base reactions. Identify acids and bases as hard or soft and explain its interaction.	C1 C2 C19	D1 D3 D4 D7 D8 D9 D12 D14
Represent the three-dimensional structure of organic molecules. Apply the principles of stereochemistry. Determine the absolute configuration. Apply the nomenclatures R/S and Z/Y.	C1 C12	
Explain the bonding solids. Relate structure and properties in amorphous solids. Describe the supercondutivity. Interpret one model structure. Predict the coordination number in function of the relation of ionic radii. Use the cycle of Born-Haber to determine the lattice enthalpy.	C5 C19	D1 D3 D4 D7 D8 D9 D12 D14
Define the standard potentials of reduction. Calculate the variation of energy of Gibbs in a redox reaction. Explain an electrochemical cell. Predict the products and its quantities in a electrolysis.	C1 C19	D1 D3 D4 D7 D8 D9 D12 D14
Characterize the types of radiation in a radioactive disintegration. Write nuclear reactions. Calculate the nuclear binding energy and the half life of an isotope. Describe the reactions in nuclear chain. Enumerate examples of the use of radioisotopes.	C1 C19	D1 D3 D4 D7 D8 D9 D12 D14

Contents	
Topic	
Subject 1: Structure of matter	Structure of the hydrogenic atoms. Polyelectronic atoms. Atomic parameters. Lanthanide contraction. Electronegativity. Polarizability.
Subject 2: Chemical bonding	Theory of OM. Types of orbital: sigma, pi, delta. Diagram of energies for diatomic homo- and heteronuclear molecules.
Subject 3: Solids	Structure of the simple solids. Structure of the metals. Alloys. Metallic bonding. Semicondutors. Ionic solids. Energetic aspects.

Subject 4: Redox properties of the main group elements	Oxidants and reductants. Nerst Equation.
Subject 5: Electrochemisty	Concentration cells. Batteries. Fuell cells. Electrolysis. Commercial electrolytic processes. Corrosion.
Subject 6: Acid-Base properties of the main group elements	Brönsted acids and bases. Lewis acids and bases.
Subject 7: Nuclear chemistry	Nuclear reactions. Radioactive disintegration. Artificial transmutations. Nuclear fission. Nuclear fusion. Nuclear radiation. Applications of the radioactivity.
Subject 8: Organic Compounds and functional groups	Structure and geometry. Approach and nomenclature of organic compounds. Physical properties.
Subject 9: Isomery	Geometrical isomery. Conformational stereoisomery. Configurational stereoisomery.

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	26	38	64
Seminars	26	40	66
Long answer tests and development	3	11	14
Short answer tests	2	4	6

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

Methodologies

	Description
Master Session	In these sessions, we present the general aspects of the program
Seminars	Each week we employe two hours to the resolution of some problems or exercises proposed related with the matter. These exercises will be delivered previously to the student through the platform Tem@ expecting that the student work them. In these sessions, we can collect questions or short problems to control the progress of the students.

Personalized attention

Methodologies	Description
Seminars	During all the educational period the students will be able to consult all type of doubts related with the matter. These queries will attend so much in schedules of tutorials as of seminars.

Assessment

	Description	Qualification	Training and Learning Results	
Seminars	The attitude and participation of the student will be valued. We also may collect questions or problems as tracking student progress. The punctuation only will be considered if the student reaches a qualification equal or upper than 5 points on 10.	15	C1 C2 C5 C9 C12 C19	D1 D3 D4 D6 D7 D8 D9 D12 D13 D14 D15
Long answer tests and development	Test for evaluation of the competitions purchased in the matter. The punctuation only will be considered if the student reaches a qualification equal or upper than 5 points on 10 in the short answer test. Students who have not passed the short answer test, will need to pass the examination of the whole course.	40	C1 C2 C5 C9 C12 C19	
Short answer tests	The students will have a short answer text along the course on the matter explained in the sessions and seminars. If students pass this exam (a qualification equal or upper than 5 points on 10), they only will need to pass the examination corresponding to the rest of subjects in the long answer test.	45	C1 C2 C5 C9 C12 C19	

Other comments on the Evaluation

Students must attend all test performed along the course. The participation in the evaluation activities throughout the semester or in some of the assessment test involve the condition of presented and therefore the student will be grade.

The final note of the subject will be:
- that note obtained by the continuous evaluation (15% seminars + 45% short answer test + 40% long answer test) for those students that have reached a punctuation equal or upper than 5 points on 10 in the short answer test. The students must attend both tests (short and long answer tests).
- that note obtained in the long answer test by the examination of the whole course for those students that have not reached an punctuation equal or upper than 5 points on 10 in the short answer test.
Assessment in July: it is governed by the above.

Sources of information

Basic Bibliography

Chang, R. and Goldsby, K. A., **Química**, 12ª, McGrawHill: Mexico, 2017

Petrucci, R.A. et al., **Química general: Principios y aplicaciones modernas.**, 11ª, Madrid: Pearson Educación, D.L., 2017

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

Brown, T.L.; Lemay, H.E.; Bursten, B.E.; Murphy, C.J.; Woodward, P.M., **Química. La ciencia central.**, 12ª, Pearson: Naucalpan (Mejico), 2014

Jr Wade, L.G., **Química Orgánica.**, 7ª, Pearson-Educación de México, 2012

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

Peterson, W. R., **Nomenclatura de las sustancias químicas.**, 4ª, Barcelona: Reverté, D.L., 2016

Complementary Bibliography

Frenking, G.and Shaik, S., **The Chemical bond.**, Weinheim: wiley-VCH, 2014

Tan, J. and Chan K.S., **Understanding Advanced Physical Inorganic Chemistry.**, World Scientific Publishing, Singapore, 2017

Pfenning, B.W., **Principles of Inorganic Chemistry.**, 1ª, Wiley, 2015

Carey, F., **Química Orgánica.**, 9ª, McGraw Hill: Interamericana, 2014

Yurkanis, B.P., **Química Orgánica.**, 9ª, Pearson-Prentice Hall, 2008

Recommendations

Subjects that continue the syllabus

Physical chemistry I/V11G200V01303
Inorganic chemistry I/V11G200V01404
Organic chemistry I/V11G200V01304

Subjects that are recommended to be taken simultaneously

Physics: Physics II/V11G200V01201
Geology: Geology/V11G200V01205
Mathematics: Mathematics II/V11G200V01203
Chemistry, physics and geology: Integrated laboratory II/V11G200V01202

Subjects that it is recommended to have taken before

Biology: Biology/V11G200V01101
Physics: Physics I/V11G200V01102
Mathematics: Mathematics I/V11G200V01104
Chemistry, physics and biology: Integrated laboratory I/V11G200V01103
Chemistry: Chemistry I/V11G200V01105

IDENTIFYING DATA				
Geology: Geology				
Subject	Geology: Geology			
Code	V11G200V01205			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Gago Duport, Luís Carlos			
Lecturers	Gago Duport, Luís Carlos			
E-mail	duport@uvigo.es			
Web	http://faitic.uvigo.es			
General description	The study of the structure of the matter in crystalline state, aim of the Crystallography, is of importance for the understanding of the most diverse phenomena, in the field of the Chemistry. Consistently, the approach of the Geology of first course of the degree in Chemistry is preferably oriented to the knowledge and characterisation of the crystalline structures and of the mechanisms of crystallisation that tackle from the point of view of the Crystallography, the Mineralogy and the Geochemistry. Of particular way, the technicians of diffraction have turned into the most spread between the chemical researchers for the characterisation and determination of structures of the most diverse substances: superconducting materials, mineral, organic compounds, inorganic, pharmaceutical products, biological macromolecules, and ceramic materials, amongst other, thus in the course seat , from an introductory and intuitive point of view, the bases of the diffraction and show the main experimental technicians associated to the process of characterisation of crystalline solids.			

Competencies	
Code	
C1	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Major aspects of chemical terminology, nomenclature, units and unit conversions.
C14	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: relationship between macroscopic properties and properties of individual atoms and molecules, including macromolecules
C27	Monitor, by observation and measurement of physical and chemical properties, events or changes, and document and record them in a consistent and reliable way
D1	Communicate orally and in writing in at least one of the official languages of the University
D3	Learn independently
D4	Search and manage information from different sources
D5	Use information and communication technologies and manage basic computer tools
D7	Apply theoretical knowledge in practice
D8	Teamwork
D9	Work independently
D12	Plan and manage time properly
D13	Make decisions
D14	Analyze and synthesize information and draw conclusions
D15	Evaluate critically and constructively the environment and oneself

Learning outcomes		
Expected results from this subject		Training and Learning Results
3. Comprise the bases of the geometrical crystallography like half for the structural characterisation of the crystalline solids, including the basic concepts like periodicity and symmetry.		D1 D3 D5 D9 D12
5. Know the basic appearances of the notation *cristalográfica and his application to the characterisation so much of the symmetry in the molecules (*Schoenflies) as to the structural characterisation of the glasses (*Hermann-*Mauguin).	C1	D1 D7 D8 D13 D14 D15
6. Understand the basic principles of the diffraction like technician for the structural analysis and the concepts *cristalográficos associated: Law of *Bragg, reciprocal cell, problem of the phases.	C1 C14	D1 D3 D5 D9 D15

10. Understand the processes of isotopic exchange in crystalline solids and know his applications for the measure of the geological time and like markers of thermodynamic and kinetical conditions.	C1	D1 D4 D5 D15
7. Purchase a basic knowledge on the principles for the structural determination by means of diagrams of diffraction of rays.		D1 D4 D5 D9 D15
6. Understand the basic principles of the diffraction like technician for the structural analysis and the concepts *cristalográficos associated: Law of *Bragg, reciprocal cell, problem of the phases.	C1	D1 D5 D7 D15
5. Know the basic appearances of the notation *cristalográfica and his application to the characterisation so much of the symmetry in the molecules (*Schoenflies) as to the structural characterisation of the glasses (*Hermann-*Mauguin).	C1	D1 D5 D7 D14 D15
1. Know and comprise, the crystallisation like a process of transition of phase, differentiating the stages of *nucleación and crystalline growth.	C1	D1 D3 D9 D14 D15
8. Know of basic form the derivative information of the distinct technicians of diffraction : *R-X, electrons, neutrons and his main applications in the field of the science of materials and of the molecular characterisation.	C1	D14 D15
9. Purchase a practical experience in the handle of programs of diffraction and in the interpretation of images of *microscopía electronic differentiated the structural information (*HREM, *SAED) and morphological (SEM).	C1 C27	D1 D4 D5 D8 D15
1. Know and comprise, the operation of the Earth like system.	C1	D1 D3 D9 D12 D15
2. Be able to characterise the interaction between the different *reservorios, the physical processes, chemists and biological *involucrados as well as the different scales space-temporary associated.	C1	D1 D4 D7 D9 D13 D15
(*)	C1	D1 D3 D7 D8 D14 D15
(*)	C1	D1 D3 D4 D7 D15

Contents	
Topic	
The process of crystallisation	Thermodynamic appearances of the *nucleación and crystalline growth. Kinetical of the crystalline growth. Structural factors associated.
The crystalline solids	Crystalline structure. Microscopic appearances. Crystalline morphology: macroscopic appearances.
Basic concepts of geometrical crystallography	Periodicity and symmetry. Two-dimensional networks. Groups of punctual symmetry. Notations of *Schoenflies and *Hermann-*Mauguin.
Three-dimensional networks	Space groups. Indexes of Miller. Fractional coordinates and axes of zone.
Crystallography of X-rays	The reciprocal network. Transformed of Fourier and diffraction in the reciprocal space.

Technicians of diffraction	Methods of *monocristal and of dust. Spectrums of diffraction of X-rays: Law of *Bragg. Sphere of *Ewald. Factor of structure. The problem of the phase.
Interpretation of spectrums of diffraction	Analysis of diagrams of diffraction of dust. Structural determination by means of electronic microscopy of high resolution (*HREM). Methods of characterisation of materials no crystalline.
Some applications of the technicians of diffraction	Characterisation of ceramic materials and alloys. Determination of the structure of proteins. Analysis *textural of amorphous materials and biological samples. Follow-up in real time of transitions of phase.
Growth of glasses in natural means	*Biomineralización. Environments *evaporíticos. Models of prediction of precipitation of crystalline phases.
Geochronology	Radioactive isotopes. Nuclear stability. Mechanisms of decomposition. Half life. Systems of temporary dating: *K-*Ar, *Rb-*Sr, *Sm-*Nd, Or-*Th-*Pb, 14C. Other methods of dating: footprints of fission.
Stable isotopes in Geology	Isotopic relation. Factors that determine the isotopic fractionation. Applications like kinetical and thermodynamic markers of processes *geoquímicos.

Planning

	Class hours	Hours outside the classroom	Total hours
Tutored works	2	13	15
Master Session	26	52	78
Troubleshooting and / or exercises	13	26	39
Others	0	14	14
Multiple choice tests	4	0	4

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

Methodologies

	Description
Tutored works	They are works that realises each student of individual way and will consist in the characterisation *cristalográfica of a crystalline substance in the structural appearances, *composicionales and morphological. They adopt the format of a small work of investigation and carry implicit the knowledge and handle of the concepts and nomenclature explained in the theoretical classes and seminars.
Master Session	They explain the basic principles of the crystallisation like process and of the structures of the crystalline solids from the ideas of periodicity and symmetry of the crystalline networks. It enters to the student to the technicians of diffraction.
Troubleshooting and / or exercises	They will employ the seminars for the preparation of practical works associated to the process of growth of glasses. And *tabajara with programs of *resolucion of structures by means of *difraccion and *microscopía *electronica
Others	They will realise presentations by groups with to expose the results and *principlaes conclusions of the works developed by groups about the processes of crystalline growth. And structural characterisation

Personalized attention

Methodologies	Description
Tutored works	These works will realise during the seminars using crystallographical software where the notation of symmetry of Herman-Mauguin is employed.
Troubleshooting and / or exercises	They developed in the classroom of computing, during the seminars, employing programs of X-ray diffraction and by means of the treatment of images of electron microscopy (HREM).
Others	They will develop in the classroom of computing and in marry theoretical as well as by means of tutorials and7or queries employing the platform Tema or the email.

Assessment

	Description	Qualification	Training and Learning Results

Tutored works	It will value that the concepts explained in the theory are employed properly, as well as the notation and nomenclature *cristalográfica. Also appearances like the coherence in the development of the work and the precision in the measures and in the quantification of the results.	10	C1 C14 C27	D1 D3 D4 D5 D7 D8 D12 D13 D14
Troubleshooting and / or exercises	It will value the realisation of practical works realised by groups during the seminars	30	C1 C27	D3 D7 D9 D14 D15
Others	It will value the exhibition in groups of the conclusions obtained in the works realised in the seminars about the resolution of structures	20	C1	D1 D4 D8 D14
Multiple choice tests	It will evaluate the degree of understanding of the concepts and definitions *cristalográficos, associated to the theoretical part.	40	C1 C14	D1 D9 D14

Other comments on the Evaluation

&*lt;*p&*gt;The evaluation in the second announcement will consist in the realisation of a theoretical exercise&*amp;*nbsp;about&*amp;*nbsp;the basic concepts of the Crystallography and his application to the resolution of structures, developed during&*amp;*nbsp;the classes&*amp;*nbsp; *magistrales. Likewise, it will be&*amp;*nbsp;necessary realise a practical exercise in the handle of the&*amp;*nbsp;computer tools for the analysis of crystalline structures employees during the course.&*lt;/*p&*gt;

Sources of information

Basic Bibliography

Andrew Putnis, **Introduction to Mineral Sciences**, 1ª,

Robert A. Evarestov, V.P. Smirnov, **Site symmetry in cristals : theory and applications**, 2ª,

Complementary Bibliography

Edward Tarbuck y FredericK Lutgens, **Ciencias de la Tierra. Una introducción a la Geología Física**, 8ª,

Christofer Hammond, **The Basic of Crystallography and Diffraction**, 3ª,

Jose Luis Amorós, **El Cristal : morfología, estructura y propiedades físicas**, 4ª,

Rousseau, J.-J., **Basic crystallography**,

Vitalij K. Pecharsky, Peter Y. Zavalij, **Fundamentals of powder diffraction and structural characterization of materials**,

Douglas, Bodie E., **Structure and chemistry of crystalline solids**, 1ª,

Woolfson, M. M., **An Introduction to X-ray crystallography**, 2ª,

Salvador Galí Medina, **Cristalografía : teoría particular, grupos puntuales y grupos espaciales**, 1ª,

Recommendations

Subjects that continue the syllabus

Inorganic chemistry I/V11G200V01404
Structural Determination/V11G200V01501

Subjects that are recommended to be taken simultaneously

Physics: Physics II/V11G200V01201
Mathematics: Mathematics II/V11G200V01203
Chemistry, physics and geology: Integrated laboratory II/V11G200V01202
Chemistry: Chemistry 2/V11G200V01204

Subjects that it is recommended to have taken before

Biology: Biology/V11G200V01101
Physics: Physics I/V11G200V01102
Mathematics: Mathematics I/V11G200V01104
Chemistry, physics and biology: Integrated laboratory I/V11G200V01103
Chemistry: Chemistry I/V11G200V01105