

(*)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 establishment of the University 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 not the pioneering spirit of the chemists in research or 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 3rd

Code	Name	Quadmester	Total Cr.
V11G200V01501	Determinación estrutural	1st	6
V11G200V01502	Enxeñaría química	1st	9

V11G200V01503	Química analítica II	1st	9
V11G200V01504	Química orgánica II	1st	6
V11G200V01601	Química analítica III	2nd	6
V11G200V01602	Química biolóxica	2nd	9
V11G200V01603	Química física III	2nd	9
V11G200V01604	Química inorgánica II	2nd	6

Year 4th

Code	Name	Quadmester	Total Cr.
V11G200V01701	Proxecto	1st	6
V11G200V01702	Química de materiais	1st	6
V11G200V01703	Química inorgánica III	1st	9
V11G200V01704	Química orgánica III	1st	9
V11G200V01901	Química alimentaria	2nd	6
V11G200V01902	Química ambiental	2nd	6
V11G200V01903	Química de fármacos	2nd	6
V11G200V01904	Química industrial	2nd	6
V11G200V01905	Química sostible	2nd	6
V11G200V01981	Prácticas externas: Prácticas en empresas	2nd	6
V11G200V01991	Traballo de Fin de Grao	2nd	18

IDENTIFYING DATA				
Structural Determination				
Subject	Structural Determination			
Code	V11G200V01501			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Álvarez Rodríguez, Rosana			
Lecturers	Álvarez Rodríguez, Rosana Castro Fojo, Jesús Antonio Vaz Araújo, Belén			
E-mail	rar@uvigo.es			
Web				
General description	The subject devotes to learning the application of the methods used in the structural determination of chemical compounds			

Competencies	
Code	
CB1	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
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CE4	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Basics and tools for solving analytical problems and characterization of chemical substances
CE8	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: main techniques for structural determination, including spectroscopy
CE12	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: structural features of chemical elements and their compounds, including stereochemistry
CE19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
CE20	Evaluate, interpret and synthesize data and chemical information
CE24	Recognize and analyze new problems and plan strategies to solve them
CT1	Communicate orally and in writing in at least one of the official languages of the University
CT3	Learn independently
CT4	Search and manage information from different sources
CT5	Use information and communication technologies and manage basic computer tools
CT7	Apply theoretical knowledge in practice
CT8	Teamwork
CT9	Work independently
CT12	Plan and manage time properly
CT13	Make decisions
CT14	Analyze and synthesize information and draw conclusions
CT15	Evaluate critically and constructively the environment and oneself
CT16	Develop an ethical commitment

Learning outcomes			
Learning outcomes	Competences		
Describe the fundamental concepts of the methods for structural elucidation	CB1	CE4 CE8 CE12	
Analyse the information that the different methods offer on the molecular structure elucidation, and understand their advantages and limitations.	CB2 CB3	CE8 CE12 CE20	CT3 CT4 CT7 CT8 CT9 CT14

Predict the basic features of a given spectrum for a particular compound.	CB2 CB3	CE4 CE8 CE12 CE20	CT3 CT4 CT7 CT9 CT14
Understand the information provided by the different methods of X-ray diffraction.	CB2 CB3	CE4 CE12	CT3 CT4 CT9 CT13 CT14 CT15 CT16
Design the rational process to obtain key structural information of a chemical compound.	CB2 CB3	CE4 CE8 CE24	CT3 CT4 CT7 CT9 CT13 CT14
Determine the molecular structure of a simple compound from the analysis of its spectroscopic data (IR, UV, MS, NMR, etc.).	CB2 CB3 CB4	CE4 CE8 CE12 CE19 CE20	CT1 CT3 CT4 CT5 CT7 CT9 CT12 CT14 CT16
Observe the presence of defects and disorder in solids.	CB1	CE4	

Contents

Topic	
Chapter 1. Obtaining general data of a chemical compound.	Combustion Analysis: empirical formula. Qualitative analysis. Optical Properties.
Chapter 2. Structural determination of crystalline samples.	Applications and limitations of the diffractometric techniques in structural determination. Three-dimensional determination of the molecular structure. Defects and disorders in crystalline solids.
Chapter 3. Electronic and photoelectronic spectroscopy.	Determination of the chromophore groups. Effect of conjugation. Study of the valence shell MOs.
Chapter 4. Vibrational Spectroscopy.	Determination of the presence of characteristic functional groups. Other applications in structural determination.
Chapter 5. Mass Spectrometry.	Determination of the molecular mass. Ionisation techniques. Detection methods. Fragmentation reactions. Isotopic patterns. Interpretation of the mass spectra.
Chapter 6. NMR Spectroscopy.	Monodimensional experiments of ^1H and ^{13}C Structural information from the chemical shift. Two-dimensional experiments. Homo- and Heteronuclear Correlation spectroscopy. Noe experiments Heteronuclear NMR

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	13	26	39
Problem solving	24	48	72
Laboratory practice	3	15	18
Essay	1	20	21

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

Methodologies

	Description
Lecturing	The theoretical classes will be devoted to the presentations of the basis of the different techniques that are most relevant for the interpretation of the data from the structural point of view (relationships between spectra and structures). The classes will be taught taking into account the hygiene and distancing measures agreed by the National Institute of Health. If the capacity of the classrooms does not allow attendance, they will be taught "online", using the means available at Fatic and the virtual offices
Problem solving	The classes of small groups will be devoted to solve exercises or problems that allow at the end of each chapter to obtain appropriate information of the corresponding techniques. The classes will be taught taking into account the hygiene and distancing measures agreed by the National Institute of Health.

Personalized assistance

Methodologies Description

Problem solving	Students may consult any doubt with the teaching staff of the subject in mentoring time and online
Tests	Description
Essay	Students may consult any doubt with the teaching staff (online) of the subject in mentoring time. In addition, students will be called individually or in small groups for mentoring of the work proposed.

Assessment

	Description	Qualification	Evaluated Competences		
Problem solving	In the different classes (lectures, seminars) the students will be given handouts with problems and/or exercises that will be used for their evaluation. Learning outcomes: (1). Describe the fundamental concepts of the methods for structural determination. (2). Analyse the information that, on the molecular structure, provide the different methods and understand their main limitations. (3). Predict the basic features of a particular spectrum for a given compound.	20	CB1 CB2 CB3	CE4 CE8 CE12 CE19 CE20 CE24	CT7 CT8 CT13 CT15
Laboratory practice	There will be two short tests of about 2 hour duration in which the students will be asked to obtain structural information from experimental data (spectra and other physical data). The first tests covers chapters 1-3 (10% of qualification), and the second chapter 4 (20% of qualification). Learning outcomes: (1). Analyse the information that, on the molecular structure, provide the different methods and understand their main limitations. (2). Predict the basic features of a particular spectrum for a given compound. (3) Design the basic process to obtain a particular structural information of a compound. (4). Solve the molecular structure of a simple compound from its spectra (UV, IR, MS, NMR, X-Ray, etc). Further, there will be a final test that covers all chapters (30% of qualification)	60	CB1 CB2 CB3 CB4	CE8 CE12 CE19 CE20 CE24	CT3 CT7
Essay	The students will carry out a small project proposed by the professors of multidisciplinary spectroscopic nature. The results will be presented as a written report. Learning outcomes:(1). Solve the molecular structure of a simple compound from its spectra (UV, IR, MS, NMR, X-Ray, etc).	20	CB1 CB2 CB3 CB4	CE4 CE8 CE12 CE19 CE20 CE24	CT1 CT4 CT5 CT9 CT12 CT14 CT16

Other comments on the Evaluation

To pass the course the students must handle the professor the following material:

- **A minimum of 80% of the handouts and homework proposed in the seminar classes.**
- **All the short tests.**
- **The final report.**

To pass the course at the end of the quarter the students will be required to get a minimum of 5 points (on the basis of 10) in the final mark. Besides, it is indispensable to obtain in the evaluation of the different parts of the course the following minima:

- 30% of the total value in each one of the short tests.
- 40% of the total value in the group of the handouts.
- 30% of the total value in the final test.

In the event the minima is not reached, the student record will show the balanced mark of the short tests.

For students that complete less than 20% of the total work scheduled, the records will not show, in agreement with the current legislation and, the quotation NOT PRESENTED. In any case, the presentation to one of the short tests, will imply the qualification of the course.

The students that fail at the end of the quartet will have to pass a final exam at the end of the academic year (June, July). Said proof will replace the results of the final tests. A minimum of 30% of the total value of the exam will be required to pass the course. The qualifications of the handouts and the project report are non-recoverable. In case the minima established in each part is not reached, the qualification will be FAILED. Once the minima is passed a global mark equal or higher than 5.0 (on the basis of 10) will be required to pass the course.

Alternatively, students could choose to be evaluated by performing a single test. To do so, they must communicate it, in writing, to the coordinator of the subject, at the beginning.

Sources of information

Basic Bibliography

Complementary Bibliography

Williams, D.H., Fleming, I., **Spectroscopic Methods in Organic Chemistry**, 6^a, 2007

Hammond, Christopher, **The Basics of crystallography and diffraction**, 2009

Pavia, D.L., Lampman, G.M., Kriz, G.S., Vyvyan, J.R., **Introduction to Spectroscopy**, 5^a, 2014

Pretsch, Ernő, **Structure determination of organic compounds : tables of spectral data**, 4a, Springer, 2009

Clayden, Jonathan, **Organic Chemistry**, 2a, 2012

Hesse, M, Meier, H, Zeeh, B., **Métodos espectroscópicos en Química orgánica**, 2a, Sintesis, 2005

Recommendations

Contingency plan

Description

ADAPTATION OF METHODOLOGIES

The teaching methodologies will be maintained and taught, if necessary, adapting them to the telematic means available to teachers, in addition to the documentation provided through FAITIC and other platforms, email, etc.

- ADAPTATION OF THE EVALUATION

The evaluation criteria will be maintained without modification and the tests will be carried out by means of the telematic means that are made available to the teaching staff.

IDENTIFYING DATA				
Chemical engineering				
Subject	Chemical engineering			
Code	V11G200V01502			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Mandatory	3rd	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	González de Prado, Begoña			
Lecturers	Canosa Saa, Jose Manuel Deive Herva, Francisco Javier Fernández Requejo, Patricia González de Prado, Begoña			
E-mail	bgp@uvigo.es			
Web				
General description	This subject is an introduction to Chemical Engineering, where the knowledge gained in the previous Chemistry degree courses is related to Chemical industry processes. The main goal is to enable the students to learn the basic knowledge about material and energy balances so that they can apply it to the design of separation processes such as distillation or liquid-liquid extraction. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. This subject gives the basis to understand other subjects such as Environmental Chemistry, Food Chemistry and Industrial Chemistry.			

Competencies	
Code	
CE1	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Major aspects of chemical terminology, nomenclature, units and unit conversions.
CE16	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: principles and procedures in chemical engineering
CE19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
CE20	Evaluate, interpret and synthesize data and chemical information
CE21	Recognize and implement good scientific practices for measurement and experimentation
CE22	Process and perform computational calculations with chemical information and chemical data
CE23	Present oral and written scientific material and scientific arguments to a specialized audience
CE25	Handle chemicals safely, considering their physical and chemical properties, including the evaluation of any specific risks associated with its use
CE27	Monitor, by observation and measurement of physical and chemical properties, events or changes, and document and record them in a consistent and reliable way
CE28	Interpret data derived from laboratory observations and measurements in terms of their significance and relate them to the appropriate theory
CE29	Demonstrate skills for numerical calculations and interpretation of experimental data, with special emphasis on precision and accuracy
CT1	Communicate orally and in writing in at least one of the official languages of the University
CT3	Learn independently
CT4	Search and manage information from different sources
CT5	Use information and communication technologies and manage basic computer tools
CT6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
CT7	Apply theoretical knowledge in practice
CT8	Teamwork
CT9	Work independently
CT10	Work at a national and international context
CT12	Plan and manage time properly
CT13	Make decisions
CT14	Analyze and synthesize information and draw conclusions
CT15	Evaluate critically and constructively the environment and oneself

Learning outcomes	
Learning outcomes	Competences

Know the different unit systems.	CE1 CE19	CT7
Interpret the flow charts of chemical processes.	CE16 CE19 CE20	
Differentiate the steady, non-steady, continuous and batch operations	CE16 CE19 CE20	CT3 CT7 CT9
Know and know how to apply the mass and energy balances in steady or not steady processes, with or without chemical reaction and with recycle, purge and bypass streams	CE16 CE19 CE20	CT3 CT9
Know and know how to apply the mass, energy and momentum conservation laws	CE16 CE19 CE20	CT3 CT7 CT9
Pose and solve the design equations to the ideal chemical reactors.	CE16 CE20 CE23	CT3 CT4 CT5
Differentiate the heat transfer mechanisms	CE16 CE19 CE20	CT3 CT4 CT6 CT7 CT9
Calculate the heat transferred by conduction and convection in simple systems and the heat transferred in shell and tube type heat interchanger.	CE16	CT4
Identify the different operation units and their application.	CE16 CE19 CE20	CT7
Elaborate and interpretate vapour-liquid, liquid-liquid and gas-liquid flow diagrams.	CE21 CE22 CE23 CE25 CE27 CE28 CE29	CT1 CT6 CT8 CT10 CT12 CT13 CT14 CT15
Solve mass balances for flash and batch distillation, liquid-liquid and solid-liquid extraction and absorption.	CE21 CE22 CE23 CE25 CE27 CE28 CE29	CT6 CT8 CT10 CT12 CT13 CT14 CT15
Determine the number of theoretical stages in separation units for simple mixtures.	CE16 CE19 CE20	CT7
Carry out and monitor separation processes in operation units at laboratory level.	CE21 CE22 CE23 CE25 CE27 CE28 CE29	CT1 CT6 CT8 CT12 CT13 CT14 CT15
Determine experimentally some properties of interest from the point of view of transport phenomena: viscosity, coefficients of convection, density.	CE16 CE20 CE21 CE22 CE23 CE25 CE27 CE28 CE29	CT1 CT4 CT5 CT7 CT8 CT10 CT12 CT13 CT14 CT15

Work with continuous and batch chemical reactors at laboratory level.

CE16
CE21
CE22
CE25
CE27
CE28
CE29
CT1
CT4
CT5
CT6
CT7
CT8
CT12
CT13
CT14
CT15

Contents

Topic	
Subject 1. Introduction to Chemical Engineering	Origin, concept and evolution of the Chemical Engineering. Discontinuous and continuous operation. Stationary and non stationary state. Cocurrent and countercurrent operations. Classification of the unit operations. Systems of units.
Subject 2. Mass and energy balances	General equation of balance. Mass balances in systems without chemical reaction in stationary and non stationary state. Recycle, purge and bypass. Mass balances in systems with chemical reaction in stationary and non stationary state. Energy balances. Energy balances in systems with chemical reaction in stationary state.
Subject 3. Design of ideal reactors	Speed of reaction. Ideal reactors: batch stirred tank reactor, continuous stirred tank reactor and plug flow reactor
Subject 4. Heat transfer	Mechanisms of heat transfer. Heat transfer through flat walls, cylindrical and spherical. Heat exchangers.
Subject 5. Distillation	Vapour-liquid equilibria. Phase diagrams for binary mixes. Simple and flash distillation. Multistage distillation
Subject 6. Liquid-liquid extraction	Liquid-liquid equilibrium for binary and ternary systems: binodal curve and distribution coefficients. Liquid-liquid extraction in cocurrent and countercurrent contact.
Laboratory sessions	Experimental determination of some properties of interest from the point of view of the design of basic operations: viscosity, coefficients of convection, density. Operation with chemical reactors at lab scale. Experimental determination of phase equilibrium curves. Analysis of the capacity of extraction of several solvents in a process of solid-liquid extraction.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	13	30	43
Problem solving	25	50	75
Laboratory practical	40	3	43
Autonomous problem solving	0	10	10
Presentation	5	5	10
Mentored work	1	10	11
Problem and/or exercise solving	2	8	10
Essay questions exam	3	20	23

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

Methodologies

	Description
Lecturing	During these classes (one hour per week) the teacher will explain the most relevant aspects of the subject. The students will have the available documentation on Tem@.
Problem solving	There will be a set of exercises of each subject available for the students. Some of these exercises will be solved in class and other ones will be solved by each student and presented to the teacher in order to be corrected.
Laboratory practical	Laboratory sessions will last 3.5 hours. The experimental procedure will be available for the students and they will have to write a report for each session.
Autonomous problem solving	The students will have to solve some exercises and questions and they will have to present them to the teacher before the deadline.
Presentation	The students will have to make an oral presentation related to the theoretical bases, experimental procedure, obtained results and conclusions for some of their laboratory sessions.

Mentored work	The students will have to write an individual report about one subject related to Chemical Engineering. The teacher will indicate them the main points of the subject that they will have to develop and the recommended literature.
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Personalized assistance

Methodologies	Description
Problem solving	In the assigned hours of tutoring the professor will solve any doubts regarding the subject
Autonomous problem solving	In the assigned hours of tutoring the professor will solve any doubts regarding the subject
Mentored work	In the assigned hours of tutoring the professor will solve any doubts regarding the subject

Assessment

	Description	Qualification	Evaluated Competences	
Laboratory practical	The qualification will depend on the laboratory work and the laboratory report made by the students. Laboratory sessions are mandatory.	10	CE21 CE22 CE23 CE25 CE27 CE28 CE29	CT1 CT6 CT8 CT10 CT12 CT13 CT14 CT15
Autonomous problem solving	The students will have to deliver, in the terms indicated, the problems proposed of each subject.	5	CE1 CE16 CE19 CE22	CT3 CT7 CT9
Presentation	The students will make an oral presentation related to laboratory work.	5	CE16 CE20 CE23	CT4 CT5 CT7 CT8 CT14
Mentored work	The students will realise, and will deliver in the date indicated, an individual work on a subject proposed to the start of course.	5	CE1 CE16 CE20 CE23	CT1 CT14
Problem and/or exercise solving	They will realise two short exams, one about the subjects 1 and 2 and another one about the subjects 3 and 4.	20	CE1 CE16 CE19	CT1 CT6 CT7 CT9
Essay questions exam	At the end of the course the students have to do an exam related to all the subjects.	55	CE1 CE16 CE19	CT1 CT6 CT7 CT9

Other comments on the Evaluation

Short and long exams. They will realise two short exams along the term. In the final exam, all topics will be evaluated and it is necessary to reach a minimum of 3 out of 10 points to take into account the other elements of evaluation. In case of not reaching the minimum note, the final qualification will be the one obtained in the long exam. Laboratory sessions. The laboratory sessions (lab work and report) and the oral presentation are mandatory and they are 15% of the final qualification. It is indispensable to have a minimum grade of 5 out of 10 points in this section. 50% or more laboratory sessions non-attendance means not to pass the course, independently of the results obtained in the other elements of evaluation. The participation of the student in any of the exams (short exams and long exam), two or more laboratory sessions or the delivery of 20% or more of the works required by the professor, involves the condition of "presented" and the obtention of a qualification. June final exam. A long exam of all the matter that will suppose 75% of the qualification will be done. The students will keep the grades of obtained in laboratory sessions, oral presentation, autonomus exercises and tutored work obtained along the course.

Sources of information

Basic Bibliography

Calleja y otros, **Introducción a la Ingeniería Química**, Síntesis, 1999

W.L. McCabe, J.C. Smith y P. Harriot, **Operaciones unitarias en Ingeniería Química**, McGraw-Hill, 2007

Complementary Bibliography

R.M. Felder, **Principios elementales de los procesos químicos**, Limusa Wiley, 2003

Recommendations

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

In front of the uncertain and unpredictable evolution of the sanitary alert caused by the COVID- 19, the University establishes an extraordinary planning that will activate in the moment in that the administrations and the own institution determine it attending to criteria of security, health and responsibility, and guaranteeing the teaching in a no face-to-face stage or no totally face-to-face. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the teaching of a way but agile and effective when being known in advance by the students and the faculty through the tool normalised and institutionalised of the educational guides DOCNET.

=== ADAPTATION OF The METHODOLOGIES ===

* educational Methodologies that keep . All

* educational Methodologies that modify - Any

The educational methodologies will give , to be necessary, adapting them to the telematic means that put the disposal of the teacher , in addition to the documentation facilitated through FAITIC and other platforms, email, etc.

When it was not possible to face-to-face teaching, in the measure of the possible, will prevail teaching of the theoretical contents by telematic as well as those contents of practices of resolution of problems, and others, that can be online or developed by the students of way guided, tried keep the classroom-based approach for the experimental practices of laboratory, whenever the groups fulfil with the rule established in the moment by the pertinent authorities in sanitary matter and of security. In the case of not being able to be given of face-to-face form, those contents will give online or will be supplied by other (autonomous work guided, etc.) that allow to achieve equally the competitions associated to them.

* Mechanism no face-to-face of attention to the students (tutoring)

The tutoring will develop of telematic form respecting or adapting the schedules of tutoring planned.

* Modifications (proceed) of the contents to give- **Ningun

* additional Bibliography to facilitate to car-learning- **Ningun

* Other modifications

=== ADAPTATION OF The EVALUATION ===

* Test already made- will be supported by the **memos weights

Tests *XX: [previous Weight 00%] [Weight Proposed 00%]

...

* Pending proofs that keep - all

Proof *XX: [previous Weight 00%] [Weight Proposed 00%]

...

* Proofs that modify -- Any

[previous Proof] =&*amp;*gt; [new Proof]

* New proofs- any

* additional Information: The proofs will develop of face-to-face form, adapting them to the valid sanitary rule, except Resolution *Rectoral that indicate that they have to do of form no face-to-face, making gave way through the distinct tools put the disposal of the faculty. Those no attainable proofs of telematic form will be supplied by other (deliveries of

IDENTIFYING DATA				
Analytical chemistry II				
Subject	Analytical chemistry II			
Code	V11G200V01503			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Mandatory	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	González Romero, Elisa Leao Martins, Jose Manuel			
Lecturers	González Romero, Elisa Leao Martins, Jose Manuel Pena Pereira, Francisco Javier			
E-mail	leao@uvigo.es eromero@uvigo.es			
Web	http://quimica.uvigo.es/decanatoquimica/guias-docentes.html			
General description	Global knowledge of Analytical Instrumental Techniques and its applications.			

Competencies	
Code	
CE4	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Basics and tools for solving analytical problems and characterization of chemical substances
CE8	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: main techniques for structural determination, including spectroscopy
CE17	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories in: metrology of chemical processes including quality management
CE18	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: principles of electrochemistry
CE19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
CE20	Evaluate, interpret and synthesize data and chemical information
CE21	Recognize and implement good scientific practices for measurement and experimentation
CE22	Process and perform computational calculations with chemical information and chemical data
CE23	Present oral and written scientific material and scientific arguments to a specialized audience
CE25	Handle chemicals safely, considering their physical and chemical properties, including the evaluation of any specific risks associated with its use
CE26	Perform common laboratory procedures and use instrumentation in synthetic and analytical work
CE27	Monitor, by observation and measurement of physical and chemical properties, events or changes, and document and record them in a consistent and reliable way
CE28	Interpret data derived from laboratory observations and measurements in terms of their significance and relate them to the appropriate theory
CE29	Demonstrate skills for numerical calculations and interpretation of experimental data, with special emphasis on precision and accuracy
CT1	Communicate orally and in writing in at least one of the official languages of the University
CT3	Learn independently
CT4	Search and manage information from different sources
CT5	Use information and communication technologies and manage basic computer tools
CT6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
CT7	Apply theoretical knowledge in practice
CT8	Teamwork
CT9	Work independently
CT12	Plan and manage time properly
CT13	Make decisions
CT14	Analyze and synthesize information and draw conclusions
CT15	Evaluate critically and constructively the environment and oneself
CT17	Develop concern for environmental aspects and quality management

Learning outcomes	
Learning outcomes	Competences

Justify the basic principles of the instrumental analysis and his field of application in base to the characteristics of the *analito and of application	CE4	CT1 CT3 CT6 CT9 CT12
Appropriated instrumental technique selection depending the phisycocochemicals properties of the analytes.	CE4 CE19 CE20 CE22	CT1 CT4 CT6 CT9 CT12 CT13
Description the quality parameters of an analytical method.	CE4 CE17 CE19 CE29	CT1 CT3 CT4 CT5 CT6 CT9
Adavances in principles of: internal standard, external standard addition, standard solutions preparation, calibration and its applications in different instrumentl equipments.	CE19 CE21 CE25 CE26 CE27 CE28 CE29	CT1 CT3 CT4 CT5 CT6 CT7 CT8 CT12 CT13 CT14
Estimation, interpretation and understand the different calibrations parameters of an instrumental method.	CE17 CE19 CE20 CE21 CE26 CE28 CE29	CT3 CT4 CT5 CT6 CT7 CT8 CT9 CT12 CT13 CT14
Spectroscopic, electrochemical and separation (chromatographic and electrophoretic) techniques basis and its applications	CE4 CE8 CE18 CE19	CT1 CT3 CT4 CT7 CT8 CT9 CT14
Instrumental equipment description and its functions required for spectroscopic, electrochemical measurements and separations techniques.	CE4 CE8 CE18 CE21 CE26 CE27	CT1 CT3 CT4 CT7 CT9 CT12 CT13
Classify and proposes different applications fields of spectroscopic, electrochemical techniques and separation	CE4 CE8 CE18 CE19 CE23	CT1 CT3 CT4 CT7 CT8 CT9 CT13 CT14

Implementation and application of spectroscopic and electrochemical techniques to carry out the determination of different analytes	CE4	CT1
	CE18	CT4
	CE19	CT5
	CE21	CT6
	CE23	CT7
	CE25	CT8
	CE26	CT12
	CE27	CT13
	CE28	CT14
	CE29	CT15
Implementation and application of chromatographic techniques with different detection modes for the separation, identification and quantification of different analytes	CE4	CT1
	CE21	CT4
	CE23	CT5
	CE25	CT6
	CE26	CT7
	CE27	CT8
	CE28	CT12
	CE29	CT13
		CT14
		CT15
		CT17

Contents	
Topic	
General Introduction	Subject (QAII) description
1-Introduction to the instrumental technicians	Introduction Classification of the instrumental techniques Quality parameters Instrumental methodology analysis Calibration Molecular absorption spectrophotometry UV-VIS: Principles, Instrumentation and applications
2- Luminescent techniques	Basic principles Relation between fluorescence intensity and concentration Instrumentation Applications
3- Atomic Absorption Spectrometry	Basic principles Atomization systems, Flame, graphite furnace, hydrides generation and cold steam. Instrumentation Applications
4- Emission Atomic Spectrometry	Basic principles Emission sources. Flame and plasma. Plasma-Mass coupling Applications
5- Electroanalytical Techniques	Basic principles Classification Potentiometry: Ion Selective Electrode Voltammetry Conductimetry Coulometry Applications
6- Chromatographic methods	Basic principles Chromatographic modes Gas Chromatography Instrumentation Applications
7- Liquid Chromatography	Liquid chromatography: Normal, reverse phase and ionic Instrumentation Applications
8- Electrophoretic Techniques	Principles High resolution capillary Electrophoresis basic and theory Electrophoretic Techniques Classification Instrumentation Applications

Planning			
	Class hours	Hours outside the classroom	Total hours
Problem solving	26	26	52
Laboratory practical	45.5	7	52.5
Lecturing	26	26	52
Report of practices, practicum and external practices	0	38	38
Problem and/or exercise solving	3.55	12.9575	16.5075
Essay questions exam	3.5	10.5	14

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

Methodologies	
	Description
Problem solving	Following the master classes, seminars be dedicated to solving problems / exercises, which aims are to finding the comprehension level of the students on issues developed. The exercises will be develop in small groups in seminars session followed a general discussion, later the student will have individual proposes exercises to solve individually. The seminars are aimed at strengthening the knowledge acquired in the lectures class, Practical analytical issues and related to the content of the subject will be discussed.
Laboratory practical	The laboratory practical sessions have a fundamental part in the teaching of the subject. On the one hand, they are essential for understanding theoretical concepts; and also allows the students to introduce on analytical methodology practical concepts, as well to understand the norms and rules of scientific work, individual and work group concept in laboratory including report writing.
Lecturing	Lecture sessions will develop during 55 minutes. The teacher provides a global vision of each agenda item, stating the main contents of each. Classes are held interactive way with the students, using online learning materials (Tem @ platform) and adequate literature.

Personalized assistance	
Methodologies	Description
Problem solving	The mentoring program is set up as a study support, where the student will have a personalized academic assistance in order to making better use of the training and knowledge in the subject. The students will have individual or group presencial tutorial sessions, this tutorial planning also can be supervised using electronic learning by Tem @ Platform (FAITIC) or by remote campus.
Laboratory practical	The mentoring program is set up as a study support, where the student will have a personalized academic assistance in order to making better use of the training and knowledge in the subject. The students will have individual or group presencial tutorial sessions, this tutorial planning also can be supervised using electronic learning by Tem @ Platform (FAITIC) or by remote campus.
Tests	Description
Report of practices, practicum and external practices	The mentoring program is set up as a study support, where the student will have a personalized academic assistance in order to making better use of the training and knowledge in the subject. The students will have individual or group presencial tutorial sessions, this tutorial planning also can be supervised using electronic learning by Tem @ Platform (FAITIC) or by remote campus.

Assessment				
	Description	Qualification	Evaluated Competences	
Problem solving	The teacher will monitor the exercises given to students in seminars class. Scientific publication, practical situations will be discussed in seminars sessions and supervised by the teacher	10	CE4 CE8 CE18 CE29	CT1 CT6
Laboratory practical	The teacher will monitor the experimental work done by students in the lab sessions. It is REQUIRED to attend practical laboratory sessions to pass the course. Students who do not perform laboratory practices are considered FAIL throughout the cycle of evaluation of the course.	15	CE20 CE21 CE25 CE26 CE27 CE28	CT4 CT7 CT8 CT13
Report of practices, practicum and external practices	The student will prepare lab reports, which reflects the work performed in the laboratory. These reports must be submitted by the deadline and will be corrected by the teacher.	10	CE17 CE19 CE20 CE28 CE29	CT1 CT4 CT6 CT7 CT14

Problem and/or exercise solving	The theoretical/practical short test will be used during semester evaluation. This test is not eliminatory and will contribute 10% of the final grade for the course.	20	CE4	CT1
			CE8	CT3
			CE18	CT6
			CE19	CT7
			CE20	CT9
			CE21	
			CE25	
			CE26	
			CE27	
			CE28	
	CE29			
Essay questions exam	The exam (the test) will be performed at the end of the semester and contains a theoretical and theoretical-practical aspects. For compensation of subject , students must achieve at least 4.0 minimum score (4.0 minimum score in each part of the test).	45	CE4	CT1
			CE8	CT3
			CE17	CT6
			CE18	CT9
			CE19	
ATTENTION: 3.0 is the minimal requirement in the final results achieve by the student for each long test corresponding to each teacher participate in the subject in order to carry out the weighting of overall examination. If you do not get this rating, the end result is FAIL				

Other comments on the Evaluation

Omission of ALL activities proposed for the evaluation of the subject (Not participated all evaluation activities) for the evaluation of the subject will be considered as NOT PRESENTED (NO EVALUATION). Attendance at laboratory practices class is mandatory and eliminatory. If the participation in these activities is less than 80%, TOTAL results in subject evaluation will be FAIL (SUSPENSO); in this case, the final official result will be the value only obtained for laboratory evaluation.

- July evaluation:

In the second evaluation, the same criteria than in the first one will be applied.

In the event that the tests are held in person, access to the classroom will not be allowed with any of the existing electronic devices (computer, tablet, mobile or mobile, etc.).

If the tests are carried out semi-face-to-face or telematically in virtual rooms, only the use of the computer (with camera and audio) will be allowed for the connection. Failing that, they will connect with the mobile to the remote campus. The rest of the devices must remain off and out of the student's reach, unless circumstances allow teachers to allow it.

Note: the teachers of the subject do not allow to be recorded, neither by videos nor by audios or any other format such as screenshots, during the development of face-to-face or telematic classes. What is communicated for the appropriate purposes to all attendees.

Note2: Virtual attendance can be controlled; Consequently, it will be considered not presented, NP, not attending 25% of the contact hours and / or they have not been virtually connected (virtual attendance), in addition to not having performed any of the tests (short or long) or having participated in scheduled activities.

Note3: If the connection allows it, the theoretical part of any of the tests that remain to be done can be oral.

Sources of information

Basic Bibliography

Douglas A. Skoog, F. James Holler, Stanley R. Crouch, **Principios de análisis instrumental**, 6ª, 2008

Satinder Ahuja, Neil D. Jespersen, **Modern instrumental analysis**, 1ª, Elsevier, 2006

James W. Robinson, Eileen M. Skelly Frame, George M. Frame, **Undergraduate instrumental analysis**, 7ª, CRC Press, 2014

Complementary Bibliography

Lucas Hernández Hernández, Claudio González Pérez, **Introducción al análisis instrumental**, 1ª, Ariel Barcelona, 2002

Donald T. Sawyer; William R. Heineman; Janice M. Beebe, **Chemistry Experiments for Instrumental Methods**, 1ª, Wiley, 1984

Rouessac, Annick Rouessac, **Chemical Analysis: Modern Instrumentation Methods and Techniques**, 6ª, John Wiley & Sons, 2007

Recommendations

Subjects that continue the syllabus

Analytical chemistry 3/V11G200V01601

Subjects that are recommended to be taken simultaneously

Structural Determination/V11G200V01501

Chemical engineering/V11G200V01502

Organic chemistry II/V11G200V01504

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

* Teaching methodologies modified

* Non-attendance mechanisms for student attention (tutoring)

* Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Pending tests that are maintained

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Tests that are modified

[Previous test] => [New test]

* New tests

* Additional Information

Methodology

All those described in the Teaching Guide are maintained and use will be made of the virtual classrooms of the Faculty of Chemistry, in combination with the Faitic, Moodle and Skype platforms (if necessary), including communication by email, for performance of said methodologies.

Bibliography

Those described in the Guide are kept and supplementary material will be posted on Faitic (documents and links) to facilitate access to information.

Evaluation

All evaluable activities are maintained in the same way, including the short test and the scheduled ordinary and extraordinary exams, which will be carried out through the Faitic and / or Moodle platforms, the dates of which will be included in the 2020-2021 course schedule.

If the tests are carried out semi-face-to-face or telematically in virtual rooms, only the use of the computer (with camera and audio) will be allowed for the connection. Failing that, they will connect with the mobile to the remote campus. The rest of

the devices must remain off and out of the student's reach, unless circumstances allow teachers to allow it.

Note: the teachers of the subject do not allow to be recorded, neither by videos nor by audios or any other format such as screenshots, during the development of face-to-face or telematic classes. What is communicated for the appropriate purposes to all attendees.

The qualifications and the revision date will be also communicated by Fatic. The revision, at a personalized time for each student, will be done in the faculty rooms of the remote campus.

IDENTIFYING DATA				
Organic chemistry II				
Subject	Organic chemistry II			
Code	V11G200V01504			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	Gómez Pacios, María Generosa Fall Diop, Yagamare			
Lecturers	Fall Diop, Yagamare Gómez Pacios, María Generosa			
E-mail	yagamare@uvigo.es ggomez@uvigo.es			
Web				
General description	Machine translation into english of the original teaching guide The course Organic Chemical II is designed to deepen in the knowledge of the properties and reactivity of functional groups. After the study of nucleophilic substitution and elimination reactions, the reactivity of bi-functional carbonylic compounds will be approached. Finally, the radical and peryclic reactions will be studied.			

Competencies	
Code	
CB1	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
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE2	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: types of chemical reactions and its main characteristics
CE8	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: main techniques for structural determination, including spectroscopy
CE10	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: properties of aliphatic, aromatic, heterocyclic and organometallic compounds
CE11	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: nature and behavior of functional groups in organic molecules
CE12	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: structural features of chemical elements and their compounds, including stereochemistry
CE13	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: main synthetic routes in organic chemistry, including interconversions of functional groups and the formation of carbon-carbon and carbon-heteroatom bonds
CE19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
CE20	Evaluate, interpret and synthesize data and chemical information
CE23	Present oral and written scientific material and scientific arguments to a specialized audience
CT1	Communicate orally and in writing in at least one of the official languages of the University
CT3	Learn independently
CT4	Search and manage information from different sources
CT5	Use information and communication technologies and manage basic computer tools
CT8	Teamwork
CT9	Work independently
CT12	Plan and manage time properly
CT13	Make decisions
CT14	Analyze and synthesize information and draw conclusions

Learning outcomes	
Learning outcomes	Competences

Explain the reactivity of the organic compounds through the different mechanisms of reaction: replacement, elimination, addition and addition-elimination.	CB1 CB2 CB3 CB5	CE2 CE10 CE11 CE12 CE13	CT1 CT3 CT4 CT5 CT9 CT12 CT13 CT14
Describe in detail the mechanisms of transformation of the organic compounds using the formalism of arrows.		CE2 CE11	CT1 CT3 CT4 CT5 CT8 CT9 CT12 CT13 CT14
Complete diagrams of reaction of organic compounds adding reactive and/or the conditions of reaction.		CE2 CE13	CT1 CT3 CT4 CT5 CT8 CT9 CT12 CT13 CT14
Propose sequences of simple reaction.		CE12 CE13	CT1 CT3 CT4 CT5 CT8 CT9 CT12 CT13 CT14
Differentiate, according to the conditions of reaction and the *sustratos used, the mechanisms of replacement *nucleófila *SN1 and *SN2.		CE2 CE11 CE12 CE13	CT1 CT3 CT4 CT5 CT8 CT9 CT12 CT13 CT14
Apply the processes of replacement *nucleófila on carbons *sp3 in the obtaining of organic compounds with simple links.		CE2 CE11 CE12 CE13	CT1 CT3 CT4 CT5 CT8 CT9 CT12 CT13 CT14
*Predecir The possible competition between the processes of replacement *nucleófila and elimination for a *sustrato given.		CE11 CE12 CE13	CT1 CT3 CT4 CT5 CT8 CT9 CT12 CT13 CT14

Apply the reactivity of *enoles and *enolatos.	CE11 CE12 CE13	CT1 CT3 CT4 CT5 CT8 CT9 CT12 CT13 CT14
Apply the processes of elimination in the preparation of organic compounds with multiple links.	CE11 CE12 CE13	CT1 CT3 CT4 CT5 CT8 CT9 CT12 CT13 CT14
Apply the reactivity of the composed alpha-*dicarbonílicos (*enolización, acidity, *alquilación in alpha, *alquilación in beta, *descarboxilación) in organic synthesis.	CE10 CE11 CE12 CE13	CT1 CT3 CT4 CT5 CT8 CT9 CT12 CT13 CT14
Design the synthesis of compounds *bifuncionales using the reaction of condensation *aldólica, the reaction of *Reformatsky and the condensation of *Claisen.	CE11 CE12 CE13	CT1 CT3 CT4 CT5 CT8 CT9 CT12 CT13 CT14
Apply the reaction of *Knoevenagel and the procedures of synthesis *acetilacética and synthesis *malónica.	CE11 CE13	CT1 CT3 CT4 CT5 CT8 CT9 CT12 CT13 CT14
Design the synthesis of derivatives of the compounds *carbonílicos alpha,beta-*insaturados by means of reactions of addition 1,2 and 1,4.	CE11 CE13	CT1 CT3 CT4 CT5 CT8 CT9 CT12 CT13 CT14
Apply the basic reactivity of the organic radicals.	CE2 CE11 CE13	CT1 CT3 CT4 CT5 CT8 CT9 CT12 CT13 CT14

Apply the reactions *pericíclicas to the organic synthesis.

CE2
CE11
CE13
CT1
CT3
CT4
CT5
CT8
CT9
CT12
CT13
CT14

(*)Characterize *compuestos organic *sencillos from *sus *datos espectroscópicos.

CE8
CE11
CE19
CE20
CE23
CT1
CT3
CT4
CT5
CT8
CT12
CT13
CT14

Contents

Topic

1. Nucleophilic substitution reactions	Bimolecular nucleophilic substitutions (SN2). Unimolecular nucleophilic substitutions (SN1). Kinetic, mechanisms, stereochemistry aspects. SN2 and SN1 competition. Transformations of functional groups through SN2 and SN1 processes.
2. Elimination Reactions.	Reactions of elimination. Bimolecular Elimination (E2). Unimolecular Elimination (E1). Base conjugated unimolecular elimination (E1cB). Intramolecular elimination (Ei). Mechanisms. Substitution and elimination competition. Application of elimination reactions in organic synthesis.
3. Oxidation-reduction reactions.	Oxidation-reduction reactions. Oxidation reactions of alcohols. Oxidation reactions of carbonyl compounds. Oxidative rupture of alkenes and alkynes. Reduction of aldehydes and ketones. Reduction of carboxylic acids, esters and nitriles.
5. Radical reactions.	Structure, stability and reactivity of radicals. Halogenation of alkanes. Radical addition of HBr to alkenes. Radical halogenation of allylic and benzylic systems. Polymerization of alkenes.
4. Reactivity in alpha position of carbonyl compounds.	Reactivity in alpha position of carbonyl groups. Enols and enolates: general reactivity. Reactions of ketones and esters enolate anions. Enolate anion reactions with carbonyl compounds: aldol, Claisen, Dieckmann and Reformatsky reactions.
5. Bifunctional Compounds.	Reactivity of 1,2-Bifunctional compounds: pinacol rearrangement, benzoin condensation, acyloin condensation, benzyl acid rearrangement, enolization. Reactions of beta-dicarbonyl compounds: malonic synthesis, acetoacetic ester synthesis, Knoevenagel reaction. Reactions of alpha-beta unsaturated carbonyl compounds: reactions with electrophiles, reactions with nucleophiles, carbanion addition (Michael reaction), Robinson annulation.
6. Pericyclic reactions.	General characteristics. Classification. Electrocyclic reactions. Cycloaddition reactions. Sigmatropic reactions. Diels-Alder reaction. 1,3-Dipolar cycloadditions.

Planning

	Class hours	Hours outside the classroom	Total hours
Mentored work	2	2	4
Lecturing	24	0	24
Seminars	24	0	24
Problem and/or exercise solving	4	0	4
Essay questions exam	3	8	11

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

Methodologies

	Description
Mentored work	The student, of individual form or in group, will prepare a short exhibition on a subject *relacionado with the matter. This activity includes the research of information, editorial and presentation of the work.

Lecturing	The sessions *magistrales will consist in the exhibition by part of the professor of the fundamental appearances of each subject. Before each session, the student will have to work the material that the professor will facilitate him through the platform FEAR, related with the content that will treat in each session.
Seminars	The students, with the support of the professor, will resolve exercises and questions previously proposed in Bulletins, related with the theoretical contents. A selection of the exercises will be delivered regularly to the professor for his evaluation.

Personalized assistance

Methodologies Description

Seminars	The professors will devote a time to attend the needs and queries of the students related with the study and the resolution of exercises on the subjects linked with the matter. The day of the presentation the professors will inform on his time availability for this.
Mentored work	The students will realise a work on a subject that *eligirán of a series proposed by the professors, once finalised, in hours of seminar will expose it and will answer to the questions that formulate him the professors and/or the students. The professors will be able to *asesorar to the student in the election and development of the subject, in the distribution, *busqueda bibliographic and presentation

Assessment

Description		Qualification	Evaluated Competences	
Mentored work	It will value the preparation and presentation of a work on a subject proposed by the professor related with the theoretical content of the *asignatura.	5	CE2 CE8 CE10 CE11 CE12 CE13 CE19 CE20 CE23	CT1 CT3 CT4 CT5 CT9 CT12 CT13 CT14
Seminars	In the classes of seminar will value the participation and the resolution of the previously proposed problems by the professor. A selection of the exercises will be resolved individually in the classroom and delivered regularly to the professor for his evaluation.	10	CE2 CE8 CE10 CE11 CE12 CE13 CE19 CE20 CE23	CT1 CT3 CT4 CT5 CT8 CT9 CT12 CT13 CT14
Problem and/or exercise solving	They will realise two proofs of short answer: the first when finalising the Subject II and the second when finalising the Subject IV. The first will constitute 20% of the total qualification, and the second 15%.	40	CE2 CE8 CE10 CE11 CE12 CE13 CE19 CE20 CE23	CT1 CT3 CT4 CT5 CT9 CT12 CT13 CT14
Essay questions exam	It will consist in a global proof on all the contents of the matter. It will be necessary to reach a minimum of 4 points on 10 in this proof to surpass the matter and to take into account the rest of the elements of evaluation. It will realise when finalising he *cuatrimestre.	45	CE2 CE8 CE10 CE11 CE12 CE13 CE19 CE20 CE23	CT1 CT3 CT4 CT5 CT9 CT12 CT13 CT14

Other comments on the Evaluation

IMPORTANT NOTES:

1. In the long proof final will evaluate the whole of the *asignatura. It will be necessary to reach in this proof a minimum of 4 points on 10 to surpass the matter and to take into account the rest of the elements of evaluation.
2. A selection of the exercises of the bulletins will be resolved individually in the classroom and delivered regularly to the

professor for his evaluation. Those students that by fault of assistance to class, do not deliver a minimum of 80% of these exercises, will not be able to present to the final proof.

CONDITION OF PRESENTED/To: The participation of the student in any one of the proofs written will involve the condition of presented/to and therefore the allocation of qualification.

EVALUATION IN THE ANNOUNCEMENT OF JULIO:

1. Punctuation obtained by the student during the course: Máximo 3.0 points.

It will keep the qualification obtained by the student during the course in works *tutelados (maximum 0.5 points), proofs of short answer (maximum 2.5 points).

2. Proof written: Máximo 7.0 points.

It will realise a proof of long answer on all the contents of the matter to which will assign a maximum of 7.0 points on 10.

Sources of information

Basic Bibliography

Complementary Bibliography

Vollhardt, K.P.C. y Schore, N.E., **Química Orgánica**, 5ª,

Wade, L.G., **Química Orgánica**, 5ª,

Yurkanis Bruice, P., **Química Orgánica**, 5ª,

Ege, S., **Organic Chemistry: Structure and reactivity**, 5ª,

Recommendations

Subjects that continue the syllabus

Organic chemistry III/V11G200V01704

Subjects that are recommended to be taken simultaneously

Structural Determination/V11G200V01501

Chemical engineering/V11G200V01502

Analytical chemistry II/V11G200V01503

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

* Teaching methodologies modified

* Non-attendance mechanisms for student attention (tutoring)

* Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Pending tests that are maintained

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Tests that are modified

[Previous test] => [New test]

* New tests

* Additional Information

IDENTIFYING DATA				
Analytical chemistry 3				
Subject	Analytical chemistry 3			
Code	V11G200V01601			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Lavilla Beltrán, María Isela			
Lecturers	Lavilla Beltrán, María Isela Pena Pereira, Francisco Javier			
E-mail	isela@uvigo.es			
Web	http://fatic.uvigo.es			
General description	"Machine translation into english of the original teaching guide" - This matter provides to the students the knowledge on important and actual aspects on Analytical Chemistry (Chemometrics; Trace Analysis; Automatism and sensors), especially those regarding strategies that have allowed the evolution of the conventional methodologies to improve the quality of the analytical information. Students will be able to complement his training by means of the integration of the knowledge of Analytical Chemistry taken previously, specially the contents in Analytical Chemical II (introduction to the instrumental analysis). This will allow them to tackle the resolution of analytical problems in different areas of interest (environment, feeding, industry, clinic etc.).			

Competencies

Code	
CB1	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
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CE4	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Basics and tools for solving analytical problems and characterization of chemical substances
CE8	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: main techniques for structural determination, including spectroscopy
CE17	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories in: metrology of chemical processes including quality management
CE18	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: principles of electrochemistry
CE19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
CE20	Evaluate, interpret and synthesize data and chemical information
CE22	Process and perform computational calculations with chemical information and chemical data
CE24	Recognize and analyze new problems and plan strategies to solve them
CT1	Communicate orally and in writing in at least one of the official languages of the University
CT3	Learn independently
CT4	Search and manage information from different sources
CT5	Use information and communication technologies and manage basic computer tools
CT6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
CT7	Apply theoretical knowledge in practice
CT8	Teamwork
CT9	Work independently
CT12	Plan and manage time properly
CT13	Make decisions
CT14	Analyze and synthesize information and draw conclusions
CT17	Develop concern for environmental aspects and quality management

Learning outcomes

Learning outcomes	Competences
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1. Select and apply distinct chemometric techniques to the resolution of practical cases and justify their utilisation.	CB1	CE17	CT1
	CB2	CE19	CT3
	CB3	CE20	CT5
		CE22	CT6
			CT7
			CT9
			CT13
2. Use the experimental design as a tool for the optimisation of an analytical method.	CB1	CE17	CT1
		CE19	CT3
		CE22	CT5
			CT6
			CT7
			CT9
			CT13
3. Justify the utilisation of Chemometrics in the quality of the results. Describe how to implement a system of quality in a laboratory of control.	CB1	CE4	CT1
	CB2	CE17	CT3
		CE19	CT5
		CE20	CT6
			CT7
			CT8
			CT9
4. Evaluate and interpret the analytical results of multicomponent and multivariate systems.	CB1	CE4	CT1
	CB2	CE17	CT3
	CB3	CE20	CT5
		CE22	CT6
			CT7
			CT8
			CT9
5. Recognise the different methods of sample treatment as well as evaluate its possibilities in the resolution of diverse analytical problems inside the field of trace analysis.	CB1	CE4	CT1
	CB2	CE19	CT3
		CE20	CT4
			CT7
			CT9
			CT12
			CT13
6. Describe the planning of the sampling and the factors involved in trace analysis.	CB1	CE4	CT1
		CE17	CT3
		CE24	CT4
			CT6
			CT7
			CT9
			CT12
7. Compare and value the different methods of existent extraction in the actuality, such as supercritical fluid extraction, solid phase microextracción, etc.	CB1	CE4	CT1
	CB2	CE19	CT3
		CE20	CT8
			CT9
			CT12
			CT14
			CT17
8. Describe the analytical methodology and instrumentation as well as know the applications of techniques of general use in analysis of traces such as anodic stripping voltametry, electrothermal atomic absorption spectrometry, plasma-source mass spectrometry and the different coupling between chromatography and mass spectrometry.	CB1	CE4	CT1
		CE8	CT3
		CE18	CT4
		CE19	CT8
			CT9

9. Classify the different types of automatic and miniaturized systems, establishing its advantages and inconveniences, modalities and more notable applications and of immediate future. Justify the automation in the different stages of the analytical process.	CB1 CB2	CE4 CE17 CE20	CT1 CT3 CT4 CT5 CT8 CT9 CT17
10. Explain the foundations of the sensors and chemical biosensors as well as its more important applications. Explain and value the importance of the utilisation of sensors for the fast and reliable acquisition of analytical information.	CB1 CB2 CB3	CE4 CE17 CE20	CT1 CT3 CT4 CT8 CT9 CT12
11. Describe the characteristics of the continuous automatic analysers, discontinuous and robotic. Know the phenomena of dispersion in continuous analysers of injection in flow and of sequential injection, as well as the form to characterise them.	CB1	CE4 CE17 CE19 CE20	CT1 CT3 CT4 CT5 CT8 CT9 CT14 CT17
12. Explain the construction of analytical tools in miniature and his applications.	CB1	CE4 CE17 CE19	CT1 CT3 CT4 CT5 CT9 CT12 CT14

Contents

Topic

SUBJECT 1. Analysis of traces	Concept and importance of the analysis of traces. Sources of pollution in the laboratory. Experimental methods in analysis of traces. Sampling. Methods of decomposition in analysis of inorganic traces. Methods of extraction in analysis of organic traces. Selected techniques of trace analysis.
SUBJECT 2. Automation	Automation in the laboratory of analysis: generalities. Automatic analysers. Discontinuous analysers, continuous and robotics. Analysers of injection in flow and segmented flow : characteristics. Phenomena of dispersion. Characteristics of the signal of injection in flow. Techniques of gradient. Analysers of sequential injection. Instrumentation and applications.
SUBJECT 3. Chemical sensors and biosensors	Concept of sensor. Components of a chemical sensor. Classification. Sensors and biosensors. Elements of recognition. Types of transducers. (Bio)Electrochemical and optical sensors. Applications of interest. Miniaturisation of analytical systems.
SUBJECT 4. Introduction to the Chemometrics	Definition and historical evolution of Chemometrics. Chemometrics in the different stages of the analytical process. Basic statistical concepts. Parameters that estimate the central value and the dispersion: parametric and non parametric. Properties of the variance and the mean. Expression of analytical results.
SUBJECT 5. Basic chemometrics: comparison of analytical results	Test of significance. Proofs of hypothesis: structure of the proofs of hypothesis. Type I and II errors. Probability. Rejection of anomalous results. Parametric tests of comparison of two variances. Parametric tests for comparison of two mean values. Comparison of several mean values by means of one-way ANOVA . Control of the accuracy and precision over time: charts of control. Non-parametric tests.
SUBJECT 6. The quality in the analytical laboratories: qualimetry.	Introduction to qualimetry: quality and chemometrics. Quality and analytical properties: validation of analytical methods. trazability. Generic approximation to the quality. Systems of quality: Norms ISO. Accreditation and certification of the laboratories.

Planning

	Class hours	Hours outside the classroom	Total hours
Problem solving	13	26	39
Lecturing	26	52	78

Essay questions exam	2	6.5	8.5
Essay questions exam	2	6.5	8.5
Essay questions exam	4	12	16

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

Methodologies	
	Description
Problem solving	In the classes of resolution of problems (in seminar) will reinforce the learning of the agenda explained during the master lectures, carrying out the resolution of numerical problems and theoretical-practical exercises. The professor will propose, of regular form, different problems/exercises that will be resolved of individual form by the student and delivered for his evaluation. LECTURES WILL BE CARRIED OUT VIRTUALLY WHEN THE CIRCUMSTANCES REQUIRE IT.
Lecturing	The professor will develop the contents of the program from the proportionate material to the student through FAITIC. In the master lectures, the professor will present the fundamental appearances of the matter that will have to complement by means of the bibliography recommended. LECTURES WILL BE CARRIED OUT VIRTUALLY WHEN THE CIRCUMSTANCES REQUIRE IT.

Personalized assistance

Methodologies	Description
Lecturing	The professor will resolve the doubts of personalised way on any one of the activities proposed (masterclasses, seminars, supervised works , resolution of problems/exercises and proofs). To such end, the professor will inform the available schedule in the presentation of the matter. PERSONALIZED ASSISTANCE WILL BE CARRIED OUT VIRTUALLY WHEN THE CIRCUMSTANCES REQUIRE IT.
Problem solving	The professor will resolve the doubts in a personalised way on any one of the activities proposed (master classes, seminars, resolution of problems/exercises and proofs). To such end, the professor will inform the available schedule in the presentation of the matter. LECTURES WILL BE CARRIED OUT VIRTUALLY WHEN THE CIRCUMSTANCES REQUIRE IT.

Assessment

	Description	Qualification	Evaluated Competences		
Problem solving	In classes of seminar, the teacher will resolve part of the problems/exercises, leaving others to be resolved by the student. It will be necessary to obtain a minimum punctuation of 3 on 10 points for the qualification of this activity can be added to the rest of elements of evaluation.	10	CB1 CB2 CB3	CE4 CE8 CE17 CE18 CE19 CE20 CE22	CT4 CT5 CT6 CT7 CT8 CT9 CT12 CT14
Essay questions exam	It will effect a first SHORT TEST on the subjects 1, 2 and 3, roughly to half of the course. The short test will consist in questions of short answer, problems and ask type test. The presentation to this est disqualifies the student to obtain the qualification of not presented.	20	CB1 CB2 CB3	CE4 CE8 CE17 CE18 CE19 CE20	CT1 CT3 CT4 CT5 CT6 CT7 CT9 CT12 CT13 CT14 CT17
Essay questions exam	It will effect a second SHORT TEST on the subjects 4, 5 and 6 to the end of the for-month period. The short test will consist in questions of short answer, problems and ask type test. The presentation to this test disqualifies the student to obtain the qualification of not presented.	20	CB1 CB2 CB3	CE4 CE17 CE19 CE20 CE22 CE24	CT1 CT3 CT4 CT5 CT6 CT7 CT9 CT12 CT13 CT14

Essay questions exam	Compulsory FINAL EXAMINATION. It will consist in a global proof of the course that will include questions of short answer, problems and ask type test. It will be necessary to obtain 3 points on 10 in this examination so that the qualification can add to the one of the rest of elements of evaluation.	50	CB1 CB2 CB3	CE4 CE8 CE17 CE18 CE19 CE20 CE22 CE24	CT1 CT3 CT4 CT5 CT6 CT7 CT9 CT12 CT13 CT14 CT17
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Other comments on the Evaluation

To pass the matter, the student can opt by one of the two following types of evaluation (to choose at the beginning of the course):

CONTINUOUS EVALUATION

The participation of the student in any one of the two tests of short answer programmed during the course, it disqualifies to obtain the qualification of NOT PRESENTED. To pass the short tests as well as the final examination, it will be necessary a balance in the qualifications of the theoretical part and the one of problems. The qualification in the first edition of the announcement will be integrated by the qualifications obtained in the classes of resolution of problems (deliverables) (1 point), short tests (4 points) and final examination (5 points).

Qualification in the 2^a call (July):

The qualification in this call will be formed by two components:

1. Punctuations obtained by the student during the course (4 points). The weighting of the problems resolved in seminars (deliverables) will be of 0.5 points and the ones of the two short tests of 3.5 points

2. Final examination of the contents of the matter (6 points).

This proof will include questions of short answer, problems and ask type test. It will be necessary that exist a balance in the qualifications of the theoretical part (ask type test and questions of short answer) and the one of problems to surpass the matter.

ONLY EVALUATION:

The student will be evaluated by means of an only final examination (10 points) that will include questions of short answer, problems and ask type test. It will be necessary a balance in the qualifications of the theoretical part (questions of short answer and ask type test) and the one of problems to pass the matter. The election of this way of evaluation has to be communicated to the professor within a month after the beginning of the four-month period by means of a form that will be available in FAITIC. Once chosen the way of evaluation (continuous or only) changes between both systems will not be allowed. In case that the student do not manifest in this regard, it will be understood that the way of continuous evaluation is selected.

ELEMENTS OF EVALUATION WILL BE CARRIED OUT VIRTUALLY WHEN THE CIRCUMSTANCES REQUIRE IT.

Sources of information

Basic Bibliography

G. Ramis Ramos; M.C. Álvarez Coque, **Quimiometría**, Síntesis, 2001

J.C. Miller; J.N. Miller, **Estadística y Quimiometría para Química Analítica**, Prentice-Hall, 2002

R. Compañó Beltrán; R. Ríos Castro, **Garantía de calidad en los laboratorios analíticos**, Síntesis, 2002

C. Cámara, **Toma y tratamiento de muestras**, Síntesis, 2002

R. Cela, **Técnicas de separación en Química Analítica**, Síntesis, 2002

C. Cámara, **Análisis químico de trazas**, Síntesis, 2011

Valcárcel, **Automatización y miniaturización en Química Analítica**, Springer, 2000

Complementary Bibliography

S. Mitra, **Sample preparation techniques in analytical chemistry**, Wiley, 2003

B.R. Eggins, **Chemical sensors and biosensors**, Wiley, 2002

L. Hernández, **Introducción al análisis instrumental**, Ariel, 2002

K.A. Robinson, **Análisis Instrumental**, Prentice-Hall, 2000

Skoog, **Principios de Análisis Instrumental**, McGraw-Hill, 2001

Kellner, **Analytical Chemistry**, Wiley-VCH, 2004

M. Valcárcel, M.D. Luque de Castro, **Flow-injection analysis. Principles and applications**, Ellis Horwood, 1987

Recommendations

Subjects that it is recommended to have taken before

Analytical chemistry II/V11G200V01503

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

Lecturing (virtual in whole or in part)

Problem solving (virtual in whole or in part)

* Teaching methodologies modified

* Non-attendance mechanisms for student attention (tutoring)

Campus remoto, correo electrónico and FaiTIC

* Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

If the evaluation is not possible in person, it will be carried out through the remote Campus and FaiTIC

=== ADAPTATION OF THE TESTS ===

The evaluation of the subject will not be affected, so there is no need to adapt it.

* Tests already carried out

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Pending tests that are maintained

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Tests that are modified

[Previous test] => [New test]

* New tests

* Additional Information

IDENTIFYING DATA				
Biological chemistry				
Subject	Biological chemistry			
Code	V11G200V01602			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Mandatory	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Teijeira Bautista, Marta Simón Vázquez, Rosana			
Lecturers	Calle González, Inmaculada de la Diego González, Lara Lavilla Beltrán, María Isela Silva López, Carlos Simón Vázquez, Rosana Teijeira Bautista, Marta			
E-mail	qomaca@uvigo.es rosana.simon@uvigo.es			
Web				
General description	Introductory course of Biochemistry, global and integrated knowledge of the molecular mechanisms responsible of biological processes.			

Competencies

Code	
CB1	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
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE4	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Basics and tools for solving analytical problems and characterization of chemical substances
CE15	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories in: chemistry of biological molecules and their processes
CE19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
CE21	Recognize and implement good scientific practices for measurement and experimentation
CE23	Present oral and written scientific material and scientific arguments to a specialized audience
CE25	Handle chemicals safely, considering their physical and chemical properties, including the evaluation of any specific risks associated with its use
CE26	Perform common laboratory procedures and use instrumentation in synthetic and analytical work
CE27	Monitor, by observation and measurement of physical and chemical properties, events or changes, and document and record them in a consistent and reliable way
CE28	Interpret data derived from laboratory observations and measurements in terms of their significance and relate them to the appropriate theory
CT1	Communicate orally and in writing in at least one of the official languages of the University
CT3	Learn independently
CT4	Search and manage information from different sources
CT5	Use information and communication technologies and manage basic computer tools
CT7	Apply theoretical knowledge in practice
CT8	Teamwork
CT9	Work independently
CT12	Plan and manage time properly
CT13	Make decisions
CT14	Analyze and synthesize information and draw conclusions
CT15	Evaluate critically and constructively the environment and oneself

Learning outcomes			
Learning outcomes	Competences		
Identify and recognise the structure of the distinct types of *biomoléculas and represent them properly, recognise his properties and his chemical reactivity.	CB1 CB3	CE15	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Recognise the distinct biological activities of the diverse types of *biomoléculas	CB1 CB3	CE15	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Define the kinetical enzymatic of reactions *catalizadas by enzymes as well as his general mechanisms. Recognise the distinct types of inhibition of the enzymatic activity and his quantification	CB1 CB3	CE4 CE15	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Relate the vitamins with the corresponding *coenzimas of enzymatic reactions	CB1 CB3	CE15	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Explain he concept of *Bioenergética. Reason conceptually the importance of him attachment of the processes *endergónicos and *exergónicos in the biological systems	CB1 CB3	CE15	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Enumerate the main structural appearances of the ATP that determine his paper in the transfer of energy. Describe the cycle of the ATP.	CB1 CB3	CE15	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15

Distinguish the metabolic roads of the *biomoléculas, as well as his interrelationships and regulation	CB1 CB3	CE15	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Explain the foundations of the current technicians of *proteómica and molecular biology in relation with the isolation, separation, purification, determination, identification and manipulation of proteins and nucleic acids	CB1 CB2 CB3	CE4 CE15	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Apply experimentally some basic technicians in Biochemistry. Justify the application of the distinct instrumental technicians in the analysis of *biomoléculas	CB1 CB2 CB3	CE4 CE15 CE19 CE21 CE23 CE25 CE26 CE27 CE28	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Distinguish the main operations involved in the commercial production of *biomoléculas, as well as his foundations. Recognise the possible practical applications of *biomoléculas, with special emphasis in the characteristic operational conditions	CB1 CB2 CB3 CB5	CE15 CE21 CE23 CE25 CE26 CE27 CE28	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Distinguish and pose analytical protocols of application of the previously mentioned technicians to the analysis of *biomoléculas in diverse areas (clinical, pharmaceutical, *biomédica, etc.)	CB1 CB2 CB3 CB5	CE4 CE15 CE19 CE21 CE23 CE25 CE26 CE27 CE28	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15

Contents

Topic	
1.Biomolecules	Structure and structure-function relationship of biomolecules: proteins, carbohydrates, lipids and nucleic acids.
2.Biocatalisis	Structure and function of enzymes. Enzymatic reactions. Enzymatic kinetics.
3.Vitamins and coenzymes	Structure and function of vitamins and coenzymes in metabolic reactions.
4.Metabolism of glucides	Degradative Metabolism of glucides: glycolysis. Metabolic crossroad of pyruvate. Degradative Oxidation of acetyl-CoA. Respiratory chain and oxidative phosphorylation. Oxidative Route of the pentoses phosphate. Gluconeogenesis. Metabolism of glycogen.

5. Metabolism of lipids	Degradation of lipids: oxidation of fatty acids. Biosynthesis of fatty acids.
6. Metabolism of proteins	Proteolysis. Degradation of amino acids. Destiny of the ion ammonium. Biosynthesis of amino acids.
7. Metabolism of nucleotides	Degradation of nucleic acids and nucleotides. Biosynthesis of nucleotides.
8. Experimental methods in Biochemistry	Techniques for synthesis and isolation of biomolecules. Separation, determination and identification of proteins. Determination and quantification of lipids. Determination and quantification of glycogen. Evaluation of the enzymatic activity. Effect of the temperature and inhibition. Polymerase chain reaction. Use of restriction enzymes.

Planning

	Class hours	Hours outside the classroom	Total hours
Seminars	13	19.5	32.5
Laboratory practical	45.5	68.25	113.75
Problem solving	3	3	6
Lecturing	26	26	52
Essay questions exam	4	6	10
Laboratory practice	2.3	3.45	5.75
Essay questions exam	2	3	5

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

Methodologies

	Description
Seminars	This teaching activity will be dedicated to the resolution of some problems or proposed exercises related to the subject. In these classes you can collect questions or short problems to track the progress of the students.
Laboratory practical	They will propose questions practice, to resolve in the laboratory.
Problem solving	Activity in which they formulate problems and/or exercises related with the matter. The student has to develop the suitable or correct solutions by means of the realisation of routines, the application of formulas or algorithms, the application of procedures of transformation of the available information and the interpretation of the results.
Lecturing	Exhibition by the professor of the contents on the matter object of study, theoretical bases and/or guidelines of a work, exercise or project to develop by the student.

Personalized assistance

Methodologies	Description
Lecturing	Throughout the teaching period students can consult all kinds of questions related to the subject. These consultations will be addressed both in tutorials and seminars.
Seminars	Throughout the teaching period students can consult all kinds of questions related to the subject. These consultations will be addressed both in tutorials and seminars.
Laboratory practical	The professor will resolve the doubts of the students for the good development of the activities proposed

Assessment

	Description	Qualification	Evaluated Competences	
Seminars	Students attitude and participation in seminar classes will be valued. Short questions and hand-made problems will be also proposed to track students' progress. Grading in this section will be only considered if students reach a mark equal or above 5/10 in the written exams.	10	CE4 CE15 CE23	CT3 CT4 CT8 CT12 CT14 CT15

Laboratory practical	The attendance to the practices and the application of the instrumental techniques learned will be valued by means of the resolution of proposed questions as well as the delivery of a practice report. Grading in this section will be only considered if students reach a mark equal or above 5/10 in the written exams.	30	CB1 CB2 CB3 CB5	CE15 CE19 CE21 CE25 CE26 CE27 CE28	CT3 CT7 CT9 CT12 CT13 CT14
Essay questions exam	There will be two written tests during the semester on the subject taught until then in the lectures and seminars. This exam will be eliminatory of matter in the final test if students reach a mark equal or above 5/10. Those students not reaching this mark will have to repeat this part of the examination in the final written test.	hasta el 30	CB1 CB3	CE4 CE15	CT1 CT3 CT4 CT9 CT12 CT14
Essay questions exam	A final written test will be proposed to evaluate the acquired competences.	hasta el 60	CB1 CB3	CE4 CE15	CT1 CT3 CT4 CT9 CT12 CT14

Other comments on the Evaluation

The final grade of the matter will be calculated taking into account the evaluation of the seminars (10%), the laboratory practices (30%) and the written tests (60%), for those students that reach an equal or upper punctuation to 5 points on 10 in the written tests. If that score is not reached, the grade of the matter will correspond to the value of the final written test. The short written tests may have eliminatory character, as long as they reach the minimum value each of 5/10, subtracting its percentage corresponding to the value of the final written test.

Attendance at laboratory practices is mandatory. The lack of assistance, even if justified, will penalize the evaluation of the same. An attendance lower than 75% of the practical sessions supposes the qualification of suspense in the matter.

The participation in the evaluation activities throughout the semester or in some of the assessment tests involve the condition of presented and therefore the student will be graded.

Assessment in July: The same rules are applied. If 75% of the laboratory sessions have been completed, the minimum grade has not been obtained, a laboratory exam may be carried out in July.

Sources of information

Basic Bibliography

Stryer L., Berg J. M. & Tymoczko J. L., **Bioquímica**, 7ª, Editorial Reverté, 2013

Lehninger, Nelson D. L. & Cox M. M., **Principios de Bioquímica**, 7ª, Macmillan Higher Education, cop. 2017, 2017

Susan R. Mikkelsen, Eduardo Cortón, **Bioanalytical Chemistry**, 1ª, Wiley-Interscience, 2004

Complementary Bibliography

McKee and McKee, **Bioquímica**, 5ª, Ediciones McGraw Hill, 2014

Andreas Manz, Nicole Pamme, Dimitri Lossifidis, **Bioanalytical Chemistry**, 2ª, Imperial College Press, 2015

Victor A. Gault and Neville H. McClenaghan, **Understanding Bioanalytical Chemistry: principles and Applications**, 1ª, Wiley Blackwell, 2009

Feduchi, Blasco, Romero, Yañez, **Bioquímica**, 2ª, Panamericana, 2015

John Kuriyan, Boyana Konforti, David Wemmer, **The Molecules of Life**, 1ª, Garland Science, 2013

Schlick, Tamar, **Molecular modeling and simulation : an interdisciplinary guide**, 1ª, Springer Science+Business Media, 2010

Recommendations

Subjects that it is recommended to have taken before

Organic chemistry II/V11G200V01504

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes

an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

- * Teaching methodologies maintained

- * Teaching methodologies modified

- * Non-attendance mechanisms for student attention (tutoring)

- * Modifications (if applicable) of the contents

- * Additional bibliography to facilitate self-learning

- * Other modifications

=== ADAPTATION OF THE TESTS ===

- * Tests already carried out
Test XX: [Previous Weight 00%] [Proposed Weight 00%]
...

- * Pending tests that are maintained
Test XX: [Previous Weight 00%] [Proposed Weight 00%]
...

- * Tests that are modified
[Previous test] => [New test]

- * New tests

- * Additional Information
-

IDENTIFYING DATA				
Physical chemistry III				
Subject	Physical chemistry III			
Code	V11G200V01603			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Mandatory	3rd	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Losada Barreiro, Sonia			
Lecturers	Losada Barreiro, Sonia Mariño López, Andrea Mosquera Castro, Ricardo Antonio Tojo Suárez, María Concepción			
E-mail	sonia@uvigo.es			
Web	http://fatic.uvigo.es/			
General description	The subject provides training in applications of Physical Chemistry of great importance, like Chemical Kinetics, including Catalysis, surface phenomena, Macromolecules and Colloids as well as some foundations of Electrochemistry.			

Competencies	
Code	
CE7	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: kinetics of change, including catalysis and reaction mechanisms
CE14	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: relationship between macroscopic properties and properties of individual atoms and molecules, including macromolecules
CE19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
CE20	Evaluate, interpret and synthesize data and chemical information
CE21	Recognize and implement good scientific practices for measurement and experimentation
CE22	Process and perform computational calculations with chemical information and chemical data
CE23	Present oral and written scientific material and scientific arguments to a specialized audience
CE26	Perform common laboratory procedures and use instrumentation in synthetic and analytical work
CE27	Monitor, by observation and measurement of physical and chemical properties, events or changes, and document and record them in a consistent and reliable way
CE28	Interpret data derived from laboratory observations and measurements in terms of their significance and relate them to the appropriate theory
CE29	Demonstrate skills for numerical calculations and interpretation of experimental data, with special emphasis on precision and accuracy
CT1	Communicate orally and in writing in at least one of the official languages of the University
CT3	Learn independently
CT4	Search and manage information from different sources
CT5	Use information and communication technologies and manage basic computer tools
CT6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
CT7	Apply theoretical knowledge in practice
CT8	Teamwork
CT9	Work independently
CT14	Analyze and synthesize information and draw conclusions
CT15	Evaluate critically and constructively the environment and oneself

Learning outcomes		
Learning outcomes	Competences	
Describe the general mechanism of the process of transport and for the transport of distinct physical properties. Comprise the origin of the ionic conductivity. Know, apply this knowledge to the determination of thermodynamic parameters like constants of balance, coefficients of activity or others like molar conductivities limit.	CE7 CE14 CE19 CE23	CT1 CT3 CT4 CT9
Define with precision, all the basic concepts in kinetic chemistry and, know the distinct methods of analysis of data to obtain rate equations.	CE7 CE19 CE23	CT1 CT3 CT4 CT9

Describe the foundation of the distinct experimental methods available for the kinetic study of the chemical reactions.	CE20 CE27 CE28	CT1 CT3 CT4 CT9
Be able to carry out the analysis of kinetic data, including the ones of complex reactions and relate the same with the mechanisms of reaction.	CE7 CE19 CE27	CT1 CT3 CT4 CT7 CT9
Explain the fundamental hypotheses of the distinct theories on the chemical change, as well as the results and the limitations of each one of them (Theory of Collisions and Theory of the State of Transition) and know, apply them like tool in the analysis of kinetic results.	CE7 CE14 CE19	CT1 CT3 CT4 CT9
Describe the distinct types of catalysis, explain the mechanism of the catalized reactions and apply it to concrete cases. Know kinetic treatment to the distinct types of catalysis.	CE7 CE19	CT1 CT3 CT4 CT9
Know the basic structure of the electrical interface and its application to the study of the stability of the colloids and of the processes in the electrical interfaces.	CE7 CE14 CE19	CT1 CT3 CT4 CT9
Explain the principles that govern the phenomena of adsorption on solid surfaces and distinguish the types. Comprise the origin of the distinct isotherms of adsorption and know apply them to concrete problems.	CE14 CE19	CT1 CT3 CT4 CT9
Explain the nature and structure of the macromolecules in solution and the most representative models for their description.	CE14 CE19	CT1 CT3 CT4 CT9
Describe with clarity the nature and the distinct types of colloidal systems. Comprise the basic appearances of the thermodynamic treatment of the macromolecular solutions.	CE14 CE19	CT1 CT3 CT4 CT9
Describe the foundation of the experimental methods more important for the determination of the structure of macromolecules and colloidal systems.	CE14 CE27	CT1 CT3 CT4 CT9
Describe the structure and explain the causes of the stability of the colloidal systems as well as recognise their chemical importance.	CE14 CE19	CT1 CT3 CT4 CT9
Know the basic appearances of the structure of the electrical interface, the origin of the distinct types of sobrepotential and its application.	CE7 CE14 CE19	CT1 CT3 CT4 CT9
Apply the distinct basic methods in the field of the kinetics for the determination, between others, of rate equations and activation energies. Determine experimentally properties associated to the phenomena of transport and surface and the structure of the macromolecules and colloidal systems.	CE19 CE20 CE21 CE22 CE26 CE27 CE28 CE29	CT1 CT4 CT5 CT6 CT7 CT8 CT9 CT14 CT15

Contents

Topic

Phenomena of transport	Kinetic theory of gases. No-electrical transport phenomena. Electrical transport transport: conductivity
Surface phenomena	Surface tension. Structure of the solid surfaces. Adsorption on solid surfaces. Physisorption and chemisorption: models. The electrical interface.
Formal kinetics	Reaction rates and rate equations. Analysis of data. Kinetic analysis of complex reactions. Mechanisms. Influence of the temperature in the rate of reaction.
Experimental methods in chemical kinetics	Transformation of the rate equations. Conventional methods. Experimental methods for the study of fast reactions.

Theoretical interpretation of the rate of the reaction	Collision theory for bimolecular reactions. Transition-state theory.
Macromolecules	Structure of the macromolecules. Structural models. Characterization of macromolecules.
Colloids	Classification of colloidal systems. Synthesis and characterization of colloids. Stability of colloidal systems.
Catalysis	General catalysis mechanism. Homogeneous catalysis mechanism. Heterogeneous catalysis mechanism.
Electrode kinetics	Stages of an electrode process. Sobrepotential. Sobrepotential of transfer of load. Diffusion sobrepotential. Sobrepotential of reactions and crystallizations. Experimental methods.
Laboratory practical	Experiments of kinetic chemistry including catalysis, transport phenomena, electrochemistry, macromolecules and colloids.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	26	0	26
Seminars	13	65	78
Laboratory practical	45.5	32.5	78
Problem and/or exercise solving	1	5	6
Problem and/or exercise solving	1	5	6
Essay questions exam	3	15	18
Report of practices, practicum and external practices	0	6	6
Problem and/or exercise solving	0	7	7

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

Methodologies

	Description
Lecturing	Lesson in a classroom. Resolution of some exercises in the classroom.
Seminars	Approach, analysis and discussion of problems and questions of some complexity.
Laboratory practical	Realization under the supervision of Professor (but of autonomous way) of laboratory practises related with the subject.

Personalized assistance

Methodologies	Description
Lecturing	Resolution of doubts on the proportionate explanations in classes. During all the educational period the students will be able to consult all type of doubts related with the subject. These questions will be able to attend by telematic ways (email, videoconference, forums of FaiTIC, ...), previous application through an email.
Seminars	Resolution of doubts on the proportionate explanations in classes. These questions will be able to attend by telematic ways (email, videoconference, forums of FaiTIC, ...), previous application through an email.
Laboratory practical	Those questions of students that may arise during the realization of laboratory practices or the corresponding reports will be resolved individually in the teacher tutoring schedule. These questions will be able to attend by telematic ways (email, videoconference, forums of FaiTIC, ...), previous application through an email.

Tests	Description
Report of practices, practicum and external practices	Those questions of students that may arise during the realization of laboratory practices or the corresponding reports will be resolved individually in the teacher tutoring schedule. These questions will be able to attend by telematic ways (email, videoconference, forums of FaiTIC, ...), previous application through an email.
Problem and/or exercise solving	Doubts and questions of problems and/or questions provided in classes. These questions will be able to attend by telematic ways (email, videoconference, forums of FaiTIC, ...), previous application through an email.

Assessment

	Description	Qualification	Evaluated Competences	
Seminars	Presentation and discussion of exercises prior to the seminar will be evaluated	4	CE7 CE14 CE19 CE23	CT1 CT6 CT7 CT14

Laboratory practical	It is scored here along with the effort and the attitude, the skills and the competences developed by the student during the accomplishment of the different practices. Attendance at practice sessions is mandatory and, therefore, it is not possible to pass the subject in case it has not taken place.	15	CE19 CE20 CE21 CE22 CE23 CE26 CE27 CE28 CE29	
Problem and/or exercise solving	Evaluation of acquired knowledge up to date with a small exam (questions, problems)	18	CE7 CE14 CE19 CE23	CT1 CT7
Problem and/or exercise solving	Evaluation of acquired knowledge up to date with a small exam (questions, problems)	18	CE7 CE14 CE19 CE23	CT1 CT7
Essay questions exam	Final exam (long exam). Evaluation of the acquired knowledge: questions and problems	40	CE7 CE14 CE19 CE23 CE28	CT1 CT7
Report of practices, practicum and external practices	The presentation and quality of the experimental data obtained in experiments will be evaluated. Reports will necessarily include some discussion on the reported data.	5	CE14 CE19 CE20 CE21 CE22 CE27 CE28	

Other comments on the Evaluation

- The assistance to masterclasses, seminars and the realisation of the practices and the delivery of the corresponding reports is compulsory.

The notes of the seminars and practical of laboratory will keep for the second evaluation. Under special circumstances, students may be required to make a special work to improve the grades obtained.

The minimum note of the "official" (long) exam will be of 3.8 (in scale 0-10, 1.52 in scale 0-4) and of 3.0 (scale 0-10) in the short ones, so that the final grade will be an average (with the corresponding percentage) of the punctuations of all sections. To pass the topic, the global grade has to be, of course, equal to or higher than 5.0. There is not minimum punctuations in other sections, but presentation and discussion of exercises during the seminars is highly relevant and will be considered important.

Sources of information

Basic Bibliography

Complementary Bibliography

I.N. LEVINE, **Physical Chemistry**, 6^a,
P.W. ATKINS y J. DE PAULA, **Physical Chemistry**, 10^a,
T. ENGEL y P.J. REID, **Physical Chemistry**, 3^a,
K. J. LAIDLER, **Chemical Kinetics**, 3^a,
A. HORTA, **Macromoléculas (2 vols)**, 2^a,
S. SENENT, **Química Física II**, 3^a,
J. Bertrán y J. Núñez (coords.), **Química Física (2 vols)**, 1^a,

Recommendations

Subjects that are recommended to be taken simultaneously

Analytical chemistry 3/V11G200V01601
Inorganic chemistry II/V11G200V01604

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

In front of the uncertain and unpredictable evolution of the sanitary alert caused by the COVID-19, the University of Vigo establishes an extraordinary planning that will activate in the moment in that the administrations and the own institution determine it attending to criteria of security, health and responsibility, and guaranteeing the teaching in a no face-to-face stage or partially face-to-face. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the teaching of a more agile and effective way when being known in advance by the students and the teachers through the tool normalised and institutionalised of the educational guides.

=== ADAPTATION OF THE METHODOLOGIES ===

All the educational methodologies foreseen in the educational guide initial will be kept, with the exception that, if the classes could not give of face-to-face form, these would give through the classrooms of the Remote Campus of the University of Vigo.

If the practices of laboratory could not be developed of face-to-face form, the content of the practices will be explained through the classrooms of the Remote Campus of the University of Vigo and some experimental data will be provided to the students, so that with them can fill the corresponding report of practices of laboratory.

The personalized assistance will be able to carry out in different modalities: by email or through the dispatches of each professor in the Remote Campus of the University of Vigo previous application through an email.

=== ADAPTATION OF THE EVALUATION ===

In the case that the small and long exams could not carry out of face-to-face way, the evaluation of the subject keeps as indicated in the educational guide, with the same percentages of qualification, but with the difference that the small and long exams will carry through the Remote Campus being able to have like support the use of the platform of FaiTIC and without prejudice to other measures that can be adopted to guarantee the accessibility of the students to the exams.

The assessment of the contents of laboratory (20% on the total of the subject in the continuous evaluation) will remain covered by means of the correction of the reports delivered during the course.

For the second assessment, the qualifications of continuous evaluation obtained along the course will be kept.

IDENTIFYING DATA				
Inorganic chemistry II				
Subject	Inorganic chemistry II			
Code	V11G200V01604			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Castro Fojo, Jesús Antonio			
Lecturers	Castro Fojo, Jesús Antonio García Fontán, María Soledad			
E-mail	jesusc@uvigo.es			
Web	http://fatic.uvigo.es			
General description	This matter presents the most relevant aspects of the Chemistry of the Transition Metals as well as an important class of derivatives known as coordination compounds.			

Competencies

Code	
CE2	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: types of chemical reactions and its main characteristics
CE7	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: kinetics of change, including catalysis and reaction mechanisms
CE8	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: main techniques for structural determination, including spectroscopy
CE9	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
CE12	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: structural features of chemical elements and their compounds, including stereochemistry
CE14	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: relationship between macroscopic properties and properties of individual atoms and molecules, including macromolecules

Learning outcomes

Learning outcomes	Competences
Classify ligands and coordination compounds, as well as recognize the presence of isomers.	CE12
Define the global and steps thermodynamic stability constants of one complex and describe the chelate, macrocyclic and cryptate effects	CE2 CE14
Deduce the spectroscopic terms for stable electronic configurations of the transition metals in a coordination compound	CE9
Construct and interpret a qualitative energy diagram of molecular orbitals in octahedral complexes	CE12 CE14
Interpret the electronic spectra of octahedral, tetrahedral and square planar complexes of transition metals and rationalize their magnetic behavior	CE8 CE14 CE7
Describe the different mechanisms of substitution and rationalize the various products obtained in substitution reactions in octahedral and square planar complex.	
Describe how you can get metals from their natural resources	CE9
Being able to differentiate the behavior between the elements of the first transition series and the second and third.	CE9
Predicting the reactivity of the metal oxides, halides and of those of the coordination compounds based on the bond and on the oxidation state of the metal.	CE9
Rationalize the thermodynamic stability of coordination compounds, depending on the oxidation state of the metal and the type of ligand.	CE9 CE12 CE14

Contents

Topic	
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Subject 1: Introduction to the Chemistry of the transition metals.	Physical properties. Electronic configuration. Multielectrons Systems. Microstates and spectroscopic terms. Reactivity and characteristic properties. General methods of obtention and purification of metals
Subject 2: Coordination Chemistry.	Numbers and geometry of coordination. Ligand types. Isomerism in metal complexes. Nomenclature.
Subject 3: Bond in coordination compounds (I): Crystal field theory	Theory of crystal field. Complexes of weak and strong field. Tetrahedric and square-plane complexes.
Subject 4: Bond in coordination compounds (II).	Molecular orbital theory in octahedral complexes. Metal-ligand interaction.
Subject 5: Spectroscopic and magnetic properties of the complexes.	Energetic states. Rules of selection. General characteristics of the electronic spectra. Magnetic behavior
Subject 6: Thermodynamic properties of the coordination compounds.	Stability constants and affecting factors them. Chelate, macrocycle and crystate effects.
Subject 7: Reaction mechanisms in coordination compounds.	Reactions of substitution in octahedral and square-plane complexes. Processes of electronic transfer
Subject 8: Chemistry of the group 3 and 4 metals.	Obtention methods and uses. Usual oxidation numbers. Representative compounds of titanium: halides, oxides and mixed oxides. Coordination compounds.
Subject 9: Chemistry of the group 5 metals.	Obtention methods and uses. Usual oxidation numbers. Representative compounds of vanadium: halides, oxides and mixed oxides. Coordination compounds.
Subject 10: Chemistry of the group 6 metals.	Production methods and uses. Usual oxidation numbers. Representative compounds of chromium: halides, oxides and oxoanions. Coordination compounds.
Subject 11: Chemistry of the group 7 metals.	Production methods and uses. Usual oxidation numbers. Representative compounds of manganese: halides, oxides and oxoanions. Coordination compounds. Bioinorganic chemistry of manganese and technetium.
Subject 12: Chemistry of the group 8 metals.	Production methods and uses. Usual oxidation numbers. Representative compounds of iron: halides, oxides and oxoanions. Coordination compounds. Bioinorganic chemistry of iron.
Subject 13: Chemistry of the group 9 metals.	Production methods and uses. Usual oxidation numbers. Representative compounds of cobalt: halides, oxides and oxoanions. Coordination compounds. Bioinorganic chemistry of cobalt.
Subject 14: Chemistry of the group 10 metals.	Production methods and uses. Usual oxidation numbers. Representative compounds of nickel: halides, oxides and oxoanions. Coordination compounds. Bioinorganic chemistry of platinum.
Subject 15: Chemistry of the group 11 metals. .	Production methods and uses. Usual oxidation numbers. Representative compounds of copper: halides, oxides and oxoanions. Coordination compounds. Bioinorganic chemistry of copper and gold.
Subject 16: Chemistry of the group 12 metals.	Production methods and uses. Usual oxidation numbers. Representative compounds of zinc and mercury: halides, oxides and oxoanions. Coordination compounds. Bioinorganic chemistry of the elements of the group.

Planning

	Class hours	Hours outside the classroom	Total hours
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Seminars	26	26	52
Lecturing	26	39	65
Objective questions exam	2	2	4
Problem and/or exercise solving	0	21	21
Essay questions exam	4	4	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	Seminar classes will be devoted to the resolution of case studies related to the subject as well as the resolution of questions or issues that arise in the development of each topic. Beheld also hold seminars that address issues not taught in other courses but necessary for the progress of the course.
Lecturing	The lectures will be devoted to presenting the fundamental aspects.

Personalized assistance

Methodologies	Description
Lecturing	Throughout the educational period students can consult any doubts on the matter tutorials or previous appointment.
Seminars	Throughout the educational period students can consult any doubts on the matter tutorials or previous appointment.

Assessment			
	Description	Qualification	Evaluated Competencies
Seminars	In the lectures they may ask students to solve simple issues that will have to deliver at that time and will serve for the evaluation. The score will be considered only if the test is long reaches a score of 3 or above on 10 points.	15	CE2 CE7 CE8 CE12 CE14
Objective questions exam	There will be two short tests throughout the school period of 1-2 hours each. The score will be considered only if the test is long reaches a score greater than or equal to 3 points out of 10.	30	CE2 CE7 CE8 CE9 CE12 CE14
Problem and/or exercise solving	Throughout the course they ask students to do exercises to perform such work. The solutions must be submitted in a timely manner previously established. It is possible that the teacher ask the student to defend his response delivered before proceeding with the assessment. The score will be considered only if the test is long reaches a score greater than or equal to 3 points out of 10.	15	CE2 CE7 CE8 CE9 CE12 CE14
Essay questions exam	There will be a test at the end of the semester in which students must resolve all issues related to the presented contents.	40	CE2 CE7 CE8 CE9 CE12 CE14

Other comments on the Evaluation

Conditions to opt the continuous evaluation:

- Attendance at lectures and seminars is mandatory. The student has to mandatorily assist it all the class and seminars.
- To pass the course the professor must have time and form of a minimum of 80% of the exercises proposed in the various activities and presences. It is also mandatory for the student to present all written tests planned to pass the course.
- The no fulfillment of the conditions involves the loss of the right to the continuous evaluation

Development of continuous evaluation:

- The competencies of the subject relating to the competencies of the degree (A1-A3, A5, A10, A12 and A20) will be assessed explicitly in classroom exercises and written tests. The transferable skills will be evaluated implicitly by the qualification of the exercises (B2, B3 and B4).

- Will need a score greater than or equal to 30% of the total value in each of written tests (short and final) and the sum total of the qualifications of the deliverables to the final qualification note the rest of the elements of evaluation (exercises and short tests). Failure to achieve any of the minimum, in the act appear the result of the tests and weighted exercises in which qualified reached criterion.

- Students who fail the course at the end of the semester will take a written test in the closing period of evaluation in the final month of July. This test will be worth 40% of the mark and replace the test results at the end of the semester. The qualification of the exercises (classroom activities) and short tests are not recoverable.

In the case of not achieving the conditions for continuous evaluation, it/the student will be able to presented the a proof at the end of the semester where will owe to resolve questions related with all the specific skills of the subject. In each question or question, the kind of skill being evaluated will be identify. This proof will be different in extension to the realized by those that opt by continuous evaluation. In this case:

1.- It will be necessary to obtain a minimum of 3 points on 10 of average in the evaluation of each specific competition to surpass the subject.

2.- It will be necessary to obtain an equal global qualification or upper to 5 on 10 in this proof to surpass the subject and, in any case previous qualifications obtained during the semester will be not considered.

3.- The qualification will not be affected by the normalization applied to be upper to 7 points.

Sources of information

Basic Bibliography

Complementary Bibliography

Housecroft, C.E. e Sharpe, A.G., **Inorganic chemistry**, 3^o Ed.,

Winter, Mark J., **D-block chemistry**, Oxford : Oxford University Press,, 1994

Housecroft, Catherine E., **The Heavier d-block metals : aspects of inorganic and coordination chemistry**, Oxford : Oxford University Press,, 1999

Atkins, Peter, **Inorganic Chemistry**, Oxford : Oxford University Press,, 2010

Housecroft, C.E. e Sharpe, A. G., **Inorganic chemistry**, 4^o ed.,

Ribas Gispert, J., **Coordination Chemistry**, Willey-VCH, Weinheim, 2008

Rodgers, G.E., **Introduction to Coordination, Solid State and Descriptive Inorganic**, 3^a Ed., Chemistry. BrooksCole Cengage Learning: Bel, 2012

Recommendations

Subjects that continue the syllabus

Materials chemistry/V11G200V01702

Inorganic chemistry III/V11G200V01703

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

In front of it uncertain and unpredictable evolution of the sanitary alert caused by the COVID- 19, the University establishes join extraordinary planning that will actuate in the moment in that the administrations and the @propio institution determine it attending to criteria of security, health and responsibility, and guaranteeing the classroom teaching and non-classroom teaching when aplicate. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the classroom teaching and non-classroom teaching when being known beforehand (or with a wide advance) pole students and the teaching staff through the tool normalized and institutionalized of the teaching guides DOCNE*T.

=== ADAPTATION OF The METHODOLOGIES ===

To teaching activity will impart by means of Remote Campus and will also foresee the use of the platform "Faitic" how reinforcement and without prejudice of other measures that can adopt to guarantee the accessibility of the students and teachers to it.

- Teaching methodologies that keep :

Depending of the situation, would keep the classroom seminars and of not being possible, will keep in a virtual format

- teaching Methodologies that modify

In the case that classroom teaching were not possible, non-classroom teaching would be used.

The attention to the students requested can be carried out by mail electronic or in virtual dispatches.

- Modifications (proceed) of the contained to impart

None

- additional Bibliography to facilitate to car-learning

Will put the disposal of the students, to be accurate, manual built ad hoc

=== ADAPTATION OF The EVALUATION ===

To evaluation will keep the same in normal periods and in exceptional periods. The platforms of teaching allow the evaluation such and how is posed.

IDENTIFYING DATA				
Project				
Subject	Project			
Code	V11G200V01701			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	Spanish			
Department				
Coordinator				
Lecturers				
E-mail				
Web				
General description	"Machine translation into english of the original teaching guide" The main aim of this subject is to give the students the methodology, direction, management and organisation of projects in the field of the Chemistry. With the knowledge in Chemistry, Chemical Engineering and other affine matters, the student has to be able to develop a Project in Chemistry. At the end of the course the student has to be able to draft, schedule, execute and direct industrial projects in the field of the Chemistry			

Competencies	
Code	
CE19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
CE20	Evaluate, interpret and synthesize data and chemical information
CE22	Process and perform computational calculations with chemical information and chemical data
CE23	Present oral and written scientific material and scientific arguments to a specialized audience
CE24	Recognize and analyze new problems and plan strategies to solve them
CT1	Communicate orally and in writing in at least one of the official languages of the University
CT3	Learn independently
CT4	Search and manage information from different sources
CT5	Use information and communication technologies and manage basic computer tools
CT6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
CT7	Apply theoretical knowledge in practice
CT8	Teamwork
CT9	Work independently
CT12	Plan and manage time properly
CT13	Make decisions
CT14	Analyze and synthesize information and draw conclusions
CT15	Evaluate critically and constructively the environment and oneself
CT16	Develop an ethical commitment
CT17	Develop concern for environmental aspects and quality management
CT18	Generate new ideas and show initiative

Learning outcomes		
Learning outcomes	Competences	
Evaluate the feasibility of the realisation of a project related with the competitions of a chemist	CE20	CT1
	CE23	CT4
	CE24	CT5
		CT7
		CT8
		CT9
		CT12
		CT13
		CT14
		CT15
		CT16

*Recopilar And analyse the necessary information for the realisation of the project in Chemistry, including normative appearances and of market	CE20 CE22 CE23 CE24	CT4 CT5 CT8 CT9 CT12 CT13 CT14 CT15 CT16
Organise and manage the diverse stages of realisation of a project in Chemistry	CE20 CE23 CE24	CT3 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15 CT16 CT17 CT18
Define the suitable scope of a project, taking into account technical appearances, economic, geographic and environmental	CE19 CE20 CE22 CE23 CE24	CT1 CT3 CT4 CT6 CT7 CT8 CT9 CT13 CT14 CT17 CT18
Realise the calculations associated to the development of a project	CE19 CE20 CE22	CT3 CT7 CT8 CT9 CT12 CT14
Estimate the costs and potential profitability of a project	CE19 CE20 CE22	CT3 CT6 CT7 CT9 CT14 CT15
Analyse the environmental implications of a project, and propose preventive measures and of improvement if it was necessary	CE19 CE20 CE22 CE24	CT1 CT7 CT8 CT9 CT12 CT14 CT16 CT17
Evaluate the potential impact (environmental, socioeconomic) of a project	CE19 CE20 CE23 CE24	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT15 CT16 CT17 CT18

Elaborate technical reports very structured and drafted and present the same using the audiovisual means more suitable

CE20
CE23
CE24

CT1
CT3
CT4
CT5
CT7
CT8
CT9
CT12
CT13
CT14
CT18

Contents

Topic

Subject 1. The projects in chemistry	Professional competitions of the chemists. Definition and aims of a Project. *Características. Stages and classification of a Project. Organisation. Norms, regulations and legislation
Subject 2. Design of a project	*Analysis Preliminary of feasibility and alternative Study of market Size of the project Location Approach of a project
Subject 3. Engineering of the project	Development of a project, stages, calculations, diagrams of flow and balances. Teams
Subject 4. Economic evaluation of a project	Investment. Costs of production and management Profitabilities Analysis of risk
Subject 5. Environmental evaluation of a project	Preventive Measured pollution and/or of correction Waste Cycle of Life
Subject 6. Documentation of a project	Memory Methods Norms

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	13	22	35
Seminars	22	58	80
Problem solving	2	7	9
Presentation	2	5	7
Objective questions exam	0	4	4
Essay questions exam	3	8	11
Essay	0	4	4

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

Methodologies

	Description
Lecturing	The sessions *magistrales are theoretical classes to all the group in 13 weeks and of an hour of length (13 *x 1 *h/*sem). They will consist in the exhibition by part of the professor of the most fundamental appearances of each subject, taking like base the available documentation in the platform FEAR. The students will have to work, before each session, the material that provides him the professor related with the content that will treat in each subject.
Seminars	They will give to groups reduced, in 13 weeks (13 *x 2 *h/*sem). The students, with the support of the professor, will realise concrete projects (total or partial) of industrial installations, applying the knowledges purchased in the career. They will use computer programs of simulation to build and design the projects realised. It will realise in the classroom of computing.
Problem solving	In each subject, that was necessary, will put to disposal of the students a bulletin of problems. Some of these problems will resolve in class and others will have to be resolved by the students of individual form and deliver them so that they are corrected by the professor.

Presentation	The students of individual form or in group, will have to realise a short exhibition on the results obtained, a discussion of the results together with the conclusions of the project developed along the course
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Personalized assistance

Methodologies	Description
Lecturing	It will give them to know to the students, to principle of course, the schedules of *tutorías in which they will resolve the doubts that exist regarding the theory, problems and works.
Problem solving	It will give them to know to the students, to principle of course, the schedules of *tutorías in which they will resolve the doubts that exist regarding the theory, problems and works.
Seminars	It will give them to know to the students, to principle of course, the schedules of *tutorías in which they will resolve the doubts that exist regarding the theory, problems and works.
Presentation	It will give them to know to the students, to principle of course, the schedules of *tutorías in which they will resolve the doubts that exist regarding the theory, problems and works.
Tests	Description
Objective questions exam	It will give them to know to the students, to principle of course, the schedules of *tutorías in which they will resolve the doubts that exist regarding the theory, problems and works.
Essay questions exam	It will give them to know to the students, to principle of course, the schedules of *tutorías in which they will resolve the doubts that exist regarding the theory, problems and works.
Essay	It will give them to know to the students, to principle of course, the schedules of *tutorías in which they will resolve the doubts that exist regarding the theory, problems and works.

Assessment

	Description	Qualification	Evaluated Competences
Problem solving	The students will have to deliver, in the terms indicated, the problems proposed	5	CE19 CE20 CE22 CE24 CT3 CT4 CT6 CT7 CT8 CT9 CT12 CT14 CT15 CT18
Presentation	The students will realise an exhibition of the project realised	10	CE23 CT1 CT3 CT5 CT8 CT9 CT12 CT14
Objective questions exam	They will realise two test type test along the course. One when finalising the two first subjects and the another when finalising the subject 3. The length of the same will be between 20 minutes and 1 hour	10	CE19 CT3 CT7 CT9 CT12 CT14
Essay questions exam	It will realise a long proof of all the matter of the *asignatura	35	CE19 CT3 CT7 CT9 CT12 CT14

Essay	The students will realise and will deliver in the dates indicated, all the parts of the project that proposes him to principle of course	40	CE20 CE22 CE24	CT1 CT3 CT4 CT5 CT6 CT7 CT8 CT9 CT12 CT13 CT14 CT15 CT16 CT17 CT18
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Other comments on the Evaluation

FIRST ANNOUNCEMENT To

surpass the *asignatura is compulsory to obtain, like minimum 50% of the qualification assigned to the total realisation of the project (project, seminars and presentation/exhibition), being necessary, besides reach like minimum a 3 on 10 points in the final proof to take into account the other elements of evaluation. CONDITION

OF PRESENTED: The participation of the student in any one of the proofs written, the delivery of some work, or the assistance to two or more sessions of seminar it will involve the condition of presented and therefore the allocation of a qualification; SECOND ANNOUNCEMENT In this announcement the students will have to present to those parts of the *asignatura that have not been surpassed previously. Ethical commitment it expects that the present student a suitable ethical behaviour. In case to detect a no ethical behaviour (copy, plagiarism, utilisation of unauthorised electronic devices, for example), will consider that the student does not gather the necessary requirements to surpass the matter.

Sources of information

Basic Bibliography

J. Frank Valle-Riestra, **Project evaluation in the chemical process industries**, McGraw-Hill, 1983

Manuel de Cos Castillo, **Teoría General del Proyecto**, Editorial Síntesis, 1997

H.F. Rase y M.H. Barrow, **Ingeniería de proyectos para plantas de procesos**, CECSA, 1977

Complementary Bibliography

Luis Cabra, Antonio de Lucas, Fernando Ruiz y María Jesús Ramos, **Metodologías del diseño aplicado y gestión de proyectos para ingenieros químicos**, Ediciones de la Universidad de Castilla-La Mancha., 2010

Arturo Jimenez Gutiérrez, **Diseño de procesos en ingeniería química.**, Editorial Reverté, 2003

Nassir Sapag Chain, Reinaldo Sapag Chain., **Preparación y evaluación de proyectos.**, Mc-Graw-Hill., 2000

J.M. Smith, H.C. Van Ness, M.M. Abbott., **Introducción a la termodinámica en Ingeniería Química.**, Mc Graw-Hill., 2007

A. Vian., **El pronóstico económico en química industrial.**, Alhambra., 1975

Eliseo Gómez, Domingo Gómez, Pablo Aragonés, Miguel Angel Sanchez, Domingo López., **Cuadernos de Ingeniería de Proyectos I.**, Universidad Politécnica de Valencia., 1997

Recommendations

Subjects that continue the syllabus

Industrial chemistry/V11G200V01904

Subjects that it is recommended to have taken before

Chemical engineering/V11G200V01502

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in

advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

- * Teaching methodologies maintained

- * Teaching methodologies modified

- * Non-attendance mechanisms for student attention (tutoring)

- * Modifications (if applicable) of the contents

- * Additional bibliography to facilitate self-learning

- * Other modifications

=== ADAPTATION OF THE TESTS ===

- * Tests already carried out

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

- * Pending tests that are maintained

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

- * Tests that are modified

[Previous test] => [New test]

- * New tests

- * Additional Information

IDENTIFYING DATA				
Materials chemistry				
Subject	Materials chemistry			
Code	V11G200V01702			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Bolaño García, Sandra			
Lecturers	Bolaño García, Sandra Tojo Suárez, María Concepción			
E-mail	bgs@uvigo.es			
Web				
General description	Structure, properties and application of the different types of materials.			

Competencies	
Code	
CE5	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
CE8	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: main techniques for structural determination, including spectroscopy
CE18	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: principles of electrochemistry
CE19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
CE20	Evaluate, interpret and synthesize data and chemical information
CE23	Present oral and written scientific material and scientific arguments to a specialized audience
CT1	Communicate orally and in writing in at least one of the official languages of the University
CT3	Learn independently
CT4	Search and manage information from different sources
CT5	Use information and communication technologies and manage basic computer tools
CT7	Apply theoretical knowledge in practice
CT8	Teamwork
CT9	Work independently
CT12	Plan and manage time properly
CT13	Make decisions
CT14	Analyze and synthesize information and draw conclusions
CT15	Evaluate critically and constructively the environment and oneself

Learning outcomes		
Learning outcomes	Competences	
Analyse the characteristics of metals and alloys through essays of traction and compression.	CE5 CE19 CE20	CT1 CT7 CT9
Differentiate between electrical and ionic conductivity. Distinguish the intrinsic semiconductors of the extrinsic.	CE5 CE19 CE20	CT1 CT7 CT9
Differentiate between the cooperative magnetism and the no cooperative.	CE5 CE19 CE20	CT1 CT9
Recognise hard magnetic materials and soft from his cycle of histéresis.	CE5 CE19 CE20	CT1 CT9
Recognise the types of superconductivity and his relation with the nature of the material.	CE5 CE19 CE20	CT1 CT9
Describe the optical properties of the metals and no metals.	CE5 CE19	CT1 CT9
Describe the applications of the optical phenomena more important.	CE5 CE19	CT1 CT9

Explain the thermal properties more important of the materials.	CE5 CE19 CE20	CT1 CT9
Analyse and describe the characteristics of the alloys in function of his diagrams of phases.	CE5 CE19 CE20	CT1 CT7 CT9 CT12 CT13 CT14
Describe the properties of the different ceramic materials and polymers.	CE5 CE20	CT1 CT7 CT9
Describe the general characteristics of the compound materials.	CE20 CE23	CT1 CT3 CT4 CT5 CT8 CT12 CT14 CT15
Analyse the corrosion of metals and ceramic and the degradation of the polymers.	CE18	CT1 CT8 CT14
Justify and enter the need of new materials and nanomaterials.	CE20 CE23	CT1 CT3 CT4 CT5 CT8 CT12 CT14 CT15
Describe the basic processes for the obtaining of nanomaterials.	CE5 CE20 CE23	CT1 CT3 CT4 CT7 CT8 CT9 CT13 CT15
Tackle the basic technicians of study of the surfaces of the materials.	CE8 CE23	CT1 CT3 CT4 CT5 CT8 CT12 CT14 CT15

Contents

Topic		
Subject 1. Introduction	Historical perspective of the development of the materials. Relation between structure and properties. Classification of the materials. Need of new materials.	
Subject 2. Properties of the materials.	Mechanical properties. Electrical properties. Magnetic properties. Optical properties. Thermal properties.	
Subject 3. Metallic materials and alloys.	Diagrams of phase. Thermal treatment of the metallic alloys. ferric Alloys. Steels. No-Ferric Alloys. Alloys with memory of form.	
Subject 4. Ceramic materials.	Usual structures. Silicates. Carbon. Imperfections. Glasses. Clays. Refractory.	
Subject 5. Material polymers.	Structures of the polymers. Mechanical and thermomechanical characteristics. Thermoplastic and thermostable polymers. Applications and forming of the polymers.	
Subject 6. Compound materials.	General characteristics. Classification. Materials reinforced with: particles, fibres and structural compounds.	
Subject 7. Degradation of materials.	Metallic oxidation and passivation. Methods of protection against the corrosion. Methods of self-reparation.	

Subject 8. New materials and nanomaterials.	Nanoscience and nanotechnology. Methods of preparation. Properties to nanoscale.
Subject 9. Characterisation of materials.	Electronic microscopy, fotoelectrónica spectroscopy.

Planning

	Class hours	Hours outside the classroom	Total hours
Seminars	13	32	45
Lecturing	26	45	71
Problem and/or exercise solving	4	30	34

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

Methodologies

	Description
Seminars	They will devote to the resolution of doubts or questions that arise in the development of each subject, to the exhibition by part of the students of subjects related with the matter, as well as to the resolution of exercises and exposed problems by the professor.
Lecturing	The students will receive 26 hours of magistral classes in an only group, that will devote to the presentation of the fundamental appearances of each subject. The platform of "teledocencia" will use to provide the supplementary material related with the matter.

Personalized assistance

Methodologies Description

Seminars	During all the educational period the students will be able to consult all type of doubts related with the matter in the tutorial hours.
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Assessment

	Description	Qualification	Evaluated Competences	
Seminars	In addition to resolving practical exercises that allow to the students settle the knowledges on the subjects unrolled in the classes of theory, and to resolve all the exposed doubts, the classes of seminar will use also to carry out to continuous evaluation of the students. This process of continuous evaluation will make through the resolution of exercises and/or problems related with the contents of the matter, as well as the resolution of exposed short questions by the professor/to that the students will have to deliver for his evaluation. Also it can carry out by means of the preparation and exhibition by part of the students of subjects related with the matter.	40	CE5 CE8 CE19 CE20 CE23	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Problem and/or exercise solving	To the long of the quadrimester will make two short proofs for the evaluation of the competitions purchased in the matter. The first of them will cover the subjects 1-5 and will suppose 36% of the final note. The second will cover the subjects 6-9 and will suppose 24% of the final note. To surpass the matter is necessary to reach a minimum of 40% in each one of the short proofs.	60	CE5 CE8 CE18 CE19 CE20	CT1 CT7 CT12 CT13

Other comments on the Evaluation

Observations: The participation in any of the proofs of planned evaluation will involve the condition of presented and, therefore, the allocation of a qualification in the record of the matter. It will be necessary to surpass the two short proofs (obtain a minimum of 40% of the grade of each one) to be able to take into account the other elements of evaluation.

Evaluation of July: The students that do not pass one or the two short proofs done during the quadrimester will have to present those proofs. This proof substitute to the results obtained in the/s short proof/s done to the long of the quadrimester. The final grade could be the highest obtained when comparing the final examination grade and the weighted examination note with the continuous evaluation (a minimum of 50% of the grade of each part is necessary).

Sources of information

Basic Bibliography

Complementary Bibliography

Callister, W.D., Rethwisch, D.G., **Materials Science and Engineering**, Wiley,

Callister, W.D., Rethwisch, D.G., **Introducción a la Ciencia e Ingeniería de los Materiales**, Reverté (trad. 9ªed),
Kirkland, A.I., Hutchison, J.L., **Nanocharacterisation**, RSC, Cambridge,
Levine, I.N., **Fisicoquímica**, McGraw-Hill / Interamericana de España, S. A.,
Singh, S. C., Hoboken J., **Nanomaterials**, John Wiley & Sons,
Smart, L.E. Moore, E.A., **Solid State Chemistry. An introduction**, Taylor & Francis, 4ªed,
Vollath, D., **Nanomaterials : an introduction to synthesis, properties and application**, Wiley-VCH,
West, A.R., **West, A.R.. Solid state chemistry and its applications**, John Wiley & Sons.,

Recommendations

Subjects that are recommended to be taken simultaneously

Inorganic chemistry III/V11G200V01703

Subjects that it is recommended to have taken before

Physical chemistry III/V11G200V01603

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

Theoretical and seminar teaching will be provided through the remote campus if it is necessary.
Tutoring will be done through e-mail, and remote campus.

=== ADAPTATION OF THE TESTS ===

In case of not being able to do the short proofs or the July exam in person, the quizzes done in the seminars during the course will have a value of 70% (previous weight 40%) and the short proofs or July exam will have a value of 30% (previous weight 60%).

IDENTIFYING DATA				
Inorganic chemistry III				
Subject	Inorganic chemistry III			
Code	V11G200V01703			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Mandatory	4th	1st
Teaching language	Spanish			
Department				
Coordinator	Bravo Bernárdez, Jorge			
Lecturers	Bravo Bernárdez, Jorge Carballo Rial, Rosa García Fontán, María Soledad García Martínez, Emilia Pérez Lourido, Paulo Antonio			
E-mail	jbravo@uvigo.gal			
Web				
General description	The first part of the subject centres in the structural study and the structure/properties relationship as well as the main methods of preparation of inorganic solids that represent an important contribution to the field of material science. The second part of the subject devotes to the study of the organometallic compounds. It will be developed the basic aspects referred to the obtaining, description of the bonding, spectroscopic characterisation, reactivity and applications of these compounds. In the laboratory will be realised experiences of synthesis and characterisation of coordination compounds, organometallic compounds and inorganic solids.			

Competencies

Code	
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE2	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: types of chemical reactions and its main characteristics
CE10	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: properties of aliphatic, aromatic, heterocyclic and organometallic compounds
CE12	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: structural features of chemical elements and their compounds, including stereochemistry
CE14	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: relationship between macroscopic properties and properties of individual atoms and molecules, including macromolecules
CE20	Evaluate, interpret and synthesize data and chemical information
CE23	Present oral and written scientific material and scientific arguments to a specialized audience
CE25	Handle chemicals safely, considering their physical and chemical properties, including the evaluation of any specific risks associated with its use
CE26	Perform common laboratory procedures and use instrumentation in synthetic and analytical work
CE27	Monitor, by observation and measurement of physical and chemical properties, events or changes, and document and record them in a consistent and reliable way
CE28	Interpret data derived from laboratory observations and measurements in terms of their significance and relate them to the appropriate theory
CT1	Communicate orally and in writing in at least one of the official languages of the University
CT3	Learn independently
CT4	Search and manage information from different sources
CT5	Use information and communication technologies and manage basic computer tools
CT6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
CT7	Apply theoretical knowledge in practice
CT8	Teamwork
CT9	Work independently
CT12	Plan and manage time properly
CT13	Make decisions
CT14	Analyze and synthesize information and draw conclusions
CT15	Evaluate critically and constructively the environment and oneself

Learning outcomes

Learning outcomes	Competences	
Recognise and predict the main structural types of solids and their implications in the chemical and physical properties.	CB5	CE12 CT1 CE14 CT3 CT4 CT5 CT9 CT14
Enumerate and recognise the types of defects in crystals and their effects on the properties of the solid.	CB5	CE12 CT1 CE14 CT3 CT4 CT5 CT9 CT14
Define solid electrolytes, recognising their general characteristics and applications.		CE2 CT1 CE12 CT3 CE14 CT4 CT14
Identify non-stoichiometric compounds.		CE2 CT1 CE12 CT3 CE20 CT4 CT9 CT14
Recognise the effect of the addition of impurities on the colour and the optical properties of some inorganic solids.	CB5	CE2 CT1 CE12 CT3 CE14 CT4 CE20 CT9 CT14
Identify the main methods of preparation of inorganic solids.		CE2 CT1 CE14 CT3 CE20 CT4 CT14
Describe methodologies for crystallogenesi		CE2 CT1 CT3 CT4
Define organometallic compound . Describe the bonding between a metal and the different types of common ligands.		CE10 CT1 CE12 CT3 CE14 CT4 CE23 CT5 CT9 CT14
Rationalise the information that usual spectroscopy techniques provide for the characterisation of the different types of organometallic compounds.		CE10 CT1 CE12 CT3 CE14 CT4 CE20 CT5 CE23 CT9 CT14
Identify the main types of organometallic reactions .		CE2 CT1 CE10 CT3 CE23 CT4 CT5 CT14
Describe the products of the most important reactions of carbonyl, olefin, carbene and cyclopentadiene complexes.		CE2 CT1 CE10 CT3 CE14 CT4 CE20 CT5 CE23 CT9 CT14
Describe the bases of the isolobal analogy. Apply the Wade's rules for metallic clusters.		CE10 CT1 CE12 CT3 CE14 CT4 CE20 CT5 CE23 CT9 CT14

Describe some important catalytic cycles.

CE2 CT1
CE10 CT3
CE14 CT4
CE20 CT5
CE23 CT9
CT14

Carry out in the laboratory the preparation, characterisation and the study of some physical and chemical properties of the metals and their compounds.

CE2 CT4
CE10 CT5
CE14 CT6
CE20 CT7
CE25 CT8
CE26 CT9
CE27 CT12
CE28 CT13
CT14
CT15

Contents

Topic

Subject 1. Organometallic chemistry of the main groups elements.	Introduction. Synthesis, properties and applications of the organometallic compounds of Li, Mg, B and Al.
Subject 2. Organometallic chemistry of the transition metals (I)	Introduction. Types of ligands. Bonding. Characterisation.
Subject 3. Organometallic chemistry of the transition metals (II)	Types of organometallic reactions: substitution, oxidative addition, reductive elimination, insertion, reactions of coordinated ligands, etc.
Subject 4. Organometallic chemistry of the transition metals (III)	Reactivity of organometallic compounds: carbonyl, olefin, carbene, and cyclopentadiene complexes.
Subject 5. Organometallic catalysis.	Introduction. Olefin metathesis. Alkene hydrogenation. Carbonylation of methanol. Hydroformylation of alkenes.
Subject 6. Metallic clusters	Introduction. Types. Structure. Properties.
Subject 7. Inorganic solids: introduction and bases.	Technological importance of the inorganic solids. Classification of solids. Polymorphism, pseudomorphism, polytypism. Formulation of inorganic solids incorporating structural information.
Subject 8. Structural rationalization in inorganic solids.	Sphere packing. Linear, planar, and theoretical densities and packing factors. Interstitial sites in crystal structures. Determining principles of the structure of the solids. Main solid structures.
Subject 9. Defects and non stoichiometry in the solids.	Types of defects. Ionic conductivity. Solid electrolytes. Non- stoichiometric compounds. Solids of different dimensionality. Diffusion.
Subject 10. Methods of preparation of solids.	Ceramic methods. Microwave methods. Sol-gel method. Precursor method. Hydrothermal methods. Chemical vapor deposition and chemical vapor transport (CVD and CVT), etc.
Practices of the chemistry of the coordination compounds (5 sessions)	Preparation and characterisation of some coordination compounds.
Practices of organometallic chemistry (4 sessions)	Preparation and characterisation of some organometallic compounds.
Practices of inorganic solids (4 sessions)	Preparation and study of the properties of some inorganic solids.

Planning

	Class hours	Hours outside the classroom	Total hours
Seminars	13	42	55
Laboratory practical	45.5	20.5	66
Lecturing	26	50	76
Problem and/or exercise solving	4	24	28

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

Methodologies

	Description
Seminars	They will devote to the resolution of doubts or questions that arise in the development of each subject, to the exhibition by part of the students of any of the subjects related with the matter, and/or to the resolution of questions, exercises and problems proposed by the professor.
Laboratory practical	They will realise practices of laboratory in which they will apply the theoretical knowledges acquired. The practices will be realised in 13 sessions of 3,5 hours each and the students will have to reflect and interpret the facts observed in the corresponding notebook lab.
Lecturing	The students, in an only group, will receive 26 one-hour lectures in which the professor will give to know the most important aspects of each subject.

Personalized assistance	
Methodologies	Description
Seminars	The students will be able to consult all type of doubts related with the matter in the scheduled tutorials.
Laboratory practical	The students will be able to consult all type of doubts related with the matter in the scheduled tutorials.

Assessment				
	Description	Qualification	Evaluated Competences	
Seminars	In addition to resolving practical exercises that allow the students to settle the knowledges on the subjects developed in the lectures, and to resolve all the exposed doubts, the classes of seminar will be used to carry out the students continuous evaluation. This process of continuous evaluation will be done through the resolution of exercises related with the contents of the matter as well as the resolution of short questions proposed by the professor. Also it will be able to carry out by means of the preparation and presentation by the students of subjects related with the subject.	25	CE20 CE23	CT1 CT3 CT4 CT5 CT6 CT7 CT8 CT9 CT14
Laboratory practical	They are mandatory and will value the realization of the practices of laboratory in the that refers so much to the fulfilment of the experimental objective foreseen how to the interpretation of the observed. It Will realize an examination when finalizing the block of Chemistry of Coordination. The blocks of Organometallic Chemistry and Solid State will be evaluated in the written proofs indicated in this guide by means of the inclusion in them of questions directly related with the work developed in the laboratory. Those students that have the practices approved in the previous course will be able to request not to repeat them in the current course keeping the qualification obtained.	20	CE25 CE26 CE27 CE28	CT1 CT3 CT4 CT5 CT6 CT7 CT8 CT9 CT12 CT13 CT14 CT15
Problem and/or exercise solving	The students will realise two 2-hours written proofs.	55	CB5 CE2 CE10 CE12 CE14 CE20	CT1 CT14

Other comments on the Evaluation

Observations: The participation in any of the proofs of planned evaluation and the assistance to two or more sessions of laboratory will involve the condition of presented and, therefore, the allocation of a qualification in the record of the matter. It will be necessary to obtain a minimum of 4 points on 10 in the qualification of each one of the planned short proofs to be able to take into account, in the final qualification, the remaining elements of evaluation. In the evaluation of July the students will have to do a written proof that will consist of two parts that will correspond with the items evaluated in the two short proofs realised during the course. It will not be necessary to realise the part of the proof that, in the corresponding short proof, obtained an equal or upper qualification to 4 on 10, keeping the qualification obtained. This proof will have a value of 55% of the qualification and will substitute to the results of the short proofs. The remaining elements of evaluation are not recoverable and the qualifications obtained will add to the one of the quoted proof as long as the qualification obtained was equal or upper to 4 on 10. In case to obtain a lower qualification, will be this the one who appear as final qualification of the matter.

Sources of information

Basic Bibliography

C. E. Housecroft y A. G. Sharpe., **Inorganic Chemistry**, 4, Pearson, 2012

Complementary Bibliography

A. R. West, **Solid State Chemistry and its applications**, 2, Wiley, 2014

L. Smart, E. Moore, **Solid State Chemistry. An introduction**, 4, CRC, 2012

G. O. Spessard, G. L. Miessler, **Organometallic chemistry**, 2, Oxford University Press, 2010

R. H. Cabtree, **The organometallic chemistry of the transition metals**, 6, Wiley, 2014

R. Toreki, **The Organometallic Hypertext Book**, <http://www.ilpi.com/organomet/index.html>, 2016

Recommendations

Subjects that it is recommended to have taken before

Inorganic chemistry II/V11G200V01604

Organic chemistry II/V11G200V01504

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

* Teaching methodologies modified

* Non-attendance mechanisms for student attention (tutoring)

* Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Pending tests that are maintained

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Tests that are modified

[Previous test] => [New test]

* New tests

* Additional Information

IDENTIFYING DATA				
Organic chemistry III				
Subject	Organic chemistry III			
Code	V11G200V01704			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Mandatory	4th	1st
Teaching language	Spanish			
Department				
Coordinator	Rodríguez de Lera, Angel			
Lecturers	Álvarez Rodríguez, Rosana Fall Diop, Yagamare Mora Ayuso, Paula Rodríguez de Lera, Angel Tojo Suárez, Emilia			
E-mail	qolera@uvigo.es			
Web				
General description	This subject will integrate all the previous knowledge of Organic Chemistry, in particular regarding organic synthesis and its consequences in the creation of new stereogenic elements. For this, will use the tools of retrosynthetic analysis, paying particular attention to the analysis of synthetic proposals that take place with selectivity (chemo-, regio- and stereoselectivity).			

Competencies

Code	
CB1	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
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE2	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: types of chemical reactions and its main characteristics
CE10	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: properties of aliphatic, aromatic, heterocyclic and organometallic compounds
CE11	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: nature and behavior of functional groups in organic molecules
CE12	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: structural features of chemical elements and their compounds, including stereochemistry
CE13	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: main synthetic routes in organic chemistry, including interconversions of functional groups and the formation of carbon-carbon and carbon-heteroatom bonds
CE19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
CE20	Evaluate, interpret and synthesize data and chemical information
CE23	Present oral and written scientific material and scientific arguments to a specialized audience
CE24	Recognize and analyze new problems and plan strategies to solve them
CE25	Handle chemicals safely, considering their physical and chemical properties, including the evaluation of any specific risks associated with its use
CE26	Perform common laboratory procedures and use instrumentation in synthetic and analytical work
CE27	Monitor, by observation and measurement of physical and chemical properties, events or changes, and document and record them in a consistent and reliable way
CE28	Interpret data derived from laboratory observations and measurements in terms of their significance and relate them to the appropriate theory
CT1	Communicate orally and in writing in at least one of the official languages of the University
CT3	Learn independently
CT4	Search and manage information from different sources
CT5	Use information and communication technologies and manage basic computer tools
CT7	Apply theoretical knowledge in practice
CT8	Teamwork
CT9	Work independently
CT13	Make decisions

CT14 Analyze and synthesize information and draw conclusions
 CT15 Evaluate critically and constructively the environment and oneself
 CT18 Generate new ideas and show initiative

Learning outcomes

Learning outcomes	Competences		
1. Recognise structural elements in organic molecules.	CB2	CE2 CE11 CE12 CE13 CE23 CE24	CT1 CT3 CT7 CT9 CT13 CT14 CT18
2. Propose retrosynthetic sequences of target molecules.	CB1 CB2 CB5	CE2 CE11 CE12 CE13 CE24	CT1 CT3 CT4 CT5 CT7 CT9 CT13 CT18
3. Analyse alternative retrosynthetic proposals.	CB1 CB2 CB5	CE2 CE10 CE11 CE12 CE13 CE20 CE24	CT1 CT3 CT4 CT5 CT7 CT9 CT13 CT18
4. Design synthetic sequences to target molecules.	CB1 CB2 CB5	CE2 CE10 CE11 CE12 CE13 CE20	CT1 CT3 CT4 CT5 CT7 CT9 CT13 CT18
5. Value the use of structure-simplifying reactions.	CB1 CB2 CB5	CE2 CE10 CE11 CE12 CE13 CE20 CE24	CT1 CT3 CT4 CT7 CT9 CT13 CT14 CT18
6. Recognise relationships between functional groups of target molecules.	CB1 CB2 CB5	CE2 CE10 CE11 CE12 CE13 CE20 CE24	CT1 CT3 CT4 CT7 CT9 CT13 CT18
7. Use properly the functional groups interconversions.	CB1 CB2 CB5	CE2 CE10 CE11 CE12 CE13 CE20 CE24	CT1 CT3 CT4 CT5 CT7 CT9 CT13 CT14 CT18

8. Propose synthesis of carbocyclic and heterocyclic compounds.	CB1 CB2 CB5	CE2 CE10 CE11 CE12 CE13 CE20 CE24 CE25 CE26 CE27 CE28	CT1 CT3 CT4 CT7 CT9 CT13 CT14 CT18
9. Know the reactivity of heterocyclic compounds.	CB1 CB2 CB5	CE2 CE10 CE11 CE12 CE13 CE20 CE24 CE26 CE27 CE28	CT1 CT3 CT4 CT7 CT9 CT13 CT14 CT18
10. Know the reactions that can provide selectivity (chemo-, regio- and stereoselectivity) in chemical transformations.	CB1 CB2 CB5	CE2 CE10 CE11 CE12 CE13 CE19 CE20 CE24	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT13 CT14 CT18
11. Handle appropriately the disconnections between unsaturated fragments.	CB1 CB2 CB5	CE2 CE10 CE11 CE12 CE13 CE20 CE24	CT1 CT3 CT4 CT5 CT7 CT9 CT13 CT14 CT18
12. Evaluate and propose the use of protective groups in organic synthesis.	CB1 CB2 CB5	CE2 CE10 CE11 CE12 CE13 CE20 CE24	CT1 CT3 CT4 CT7 CT9 CT13 CT14 CT18
13. Recognise and value the importance of organic synthesis in the advancement of society.	CB2 CB4 CB5	CE23	CT15

Contents

Topic

1. THE DESIGN OF ORGANIC SYNTHESIS. RETROSYNTHETIC ANALYSIS	1.1. Introduction to target-oriented synthesis. 1.2. Rethrosynthetic analysis. The synthon approach. Transforms and rethrons. Strategic disconnections. The synthesis tree. i. Preliminary evaluation. ii. Simplifying transforms. iii. Powerful transforms. iv. Interconversion, addition and removal of functional groups. 1.3. Computer-based synthetic strategies.
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2. CRITERIA OF SELECTION OF DISCONNECTIONS	2.1. One- and two-group C-X disconnections (1,n). i. Synthons and synthetic equivalents. ii. Alternate polarities. iii. Inversion of polarity. iv. Functional groups interconversions. v. Addition and removal of functional groups. 2.2. One- and two-group C-C disconnections (1,n). i. One-group C-C disconnections. ii. (1,n) C-C disconnections of difunctionalized compounds. 2.3. Tactics of skeletal transformations. Rearrangements and fragmentations.
3. FUNCTIONAL GROUPS INTERCONVERSIONS	3.1. Interconversion of functional groups by substitution, addition and elimination. 3.2. Oxidation reactions. i. Transition metals (*Cr and *Mn). ii. Methods based in the generation of "activated DMSO". iii. Hypervalent iodine reagents. iv. Olefin epoxidation and dihydroxylation. 3.3. Reduction reactions.
4. CHEMOSELECTIVITY. PROTECTIVE GROUPS IN ORGANIC SYNTHESIS	4.1. Strategies for the selection of protective groups: orthogonal or of modulated sensitivity . 4.2. Description of protective groups. i. Sensitive to acids or bases. ii. Sensitive to fluoride. iii. Sensitive to reduction and oxidation reagents . iv. Other protective groups.
5. STEREOCHEMICAL STRATEGIES . STEREOSELECTIVITY	5.1. Description of Stereochemistry. i. Symmetry and chirality. Stereogenic units. ii. Topicity. iii. Relative configuration. Descriptors. 5.2. *Stereochemistry in chemical reactions. i. Product selectivity. ii. Simple- and induced-distereoselectivity. 5.3. Disconnections based in chiral fragments.
6. DISCONNECTIONS OF UNSATURATED COMPOUNDS	6.1. Stereoselective olefin synthesis . i. Carbanions stabilised by phosphorous: Wittig and HWE reactions. ii. Carbanions stabilised by silicon: Peterson reaction. iii. Carbanions stabilised by sulphur: Julia reaction. iv. Claisen rearrangement. v. Olefin metathesis. 6.2. Palladium-catalyzed reactions. i. Heck reaction. ii. Stille, Negishi and Suzuki cross-coupling.
7. FORMATION AND REACTIVITY OF CYCLIC COMPOUNDS. TOPOLOGICAL STRATEGIES	7.1. Formation of saturated carbocyclic and heterocyclic compounds. i. Cyclization reactions. The Thorpe-Ingold effect. ii. Baldwin Rules. iii. Formation of carbocyclic compounds. 7.2. Formation of heterocyclic compounds. i. (3+2) Cycloadditions. ii. Condensation of dicarbonyl compounds. 7.3. Properties and reactivity of aromatic heterocyclic compounds. 7.4. Topological strategies in Retrosynthetic Analysis.
LAB EXPERIMENT 1. Preparation of a-D-glucopyranoside pentaacetate	One session
LAB EXPERIMENT 2. Preparation of b-D-glucopyranoside pentaacetate	Two sessions
LAB EXPERIMENT 3. Reactivity of dimethylsulfoxonium methylide with conjugated and nonconjugated carbonyl compounds: synthesis of epoxides and cyclopropanes.	One session
LAB EXPERIMENT 4. Microwave-assisted Diels-Alder reaction	One session
LAB EXPERIMENT 5. Preparation of an Ionic Liquid. Application in the synthesis of coumarines	Two sessions
LAB EXPERIMENT 6. Suzuki reaction in water	One session
LAB EXPERIMENT 8. Total synthesis of a natural product: caffeic acid phenethyl ester (CAPE)	Four sessions

Planning			
	Class hours	Hours outside the classroom	Total hours
Seminars	26	49	75
Laboratory practical	45.5	32.5	78
Lecturing	13	17	30
Problem and/or exercise solving	3	27	30
Essay questions exam	2	10	12

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

Methodologies	
	Description
Seminars	In this activity, which is scheduled to take place twice a week, the most complex topics of the subject will be discussed, and the exercises and problems previously proposed by the teaching staff will be solved. These seminars will be taught taking into consideration the health and distance recommendation provided by the National Institute of Health (INS). When the capacity of the classrooms do not allow the students to be present, they will be taught on line using the teaching resources available in FAITIC and also the virtual offices.
Laboratory practical	Each student will plan and execute the corresponding lab experiments in sessions lasting 3.5 hours. The students will be provided with the explanation of the lab session by the teaching staff. All the observations, calculations and notes for every experiment will be collected in a lab notebook, which will also include the discussion of the questions posed in the experiment description as well as the spectroscopic characterization of the synthesized compounds.
Lecturing	The teaching staff will explain the general contents of the course paying particular attention to those considered key topics and of the greater difficulty. In anticipation of each master session, all the handouts and presentations will be made available in the TEMA teaching platform for downloading by the students.

Personalized assistance

Methodologies	Description
Lecturing	The teaching staff will devote the necessary time to solve the requests and questions raised by the students related to the course syllabus, informing beforehand about his/her availability.
Seminars	The teaching staff will devote the necessary time to solve the requests and questions raised by the students related to the course syllabus, informing beforehand about his/her availability.
Laboratory practical	The teaching staff will devote the necessary time to solve the requests and questions raised by the students related to the laboratory practice, particularly in the lab sessions and beforehand.
Tests	Description
Problem and/or exercise solving	The teaching staff will devote the necessary time to solve the requests and questions raised by the students related to the short answer tests, informing beforehand about his/her availability. In addition, short answer test exams from previous years will be solved in seminars before the official tests take place.
Essay questions exam	The teaching staff will devote the necessary time to solve the requests and questions raised by the students related to the long answer tests, informing beforehand about his/her availability. In addition, long answer test exams from previous years will be solved in seminars before the official tests take place.

Assessment

	Description	Qualification	Evaluated Competences		
Seminars	The resolution of problems and questions posed in the seminar classes, as well as the homework carried out by the students in those tasks of personal work entrusted by the teachers will be valued. Results of the learning: All the indicated, since the seminars will take place along the course.	20	CB1 CB2 CB4 CB5	CE2 CE10 CE11 CE12 CE13 CE19 CE20 CE23 CE24	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT13 CT14 CT15 CT18

Laboratory practical	1.- The work carried out in the laboratory: the assistance to each one of the sessions is compulsory. The attitude and skill of the student in the laboratory and the interpretation of the mechanisms and spectra will be valued. 2.- The laboratory notebook. 3.- Written exam: it will consist on theoretical and practical questions related to the lab experiments. It will take place in the official dates established by the Faculty. To pass the lab course it is mandatory to have passed each one of the three parts evaluated. Those students who passed the lab course in the academic year 2014-2015 are entitled to keep that grade in the present academic year. In the extraordinary exam the student will answer the written examination and will deliver a new laboratory notebook if required, keeping the qualifications obtained during the course in the others parts of the subject. Results of the learning: 1. Recognise structural elements in the organic molecules. 2. Design alternative synthetic sequences. 3. Handle reactions of functional groups interconversions. 4. Propose synthesis of carbo- and heterocyclic molecules. 5. Recognise selective reactions. 6. Recognise the importance of organic synthesis to the advancement of society.	30	CB1 CB2 CB4	CE25 CE26 CE27 CE28	
Problem and/or exercise solving	A short answer exam will be carried out (10%). Results of the learning: 1. Recognise structural elements of organic molecules. 2. Propose retrosynthetic sequences. 3. Analyse alternative retrosynthetic proposals. 4. Value the use of structurally-simplifying reactions. 5. Recognise relationships between functional groups. 6. Use properly functional groups interconversion reactions.	10	CB1 CB2 CB5	CE2 CE10 CE11 CE12 CE13 CE20 CE24	CT1 CT3 CT4 CT5 CT7 CT9 CT13 CT14 CT18
Essay questions exam	A global proof for the evaluation of the competitions acquired in the subject. For passing the subject the students will have to obtain a minimum of 50% in the written proofs (short and long answer). Therefore, the qualification of the remaining parts will only be added when the grade obtained in overall written proofs is equal or higher than two and a half points. Results of the learning: 1. Recognise structural elements of organic molecules. 2. Propose retrosynthetic sequences. 3. Analyse alternative retrosynthetic proposals. 4. Value the use of structurally-simplifying reactions. 5. Recognise relationships between functional groups. 6. Use properly functional groups interconversion reactions. 7. Design synthetic sequences. 8. Propose synthesis of carbo- and heterocyclic molecules. 9. Know the reactivity of heterocyclic compounds. 10. Know selective reactions. 11. Propose disconnections in unsaturated compounds. 12. Know the use of protective groups in organic synthesis.	40	CB1 CB2 CB4 CB5	CE2 CE10 CE11 CE12 CE13 CE19 CE20 CE23 CE24 CE25 CE26 CE27 CE28	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT13 CT14 CT15 CT18

Other comments on the Evaluation

The participation of the students in any of the acts of evaluation of the subject will involve that they purchase the condition of "presented" and, therefore, they will have assigned a qualification. Acts of evaluation are considered the assistance to the classes of laboratory (three or but sessions), the realisation of the written exams and the handling of a minimum of 25% of the homework assigned by the teaching staff.

Evaluation of the July call:

>1) Grade obtained by the students during the course: maximum of 4 points, divided in the qualification obtained by the students along the course in the resolution of the problems, homework, etc (maximum of 1 point) and the realisation of the laboratory exams (maximum of 3 points).

2) Work carried out by the students: maximum of 1,5 points

for the resolution and handling of the exercises proposed by the teaching staff after the evaluation of January, that will be oriented to the acquisition of the necessary knowledge to pass the matter. This work will be handled in advance to the official date of the exam.

3) Written Tests: maximum of 4,5 points, which will evaluate the knowledge of the matter.

Sources of information

Basic Bibliography

Complementary Bibliography

Warren, S.; Wyatt, P., **Organic Synthesis: The Disconnection Approach**, 2nd, Wiley, 2008

Wyatt, P.; Warren, S., **Organic Synthesis: Strategy and Control**, 1st, Wiley, 2008

Zweifel, G. S.; Nantz, M. H., **Modern Organic Synthesis: An Introduction**, 1st, W H Freeman, 2007

Clayden, J.; Greeves, N.; Warren, S., **Organic Chemistry**, 2nd, Oxford University Press, 2012

Starkey, L. S., **Introduction to strategies for organic synthesis**, 1st, Wiley, 2012

Recommendations

Subjects that continue the syllabus

Pharmaceutical chemistry/V11G200V01903

Subjects that it is recommended to have taken before

Structural Determination/V11G200V01501

Organic chemistry II/V11G200V01504

Contingency plan

Description

Adaptation of methodologies:

1) Teaching methodologies will be adapted according to the telematic resources available to teachers, in addition to the documents provided by FAITIC and other platforms, e-mail, etc. Personal interviews will take place upon request via the virtual office of professors or Campus Remoto.

2) Adaptation of evaluation:

The evaluation criteria will be maintained without changes, and the probes will be carried out using the available telematic resources.

IDENTIFYING DATA				
Food chemistry				
Subject	Food chemistry			
Code	V11G200V01901			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4th	2nd
Teaching language				
Department				
Coordinator				
Lecturers				
E-mail				

----- UNPUBLISHED TEACHING GUIDE -----

IDENTIFYING DATA				
Environmental chemistry				
Subject	Environmental chemistry			
Code	V11G200V01902			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish English			
Department				
Coordinator	González Romero, Elisa			
Lecturers	González Romero, Elisa Tojo Suárez, María Concepción			
E-mail	eromero@uvigo.es			
Web				
General description	Global knowledge of the chemical processes involved in the environment, analysis of pollutants, control of quality, treatment and management of the pollution. Evaluation of the environmental impact			

Competencies

Code	
CE2	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: types of chemical reactions and its main characteristics
CE4	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Basics and tools for solving analytical problems and characterization of chemical substances
CE17	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories in: metrology of chemical processes including quality management
CE18	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: principles of electrochemistry
CT1	Communicate orally and in writing in at least one of the official languages of the University
CT3	Learn independently
CT4	Search and manage information from different sources
CT5	Use information and communication technologies and manage basic computer tools
CT6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
CT7	Apply theoretical knowledge in practice
CT8	Teamwork
CT9	Work independently
CT10	Work at a national and international context
CT12	Plan and manage time properly
CT13	Make decisions
CT14	Analyze and synthesize information and draw conclusions
CT15	Evaluate critically and constructively the environment and oneself
CT16	Develop an ethical commitment
CT17	Develop concern for environmental aspects and quality management

Learning outcomes

Learning outcomes	Competences	
Describe the main chemical processes that occur in each layer of the atmosphere. Describe the mechanisms of production and destruction of ozone.	CE2	CT1
Explain the greenhouse effect	CE17	CT3
		CT4
		CT5
		CT6
		CT7
		CT8
		CT9
		CT10
		CT12
		CT13
		CT14
		CT15
		CT16
		CT17

Describe the composition and properties of the natural waters	CE2 CE17	CT1 CT3 CT4 CT5 CT6 CT7 CT8 CT9 CT10 CT12 CT13 CT14 CT15 CT16 CT17
Explain the exchange of matter between the distinct environmental compartments. Time of residence	CE2 CE17	CT1 CT3 CT4 CT5 CT6 CT7 CT8 CT9 CT10 CT12 CT13 CT14 CT15 CT16 CT17
Explain the main causes of the corrosion and how minimise it	CE2 CE18	CT3 CT4 CT5 CT6 CT7 CT9 CT10 CT14 CT16 CT17
Identify the main pollutants present in the natural media and the main pollutants according to the different environmental rules	CE2 CE4 CE17	CT3 CT4 CT5 CT6 CT7 CT9 CT10 CT13 CT14 CT16 CT17
Recognise the different types of chemical reactions that experience the pollutants in the natural medias	CE2 CE4 CE17	CT3 CT4 CT5 CT6 CT7 CT10 CT14 CT16 CT17

Estimate the harmful effects for the environment of the diverse types of pollutants	CE2 CE4 CE17	CT3 CT4 CT5 CT6 CT7 CT8 CT9 CT10 CT13 CT14 CT16 CT17
Describe the sampling, pre-treatment and preparation of sample for the analysis of environmental pollutants	CE4 CE17	CT3 CT4 CT5 CT6 CT7 CT8 CT10 CT13 CT14 CT16 CT17
Select the appropriate analytical techniques and the concrete methods for its determination in the atmosphere, waters, floors, sediments and biota	CE4 CE17	CT3 CT4 CT5 CT6 CT7 CT8 CT10 CT13 CT14 CT15 CT16 CT17
Describe the main available technologies for the treatment of the pollution and evaluate its applicability in diverse cases	CE4	CT1 CT4 CT5 CT6 CT7 CT8 CT10 CT12 CT13 CT14 CT15 CT16 CT17
Know the fundamental methodologies for the evaluation of the environmental impact and the rule related	CE4 CE17	CT1 CT4 CT5 CT6 CT7 CT8 CT10 CT12 CT13 CT14 CT15 CT16 CT17

Contents

Topic

1.- The matter and its cycles	Generalities
2.- Chemical processes in the atmosphere	Photochemical processes. Chemistry of the layer of ozone. Greenhouse effect .

3.- Chemical processes in the hydrosphere	Salinity and alkalinity. Transfer of matter between environmental compartments. Interface Atmosphere-water. Exchange of gases. Interface Sediment-water
4.- Electrochemical processes in the environment	Corrosion
5.- Environmental Pollutants	Classification. Natural transformations of the pollutants.
6.- Analysis of pollutants	Analytical methodology: sampling and treatment of sample, techniques and methods in the determination of pollutants. Applications in atmosphere, waters, floors, sediments and biota
7.- Quality Control in the laboratories of environmental analysis	Generalities
8.- Quality Assurance of the pollution	Generalities
9.- Evaluation of the environmental impact	Systems of environmental management

Planning

	Class hours	Hours outside the classroom	Total hours
Seminars	10	25	35
Presentation	4	14	18
Scientific events	3	4.5	7.5
Workshops	0	12	12
Lecturing	22	33	55
Problem and/or exercise solving	2	9	11
Essay questions exam	2	9.5	11.5

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

Methodologies

	Description
Seminars	The aim that pursues in the seminars is to settle the knowledges and expand the competitions purchased in the masterclasses, giving practical and representative examples of the fundamental concepts that collect in each subject.
Presentation	Each student will choose, to the start of the course, a subject of which suggest , or another if it is of interest for him, but always related with the program of the Environmental Chemical matter, and will realise a diagram and synthesis of the work to be exposed in a maximum time of 10 min, in which it will include a practical example extracted of one or several scientific articles. The aims to cover are: introduction and/or practical in the bibliographic research, preparation and presentation of the scientific work, comparison of results between different technical, evaluation of the environmental impact, etc... Previous to the exhibition, the student/to will deliver, in a dossier with his name and title of the exhibition, a copy of all the articles consulted and of the presentation of the same. The assistance to the exhibitions is compulsory and any of the questions formulated during his development can fall in the examinations
Scientific events	They include other less conventional activities inside the program of the matter, like the assistance to conferences, webinars of the ACS, "workshops" or congresses that celebrate in the own University, what will allow to the student expand his horizons and begin to go in in contact with other realities further of the faculty, obtaining information at first hand through representatives of companies, of professors of other universities -and, even, of other countries - that will orient them on other opportunities and will promote the mobility of these students. Of this form, pretends transmit to the student the multiple possibilities that can him present in the future, showing him a fan of labour possibilities. These events are subject to the programmings extra-academic of the different centres in the own University, but in any moment overlap with activities programmed previously and, in his case, would look for other alternatives.
Workshops	They would form part of the seminars in which the students will have to resolve by himself same, under the supervision of the professor but with a greater autonomy, real practical suppositions of chemical processes, detection of possible pollutants in which they derive, the environmental impact that produce and design strategies for his control
Lecturing	The masterclasses (55 min) pretend to give a global and real vision of the chemical processes that produce in the environment, the interaction between the different compartmentalized means, the pollutants present and those that generate , the most appropriate methodology for his analysis and his environmental control. Each one of the subjects will go documented with scientific articles, whose contents will serve to settle and expand the knowledges purchased in the theoretical classes, and of representative examples of the fundamental concepts that collect each subject. The methodology education-learning will be centred in the student, by what the classes will be headed to motivate a high participation by part of these in the classroom. The platform *Tem@ will be the resource that allow to the student the communication with the professor and his mates, through a virtual application, at the same time to be the source of information of immediate access for them. In her they will be able to find the basic information and documentation on the matter that gives , the diary of activities, the exercises to realise and the qualifications.

Personalized assistance**Methodologies Description**

Seminars	In the seminars and in the workshops will do a follow-up of the personal work that was realising the student in this moment, related with the matter. They realised experiments of classroom, useful for the problems resolution, including the oral exposition and other complementary works that propose, in function of the evolution of the student in the process of learning
Workshops	In the seminars and in the workshops will do a follow-up of the personal work that was realising the student in this moment, related with the matter. They realised experiments of classroom, useful for the problems resolution, including the oral exposition and other complementary works that propose, in function of the evolution of the student in the process of learning

Assessment

	Description	Qualification	Evaluated Competences	
Presentation	The presentations and other activities associated (ACS Webinars, conferences and Meeting/Symposiums) until arriving to the defence of the work.	20	CE17	CT1 CT3 CT4 CT5 CT8 CT9 CT10 CT14 CT16 CT17
Problem and/or exercise solving	They will realise two short proofs of one or two hours of length, C1 and C2, at the end of quatrimester and same day, in which it gives the matter and whose date will be fixed in the chronogram to the start of the course. They are not eliminatory.	30	CE2 CE4 CE18	CT1 CT3 CT6 CT7 CT12 CT13 CT14 CT15 CT16
Essay questions exam	The long proof (divided into 2 parts) will have until three hours and in her will go in all the subjects given of the matter and the activities associated to them. A minimum of 4 in each part is required to be compensated by both parties	50	CE2 CE4 CE18	CT1 CT3 CT6 CT7 CT12 CT13 CT14 CT15 CT16

Other comments on the Evaluation

All the partial qualifications will allow to make the final qualification, valuing the attitude of participation and the interest showed by the student along the course. Due to the fact that each one of the subjects will go documented with scientific articles, some question extracted of them will be able to form part of the short proofs and/or long and in the second announcement.

It considers no-presented (NP) not assisting to 25% of the face-to-face hours and/or not realising any of the proofs (short or long) neither participate in the activities programmed. In the moment in that any of the parts have qualification, in records will appear said qualification obtained, although it have not realised any another proof or activity programmed.

In the second announcement, the students will have the opportunity to recover 50% of the matter. This proof contemplates the same contents that require for the long proof and will keep the qualifications of the others sections evaluated along the course.

To achieve approve the matter, the students will have to surpass 50% of all and each one of the proofs and activities program of the matter.

In the event that the tests are held in person, access to the classroom will not be allowed with any of the existing electronic devices (computer, tablet, mobile or mobile, etc.)

If the tests are carried out semi-face-to-face or telematically in virtual rooms, only the use of the computer (with camera and audio) will be allowed for the connection. Failing that, they will connect with the mobile to the remote campus. The rest of the devices must remain off and out of the student's reach, unless circumstances allow teachers to allow it.

Note: the teachers of the subject do not allow to be recorded, neither by videos nor by audios or any other format such as screenshots, during the development of face-to-face or telematic classes. What is communicated for the appropriate purposes to all attendees.

Note2: Virtual attendance can be controlled; Consequently, it will be considered not presented, NP, not attending 25% of the contact hours and / or they have not been virtually connected (virtual attendance), in addition to not having performed any of the tests (short or long) or having participated in scheduled activities.

Note3: If the connection allows it, the theoretical part of any of the tests that remain to be done can be oral.

Sources of information

Basic Bibliography

Complementary Bibliography

P.W. ATKINS, **Química Física**,

I.N. LEVINE, **Fisicoquímica**,

Stanley E. Manahan, **Environmental Chemistry**, 9,

Roger N. Reeve, **Introduction to Environmental Analysis**,

F. W. Fifield y P. J. Haines (Editores), **Environmental Analytical Chemistry**, 2,

Frank M. Dunnivant, **Environmental Laboratory Exercises for Instrumental Analysis and Environmental Chemistry**,

Chunlong Zhang, **Fundamentals of Environmental Sampling and Analysis**,

J. P. RILEY y G. SKIRROW, **Chemical Oceanography**,

ISI WEB OF KNOWLEDGE,

Scifinder,

Environmental Sciences Category,

Colin Baird y Michael Cann, **QUIMICA AMBIENTAL**, 2ª edición,

Recommendations

Subjects that continue the syllabus

Final Year Dissertation/V11G200V01991

Subjects that are recommended to be taken simultaneously

Industrial chemistry/V11G200V01904

Final Year Dissertation/V11G200V01991

Subjects that it is recommended to have taken before

Analytical chemistry II/V11G200V01503

Analytical chemistry 3/V11G200V01601

Physical chemistry III/V11G200V01603

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

* Teaching methodologies modified

* Non-attendance mechanisms for student attention (tutoring)

* Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Pending tests that are maintained

Test XX: [Previous Weight 00%] [Proposed Weight 00%]

...

* Tests that are modified

[Previous test] => [New test]

* New tests

* Additional Information

Methodology

All those described in the Teaching Guide are maintained and use will be made of the virtual classrooms of the Faculty of Chemistry, in combination with the Faitic, Moodle and Skype platforms (if necessary), including communication by email, for performance of said methodologies.

Bibliography

Those described in the Guide are kept and supplementary material will be posted on Faitic (documents and links) to facilitate access to information.

Evaluation

All evaluable activities are maintained in the same way, including the short test and the scheduled ordinary and extraordinary exams, which will be carried out through the Faitic and / or Moodle platforms, the dates of which will be included in the 2020-21 course schedule.

If the tests are carried out semi-face-to-face or telematically in virtual rooms, only the use of the computer (with camera and audio) will be allowed for the connection. Failing that, they will connect with the mobile to the remote campus. The rest of the devices must remain off and out of the student's reach, unless circumstances allow teachers to allow it.

Note: the teachers of the subject do not allow to be recorded, neither by videos nor by audios or any other format such as screenshots, during the development of face-to-face or telematic classes. What is communicated for the appropriate purposes to all attendees.

The qualifications and the revision date will be also communicated by Faitic. The revision, at a personalized time for each student, will be done in the faculty rooms of the remote campus.

IDENTIFYING DATA				
Pharmaceutical chemistry				
Subject	Pharmaceutical chemistry			
Code	V11G200V01903			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Terán Moldes, María del Carmen			
Lecturers	Terán Moldes, María del Carmen			
E-mail	mcteran@uvigo.es			
Web				
General description	The subject is allocated to contribute to the students basic knowledges on Pharmaceutical Chemistry, an interdisciplinary science that is among different disciplines of chemical and biological content, whose aim is the study of the bioactive compounds and in particular its discovery, development, identification and mechanism of action at molecular level. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Competencies	
Code	
CB1	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
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
CE20	Evaluate, interpret and synthesize data and chemical information
CE22	Process and perform computational calculations with chemical information and chemical data
CE23	Present oral and written scientific material and scientific arguments to a specialized audience
CT1	Communicate orally and in writing in at least one of the official languages of the University
CT3	Learn independently
CT4	Search and manage information from different sources
CT5	Use information and communication technologies and manage basic computer tools
CT7	Apply theoretical knowledge in practice
CT8	Teamwork
CT9	Work independently
CT10	Work at a national and international context
CT12	Plan and manage time properly
CT13	Make decisions
CT14	Analyze and synthesize information and draw conclusions
CT15	Evaluate critically and constructively the environment and oneself
CT16	Develop an ethical commitment
CT17	Develop concern for environmental aspects and quality management

Learning outcomes	
Learning outcomes	Competences
Diferenciate and understand the concepts: drug, active principle, medicine and pharmacological target	CB4 CE20 CT1 CE23 CT4 CT5 CT14

Differentiate the types of receptors, as well as an agonist drug from an antagonist.	CB4 CB5	CE20 CE23	CT1 CT3 CT4 CT5 CT7 CT9 CT13 CT14
Relate the physicochemical properties of drugs with their pharmacokinetics.	CB1 CB3 CB5	CE19 CE20 CE22 CE23	CT1 CT3 CT5 CT7 CT8 CT14
Differentiate the pharmacomodulation techniques.	CB3 CB5	CE19 CE20 CE23	CT1 CT4 CT5 CT7 CT8
Differentiate a chemotherapeutic from a pharmacodynamic agent	CB3 CB4 CB5	CE19 CE20 CE23	CT1 CT3 CT4 CT7 CT9
Familiarise with the most recent tools in drug design: combinatorial chemistry and computer-aided drug design (QSAR and docking methods)	CB3 CB5	CE19 CE20 CE22 CE23	CT1 CT3 CT4 CT5 CT8 CT12 CT13 CT15 CT16
Describe the methods of structural analysis involved in drug design and differentiate the type of information that they provide	CB3 CB5	CE19 CE20 CE22 CE23	CT1 CT3 CT5 CT7 CT9 CT14 CT15
Identify the different forms of drug administration and their fundamentals.	CB1 CB3 CB4 CB5	CE19 CE20 CE23	CT1 CT3 CT4 CT9 CT14
Identify the formulation and composition variables in the preparation of suspensions and emulsions, and describe their characteristic properties, as well as and the instability phenomena	CB3 CB5	CE19 CE20 CE23	CT1 CT3 CT9 CT13 CT14
Recognise the main stages of fermentative and enzymatic processes applied to the drug production, including production and purification steps	CB3 CB5	CE19 CE20 CE22 CE23	CT1 CT3 CT4 CT7 CT8 CT12 CT14 CT15
Apply the basic principles of safety and pollution control in operations and processes oriented to drug production	CB3 CB5	CE19 CE20 CE23	CT1 CT3 CT5 CT8 CT10 CT13 CT16 CT17

Explain the sampling, pretreatment and sample preparation, as well as the appropriate instrumental techniques for the analysis of prime matters, bioactive compounds and pharmaceutical formulations in the biological media	CB3 CB5	CE19 CE20 CE22 CE23	CT1 CT3 CT8 CT13 CT14
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Contents

Topic	
Subject 1. Introduction: general aspects of Pharmaceutical Chemistry	Definitions, aims and scope of the Pharmaceutical Chemistry. Nomenclature of drugs and classification systems. Chemotherapeutic and pharmacodynamic agents
Subject 2. Drug targets	Types of drug targets. Drug-target interactions. Nucleic Acids, enzymes and proteins as drug targets.
Subject 3. Receptors as drug targets	Types of receptors. Agonist, antagonist and inverse agonist drugs. Measure and expression of pharmacological effect. Drug tolerance and tachyphylaxis
Subject 4. Pharmacokinetic and related aspects	Absorption and transport through biological membranes, the Lipinski rules, bioavailability. Metabolism, prodrugs. Excretion. ways of drug administration and pharmaceutical forms.
Subject 5. Discovery, design and development of drugs	Strategies for lead discovery, serendipity, systematic screening, rational design. Pharmacomodulation. Patents. preclinical and clinical trials.
Subject 6. Strategies for drug design	Molecular modeling, indirect methods (QSAR, pharmacophore design), direct methods (docking).
Subject 7. Preparation, analysis and purification of drugs	Production in the pharmaceutical industry. fermentative processes. Drug processing.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	26	52	78
Seminars	13	39	52
Studies excursion	3	3	6
Problem and/or exercise solving	1	3	4
Essay questions exam	2	8	10

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

Methodologies

	Description
Lecturing	In these sessions the professor will present in a structured form the general contents of the program, doing emphasis in important or difficult aspects of the subject. In addition, the professor, in advance and through the Tem@ platform, will make available to the student the material that will be used in these sessions. Students should previously check and complete this material by using the recommended literature. In addition, periodic controls will be carried out to follow the study and understanding of the subject. These tests will be performed during some master sessions which will be determined in advance
Seminars	They will devote time to discuss the most complicated aspects of the treated subjects, to use programs of molecular modeling which will allow to work with several biomolecules cocrystallized with different ligands, as well as to present works, researchs or summaries carried out by the students and related with the content of the subject.
Studies excursion	The students will visit a company of the pharmaceutical sector, in which it will be able to appreciate the process of production in all its phases. After the visit the students will have to answer, in schedule of class, to a test related with this visit.

Personalized assistance

Methodologies	Description
Seminars	Time devoted by the teachers to attend the needs and queries of the students related with the study of the subject and developed activities. The teachers will inform in the presentation of the subject about the available schedule.

Assessment

Description	Qualification	Evaluated Competences
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Lecturing	Contents developed in the program study will be evaluated by means of verbal or written questions formulated in the theoretical sessions. The written questions will be referents to the content treated in the previous two or three weeks.	5	CB1 CB3	CE19 CE23	CT14 CT15 CT16
Seminars	Attendance and participation in the sessions, exercises and questions resolution, as well as the presentation of reports, summaries and works, will be qualified	20	CB1 CB3 CB4 CB5	CE19 CE20 CE22 CE23	CT1 CT3 CT4 CT5 CT7 CT8 CT9 CT10 CT12 CT13 CT14 CT16
Studies excursion	Attendance and active participation in the visit, as well as the results of the test will be qualified.	10	CB3	CE20	CT14 CT15 CT17
Problem and/or exercise solving	A short exam (one hour long) will be carried out at week ten. In this exam will enter the subject explained until that moment.	15	CB1 CB3 CB5	CE19 CE20	CT7 CT12 CT13 CT14
Essay questions exam	A global exam will be carried on closing date of evaluation in order to analyze the acquired competencies	50	CB1 CB3 CB5	CE19 CE20	CT7 CT12 CT13 CT14

Other comments on the Evaluation

Participation of students in any of the evaluation parts, such as attendance to seminars (four or more) or the performance of written exams, will involve the condition of presented and therefore the obtaining of a qualification. Students should have a minimum mark in some of the evaluation parts in order to pass the subject (5 or more points). This minimum mark should be of 4 in the global exam, as well as in seminars and study visit.

Evaluation in the July Call

1. Mark obtained by the students during the academic course: maximum 3.5 points

Marks obtained from verbal or written questions formulated in the theoretical sessions (maximum 0.5 point), visit test (maximum 1 point) and seminars (maximum 2 points) will be preserved.

2. Work carried out by the students: maximum 1.5 points

Finished the evaluation process of June, teachers will propose to the students who have not pass the subject to perform an individual work in order to acquire the competencies of which they will be evaluated in July. This work should be presented and defended before the exam.

The students will perform a written exam similar to June in which they will obtain a maximum of 5 points

Sources of information

Basic Bibliography

Complementary Bibliography

A. Delgado C. Minguillón y J. Juglar, **Introducción a la Química Terapéutica**, 2ª Edición 2003,
G. L. Patrick, **An introduction to Medicinal Chemistry**, 6th Edition 2017,
C. G. Wermuth, **4. The Practice of Medicinal Chemistry**, 4th Edition 2015,
R. Renneberg, **Biotechnología para principiantes**, 2004,

Recommendations

Subjects that it is recommended to have taken before

Structural Determination/V11G200V01501
Chemical engineering/V11G200V01502
Analytical chemistry II/V11G200V01503
Biological chemistry/V11G200V01602

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies modified

Lecturing: the master sessions would be replaced by remote work sessions, in synchronous mode. For this, the university's own tools (virtual classrooms and virtual offices / remote campus) will be used.

Seminars: the face-to face sessions would be replaced by remote work sessions, in synchronous mode. For this, the university's own tools (virtual classrooms and virtual offices / remote campus) will be used

Studies excursion: the studies excursion will be replaced by a written bibliographic review on the pharmaceutical industry in the biotechnology sector.

* Non-attendance mechanisms for student attention (tutoring)

Students will continue to have tutoring sessions. These sessions will be carried out by telematic means (e-mail, videoconference, forums in the virtual classroom etc.). In this case, a prior request will be necessary.

---Adaptation of the evaluation---

* Tests

Exams: the face-to-face exams will be replaced by remote exams, synchronous mode, complementing them, when necessary, with oral presentations. For this, the university's own tools (virtual classrooms and virtual offices/remote campus) will be used.

IDENTIFYING DATA				
Industrial chemistry				
Subject	Industrial chemistry			
Code	V11G200V01904			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish			
Department				
Coordinator	Deive Herva, Francisco Javier			
Lecturers	Deive Herva, Francisco Javier Leao Martins, Jose Manuel			
E-mail	deive@uvigo.es			
Web				
General description	Chemical industry represents one of the most booming sectors in the economy of many countries, being the basis for many other industries like metallurgic, petrochemical, food and electronic ones. Similarly, recent advances on high efficient materials, electronic devices, medical applications, together with new environmental and agricultural technologies are fostered by continuous improvements and innovations in each stage of the process design. Therefore, this subject is devoted to provide the student with a comprehensive approach of Industrial Chemistry, going from the construction and understanding of process flowsheets diagrams of chemical processes with socio-economic interest, to the performance of quality principles underlying them.			

Competencies

Code	
CE16	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: principles and procedures in chemical engineering
CE19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
CE20	Evaluate, interpret and synthesize data and chemical information
CE22	Process and perform computational calculations with chemical information and chemical data
CE23	Present oral and written scientific material and scientific arguments to a specialized audience
CT1	Communicate orally and in writing in at least one of the official languages of the University
CT3	Learn independently
CT4	Search and manage information from different sources
CT5	Use information and communication technologies and manage basic computer tools
CT6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
CT7	Apply theoretical knowledge in practice
CT8	Teamwork
CT9	Work independently
CT10	Work at a national and international context
CT12	Plan and manage time properly
CT13	Make decisions
CT14	Analyze and synthesize information and draw conclusions
CT15	Evaluate critically and constructively the environment and oneself

Learning outcomes

Learning outcomes	Competences	
(*) To identify generic systems for quality management in laboratories and to know the required essential documentation	CE16	CT1
	CE19	CT3
	CE20	CT4
	CE23	CT5
		CT6
		CT7
		CT8
		CT9
		CT10
		CT12
		CT13
		CT14
		CT15

(*)To establish analytical methodology suitable for warranting the quality of raw materials and products, as well as the pollution derived from the industrial process.	CE16	CT1
	CE19	CT3
	CE20	CT4
	CE22	CT5
	CE23	CT6
		CT7
		CT8
		CT9
		CT10
		CT12
		CT13
		CT14
		CT15
(*)To integrate automatized and miniaturized systems on the control of industrial processes.	CE16	CT1
	CE19	CT3
	CE22	CT4
	CE23	CT5
		CT6
		CT7
		CT8
		CT9
		CT10
		CT12
		CT13
		CT14
		CT15
(*)To acquire the ability of designing a process for the production of biofuels or biocatalysts at laboratory scale, on the basis of the process flowsheet diagrams.	CE16	CT1
	CE19	CT3
	CE20	CT4
	CE22	CT5
	CE23	CT6
		CT7
		CT8
		CT9
		CT10
		CT12
		CT13
		CT14
		CT15
To understand the role of bioengineering as an environmentally sustainable alternative to obtain products with commercial interest	CE16	CT1
	CE19	CT3
	CE20	CT4
		CT5
		CT6
		CT7
		CT8
		CT9
		CT10
		CT12
		CT13
		CT14
		CT15
(*)To evaluate the economic viability of industrial processes by using basic tools such as the Net Present Value, the Internal Rate of Return of the Return of Investment	CE20	CT1
	CE22	CT3
	CE23	CT4
		CT5
		CT6
		CT7
		CT8
		CT14
		CT15
New	CE16	CT4
	CE19	CT5
	CE20	CT7
		CT8
		CT9

Contents

Topic	
Subject 1. Introduction to processes in Industrial Chemistry	General aspects of chemical processes. Characteristics and sectorial structure of chemical industry. Facts and figures of Spanish and European chemical industry. Process flowsheet diagrams
Subject 2.- Economy of industrial processes.	Preparation of budget. Analysis of costs and profits. Criteria of economic feasibility: Net Present Value, Internal Rate of Return, Time of return.
Subject 3.- Biotechnological Processes.	Fundamental stages of biotechnological processes. Pretreatment of raw materials. Types of bioreactors. Product recovery and downstream strategies. Processes for the production of biofuels. Food biotechnology
Subject 5.- Petrochemistry.	Oil reserves, types and composition. Crude refining. Types of refineries: basic structure. General flowsheet of a petrochemical refinery. Crude fractionation. Thermal cracking: coking unit. Catalytic cracking, reactors, etc. Catalytic reforming. Desulfurization.
Subject 4.- Biofuels	Energy concerns and current regulations. Raw materials. Processes for the production of biofuels. Alternatives for conventional processes
Subject 7.- Basic elements and principles of quality.	Introduction to the control of quality. Implementation of systems of quality. Tools of quality. International Standards - ISO. Quality manual. Control of Processes quality (prime Matters, transformation and final product)

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	26	52	78
Problem solving	5	13	18
Mentored work	5	10	15
Presentation	3	6	9
Studies excursion	3	6	9
Problem and/or exercise solving	1	4	5
Essay questions exam	2	14	16

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

Methodologies

	Description
Lecturing	The lecturer will describe the general aspects of the program in a structured way, highlighting the fundamentals and aspects involving greater difficulties for the student. The lecturer will deliver (by means of the online platform "TEMA") all the material required for a proper understanding of the subject. The student is encouraged to work on that material and consult relevant literature to acquire a deeper knowledge.
Problem solving	After each subject, the most relevant aspects will be tackled by means of problem and questions solving.
Mentored work	The students will carry out a work focused on the design of a process for producing some product with industrial interest, taking into account the knowledge acquired during the master sessions.
Presentation	The students have to defend their tutored works in front of a jury made up of lecturers from the departments of Chemical Engineering or Analytical Chemistry and/or professionals from chemical industries
Studies excursion	Different outdoor studies will be carried out throughout the course, in order to get a deeper insight into the processes explained during the master sessions. Priority will be given to top companies of our socioeconomic environment.

Personalized assistance

Methodologies	Description
Lecturing	During tutoring hours, the students can ask the lecturers about any aspect of the subject. In the same way, students can communicate with the teachers via E-mail or Tema platform. The lecturers will show their availability for tutoring on the first day.

Problem solving	During tutoring hours, the students can ask the lecturers about any aspect of the subject. In the same way, students can communicate with the teachers via E-mail or Tema platform. The lecturers will show their availability for tutoring on the first day.
Mentored work	During tutoring hours, the students can ask the lecturers about any aspect of the subject. In the same way, students can communicate with the teachers via E-mail or Tema platform. The lecturers will show their availability for tutoring on the first day.
Presentation	During tutoring hours, the students can ask the lecturers about any aspect of the subject. In the same way, students can communicate with the teachers via E-mail or Tema platform. The lecturers will show their availability for tutoring on the first day.
Studies excursion	During tutoring hours, the students can ask the lecturers about any aspect of the subject. In the same way, students can communicate with the teachers via E-mail or Tema platform. The lecturers will show their availability for tutoring on the first day.

Assessment				
	Description	Qualification	Evaluated Competences	
Problem solving	Different troubleshooting will be solved by the students at the framework of their tutored works	10	CE16 CE19 CE22	CT3 CT5 CT6 CT7 CT9 CT14
Mentored work	A work focused on the design of an industrially relevant process flowsheet diagram will be carried out during the term.	20	CE16 CE20 CE22 CE23	CT1 CT4 CT5 CT6 CT7 CT8 CT10 CT12 CT13 CT14 CT15
Presentation	The tutored works will be defended against a jury composed of lecturers from the Departments of Chemical Engineering and Analytical Chemistry and/or professionals from the chemical industry.	10	CE16 CE23	CT1 CT5 CT8 CT12 CT13 CT14
Studies excursion	The students must unavoidably attend the outdoor studies in order to get a deeper insight into the processes tackled during the master sessions. A report about questions on the plants will be done by them after each visit.	5	CE20 CE22	CT7 CT8 CT14 CT15
Problem and/or exercise solving	Short tests will be performed in the middle and at the end of the course. Students will be encouraged to relate new ideas with their own views, and to solve problems based on the new knowledge acquired	10	CE16 CE19 CE20 CE22 CE23	CT3 CT7 CT9 CT12 CT13 CT14
Essay questions exam	A final long answer test will be done at the end of the course, and the students will have to have a minimum of 5 out of 10 to pass the course.	45	CE16 CE19 CE20 CE22 CE23	CT3 CT7 CT12 CT13 CT14

Other comments on the Evaluation

In order to pass the subject, at least 5 points out of 10 should be achieved in each of the evaluated activities. It is expected that the students show an ethical behaviour concerning plagiarism, use of unauthorized electronic devices or suitable team work. Otherwise, the student will be rated with 0 (fail).

Evaluation in July

The activities that have been obtained a mark higher than 5 will be maintained.

Sources of information

Basic Bibliography

M.M Camps, **Los Biocombustibles**, Mundi-Prensa,

M. Díaz, **Ingeniería de bioprocesos**, Paraninfo,
 J. Happel, **Economía de los procesos químicos**, Reverté,
 M.A. Ramos Carpio, **Refino de petróleo, gas natural y petroquímica**, Fomento Innovación Industrial,
Complementary Bibliography
 G.T. Austin, **Manual de Procesos Químicos en la Industria**, McGraw Hill,
 J.H.Gary, **Refino de petróleo: tecnología y economía**, Reverté,
 A. Vian Ortuño, **Introducción a la Química Industrial**, Reverté,
 G. Ramis Ramos et al., **Quimiometría**, Síntesis,
 W. Wegscheider, **Quality in Chemical Measurements, Training Concepts and Teaching Materials**, Springer,
 D. Hoyle, **ISO 9000 Quality Systems Handbook**, Elsevier,
 J.M. de Juana, **Energías renovables para el desarrollo**, Thompson,

Recommendations

Subjects that it is recommended to have taken before

Chemical engineering/V11G200V01502

Contingency plan

Description

== EXCEPTIONAL MEASUREMENTS PLANNED ==

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes extraordinary planning that will be activated at the time that the administrations and the institution itself determine it based on safety, health and responsibility criteria, and guaranteeing teaching in a non-classroom or partial classroom setting. These already planned measurements guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance by the students and lecturers through the standardized tool and institutionalized teaching guides.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies that are maintained

Master Session, Project Learning, Problem Learning

* Teaching methodologies that are modified

Only visit to companies would be modified by changing them for the visualization of a video.

* Non-face-to-face service mechanism for students (tutorships)

They would take place in the teacher's virtual office

=== ADAPTATION OF THE EVALUATION ===

The evaluation tests will also be carried out by using the usual telematic tools (virtual classroom and Faitic).

IDENTIFYING DATA				
Sustainable chemistry				
Subject	Sustainable chemistry			
Code	V11G200V01905			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4th	2nd
Teaching language				
Department				
Coordinator				
Lecturers				
E-mail				

----- UNPUBLISHED TEACHING GUIDE -----

IDENTIFYING DATA				
Prácticas externas: Prácticas en empresas				
Subject	Prácticas externas: Prácticas en empresas			
Code	V11G200V01981			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4	2c
Teaching language	Castellano Gallego			
Department	Química Física Química inorgánica			
Coordinator	García Bugarín, Mercedes Peña Gallego, María de los Ángeles			
Lecturers	García Bugarín, Mercedes Peña Gallego, María de los Ángeles			
E-mail	mgarcia@uvigo.es mpena@uvigo.es			
Web	http://quimica.uvigo.es/index.php/practicas-en-empresas.html			
General description	El objetivo de esta materia es que los estudiantes lleven a cabo una estancia en una empresa con el fin de realizar tareas relacionadas con el ámbito profesional de la Química. Mediante la realización de prácticas en empresa los estudiantes podrán aplicar los conocimientos y competencias adquiridas durante sus estudios, lo que permitirá complementar y reforzar su formación y facilitar su incorporación al mercado laboral.			

Competencias

Code	
CB1	Que los estudiantes hayan demostrado poseer y comprender conocimientos en un área de estudio que parte de la base de la educación secundaria general, y se suele encontrar a un nivel que, si bien se apoya en libros de texto avanzados, incluye también algunos aspectos que implican conocimientos procedentes de la vanguardia de su campo de estudio.
CB2	Que los estudiantes sepan aplicar sus conocimientos a su trabajo o vocación de una forma profesional y posean las competencias que suelen demostrarse por medio de la elaboración y defensa de argumentos y la resolución de problemas dentro de su área de estudio.
CB3	Que los estudiantes tengan la capacidad de reunir e interpretar datos relevantes (normalmente dentro de su área de estudio) para emitir juicios que incluyan una reflexión sobre temas relevantes de índole social, científica o ética.
CB4	Que los estudiantes puedan transmitir información, ideas, problemas y soluciones a un público tanto especializado como no especializado.
CE20	Evaluar, interpretar y sintetizar datos e información química
CE24	Reconocer y analizar nuevos problemas y planear estrategias para solucionarlos
CE25	Manejar con seguridad sustancias químicas, considerando sus propiedades físicas y químicas, incluyendo la valoración de cualquier riesgo específico asociado con su uso
CT1	Comunicarse de forma oral y escrita en al menos una de las lenguas oficiales de la Universidad
CT2	Comunicarse a nivel básico en inglés en el ámbito de la Química
CT3	Aprender de forma autónoma
CT4	Buscar y gestionar información procedente de distintas fuentes
CT5	Utilizar las tecnologías de la información y de las comunicaciones y manejar herramientas informáticas básicas
CT6	Manejar las matemáticas, incluyendo aspectos tales como análisis de errores, estimaciones de órdenes de magnitud, uso correcto de unidades y modos de presentación de datos
CT7	Aplicar los conocimientos teóricos a la práctica
CT8	Trabajar en equipo
CT9	Trabajar de forma autónoma
CT10	Trabajar en un contexto tanto nacional como internacional
CT11	Adaptarse a nuevas situaciones
CT12	Planificar y gestionar adecuadamente el tiempo
CT13	Tomar decisiones
CT14	Analizar y sintetizar información y obtener conclusiones
CT15	Evaluar de modo crítico y constructivo su entorno y a sí mismo
CT16	Desarrollar un compromiso ético
CT17	Desarrollar preocupación por los aspectos medioambientales y de gestión de la calidad
CT18	Generar nuevas ideas y demostrar iniciativa

Resultados de aprendizaje

Learning outcomes	Competences		
Contrastar las actitudes y competencias teórico-prácticas adquiridas.	CB1	CE20	CT1
	CB2	CE24	CT2
	CB3	CE25	CT3
	CB4		CT4
			CT5
			CT6
			CT7
			CT8
			CT9
			CT10
			CT11
			CT12
			CT13
			CT14
			CT15
			CT16
			CT17
			CT18
Realizar trabajos que pongan a prueba la capacidad crítica y reflexiva.	CB1	CE20	CT1
	CB2	CE24	CT2
	CB3	CE25	CT3
	CB4		CT4
			CT5
			CT6
			CT7
			CT8
			CT9
			CT10
			CT11
			CT12
			CT13
			CT14
			CT15
			CT16
			CT17
			CT18
Tomar decisiones y poner en práctica la capacidad de análisis y síntesis en la resolución de problemas prácticos.	CB1	CE20	CT1
	CB2	CE24	CT2
	CB3	CE25	CT3
	CB4		CT4
			CT5
			CT6
			CT7
			CT8
			CT9
			CT10
			CT11
			CT12
			CT13
			CT14
			CT15
			CT16
			CT17
			CT18

Contenidos

Topic

Los estudiantes se integrarán en la organización de la empresa y se coordinarán con los miembros del grupo de trabajo al que sean asignados.

Los estudiantes realizarán actividades ligadas al desempeño de la profesión y relacionadas con los conocimientos y las competencias de sus estudios.

Las actividades que realicen los estudiantes serán supervisadas y evaluadas por los tutores académico y de la empresa designados a tal efecto.

Planificación

	Class hours	Hours outside the classroom	Total hours
Prácticum, Practicas externas y clínicas	0	120	120
Informe de prácticas, prácticum y prácticas externas	0	30	30

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

Metodologías

	Description
Prácticum, Practicas externas y clínicas	Los estudiantes desarrollan actividades en un contexto relacionado con el ejercicio de una profesión, durante un período determinado, realizando las funciones asignadas y previstas en la propuesta de prácticas.

Atención personalizada

Methodologies	Description
Prácticum, Practicas externas y clínicas	
Tests	Description
Informe de prácticas, prácticum y prácticas externas	

Evaluación

	Description	Qualification	Evaluated Competences
Prácticum, Practicas externas y clínicas	En la evaluación se tendrá en cuenta la valoración del desempeño del alumno realizada por el tutor en la empresa y el seguimiento realizado por el tutor académico.	80	
Informe de prácticas, prácticum y prácticas externas	Al concluir las prácticas, los alumnos deberán entregar a su tutor académico una memoria final para ser evaluada.	20	

Other comments on the Evaluation

* Esta materia se regirá por lo establecido en la Normativa de Prácticas Externas del Grado en Química.

* Los tutores académicos realizarán la evaluación global de las prácticas externas considerando:

(70%) El informe realizado por el tutor de la empresa (impreso D5 de la Universidad de Vigo) en el que valorará aspectos relacionados con las prácticas realizadas por el alumno: puntualidad, asistencia, responsabilidad, capacidad de trabajo en equipo e integración en la empresa, calidad del trabajo realizado, etc.

(20%) La memoria explicativa que deben realizar los estudiantes a la conclusión de las prácticas en la que deberán figurar, entre otros, una descripción concreta y detallada de las tareas, trabajos desarrollados y departamentos de la entidad a los que ha estado asignado, una relación de los problemas planteados y el procedimiento seguido para su resolución, el nivel de integración dentro de la empresa y las relaciones con el personal y una reflexión sobre la adecuación de las enseñanzas recibidas durante los estudios de Grado para el desempeño de la práctica (ver apartado 3 del artículo 8 de la Normativa de Prácticas Externas).

La memoria deberá tener una extensión mínima de 10 y máxima de 20 páginas de tamaño A4, incluyendo portada, índice y anexos. Se recomienda márgenes mínimas de 2 cm, tamaño de letra de 12 puntos, interlineado sencillo y justificado de párrafo. Las tablas y figuras se numerarán de forma consecutiva a medida que aparezcan en el texto e incluirán un breve encabezado describiendo su contenido.

La calificación de esta memoria se hará constar en el apartado *Observaciones/Sugerencias* del impreso D7 de valoración del tutor académico.

(10%) La valoración del tutor académico (impreso D7 de la Universidad de Vigo) de la aptitud y actitud del estudiante durante el desarrollo de las actividades realizadas.

* El tutor académico reflejará el resultado de la evaluación global en el impreso D8 de la Universidad de Vigo.

Fuentes de información

Basic Bibliography

Complementary Bibliography

Recomendaciones

Plan de Contingencias

Description

=== MEDIDAS EXCEPCIONALES PLANIFICADAS ===

Ante la incierta e imprevisible evolución de la alerta sanitaria provocada por el COVID-19, la Universidad de Vigo establece una planificación extraordinaria que se activará en el momento en que las administraciones y la propia institución lo determinen atendiendo a criterios de seguridad, salud y responsabilidad, y garantizando la docencia en un escenario no presencial o parcialmente presencial.

=== ADAPTACIÓN DE LAS METODOLOGÍAS ===

* Las prácticas externas pasarán a prácticas telemáticas de ser posible. En el caso de no serlo, se aplazarán hasta que la situación lo permita. En caso excepcional, que no pudieran retomarse, se realizarán actividades equivalentes no presenciales.

* Mecanismo no presencial de atención al alumnado (tutorías)

Las tutorías de atención al alumnado se realizarán previa cita por medios telemáticos (despacho virtual del profesorado,...).

IDENTIFYING DATA				
Final Year Dissertation				
Subject	Final Year Dissertation			
Code	V11G200V01991			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	18	Mandatory	4th	2nd
Teaching language	Spanish Galician English			
Department				
Coordinator	Peña Gallego, María de los Ángeles			
Lecturers	Peña Gallego, María de los Ángeles			
E-mail	mpena@uvigo.es			
Web	http://quimica.uvigo.es/traballo-fin-de-grao.html			
General description	According to the memory of the Degree in Chemistry of the University of Vigo, the End of Degree project is a mandatory subject of 18 credits ECTS in the second term of the fourth course. The objective of the subject is to offer the students the opportunity to apply the knowledges, skills and competences adquired during the Degree studies. The TFG is an original work that each student will do individually under the supervision of one or two tutors. TFG subjects can correspond to experimental and/or theoretical works and/or of bibliographic reviews on subjects related with the contains in the Degree in Chemistry. The final stage of the TFG will consist in a written report and its public presentation.			

Competencies

Code	
CB1	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
CB2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
CB3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
CB4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
CB5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
CE1	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Major aspects of chemical terminology, nomenclature, units and unit conversions.
CE2	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: types of chemical reactions and its main characteristics
CE3	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories in: principles of quantum mechanics and its application in the description of the structure and properties of atoms and molecules
CE4	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Basics and tools for solving analytical problems and characterization of chemical substances
CE5	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
CE6	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories in: principles of thermodynamics and their applications in chemistry
CE7	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: kinetics of change, including catalysis and reaction mechanisms
CE8	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: main techniques for structural determination, including spectroscopy
CE9	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
CE10	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: properties of aliphatic, aromatic, heterocyclic and organometallic compounds
CE11	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: nature and behavior of functional groups in organic molecules
CE12	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: structural features of chemical elements and their compounds, including stereochemistry
CE13	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: main synthetic routes in organic chemistry, including interconversions of functional groups and the formation of carbon-carbon and carbon-heteroatom bonds

CE14	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: relationship between macroscopic properties and properties of individual atoms and molecules, including macromolecules
CE15	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories in: chemistry of biological molecules and their processes
CE16	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: principles and procedures in chemical engineering
CE17	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories in: metrology of chemical processes including quality management
CE18	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: principles of electrochemistry
CE19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
CE20	Evaluate, interpret and synthesize data and chemical information
CE21	Recognize and implement good scientific practices for measurement and experimentation
CE22	Process and perform computational calculations with chemical information and chemical data
CE23	Present oral and written scientific material and scientific arguments to a specialized audience
CE24	Recognize and analyze new problems and plan strategies to solve them
CE25	Handle chemicals safely, considering their physical and chemical properties, including the evaluation of any specific risks associated with its use
CE26	Perform common laboratory procedures and use instrumentation in synthetic and analytical work
CE27	Monitor, by observation and measurement of physical and chemical properties, events or changes, and document and record them in a consistent and reliable way
CE28	Interpret data derived from laboratory observations and measurements in terms of their significance and relate them to the appropriate theory
CE29	Demonstrate skills for numerical calculations and interpretation of experimental data, with special emphasis on precision and accuracy
CT1	Communicate orally and in writing in at least one of the official languages of the University
CT2	Communicate at a basic level in English in the field of chemistry
CT3	Learn independently
CT4	Search and manage information from different sources
CT5	Use information and communication technologies and manage basic computer tools
CT6	Use mathematics, including error analysis, estimates of orders of magnitude, correct use of units and data representations
CT7	Apply theoretical knowledge in practice
CT8	Teamwork
CT9	Work independently
CT10	Work at a national and international context
CT11	Adapt to new situations
CT12	Plan and manage time properly
CT13	Make decisions
CT14	Analyze and synthesize information and draw conclusions
CT15	Evaluate critically and constructively the environment and oneself
CT16	Develop an ethical commitment
CT17	Develop concern for environmental aspects and quality management
CT18	Generate new ideas and show initiative

Learning outcomes

Learning outcomes	Competences
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(*)Todos os da titulación

CB1	CE1	CT1
CB2	CE2	CT2
CB3	CE3	CT3
CB4	CE4	CT4
CB5	CE5	CT5
	CE6	CT6
	CE7	CT7
	CE8	CT8
	CE9	CT9
	CE10	CT10
	CE11	CT11
	CE12	CT12
	CE13	CT13
	CE14	CT14
	CE15	CT15
	CE16	CT16
	CE17	CT17
	CE18	CT18
	CE19	
	CE20	
	CE21	
	CE22	
	CE23	
	CE24	
	CE25	
	CE26	
	CE27	
	CE28	
	CE29	

Contents

Topic

(*)Dado o seu carácter especial, a materia non ten contidos propios.

Planning

	Class hours	Hours outside the classroom	Total hours
Mentored work	160	256	416
Presentation	0.5	33.5	34

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

Methodologies

	Description
Mentored work	Individual work that each student will make of autonomous form under the supervision of one or two tutors. The allocation of the subject of work will do in accordance with the Rule of the TFG of the Faculty of Chemistry.

Personalized assistance

Methodologies	Description
Mentored work	

Assessment

Description	Qualification	Evaluated Competences
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Mentored work	30	CB1	CE1	CT1
		CB2	CE2	CT2
		CB3	CE3	CT3
		CB4	CE4	CT4
		CB5	CE5	CT5
			CE6	CT6
			CE7	CT7
			CE8	CT8
			CE9	CT9
			CE10	CT10
			CE11	CT11
			CE12	CT12
			CE13	CT13
			CE14	CT14
			CE15	CT15
			CE16	CT16
			CE17	CT17
			CE18	CT18
			CE19	
			CE20	
			CE21	
			CE22	
			CE23	
			CE24	
			CE25	
			CE26	
			CE27	
			CE28	
			CE29	
Presentation	70	CB1	CE1	CT1
		CB2	CE2	CT2
		CB3	CE3	CT3
		CB4	CE4	CT4
		CB5	CE5	CT5
			CE6	CT6
			CE7	CT7
			CE8	CT8
			CE9	CT9
			CE10	CT10
			CE11	CT11
			CE12	CT12
			CE13	CT13
			CE14	CT14
			CE15	CT15
			CE16	CT16
			CE17	CT17
			CE18	CT18
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			CE21	
			CE22	
			CE23	
			CE24	
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			CE27	
			CE28	
			CE29	

Other comments on the Evaluation

TFG is ruled by the norms approved in the Junta de Facultad and published in the web page web of the faculty.
The TFG Commission will do public, with sufficient advance, the criteria of evaluation that will use the tutor and the jury.
The TFG Commission will do public, with sufficient advance, the conditions for the written report and the public defences.
All the information generated by the TFG Commission will be included in the platform Tem@ and/or in the web page of the faculty.

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

Subjects that are recommended to be taken simultaneously

Environmental chemistry/V11G200V01902

Pharmaceutical chemistry/V11G200V01903

Industrial chemistry/V11G200V01904

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF The METHODOLOGIES ===

An adaptation of the proposals by the tutors may be necessary.

Tutoring will be developed by email or videoconference in Remote Campus.

=== ADAPTATION OF The EVALUATION ===

Defenses of Final Year Dissertation may have to be remote employing the Remote Campus of the University of Vigo.
