



(*)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>

Grado en Química

Subjects

Year 4th

Code	Name	Quadmester	Total Cr.
V11G200V01701	Project	1st	6
V11G200V01702	Materials chemistry	1st	6

V11G200V01703	Inorganic chemistry III	1st	9
V11G200V01704	Organic chemistry III	1st	9
V11G200V01902	Environmental chemistry	2nd	6
V11G200V01903	Pharmaceutical chemistry	2nd	6
V11G200V01904	Industrial chemistry	2nd	6
V11G200V01981	Internships: Internships in companies	2nd	6
V11G200V01991	Final Year Dissertation	2nd	18

IDENTIFYING DATA				
Project				
Subject	Project			
Code	V11G200V01701			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	Spanish			
Department				
Coordinator				
Lecturers				
E-mail				
Web				
General description	<p>"Machine translation into english of the original teaching guide"</p> <p>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</p>			

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 ANNOUNCEMENTIn this announcement the students will have to present to those parts of the *asignatura that have not been surpassed previously.Ethical commitmentit 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

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	Grado 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

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, 4^{ed},
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.,
Complementary Bibliography

Recommendations

Subjects that are recommended to be taken simultaneously

Inorganic chemistry III/V11G200V01703

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	Grado en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Mandatory	4th	1st
Teaching language	Spanish			
Department				
Coordinator	Bravo Bernárdez, Jorge			
Lecturers	Bolaño García, Sandra Bravo Bernárdez, Jorge Castro Fojo, Jesús Antonio García Martínez, Emilia Pérez Lourido, Paulo Antonio Rodríguez Arguelles, María Carmen Valencia Matarranz, Laura María			
E-mail	jbravo@uvigo.gal			
Web				
General description	<p>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.</p> <p>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.</p> <p>In the laboratory will be realised experiences of synthesis and characterisation of coordination compounds, organometallic compounds and inorganic solids.</p>			

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

Describe some important catalytic cycles.

CE2
CE10
CE14
CE20
CE23
CT1
CT3
CT4
CT5
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
CE10
CE14
CE20
CE25
CE26
CE27
CE28
CT4
CT5
CT6
CT7
CT8
CT9
CT12
CT13
CT14
CT15

Contents

Topic

Subject 1. Solid state: Introduction and bases.	Technological importance of the inorganic solids. Classification of solids. Formulation of inorganic solids incorporating structural information. Polymorphism, pseudomorphism, polytypism.
Subject 2. Structural rationalization.	Sphere packing. Polyhedral representations. Pauling rules. Rule of the connectivity.
Subject 3. Structure of the solid.	Main structural types and his implication in the generation of useful properties of the solid.
Subject 4. Perfect and non-perfect crystals and their properties	Types of defects. Crystal point defects. Consequences of the presence of defects in the properties of the solid. Conductivity. Optical properties.
Subject 5. Organometallic chemistry of the main groups elements.	Introduction. Synthesis, properties and applications of the organometallic compounds of Li, Mg, B and Al.
Subject 6. Organometallic chemistry of the transition metals (I).	Introduction. Ligand types. Bonding. Characterization.
Subject 7. Organometallic chemistry of the transition metals (II).	Types of organometallic reactions: substitution, oxidative addition, reductive elimination, insertion, coordinated ligand reactions, etc.
Subject 8. Organometallic chemistry of the transition metals (III).	Reactivity of organometallic compounds: carbonyls, olefin complexes, carbenes, cyclopentadienyl complexes.
Subject 9. Organometallic catalysis.	Introduction. Olefin metathesis. Alkene hydrogenation. Methanol carbonylation. Alkene hydroformylation.
Subject 10. Metal atom clusters	Introduction. Types. Structure. Properties.
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 CT1 CE23 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 CT1 CE26 CT3 CE27 CT4 CE28 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 CT1 CE10 CT14 CE12 CE14 CE20

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

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	Grado en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Mandatory	4th	1st
Teaching language	Spanish			
Department				
Coordinator	Rodríguez de Lera, Angel			
Lecturers	Fall Diop, Yagamare Gómez Bouzó, Uxía Mora Ayuso, Paula Otero Calleiras, Daniel 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 his 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	<p>2.1. One- and two-group C-X disconnections (1,n).</p> <p>i. Synthons and synthetic equivalents.</p> <p>ii. Alternate polarities.</p> <p>iii. Inversion of polarity.</p> <p>iv. Functional groups interconversions.</p> <p>v. Addition and removal of functional groups.</p> <p>2.2. One- and two-group C-C disconnections (1,n).</p> <p>i. One-group C-C disconnections.</p> <p>ii. (1,n) C-C disconnections of difunctionalized compounds.</p> <p>2.3. Tactics of skeletal transformations. Rearrangements and fragmentations.</p>
4. CHEMOSELECTIVITY. PROTECTIVE GROUPS IN ORGANIC SYNTHESIS	<p>4.1. Strategies for the selection of protective groups: orthogonal or of modulated sensitivity .</p> <p>4.2. Description of protective groups.</p> <p>i. Sensitive to acids or bases.</p> <p>ii. Sensitive to fluoride.</p> <p>iii. Sensitive to reduction and oxidation reagents .</p> <p>iv. Other protective groups.</p>
5. STEREOCHEMICAL STRATEGIES . STEREOSELECTIVITY	<p>5.1. Description of Stereochemistry.</p> <p>i. Symmetry and chirality. Stereogenic units.</p> <p>ii. Topicity.</p> <p>iii. Relative configuration. Descriptors.</p> <p>5.2. *Stereochemistry in chemical reactions.</p> <p>i. Product selectivity.</p> <p>ii. Simple- and induced-distereoselectivity.</p> <p>5.3. Disconnections based in chiral fragments.</p>
6. DISCONNECTIONS OF UNSATURATED COMPOUNDS	<p>6.1. Stereoselective olefin synthesis .</p> <p>i. Carbanions stabilised by phosphorous: Wittig and HWE reactions.</p> <p>ii. Carbanions stabilised by silicon: Peterson reaction.</p> <p>iii. Carbanions stabilised by sulphur: Julia reaction.</p> <p>iv. Claisen rearrangement.</p> <p>v. Olefin metathesis.</p> <p>6.2. Palladium-catalyzed reactions.</p> <p>i. Heck reaction.</p> <p>ii. Stille, Negishi and Suzuki cross-coupling.</p>
7. FORMATION AND REACTIVITY OF CYCLIC COMPOUNDS. TOPOLOGICAL STRATEGIES	<p>7.1. Formation of saturated carbocyclic and heterocyclic compounds.</p> <p>i. Cyclization reactions. The Thorpe-Ingold effect.</p> <p>ii. Baldwin Rules.</p> <p>iii. Formation of carbocyclic compounds.</p> <p>7.2. Formation of heterocyclic compounds.</p> <p>i. (3+2) Cycloadditions.</p> <p>ii. Condensation of dicarbonyl compounds.</p> <p>7.3. Properties and reactivity of aromatic heterocyclic compounds.</p> <p>7.4. Topological strategies in Retrosynthetic Analysis.</p>
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

*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	<p>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.</p> <p>2.- The laboratory notebook.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>Results of the learning:</p> <ol style="list-style-type: none"> 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	<p>A short answer exam will be carried out (10%).</p> <p>Results of the learning:</p> <ol style="list-style-type: none"> 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	<p>A global proof for the evaluation of the competitions acquired in the subject.</p> <p>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.</p> <p>Results of the learning:</p> <ol style="list-style-type: none"> 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

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

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

Complementary Bibliography

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

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

Recommendations

Subjects that continue the syllabus

Pharmaceutical chemistry/V11G200V01903

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				
Environmental chemistry				
Subject	Environmental chemistry			
Code	V11G200V01902			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish English			
Department				
Coordinator	Leao Martins, Jose Manuel			
Lecturers	Leao Martins, Jose Manuel Tojo Suárez, María Concepción			
E-mail	leao@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

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	Grado 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	<p>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.</p> <p>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.</p>			

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	
Diferentiate and understand the concepts: drug, active principle, medicine and pharmacological target	CB4	CE20 CE23	CT1 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 Moovi 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

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

Complementary Bibliography

Recommendations

Subjects that are recommended to be taken simultaneously

Final Year Dissertation/V11G200V01991

Subjects that it is recommended to have taken before

Organic chemistry III/V11G200V01704

Other comments

It is recommended to have previous knowledge of Biological Chemistry

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	Grado en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Vecino Bello, Xanel			
Lecturers	Leao Martins, Jose Manuel Vecino Bello, Xanel			
E-mail	xanel.vecino@uvigo.es			
Web				
General description	<p>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.</p> <p>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.</p> <p>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.</p>			

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
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(*) 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 CE19 CE20	CT4 CT5 CT7 CT8 CT9
New	CE16 CE20	CT4 CT8 CT9 CT10 CT12 CT13

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
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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

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				
Internships: Internships in companies				
Subject	Internships: Internships in companies			
Code	V11G200V01981			
Study programme	Grado en Química			
Descriptors	ECTS Credits 6	Type Optional	Year 4th	Quadmester 2nd
Teaching language	Spanish Galician			
Department				
Coordinator	García Bugarín, Mercedes Peña Gallego, María de los Ángeles			
Lecturers	García Bugarín, Mercedes			
E-mail	mgarcia@uvigo.es mpena@uvigo.es			
Web	http://quimica.uvigo.es/index.php/practicas-en-empresas.html			
General description	<p>The aim of this matter is that the students carry out a stay in a company with the end to make tasks related with the professional field of the Chemistry.</p> <p>By means of the realisation of internships periods in companies the students will be able to apply the knowledges and competitions adquired during his studies, to complement and reinforce his training and to facilitate his incorporation to the labour market.</p>			

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
CE20	Evaluate, interpret and synthesize data and chemical information
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
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

Contrast the attitudes and the theoretical-practical competences acquired.	CB1 CB2 CB3 CB4	CE20 CE24 CE25	CT1 CT2 CT3 CT4 CT5 CT6 CT7 CT8 CT9 CT10 CT11 CT12 CT13 CT14 CT15 CT16 CT17 CT18
Perform tasks to test the critical and reflexive capacity.	CB1 CB2 CB3 CB4	CE20 CE24 CE25	CT1 CT2 CT3 CT4 CT5 CT6 CT7 CT8 CT9 CT10 CT11 CT12 CT13 CT14 CT15 CT16 CT17 CT18
Take decisions and put in practice the capacity of analysis and synthesis in the resolution of practical problems.	CB1 CB2 CB3 CB4	CE20 CE24 CE25	CT1 CT2 CT3 CT4 CT5 CT6 CT7 CT8 CT9 CT10 CT11 CT12 CT13 CT14 CT15 CT16 CT17 CT18

Contents

Topic

The students will integrate in the company organization and will coordinate with the members of the work group assigned.

The students will make activities related to the exert of the profession and with the knowledges and the competences of his studies.

The activities made by the students will be supervised and evaluated by the academic tutor and the company tutor.

Planning

	Class hours	Hours outside the classroom	Total hours
Practicum, External practices and clinical practices	0	120	120
Report of practices, practicum and external practices	0	30	30

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

Methodologies

	Description
Practicum, External practices and clinical practices	(*)Os estudantes desenvolven actividades nun contexto relacionado co exercicio dunha profesión, durante un período determinado, realizando as funcións asignadas e previstas na proposta de prácticas.

Personalized assistance

Methodologies	Description
Practicum, External practices and clinical practices	
Tests	Description
Report of practices, practicum and external practices	

Assessment

	Description	Qualification	Evaluated Competences
Practicum, External practices and clinical practices	The qualification will take into account the performance evaluation of the student made by the company tutor and the monitoring made by the academic tutor.	80	
Report of practices, practicum and external practices	When concluding the practices, the students will have to deliver to his academic tutor a final memory to be evaluated.	20	

Other comments on the Evaluation

* This matter will be ruled by the established in the Normative of External Practices of the Degree in Chemistry.

* The academic tutors will make the global evaluation of the external practices considering:

(70%) The report made by the company tutor (D5 form of the University of Vigo) in which it will value elements related with the practices made by the student as punctuality, assistance, responsibility, capacity of work in groups and integration in the company, quality of the work made, etc.

(20%) The memory that students must elaborated at the conclusion of the internship period in which they will have to appear, among others, a concrete and detailed description of the tasks performed and the departments within the company to which the student was assigned, a relation of the problems proposed and the procedure followed for his resolution, the level of integration inside the company and the relations with the personnel and a critical reflection about the education received during the degree studies and its adequation for the realization of external practices (see section 3 of article 8 of the Normative of External Practices).

The memory will have a minimum extension of 10 and a maximum of 20 pages of A4 size, including cover, index and annexes. Minimum margins of 2 cm, size of letter of 12 points, simple leading and paragraph justification are recommended. Tables and figures will appear numbered consecutively along the text and must include a brief heading to describe its content.

The grade of the written memory will be included in the *Observaciones/Sugerencias* section of the D7 form filled by the academic tutor.

(10%) The assessment of the academic tutor (D7 form of the University of Vigo) of the aptitude and attitude showed by the student during the development of the activities made.

* The academic tutor will reflect the result of the global evaluation in the D8 form of the University of Vigo.

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

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 ===

Internships will change to telematic work if it is possible. In other case, it will postpone until the situation allow it. In exceptional case, students will carry out equivalent activities.

Individual tutoring will be carried out by telematic means (email, videoconference at the Remote Campus, FAITIC forums, ...).

IDENTIFYING DATA				
Final Year Dissertation				
Subject	Final Year Dissertation			
Code	V11G200V01991			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Type	Year	Quadmester
	18	Mandatory	4th	2nd
Teaching language	#EnglishFriendly 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	<p>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.</p> <p>The objective of the subject is to offer the students the opportunity to apply the knowledges, skills and competences adquired during the Degree studies.</p> <p>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.</p> <p>English Friendly subject: International students may request from the teachers:</p> <p>a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.</p>			

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
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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
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			CE17	CT17
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			CE19	
			CE20	
			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.
