(*)Facultade de Química

Presentation

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

Degrees given in the Faculty

Degree in Chemistry

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

Web page

Information about the Faculty of Chemistry:

http://quimica.uvigo.es

Grado en Química

Subjects

Year 4th

Code	Name	Quadmester	Total Cr.
V11G201V01401	Project	1st	6
V11G201V01402	Chemistry of Materials	1st	6
V11G201V01403	Nanochemistry	1st	6
V11G201V01404	Organometallic Chemistry	1st	6
V11G201V01405	Stereoselective Synthesis of Bioactive Compounds	1st	6
V11G201V01406	Enhancement of Analytical Chemistry	2nd	6
V11G201V01407	Quality in Analytical Labs	1st	6

V11G201V01408	Industrial Chemistry	1st	6
V11G201V01409	Enhancement of Physical Chemistry	2nd	6
V11G201V01410	Food, Agricultural and Environmental Analytical Chemistry	2nd	6
V11G201V01411	Computational Chemistry	2nd	6
V11G201V01412	Environmental and Bioinorganic Chemistry	2nd	6
V11G201V01413	Therapeutic Chemistry	2nd	6
V11G201V01414	Industrial Health and Safety	2nd	6
V11G201V01415	Computing Techniques for Chemistry	2nd	6
V11G201V01416	Environmental Technologies	2nd	6
V11G201V01417	Theory of Organic Reactions	2nd	6
V11G201V01418	Condensed Matter	2nd	6
V11G201V01419	Immunochemistry	2nd	6
V11G201V01420	Introduction to Business Management	1st	6
V11G201V01981	Internships	2nd	6
V11G201V01991	Final Year Dissertation	2nd	18

IDENTIFYING DATA				
Project				
Subject	Project			
Code	V11G201V01401			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Gómez Costas, Elena			
Lecturers	Gómez Costas, Elena González de Prado, Begoña			
E-mail	elenagc@uvigo.es			
Web	http://https://moovi.uvigo.gal/			
General description	This subject, from the fourth year of the Chemistry Degree, has as main objective to introduce the student to the methodology, direction, management and organization of projects in the field of Chemistry. With the knowledge acquired in Chemistry, Chemical Engineering and other related subjects, the student must be able to develop a project in Chemistry. At the end of the course, the student must be able to write, plan, execute and direct industrial projects in the field of Chemistry. As a subject of the English Friendly program, international students may request from the teacher: a) materials and bibliographical references to follow the subject in English, b) attend tutorials in English, c) tests and evaluations in English.			

Training and Learning Results	
Code	
A1	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
B3	Ability to manage information
C4	Use computer tools properly to obtain information, process data, perform computational calculations and calculate matter properties
C5	Present material and scientific arguments in oral and written form to a specialized audience
D2	Capacity for teamwork
D3	Ability to communicate in both oral and written form in Spanish and / or Galician and / or English

Expected results from this subject	Training and Learning Results			
Evaluate the feasibility of carrying out a project related to the competencies of a chemist.	A1 A4	B3	C4	D2
Organise, manage and develop a project in Chemistry	A1 A4		C5	D3
Evaluate the potential impact (environmental, socioeconomic) of a project.	A1 A4		C4	D3
Elaborate structured technical reports and present them using appropriate audiovisual means.	A1	B3		D3

Contents	
Topic	
Subject 1. The projects in chemistry	Professional competitions of the chemists. Definition and aims and classification. Stages and organisation. Legal appearances
Subject 2. Design of a project	Analysis of the sector. Study of market. Size of the project. Location.
Subject 3. Engineering of the project	Diagrams of flow. Calculations and balances. Equipment.
Subject 4. Economic evaluation of a project	Investment and costs. Profitability. Analysis of risk.

Subject 5. Environmental evaluation of a project	Pollution. Preventive measures and/or of correction. Waste. Cycle of Life.
Subject 6. Documentation of a project	Memory. Planes. I fold of conditions. Methods. Norms.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	12	17	29
Seminars	28	39	67
Essay questions exam	2	0	2
Objective questions exam	0	2	2
Project	0	50	50
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Exhibition by part of the professor of the most fundamental appearances of each subject, taking like base the available documentation in the platform Moovi. The students will be able to work, before each session, the material that provides him the professor related with the content that will treat in each subject.
Seminars	The students, with the support of the professor, will make the design and development of some concrete projects of chemistry that will form part of the evaluation of the subject, and resolution of practical cases related with the matter.

Personalized assistance	
Methodologies	**Description**
Lecturing	It will resolve him to the student any doubt related with the contents, problems or the project of face-to-face form (previous appointment by email), or of virtual form, according to preference of the student.
Seminars	It will resolve him to the student any doubt related with the contents, problems or the project of face-to-face form (previous appointment by email), or of virtual form, according to preference of the student.
Tests	**Description**
Objective questions exam	It will resolve him to the student any doubt related with the contents, problems or the project of face-to-face form (previous appointment by email), or of virtual form, according to preference of the student.
Essay questions exam	It will resolve him to the student any doubt related with the contents, problems or the project of face-to-face form (previous appointment by email), or of virtual form, according to preference of the student.
Project	It will resolve him to the student any doubt related with the contents, problems or the project of face-to-face form (previous appointment by email), or of virtual form, according to preference of the student.

Assessment			
	Description	Qualification	Training and Learning Results
Essay questions exam	It will make a long proof of all the matter	30	D3
Objective questions exam	They will make four proofs the long of the course. Said proofs will consist in one splits type test and in another part of resolution of practical cases. The first when finalising the two first subjects, the second of the subject 4, the third of the subject 5 and the last when finalising the subject 6. The length of the same will be between 1 hour and 2 hours.	40	D3
Project	The student will make the approach and development of a concrete project of chemistry, and east will be evaluated so much by his oral exhibition as by his presentation written.	30	

Other comments on the Evaluation

FIRST ANNOUNCEMENT

To surpass the subject is compulsory to obtain like minimum 40% of the calification assigned to the project and to the final examination.

The participation of the student in any one of the proofs written or the delivery of n work to involve the condiction of presented and therefore the asignation of calification

SECOND ANNOUNCEMENT

For the second announcement keep the qualifications of evaluation continuous (so much of the 4 proofs of questions written as of the work) obtained along the course, always that these were equal or upper to 4. The student will present to the no surpassed parts previously.

Commitment etic

It expects that the present student a behaviour etic suitable. In case to detect a behaviour no etic (copy, plagiarism, use of devices electronics unauthorised, for example), there are that the student have not 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 gestíon de proyectos para ingenierios 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 it is recommended to have taken before

Chemical engineering/V11G201V01301

IDENTIFYING DATA				
Chemistry of Materials				
Subject	Chemistry of Materials			
Code	V11G201V01402			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Pérez Lourido, Paulo Antonio			
Lecturers	Pérez Lourido, Paulo Antonio Puértolas Lacambra, Begoña Valencia Matarranz, Laura María			
E-mail	paulo@uvigo.es			
Web				
General description	Structure, properties and application of the different types of materials. English Friendly Subject: International students may request from teachers: a) materials and bibliographic references in english, b) tutoring sessions in english, c) exams and assessments in english.			

Training and Learning Results	
Code	
A2	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
B1	Ability for auronomous learning
B3	Ability to manage information
B4	Ability for analysis and synthesis
C16	Know the relationship between macroscopic properties and properties of individual atoms and molecules, including macromolecules (natural and synthetic), polymers, colloids, crystals and other materials
C24	Know the properties and applications of materials
D3	Ability to communicate in both oral and written form in Spanish and / or Galician and / or English

Expected results from this subject	Training and Learning Results			
Recognise the differences between the plastic and elastic deformation		B1 B3 B4	C16 C24	D3
Differentiate between electrical and ionic conductivity. Distinguish the intrinsic semiconductors of the *extrínsecos.		B1 B3 B4	C16 C24	D3
Distinguish hard magnetic materials and soft from his cycle of *histérisis.		B1 B3 B4	C16 C24	D3
Describe the optical properties of the metals and no metals		B1 B3 B4	C16 C24	D3
Explain the thermal properties more important of the materials.		B1 B3 B4	C16 C24	D3
Analyse and describe the characteristics of the alloys in function of his diagrams of phases.	A2 A3	B1 B3 B4	C16 C24	D3
Describe the properties of the different ceramic materials, polymers and compound.	A2 A3	B1 B3 B4	C16 C24	D3
Tackle the processes and basic technicians for the obtaining and characterisation of (*nano)material.	A2 A3	B1 B3 B4	C16 C24	D3

Contents	
Topic	
Subject 1. Introduction	Historical perspective of the development of the materials. Why study the materials? Classification of the materials. Need of new materials.
Subject 2. Properties of the materials	Mechanical properties, electrical, magnetic, optical and thermal of the materials.
Subject 3. Metallic materials and alloys, polymeric and ceramic materials.	Characteristics, properties and applications of the metals, alloys (diagrams of phases), polymers and ceramic.
Subject 4. Compound materials	General characteristics. Classification. Materials reinforced.
Subject 5. New materials and Nanomaterials	Nanoscience and nanotechnology. Methods of preparation. Properties to nanoscale.
Subject 6. Characterisation of materials	Isotherms of adsorption and quimisorción to temperature programmed. Microscopy of vicinity and electronic. Fotoelectrónic Spectroscopy.

Planning			
	Class hours	Hours outside the classroom	Total hours
Seminars	12	45	57
Lecturing	24	45	69
Objective questions exam	2	10	12
Objective questions exam	2	10	12
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Seminars	They will devote to the resolution of doubts and questions that arise in the development of each subject, to the resolution of problems and/or exposed exercises by the profes@r and to the presentation by part of the alumn@s of some report and/or work related with the matter.
Lecturing	The alumn@s will receive 24 hours of classes *expositivas in an only group, that will devote to the presentation of the fundamental appearances of each subject.

Personalized assistance	
Methodologies	**Description**
Seminars	The alumn@s will be able to consult *toto type of doubts related with the matter in the *tutorías.

Assessment							
	Description	Qualification	Training and Learning Results				
Seminars	In addition to resolving practical exercises that allow to the alumn@s 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 the continuous evaluation of the alumn@s. This process of continuous evaluation will make through the resolution of exercises and/or problems as well as by means of the realisation of reports and/or works that will be exposed by the alumn@s and that will be related with the contents of the matter. The evaluation of the Seminars of the subjects 1-3 *equivaldrá to 10% of the final note and the one of the subjects 4-6 to 25%.	35	A3	B1 B3 B4	C16 C24	D3
Objective questions exam	Along the cuatrimestre will make a proof that will cover the Subjects 1-3 and will suppose 40% of the final note.	40	A3	B1 B3 B4	C16 C24	D3
Objective questions exam	At the end of the *cuatrimestre will make a second proof that will cover the Subjects 4-6 and will suppose 25% of the final note.	25	A3	B1 B3 B4	C16 C24	D3

Other comments on the Evaluation

Observations:

The participation of any of the proofs 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 note in each one) to be able to take into account the other elements of evaluation.

Evaluation of July: The students that non surpass one or the two short proofs that make during the cuatrimestre, will have to present to the corresponding part in the announcement of July. This proof will substitute the results obtained in the tests/s short/s made along the cuatrimestre. 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 like final qualification of the matter.
If the student renounces to the continuous evaluation and opts by a global evaluation, each one of the short proofs will cost 50% of the final note. The students that non surpass one or the two short proofs that make during the cuatrimestre, will have to present to the corresponding part in the announcement of July.

Sources of information

Basic Bibliography

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

Complementary Bibliography

Recommendations

Subjects that are recommended to be taken simultaneously

Nanochemistry/V11G201V01403

Subjects that it is recommended to have taken before

Physics: Physics 2/V11G201V01107
Physical Chemistry II: Surfaces and Colloids/V11G201V01208
Inorganic chemistry II/V11G201V01209
Inorganic Chemistry III: Coordination Chemistry/V11G201V01304
Inorganic Chemistry IV: Transition Metals and Solid State/V11G201V01309

IDENTIFYING DATA				
Nanoquímica				
Subject	Nanoquímica			
Code	V11G201V01403			
Study programme	Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	1c
Teaching language	Castelán			
Department	Química Física			
Coordinator	Correa Duarte, Miguel Ángel			
Lecturers	Correa Duarte, Miguel Ángel Pastoriza Santos, Isabel			
E-mail	macorrea@uvigo.es			
Web				
General description	Esta asignatura optativa do 1º cuatrimestre de 4º do Grao en Química combina coñecementos de química cos de otras ciencias fundamentais eaplicadas nos temas que trata, como biotecnoloxía, mediciña, física, materiais, inxeniería, etc. Por iso está pensada con un gran carácter práctico. Deste modo diferentes conceptos relacionados coa nanoquímica serán explicados en las clases maxistrales e seminarios (superhidrofobicidade, materiais autoreparables, células fotovoltaicas, propiedades ópticas, magnéticas de nanomateriais, etc□) e después nas clases de laboratorio os alumnos, dende un punto de vista práctico, verán como estos coñecementos teñen una traducción directa na nanotecnoloxía, xenerando aplicacions reales y tanxibles (materiales autolimpiables, sensores colorimétricos, células fotovoltaicas, catalizadores, etc□).			

Resultados de Formación e Aprendizaxe	
Code	
A1	Que os estudantes saiban aplicar os seus coñecementos ó seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo
A5	Que os estudantes desenvolvan aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores cun alto grao de autonomía
B4	Capacidade de análise e síntese
B5	Capacidade de adaptarse a novas situacións e adoptar decisións
C34	Seleccionar e utilizar distintos procedementos de obtención e caracterización de nanomateriales e coñecer o seu potencial no desenvolvemento de novas aplicacións
D2	Capacidade para traballar en equipo
D3	Capacidade para comunicarse de forma oral e escrita en castelán e/ou galego e/ou inglés

Resultados previstos na materia				
Expected results from this subject	Training and Learning Results			
Coñecer os métodos de síntese de nanomateriais máis extendidos e ser capaz de describir os aspectos máis importantes dos mesmos.	A1 A5		C34	D3
Coñecer técnicas básicas de analisis de nanoestructuras.	A5	B4 B5	C34	
Coñecemento das principais aplicacións das nanoestruturas	A1	B4 B5	C34	D2 D3

Contidos	
Topic	
Tema 1. Introducción a Nanoquímica. Mecanismos de obtención de nanomateriales. Propiedades de Nanomateriales	Introducción. Metodos de síntesis de nanomateriales Propiedades de los Materiales
Tema 2. Tecnicas de caracterización de nanomateriales.	Microscopía de forzas atómicas e microscopía de efecto tunel.
Tema 3. Aplicaciones dos nanomateriales	Applicaciones en nanomedicina, enerxía, catalises, etc...

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	12	20	32
Seminario	12	24	36
Prácticas de laboratorio	28	37	65
Exame de preguntas obxectivas	2	15	17

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

Metodoloxía docente	
	Description
Lección maxistral	Exposición oral e directa, por parte do profesorado, dos coñecementos fundamentais correspondentes aos contidos da materia.
Seminario	Presentación e discusión de publicacións científicas e diferentes tópicos previamente asignados polo profesorado.
Prácticas de laboratorio	Realización, por parte do alumnado, de experimentos relacionados cos contidos da materia

Atención personalizada	
Methodologies	**Description**
Lección maxistral	Resolución de dúbidas, mediante concertación de cita previa, ao través do Campus Remoto.
Seminario	Resolución de dúbidas, mediante concertación de cita previa, ao través do Campus Remoto.
Prácticas de laboratorio	Resolución de dúbidas, mediante concertación de cita previa, ao través do Campus Remoto.

Avaliación						
	Description	Qualification	Training and Learning Results			
Lección maxistral	A finalidade desta proba coñecementos alcanzado polo alumnado. O seu peso, dependendo dos outros apartados da avaliación será: 40%-100%. A cualificación ha de ser polo menos 4.0 sobre 10 para que poida realizarse media cos outros apartados.	40	A5		C34	
Seminario	A súa realización é obrigatoria. Puntúanse por valoración da participación activa do alumno nos seminarios, resolución de problemas, exposición de traballos, etc.	30	A1	B4	C34	D2 D3
Prácticas de laboratorio	A súa realización é obrigatoria. Puntúanse por valoración do seu desenvolvemento experimental (15%) así como pola dun informe de prácticas. Este ha de confeccionarse de forma individual ou en grupo (segun determine o profesor), conter táboas, gráficas e os cálculos necesarios para a obtención dos resultados, así como unha análise dos mesmos, en relación co procedemento experimental e o fundamento teórico empregados. Debe entregarse ao profesor encargado do correspondente grupo de laboratorio no prazo que se estableza (15%)	30	A1 A5		C34	D2 D3

Other comments on the Evaluation

Para aprobar a materia é necesario aprobar as prácticas de laboratorio e seminarios.

De realizarse unha proba escrita a puntuación debe ser polo menos 4 sobre 10 para poder facer media coas outras seccións

da avaliación. A puntuación media total debe ser de 5 puntos sobre 10 ou superior para que poda superarse a materia.

A presentación de calquera exercicio que poida ser avaliado, ou a realización de práctica ou proba imposibilita que a

cualificación sexa 'non presentado'.

No exame de Xullo (2ª oportunidade) manterase a cualificación obtida polo alumnado na presentación e nas prácticas de laboratorio realizadas durante o período docente. Iso significa que o alumnado unicamente realizará a proba de preguntas obxectivas no devandito exame.

Compromiso ético. Espérase que o alumnado presente un comportamento ético adecuado. En caso de detectar un comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non autorizados, por exemplo), considerarase que esa persoa non reúne os requisitos necesarios para superar a materia.

Bibliografía. Fontes de información

Basic Bibliography

Kirkland, A.I., Hutchison, J.L., **Nanocharacterisation**, RSC, Cambridge, 2007

Dieter Vollath, **Nanomaterials : an introduction to synthesis, properties and application**, 2, Weinheim : Wiley-VCH, cop., 2013

Complementary Bibliography

C. Bréchignac, P. Houdy, M. Lahmani, **Nanomaterials and nanochemistry**, Berlin : Springer,, 2010

Ozin, Geoffrey A., **Nanochemistry : a chemical approach to nanomaterials**, Cambridge : RSC Publishing, cop., 2005

Recomendacións

IDENTIFYING DATA				
Organometallic Chemistry				
Subject	Organometallic Chemistry			
Code	V11G201V01404			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Talavera Nevado, María			
Lecturers	Talavera Nevado, María			
E-mail	matalaveran@uvigo.es			
Web				
General description	In this subject we'll study the properties of the compounds that have, at least, one bond between a transition metal and a carbon atom. We'll also study their applications in different processes of organic synthesis catalized by transition metals. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English			

Training and Learning Results	
Code	
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
B1	Ability for auronomous learning
B3	Ability to manage information
B4	Ability for analysis and synthesis
C38	Relate the structural bases of organometallic compounds with their physical, spectroscopic and chemical properties
C39	Select the appropriate techniques and procedures for problems of structural elucidation, synthesis, isolation and purification of organometallic compounds
D2	Capacity for teamwork

Expected results from this subject	Training and Learning Results			
Define organometallic compound.			C38	
Rationalize the information provided by the usual spectroscopic techniques for the characterization of the different types of organometallic compounds.	A3	B1 B3 B4	C38 C39	
Identify the main types of organometallic reactions.		B1	C38	
Propose methods of synthesis for the different types of organometallic compounds.	A3	B1 B3 B4	C38 C39	
Predict the stability and reactivity of the different types of organometallic compounds.	A3	B1 B3 B4	C38	
Describe the most important catalytic cycles.	A3	B1	C38	
Carry out in the laboratory the preparation, characterization and study of organometallic compounds.	A3		C38 C39	D2

Contents	
Topic	
Subject 1. Introduction	Definition. History. Ranking. Types of ligands. Rule of the 18 electrons.
Subject 2. Organometallic compounds with type L ligands (I).	Carbonyls, phosphines, carbenes and carbines.
Subject 3. Organometallic compounds with type L ligands (II).	Pi complexes: Alkenes, alkynes, polyenes and arenes.
Subject 4. Organometallic compounds with type L ligands (III).	Sigma complexes: Dihydrogen, silanes, boranes and alcanes.
Subject 5. Organometallic compounds with type X ligands.	Hydrides, alkyls, aryls and vinyls.

Subject 6. Organometallic compounds with carbon LnX ligands.	Alyls and cyclopentadienyls.
Subject 7. Types of organometallic reactions (I).	Ligand substitution reactions.
Subject 8. Types of organometallic reactions (II).	Reactions of oxidative addition and reductive elimination.
Subject 9. Types of organometallic reactions (III).	Reactions of migratory insertion and elimination.
Subject 10. Types of organometallic reactions (IV).	Reactions of nucleophilic and electrophilic attack to coordinated ligands.
Subject 11. Organometallic catalysis.	General comments. Relevant catalytic cycles.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	24	48	72
Problem solving	12	24	36
Laboratory practical	14	14	28
Essay questions exam	1	4	5
Essay questions exam	1	8	9

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

Methodologies

	Description
Lecturing	Students, in a single group, will receive 24 hours of expository classes in which the teacher will present the most relevant aspects of each topic.
Problem solving	Students, in a single group, will receive 12 hours of seminar classes that will be dedicated to solving doubts or questions that arise in the development of each topic, and to the resolution of questions, exercises and problems proposed by the teacher.
Laboratory practical	Laboratory practices will be carried out in which the theoretical knowledge acquired will be applied. The practices will be carried out in 4 sessions of 3.5 hours and the students must reflect and interpret what is observed in the corresponding laboratory notebook.

Personalized assistance

Methodologies	Description
Lecturing	Students will be able to consult all kinds of doubts related to the subject during the tutorial hours.
Problem solving	Students will be able to consult all kinds of doubts related to the subject during the tutorial hours.
Laboratory practical	Students will be able to consult all kinds of doubts related to the subject during the tutorial hours.

Assessment

	Description	Qualification	Training and Learning Results
Problem solving	In addition to resolving practical exercises that allow to the students settle the knowledges on the subjects developed in the classes of theory, and to resolve all the exposed doubts, the classes of seminar, will use to carry out the continuous evaluation of the students. This process of continuous evaluation will make through the resolution of exercises inside and out of the classroom related with the contents of the matter as well as the resolution of short questions proposals by the professor. The global note of all the exercises will have to surpass the 3 on 10 to be taken into account in the final note.	20	A3 B1 C38 B3 C39 B4
Laboratory practical	The assistance to the face-to-face practical classes is compulsory. The evaluation in the practices of laboratory will consist of a part based in the behaviour and skill by direct observation of the/to professor/to as well as of the previous and back work to the experimental work. It needs a 5 on 10 to pass the course. 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.	15	A3 B1 C38 D2 B3 C39 B4
Essay questions exam	A short proof on the contents of the first part of the course. It will demand a minimum note of 3.5 points out of 10 to pass the course	25	B1 C38 B3 C39 B4
Essay questions exam	A final proof in which it will have a global evaluation of the course and will cost 40% of the final note. It requires a 4 on 10 to pass the course	40	B1 C38 B3 C39 B4

Other comments on the Evaluation

Requirements for passing the course

- Pass the laboratory practicals with a grade equal to or higher than 5 out of 10.

- A mark of 5 out of 10 in the global calification of all the methodologies/tests in continuous assessment or exclusively in the final exam in the second opportunity for non-continuous assessment.

Development of continuous evaluation

- The specific competences of the subject related to the competences of the degree will be evaluated explicitly in deliverable exercises and written tests. The basic, general and transversal competences will be assessed implicitly in the marking of the exercises.

- In order to take them into account in the final grade, a score higher or equal to that detailed in the description of each test will be required.

-Students who do not pass the subject at the end of the term will have to take a written test in the final evaluation period in July. This test will be worth 40% of the mark and will replace the results of the end of term test. The marks for the rest of the activities are not recoverable.

Non-continuous evaluation

The choice of the non-continuous assessment modality implies the renunciation of the right to continue the assessment of the remaining activities of the continuous assessment modality and of the grade obtained up to that moment in any of the tests that have already taken place.

In the case of choosing the non-continuous evaluation or not achieving the minimum mark required for continuous assessment, the student may take a test at the end of the term in which he/she will have to solve questions related to all the specific competences of the subject except the practicals. This test will be different in length to the one taken by those who opt for continuous assessment and the grade obtained will be the final grade for the subject without taking into account the grade for the practicals. A 5 out of 10 will be required to pass the course.

Sources of information
Basic Bibliography
Housecroft, C. E.; Sharpe, A. G., **Inorganic Chemistry**, 5, Harlow: Pearson Education, 2018
Crabtree, R. H., **The organometallic chemistry of the transition metals**, 6, Wiley, 2014
Complementary Bibliography
Spessard, G. O., **Organometallic chemistry**, 3, Oxford University Press, 2015
Astruc, D., **Química organometálica con ejercicios corregidos**, 1, Reverté, 2003
Elschenbroich, Ch., **Organometallics**, 3, Wiley-VCH, 2006
Haiduc, I., **Basic organometallic chemistry**, 1, Walter De Gruyter, 1985
Toreki, R., **The Organometallic Hypertext Book, http://www.ilpi.com/organomet/index.html**, 2016

Recommendations

IDENTIFYING DATA				
Síntese estereoselectiva de compostos bioactivos				
Subject	Síntese estereoselectiva de compostos bioactivos			
Code	V11G201V01405			
Study programme	Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	1c
Teaching language	Castelán			
Department	Química orgánica			
Coordinator	Rodríguez de Lera, Angel			
Lecturers	Rodríguez de Lera, Angel			
E-mail	qolera@uvigo.es			
Web	http://https://cinbio.es/orchid			
General description	Tras haber recibido formación en las propiedades de los grupos funcionales y en los procesos de transformación entre los mismos, se abordará en este curso la creación de nuevos estereocentros en moléculas orgánicas, y se detallarán las consideraciones conformacionales y electrostáticas de las moléculas que puedan participar en la creación de nuevos estereocentros. Los estudiantes internacionales pueden solicitar al profesorado el material del curso en inglés, así como recibir tutorías, pruebas y evaluaciones en dicho idioma.			

Resultados de Formación e Aprendizaxe	
Code	
A4	Que os estudantes poidan transmitir información, ideas, problemas e solución a un público tanto especializado coma non especializado
A5	Que os estudantes desenvolvan aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores cun alto grao de autonomía
B4	Capacidade de análise e síntese
C42	Coñecer estratexias sintéticas que permitan a obtención estereoselectiva de compostos con actividade biolóxica
D1	Capacidade para resolver problemas
D2	Capacidade para traballar en equipo

Resultados previstos na materia				
Expected results from this subject	Training and Learning Results			
(*)Nueva	A4 A5	B4	C42	D1 D2

Contidos
Topic
1. FUNDAMENTOS DA SÍNTESE ESTEREOSELECTIVA 1.1. Introducción. Evolución da síntese estereoselectiva 1.2. Descripción da estereoselectividade 1.2.1. Simple 1.2.2. Inducida 1.2.2.1. Inducida polo sustrato 1.2.2.2. Inducida polo auxiliar 1.2.2.3. Inducida polo aditivo 1.2.2.4. Ligandos enantiopuros 1.3. Análisis Conformacional 1.3.1. Alcanos 1.3.2. Olefinas. Tensión alílica 1.3.3. Ciclohexanos e derivados 1.3.4. Tetrahidropiranos. O efecto anomérico 1.3.5. Tensión I 1.3.6. Compuostos bicíclicos 1.3.7. A regla de Fürst-Plattner

2. CINÉTICA E TERMODINÁMICA DAS REACCIÓNS ESTEREOSELECTIVAS
2.1. Procesos de creación de novos estereocentros
2.1.1. Reaccións non estereoselectivas
2.1.2. Reaccións estereoselectivas
2.2. Análisis de traxectorias de adición nucleófila
2.3. Postulado de Hammond
2.4. O principio de Curtin-Hammett
2.5. Reaccións organocatalizadas
2.5.1. Modos de activación con organocatalizadores
2.5.2. Reaccións en cascada organocatalizadas

3. PROCESOS DE OXIDACIÓN ASIMÉTRICA
3.1. Epoxidación asimétrica de Sharpless
3.1.1. Fundamento e aplicacións
3.1.2. Modelo de enantioselectividade
3.1.3. Aplicacións sintéticas
3.2. Epoxidación asimétrica de Jacobsen
3.2.1. Fundamento e aplicacións
3.2.2. Modelo de enantioselectividade
3.2.3. Aplicacións sintéticas
3.3. Dihidroxilación asimétrica de Sharpless
3.3.1. Fundamento e aplicacións
3.3.2. Modelo de enantioselectividade
3.3.3. Aplicacións sintéticas

4. PROCESOS DE REDUCCIÓN ASIMÉTRICA
4.1. Hidroxenación enantioselectiva catalítica de olefinas
4.2. Reducción enantioselectiva de cetonas
4.2.1. Reacción de Corey-Bakshi-Shibata (CBS)
4.2.2. Reducción diastereoselectiva de □-hidroxicetonas
4.2.3. Reducción diastereo e enantioselectiva de □-dicarbonilos

5. PROCESOS DE FORMACIÓN ESTEREOSELECTIVA DE ENLACES C-C
5.1. Adición enantioselectiva a grupos carbonilo
5.1.1. Reacción de organozincios
5.1.2. Reacción de derivados de alquinilo
5.1.3. Reacción de Nozaki-Hiyama-Kishi
5.2. Adición conxugada enantioselectiva a compostos □□□-insaturados
5.2.1. Adición de organozincios
5.2.2. Reducción asimétrica
5.2.3. Adición de heteroátomos
5.2.3. Alquilación de enolatos
5.2.4. Alquilación de azaenolatos
5.3. Reaccións enantioselectivas organocatalizadas
5.3.1. Adición conxugada
5.3.2. Epoxidación
5.3.3. Oxidación de cetonas
5.3.4. Adicións conxugadas con inversión de polaridade
5.3.5. Reaccións organocatalizadas en cascada

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	24	24	48
Seminario	12	36	48
Prácticas de laboratorio	14	11	25
Resolución de problemas e/ou exercicios	0	27	27
Exame de preguntas de desenvolvemento	1	0	1
Exame de preguntas de desenvolvemento	1	0	1

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

Metodoloxía docente	
	Description
Lección maxistral	Descripción, por parte del profesorado, dos contidos sobre a materia obxecto do estudo, bases teóricas e/ou directrices dun traballo, exercicio ou proxecto a desenvolver polos estudantes.
Seminario	Actividade de consolidación dos coñecementos adquiridos ao propoñer e resolver problemas de transformacións estereoselectivas na construcción de esqueletos funcionalizados con estereocentros.
Prácticas de laboratorio	Desenvolvemento práctico de tres procesos de síntese estereoselectiva empregando catalizadores quirais enantiopuros, incluíndo a organocatálise, complementado co análise espectroscópico dos estereoisómeros mayoritarios das transformacións sintéticas.

Atención personalizada	
Methodologies	**Description**
Lección maxistral	Cada estudante poderá solicitar ao docente as aclaracións que estime oportunas para unha mellor comprensión da materia e sobre a resolución con éxito dos exercicios e problemas propostos. Esta consulta puede tamén ser atendida en horario de titorías. Os horarios e despachos das mesmas estarán recollidas na páxina web do centro.
Seminario	Cada estudante poderá solicitar ao docente las aclaraciones que estime oportunas para unha mellor comprensión da materia e sobre a resolución con éxito dos exercicios e problemas propostos. Esta consulta pode tamén ser atendida en horario de titorías. Os horarios e despachos das mesmas están recollidas na páxina web do centro.
Prácticas de laboratorio	As prácticas de laboratorio xa presentan o diseño de aprendizaxe previo e a proposta metodolóxica que requiren antes da execución práctica. Os profesores atenden as mesmas de forma personalizada.
Tests	**Description**
Resolución de problemas e/ou exercicios	Similar ao indicado en Seminario.

Avaliación								
	Description	Qualification	Training and Learning Results					
Prácticas de laboratorio	A avaliación das clases de prácticas de xeito continuo, con cuestións do profesorado sobre o contido e desenvolvemento, así como e a Memoria das mesmas, suporá un 15% da cualificación final. Esixirase unha nota mínima de 4.0 puntos sobre 10.0 para superar a materia.	15	A4 A5	B4	C42	D1 D2		
Resolución de problemas e/ou exercicios	Cada estudante terá á súa disposición as titorías cos profesores da materia para resolver de forma individualizada as dúbidas que poidan xurdir ao longo do curso en cualquera dos seus aspectos: clases de teoría, clases de seminario ou resolución de problemas e/ou actividades autónomas. O obxectivo de ditas titorías é o de contribuir a que os estudantes poidan afianzar os seus coñecementos e enfrentarse en millores condicións as distintas actividades de avaliación propostas (probas escritas, resolución de exercicios). Entregables: O alumnado realizará traballos relacionados co contido da materia. Estes traballos deberán axustarse aos parámetros especificados polo profesorado, e presentaranse de forma escrita a través da plataforma habilitada ou a través dunha exposición oral e formarán parte da avaliación continua (20%).	40	A4 A5	B4	C42	D1 D2		
Exame de preguntas de desenvolvemento	Unha proba sobre os contidos dos primeiros temas, que suporá o 15% da cualificación final. Esixirase unha nota mínima de 2.5 puntos sobre 10.0 nesta proba para superar a materia.	15	A4 A5	B4	C42	D1 D2		
Exame de preguntas de desenvolvemento	Unha proba sobre TODOS OS CONTIDOS DA MATERIA, que suporá un 30% da cualificación final. Esixirase unha nota mínima de 4.0 puntos sobre 10.0 nesta proba para superar a materia.	30	A4 A5	B4	C42	D1 D2		

Other comments on the Evaluation

Prácticas de laboratorio:

A asistencia ás clases prácticas de laboratorio é obrigatoria.

O traballo de laboratorio será avaliado como se indicóu con anterioridade. Neste apartado incluiranse os seguintes aspectos: traballo previo e/ou posterior, desenvolvemento do traballo experimental e caderno de laboratorio. A avaliación do desenvolvemento do traballo experimental realizarase utilizando a ferramenta de observación sistemática.

Para que o alumnado supere a materia deberá obter a cualificación de APTO no traballo de prácticas de laboratorio.

No caso de que non se superen os mínimos esixidos nalghuna das probas anteriores, a cualificación final obtida na materia será a cualificación ponderada da proba de avaliación global.

Mínimos esixibles:

A identificación de erros conceptuais graves, conlevará unha asignación de actividades específicas orientadas a adquirir ditas competencias. Estas actividades serán evaluadas como parte do 20% correspondente aos entregables.

AVALIACIÓN EN XULLO: manterase a cualificación obtida polo alumnado durante o curso en resolución de problemas, prácticas de laboratorio e traballos. Realizarase unha proba sobre todos os contidos teóricos da materia que suporá un 45% da cualificación final e unha proba escrita da parte experimental que suporá un 15% da cualificación final. Será necesario alcanzar nestas probas un mínimo de 4 puntos sobre 10 para superar a materia e para ter en conta o resto dos elementos de avaliación.

ALUMNADO DE 2ª E POSTERIORES MATRÍCULAS: Ao estudantado que fose avaliado con APTO/A no traballo de laboratorio no curso anterior outorgaráselle mención de APTO/A no seguimento do traballo de laboratorio no curso académico actual, non sendo necesaria a realización dos experimentos novamente. Con todo, deberán realizar os entregables e a proba escrita da parte experimental para conseguir a cualificación correspondente á parte experimental da materia no curso académico actual.

CONDICIÓN DE PRESENTADO/A: A participación do/a estudante nalgún dos actos de avaliación da materia implicará a condición de presentado/a e, polo tanto, a asignación dunha cualificación. Considéranse actos de avaliación a asistencia a clases prácticas de laboratorio, a entrega de traballos e exercicios encargados polo profesorado, ou a realización de algunha proba.

OPCIÓN DE AVALIACIÓN NON CONTINUA: (provisional). A UVigo está a elaborar unha normativa ao respecto) o alumnado que desexe non optar á avaliación continua deberá solicitalo durante as tres primeiras semanas de curso á persoa coordinadora da materia.Para superar a materia deberá realizar as Prácticas de Laboratorio, acadar cualificación APTO/A no traballo desenvolvido no laboratorio e cualificación igual ou superior a 5 puntos sobre 10 na proba escrita da parte experimental. Ademais deberá obter como mínimo 5 puntos sobre 10 nunha proba na que se avaliarán todos os contidos da materia.

Bibliografía. Fontes de información

Basic Bibliography

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

Zweifel, G. S.; Nantz, M. H.; Somfai, P., **Modern Organic Synthesis. An Introduction**, Wiley, 2017

Complementary Bibliography

Corey, E. J.; Kürti, L., **Enantioselective Chemical Synthesis. Methods, Logic and Practice.**, Direct Book Publishing. Dallas: Texas, 2010

Corey, E. J.; Czakó, B.; Kürti, L., **Molecules and Medicines**, Wily, 2007

Recomendacións

Subjects that it is recommended to have taken before

Química orgánica III: Reaccións concertadas, radicalarias e fotoquímicas/V11G201V01305
Química orgánica IV: Deseño da síntese orgánica/V11G201V01310

IDENTIFYING DATA				
Enhancement of Analytical Chemistry				
Subject	Enhancement of Analytical Chemistry			
Code	V11G201V01406			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish			
Department				
Coordinator	Lavilla Beltrán, María Isela			
Lecturers	Lavilla Beltrán, María Isela			
E-mail	isela@uvigo.es			
Web	http://quimica.uvigo.es/gl/			
General description	This subject provides students with knowledge about important and current aspects of analytical chemistry (e.g., bioanalytical techniques, automation and miniaturisation, sensors and chemometrics). Students will be able to complete their training and integrate the knowledge acquired in analytical chemistry, which will allow them to address problem-solving in areas of special interest (e.g., clinical, environmental and industrial fields).			

Training and Learning Results	
Code	
A1	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
B4	Ability for analysis and synthesis
C30	Ability to understand, interpret and adapt the advances in the field of Analytical Chemistry
D1	Ability to solve problems

Expected results from this subject	Training and Learning Results			
Recognize the main current trends in analytical chemistry.		B4	C30	
Use and recognize different bioanalytical methodologies.	A1		C30	
Describe and distinguish the different types of automatic analysis systems.		B4	C30	
Understand the advantages and limitations of automation.	A3	B4	C30	
To train students in the development of miniaturized analytical tools and their application.	A1		C30	
Value the importance of the use of sensors to obtain fast and reliable analytical information.	A3		C30	
Correctly apply different chemometric techniques to solve analytical problems.	A1 A3		C30	D1
Acquire skills to approach an analytical problem in all its stages (from the selection of an appropriate analytical methodology, through the practical laboratory work, to the interpretation of results).	A1 A3	B4	C30	D1

Contents	
Topic	
Topic 1. Immunoassay	Introduction. In vitro antigen-antibody reaction. Immunoassay techniques without marker. Immunoassay techniques with marker: generalities. Radioimmunoassay. Enzyme immunoassay. Fluoroimmunoassay. Luminoimmunoassay.
Topic 2. Enzymatic methods of analysis	Introduction. Enzymatic end-point methods: single-step methods and methods with coupled reactions. Enzyme kinetic methods: methods based on zero-order kinetics and methods based on one-order kinetics.
Topic 3. Determination of nucleic acids: Hybridization and PCR techniques	Introduction. Nucleic acid extraction and purification techniques. Hybridization assays: liquid phase, solid phase and in situ. Polymerase chain reaction: basics. Variants of classical PCR.
Topic 4. Automation and miniaturization	Introduction. Automation: generalities. Analyzers. Flow Injection Analysis (FIA). Sequential injection analysis (SIA). Miniaturization: fundamentals and approaches.

Topic 5. Chemical sensors and biosensors	Introduction. Recognition systems. Classification of chemical sensors and biosensors. Analytical characteristics of the sensors. Applications of interest.
Topic 6. Chemometrics	Introduction to chemometrics. Structure of hypothesis testing. Rejection of anomalous results. Comparison of analytical results: parametric and non-parametric tests. Control charts. Introduction to experimental design.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	24	36	60
Seminars	12	24	36
Laboratory practical	14	10	24
Objective questions exam	2	10	12
Objective questions exam	0	18	18

*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 develop the contents of the programme based on the material provided to the student through Moovi. In the lecture sessions, the lecturer will present the fundamental aspects of the subject, which should be complemented by the recommended bibliography.
Seminars	The seminar classes will help to reinforce the learning of the subject matter explained during the lectures by solving numerical problems and/or theoretical-practical exercises. The lecturer will regularly propose different problems, exercises or questionnaires that will be solved individually by the student and delivered for evaluation.
Laboratory practical	Laboratory experiments will be carried out in 4 sessions of 3.5 hours each. Prior to each practical session, the student will be provided with supporting material in Moovi for the preparation of the experiments to be carried out.

Personalized assistance

Methodologies	**Description**
Lecturing	The lecturer will resolve doubts in a personalised manner on any of the proposed activities (lectures, seminars, laboratory practicals and exams). For this purpose, the tutoring hours of the teaching staff will be used.
Seminars	The lecturer will resolve doubts in a personalised manner on any of the proposed activities (lectures, seminars, laboratory practicals and exams). For this purpose, the tutoring hours of the teaching staff will be used.
Laboratory practical	The lecturer will resolve doubts in a personalised manner on any of the proposed activities (lectures, seminars, laboratory practicals and exams). For this purpose, the tutoring hours of the teaching staff will be used.
Tests	**Description**
Objective questions exam	The lecturer will resolve doubts in a personalised manner on any of the proposed activities (lectures, seminars, laboratory practicals and exams). For this purpose, the tutoring hours of the teaching staff will be used.
Objective questions exam	The lecturer will resolve doubts in a personalised manner on any of the proposed activities (lectures, seminars, laboratory practicals and exams). For this purpose, the tutoring hours of the teaching staff will be used.

Assessment

	Description	Qualification	Training and Learning Results			
Seminars	For the evaluation of this activity, the teacher will propose the resolution and delivery by the student of some problems, exercises and/or questionnaires in seminar classes.	5	A1 A3	B4	C30	D1
Laboratory practical	The teacher will assess the experimental work carried out by the student in the laboratory sessions through observation and the delivery of the obtained results (laboratory report). Attendance at laboratory sessions is compulsory. Absence from any laboratory session must be duly justified.	15	A1 A3	B4	C30	D1

Objective questions exam	There will be a first examination limited to approximately half of the subject. This exam may consist of short answer questions, problems and multiple choice questions. The fact of sitting the exam precludes the student from the grade "Not presented". Students who obtain a minimum score of 5 out of 10 will not be examined again in the contents considered in the first examination.	40	A1 A3	B4	C30	D1
Objective questions exam	This final exam is compulsory. Students who have passed the first part will take the second part of the syllabus. This examination may consist of short answer questions, problems and/or multiple-choice questions. The fact of sitting the exam precludes the student from the grade "Not presented". Students who have not passed the first part will have to take the first part of the sylabus (40% final mark).	40	A1 A3	B4	C30	D1

Other comments on the Evaluation

Second opportunity (July):

The marks obtained by the student during the course in the laboratory practicals and seminars will be retained (20 % of the grade).

Students will be able may do both exams.
The student who wishes may opt for the overall assessment.

Sources of information

Basic Bibliography

Paolo Ugo, Pietro Marafini, Marta Meneghello, **Bioanalytival chemistry. From biomolecular recognition to nanobiosensing**, Primera, De Gruyter, 2021

Miguel Valcárcel, Soledad Cárdenas, **Automatización y miniaturización en Química Analítica**, Primera, Springer, 2000

Florinel-Gabriel Bănică, **Chemical sensors and biosensors: Fundamentals and applications**, Primera, Wiley, 2012

Guillermo Ramis Ramos, María Celia García Álvarez-Coque, **Quimiometría**, Prmera, Síntesis, 2001

Complementary Bibliography

Recommendations

Subjects that are recommended to be taken simultaneously

Quality in Analytical Labs/V11G201V01407
Food, Agricultural and Environmental Analytical Chemistry/V11G201V01410

Subjects that it is recommended to have taken before

Biochemistry/V11G201V01201
Analytical Chemistry I: Principles of Analytical Chemistry/V11G201V01202
Analytical Chemistry II: Optical Methods of Analysis/V11G201V01207
Analytical Chemistry III: Electroanalytical Methods and Separations/V11G201V01302
Analytical Chemistry IV: Chromatographic and Affine Methods/V11G201V01306

IDENTIFYING DATA				
Calidade nos laboratorios analíticos				
Subject	Calidade nos laboratorios analíticos			
Code	V11G201V01407			
Study programme	Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	1c
Teaching language	#EnglishFriendly Castelán			
Department	Química analítica e alimentaria			
Coordinator	Calle González, Inmaculada de la			
Lecturers	Calle González, Inmaculada de la Pena Pereira, Francisco Javier			
E-mail	incalle@uvigo.es			
Web				
General description	O aseguramento da calidade nos laboratorios analíticos representa un aspecto de crecente relevancia. Nesta materia preténdese introducir ao alumnado do último curso do Grao aos principios xerais para a avaliación e mellora continua da calidade nos laboratorios de análise. Ao longo do curso se introducirán as referencias normativas e documentación básica dos sistemas da calidade, se describirán e aplicarán ferramentas estatísticas empregadas de xeito sistemático para acadar a calidade analítica, se abordará a selección e validación de métodos de análise e aspectos relativos á xestión de laboratorio, equipos e reactivos. Así mesmo, o alumno entenderá as dificultades na toma de mostra e a importancia de realizar un deseño do plan de mostraxe. Ademais, se verá como se realiza a avaliación interna e externa da calidade. No primeiro caso, mediante o control dos brancos, reactivos, uso de materiais de referencia certificados e, no segundo caso, mediante os exercicios de intercomparación, as auditorías e as acreditacións. Materia do programa English Friendly. Os/ as estudantes internacionais poderán solicitar ao profesorado: a) materiais e referencias bibliografías para o seguimento da materia en inglés, b) atender as titorías en inglés, c) probas e avaliacións en inglés.			

Resultados de Formación e Aprendizaxe	
Code	
A1	Que os estudantes saiban aplicar os seus coñecementos ó seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo
A4	Que os estudantes poidan transmitir información, ideas, problemas e solución a un público tanto especializado coma non especializado
B5	Capacidade de adaptarse a novas situacións e adoptar decisións
C31	Coñecer os procesos de control aplicados nos laboratorios analíticos para lograr a súa correcta xestión e asegurar a calidade dos resultados
C33	Coñecer a metroloxía dos procesos químicos, incluíndo a xestión da calidade
D1	Capacidade para resolver problemas

Resultados previstos na materia				
Expected results from this subject	Training and Learning Results			
Interpretar as normas de xestión de calidade aplicables ao laboratorio analítico.	A4	B5	C33	D1
Explicar os principais parámetros de calidade.	A1 A4		C31 C33	
Calcular e interpretar os distintos parámetros de calidade.	A4	B5	C31 C33	D1
Interpretar a aplicación das distintas ferramentas estatísticas.	A1 A4	B5	C31 C33	D1
Interpretar as normas e parámetros de validación dun método analítico.	A1 A4	B5	C31 C33	D1
Explicar os parámetros esenciais para a avaliación da calidade.	A1 A4		C31 C33	

Contidos
Topic

TEMA 1. Introdución á calidade.	Conceptos xerais. Evolución histórica do concepto de Calidade. Elementos básicos e compromisos da calidade. Calidade no proceso analítico. Propiedades analíticas e metrolóxicas. Trazabilidade. Implantación de sistemas de calidade.
TEMA 2. Referencias normativas e documentación dos sistemas de calidade.	Normalización, certificación e acreditación. Sistemas xenéricos de xestión da calidade. Serie de normas ISO 9000. Norma UNE-EN ISO/IEC 17025. Boas Prácticas de Laboratorio. Documentos utilizados no sistema de calidade. Xestión da documentación.
TEMA 3. Ferramentas estatísticas para asegurar a calidade analítica.	Probas estatísticas de significación. Compoñentes de incerteza. Avaliación de incertezas de operacións unitarias e de procesos analíticos. Expresión de resultados.
TEMA 4. Selección e validación de métodos de análise.	Selección de métodos de análise. Concepto e alcance da validación dun método de análise. Tipos de validación. Parámetros de calidade dos métodos analíticos.
TEMA 5. Xestión de laboratorio, equipos e reactivos.	Organización e infraestrutura dos laboratorios. Materiais e métodos. Clasificacións dos métodos analíticos. Calidade dos reactivos.
TEMA 6. Calidade na toma de mostra.	A mostraxe no proceso analítico (plan de mostraxe, tipos de mostraxe, manipulación de mostras). Limitacións da mostraxe. Garantía de calidad na mostraxe.
TEMA 7. Avaliación interna da calidade.	Referencias analíticas. Materiais de referencia certificados (preparación, selección e emprego de CRMs). Estudos de recuperación. Aplicación de test t. Actividades de control interno. Brancos e mostras de control. Gráficos de control.
TEMA 8. Avaliación externa da calidade.	Exercicios de intercomparación (definición e tipos). Auditorías nun sistema de calidade (obxectivos, tipos, planificación, realización e documentación). Acreditación (concepto, implicacións, organismos, proceso e documentos para a acreditación).

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	24	36	60
Seminario	12	24	36
Prácticas de laboratorio	14	10	24
Exame de preguntas obxectivas	2	10	12
Exame de preguntas obxectivas	0	18	18
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Lección maxistral	O profesor desenvolverá os contidos do programa a partir do material proporcionado ao alumno a través de Moovi. Nas sesións maxistrais, o profesor presentará os aspectos fundamentais da materia que deberán complementarse mediante a bibliografía recomendada.
Seminario	Nas clases de seminario reforzarase a aprendizaxe do temario explicado durante as sesións maxistrais mediante a resolución de problemas numéricos e/ou exercicios teóricos-prácticos. O profesor proporá, de xeito regular, diferentes problemas, exercicios ou cuestionarios que serán resoltos de xeito individual polo alumno e entregados para a súa avaliación.
Prácticas de laboratorio	Realizaranse experimentos de laboratorio en 4 sesións de 3,5 horas cada unha. Previamente á realización de cada práctica, o estudante disporá de material de apoio en Moovi para a preparación dos experimentos a realizar.

Atención personalizada	
Methodologies	**Description**
Lección maxistral	O profesor resolverá as dúbidas de maneira personalizada sobre calquera das actividades propostas (clases maxistrais, seminarios, prácticas de laboratorio e exames). A tal fin, utilizaranse as horas de titoría do profesorado.
Seminario	O profesor resolverá as dúbidas de maneira personalizada sobre calquera das actividades propostas (clases maxistrais, seminarios, prácticas de laboratorio e exames). A tal fin, utilizaranse as horas de titoría do profesorado.
Prácticas de laboratorio	O profesor resolverá as dúbidas de maneira personalizada sobre calquera das actividades propostas (clases maxistrais, seminarios, prácticas de laboratorio e exames). A tal fin, utilizaranse as horas de titoría do profesorado.
Tests	**Description**

Exame de preguntas obxectivas	O profesor resolverá as dúbidas de maneira personalizada sobre calquera das actividades propostas (clases maxistrais, seminarios, prácticas de laboratorio e exames). A tal fin, utilizaranse as horas de titoría do profesorado.
Exame de preguntas obxectivas	O profesor resolverá as dúbidas de maneira personalizada sobre calquera das actividades propostas (clases maxistrais, seminarios, prácticas de laboratorio e exames). A tal fin, utilizaranse as horas de titoría do profesorado.

Avaliación

	Description	Qualification	Training and Learning Results			
Seminario	Para a avaliación desta actividade, o profesor proporá a resolución e entrega por parte do alumno dalgúns problemas, exercicios e/ou cuestionarios en clases de seminario.	5	A1 A4	B5	C31 C33	D1
Prácticas de laboratorio	O profesor realizará o seguimento do traballo experimental realizado polo alumno nas sesións de laboratorio a través da observación e a entrega dos resultados obtidos (informe de laboratorio). A asistencia ás sesións de laboratorio é obrigatoria. A falta a algunha sesión de laboratorio deberá ser debidamente xustificada.	15	A1 A4	B5	C31 C33	D1
Exame de preguntas obxectivas	Efectuarase un primeiro exame sobre a metade da materia aproximadamente. Este exame poderá consistir en cuestións de resposta curta, problemas e preguntas de tipo test. A presentación a este exame inhabilita ao alumno para obter a cualificación de non presentado. Este exame eliminará materia se o alumno obtén unha puntuación mínima de 5 puntos sobre 10.	40	A1 A4	B5	C31 C33	D1
Exame de preguntas obxectivas	Este exame final é obrigatorio. Este exame poderá consistir en cuestións de resposta curta, problemas e/ou preguntas de tipo test. A presentación a este exame inhabilita ao alumno para obter a cualificación de non presentado. Os alumnos que aproben a primeira parte examinaranse da segunda parte do temario. Os alumnos que non superen a primeira parte terán que examinarse tamén da primeira parte do temario (40% da nota final).	40	A1 A4	B5	C31 C33	D1

Other comments on the Evaluation

Segunda oportunidade (Xullo):

Conservaranse as cualificacións obtidas polo estudante durante o curso nas prácticas de laboratorio e nos seminarios (20 % da cualificación).

Este exame poderá consistir en cuestións de resposta curta, problemas e/ou preguntas de tipo test.

O alumnado que o desexe poderá optar pola modalidade de avaliación global e deberá comunicalo por escrito ó coordinador da materia durante o primeiro mes do cuatrimestre, neste caso a avaliación será 85 % o exame e 15 % as prácticas de laboratorio.

Bibliografía. Fontes de información

Basic Bibliography

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

M. Valcárcel, Á. Ríos, **La calidad en los laboratorios analíticos**, Reverté, 1992

E. Prichard, V. Barwick, **Quality assurance in analytical chemistry**, Wiley, 2007

Complementary Bibliography

S. Sagrado, E. Bonet, M.J. Medina, Y. Martín, **Manual práctico de calidad en los laboratorios - Enfoque ISO 17025 (2ª edición)**, AENOR, 2005

P.P. Morillas Bravo, **Guía para la aplicación de UNE-EN ISO/IEC 17025:2017**, AENOR, 2019

J.C. Miller; J.N. Miller, **Estadística y quimiometría para química analítica**, Prentice-Hall, 2002

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

D.L. Massart, B.G.M. Vandeginste, L.M.C. Buydens, S. de Jong, P.J. Lewi, J. Smeyers-Verbeke, **Handbook of chemometrics and qualimetrics. Part A**, Elsevier Science, 1997

S. Sáez Ramirez, L.G. Gómez-Cambronero, **Sistema de mejora continua de la calidad en el laboratorio - Teoría y práctica**, Universitat de València, 2006

Recomendacións

Subjects that are recommended to be taken simultaneously

Ampliación de química analítica/V11G201V01406
Química analítica ambiental e agroalimentaria/V11G201V01410

Subjects that it is recommended to have taken before

Química analítica I: Principios de química analítica/V11G201V01202
Química analítica II: Métodos ópticos de análise/V11G201V01207
Química analítica III: Métodos eletroanalíticos e separacións/V11G201V01302
Química analítica IV: Métodos cromatográficos e afins/V11G201V01306

IDENTIFYING DATA				
Industrial Chemistry				
Subject	Industrial Chemistry			
Code	V11G201V01408			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Rosales Villanueva, Emilio			
Lecturers	Fernández Sanromán, Antía Rosales Villanueva, Emilio			
E-mail	emiliorv@uvigo.es			
Web				
General description	The chemical industry represents one of the most thriving sectors in the economies of many countries, serving as the basis for producing a wide variety of products that range from materials for general use, to materials with a high technological content and cutting-edge for other industries. Recent advances in obtaining new products together with new technologies to remedy environmental damage and increase productivity arise from innovations and continuous improvement developed in each of the stages of chemical processes. This subject aims to provide students with a global vision of Industrial Chemistry, ranging from the development and understanding of flow diagrams of chemical processes of great economic and social relevance to the quality principles that govern them. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
C45	Apply chemical and chemical engineering knowledge to industrial processes
D1	Ability to solve problems
D2	Capacity for teamwork
D3	Ability to communicate in both oral and written form in Spanish and / or Galician and / or English

Expected results from this subject	Training and Learning Results		
Appreciate the importance and complexity of the industrial chemical processes.	A3	C45	D1
Describe the main stages of an industrial chemical process and elaborate flow diagrams of simple processes.	A3	C45	D1 D2 D3
Identify the main raw materials used in the chemical industry and their characteristics.	A3	C45	D1 D2
Compare the diverse sources of energy used in the industry and make simple studies of energetic integration.	A3	C45	D1 D2
Describe the industrial chemical processes more usual in diverse productive sectors.	A3	C45	D2 D3

Contents	
Topic	
General appearances of the Industrial Chemistry.	Introduction to the processes of the Chemical Industry. Characteristics and sectorial structure of the chemical industry. Situation of the chemical industry Spaniard in the European and world-wide context. Introduction to the diagrams of flow for processes of industrial chemistry
Raw materials used in the chemical industry	Classification and typology. Sources. Circular economy.
The energy in the chemical industry	General characteristics. Sources of traditional and alternative energy. Energetic integration.
Industrial chemical processes	Petrochemical, biotechnological processes and other productive processes for raw materials transformation.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	12	24	36
Problem solving	16	25	41
Seminars	3	9	12
Mentored work	4	30	34
Presentation	1	4	5
Laboratory practical	14	5	19
Essay questions exam	1	0	1
Objective questions exam	0.5	0.5	1
Oral exam	0.5	0.5	1
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Presentation by the teacher of the general aspects of the programme in a structured way, with special emphasis on the fundamentals and the most important or difficult aspects for the student to understand. The professor will facilitate, through the platform MOOVI, the necessary material for a correct follow-up of the matter. The student will have to work previously the material delivered by the professor and consult the bibliography recommended to complete the information.
Problem solving	During the development of the subject will use the resolution of questions and problems so as to reinforce the appearances presented in the lectures.
Seminars	With the development of the syllabus, some activities focused to the work on a specific subject will be made, that will allow to deepen and complement the contents of the subject as it complement of the lecturing.
Mentored work	Inside the problem solving, the students working in groups will develop a work that will be based in the search of solutions for real problems where the students will have to provide a feasible and viable solution to proposed problem.
Presentation	The students will make by group a short presentation of the mentored work with the solution proposed for the problem assigned.
Laboratory practical	Laboratory experiments and field trips to companies related to subject will be carried out. The student will be provided with practice guide as well as the necessary support material for a proper understanding of the experiments to be carried out. The student will prepare a final report in which the main results and conclusions will be presented.

Personalized assistance	
Methodologies	**Description**
Lecturing	During the hours of tutorship the students, individually or in group, can consult with the lecturers any doubt posed on the subject. The lecturer will inform on the available schedule in the presentation of the subject.
Problem solving	During the hours of tutorship the students, individually or in group, can consult with the lecturers any doubt posed on the problem solving. The lecturer will inform on the available schedule in the presentation of the subject.
Laboratory practical	During the hours of tutorship the students, individually or in group, can consult with the lecturers any doubt posed on the laboratory practical. The lecturer will inform on the available schedule in the presentation of the subject.
Seminars	During the hours of tutorship the students, individually or in group, can consult with the lecturers any doubt posed on the seminars. The lecturer will inform on the available schedule in the presentation of the subject.
Mentored work	During the hours of tutorship the students, in groups or their members of individual way, can consult with the lecturer any doubt posed on the development of the work. The lecturer will inform on the available schedule in the presentation of the matter.
Presentation	During the hours of tutorship the students, in groups or their members of individual way, can consult with the lecturer any doubt posed on the presentation. The lecturer will inform on the available schedule in the presentation of the matter

Assessment			
	Description	Qualification	Training and Learning Results

Problem solving	After each subject will argue the most notable appearances by means of resolution of questions and problems	10	A3	C45	D1 D2 D3
Mentored work	It will be evaluated the solution presented together with structure of contents, quality of the content, sources consulted, format.	10	A3	C45	D1 D2 D3
Presentation	The sudent will present the mentored work for its discussion with the other students of the matter. It will be evaluated the oral presentation as well as the answers to the lecturer and the other students.	10	A3	C45	D1 D2 D3
Laboratory practical	The students will make diverse practices of laboratory and visits to companies. When finalising the diverse practical and in the dates indicated by the professors , they will have to deliver the reports of practices and make a questionnaire on the company visits.	10	A3	C45	D1 D2 D3
Essay questions exam	A global exam of for the evaluation of the acquired knowledge in the subject will be assessed.	25	A3	C45	D1 D3
Objective questions exam	In the final exam the student will have to answer a series of short questions or multiple-choice questions in which they will have to demonstrate their knowledge as well as their capacity for synthesis.	25	A3	C45	D3
Oral exam	There will be an individual oral examination of the laboratory practicals carried out in the course.	10	A3	C45	D3

Other comments on the Evaluation

ASSESSMENT: The participation of the student in any of the systems of evaluation of the subject (problem solving, mentored work , presentation and laboratory practical) will involve the qualificationof the subject. It is required a minimum attendance to 90% of the laboratory practical to have right to its evaluation. Otherwise, the mark for this section will be 0.0 and they will have to take an exam in the FINAL EXAM.The evaluation by both essay and objective questions (50%) will be carried out in several exams along the course. If the students fail to pass the exam, they have to recover it in the FINAL EXAM.

A student who do not "officially renounces to continuous assessment", will fail if he/she does not achieve a MINIMUM mark of 4.0 points (out of 10) in each of the parts of the "FINAL EXAMINATION". If the minimum mark in the "FINAL EXAMINATION" is passed, the student will pass the course if the FINAL GRADE is ≥ 5.0, that is, if the sum of the marks obtained in the different systems of evaluation of the course is ≥ 5.0.

Second call: The same criteria will be applied in the second sitting. With regard to the July exam, the grade of the different assessment systems (laboratory practicals, problem solving and exercises) will be maintained, so students will only take the "FINAL EXAM".

STUDENTS RELEASED FROM CONTINUOUS ASSESSMENT: When the School releases a student from the continuous assessment process, his/her grade will be the sum of 90% of the mark obtained in the "FINAL EXAM" and 10% of the laboratory practicals mark.**ETHICAL COMMITMENT:The student is expected to show appropriate ethical behaviour. If ethically reprehensible behaviour is detected (for example: copying, plagiarism, use of unauthorised electronic devices, etc.) the student will not be considered to meet the necessary requirements to pass the subject. In this case the overall grade for the current academic year will be a fail (0.0). The use of any electronic device will not be permitted during the assessment tests unless expressly authorised. Bringing an unauthorised electronic device into the examination room will be considered as a reason for failing the subject in the current academic year and the overall grade will be a fail (0.0).**

Sources of information

Basic Bibliography

Vián Ortuño, A., **Introducción a la Química Industrial**, 2ª, Reverté, 1994

Sinnott, R.K., **Diseño en ingeniería química**, 5ª, Reverté, 2012

Díaz, M., **Ingeniería de bioprocesos**, Paraninfo, 2012

Wauquier, J.-P., **El refino del petróleo**, 1ª, Dias de Santos, 2004

De Juana, J.M., **Energías renovables para el desarrollo**, 1ª, Thomson Paraninfo, 2003

Complementary Bibliography

Turton, R., **Analysis, synthesis, and design of chemical processes**, 2ª, Pearson education, 2013

Federación Empresarial de la Industria Química Española, **Radiografía del sector químico español 2022**, FEIQUE, 2022

Recommendations

Subjects that it is recommended to have taken before

Chemical engineering/V11G201V01301

IDENTIFYING DATA				
Ampliación en química física				
Subject	Ampliación en química física			
Code	V11G201V01409			
Study programme	Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	2c
Teaching language				
Department				
Coordinator				
Lecturers				
E-mail				
Web				
General description				

Resultados de Formación e Aprendizaxe
Code

Resultados previstos na materia	
Expected results from this subject	Training and Learning Results

Contidos
Topic

Planificación			
	Class hours	Hours outside the classroom	Total hours
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description

Atención personalizada

Avaliación		
Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Bibliografía. Fontes de información
Basic Bibliography
Complementary Bibliography

Recomendacións

IDENTIFYING DATA				
Food, Agricultural and Environmental Analytical Chemistry				
Subject	Food, Agricultural and Environmental Analytical Chemistry			
Code	V11G201V01410			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish			
Department				
Coordinator	Gago Martínez, Ana			
Lecturers	Estévez Bastos, Pablo Gago Martínez, Ana Leao Martins, Jose Manuel			
E-mail	anagago@uvigo.es			
Web				
General description	(*)A materia abarca os aspectos relacionados co estudo da *problématica asociada ao estudo desde o punto de vista analítico da contaminación química do ambiente e os alimentos, con especial énfase nos contaminantes máis relevantes tanto naturais como *antropogénicos, identificando as metodoloxías analíticas máis eficaces para o control dos mesmos.			

Training and Learning Results	
Code	
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B2	Organization and planning capacity
B3	Ability to manage information
C32	Acquire basic knowledge on enviromental control and evaluation and agro-food security
D4	Incorporate criteria of sustainability and environmental commitment into the professional exercise. Acquire skills in the equitable, responsible and efficient use of resources

Expected results from this subject	Training and Learning Results			
New	A3 A5	B2 B3	C32	D4

Contents	
Topic	
(*)Contaminantes químicos : Xeneralidades	(*) Estrutura e Propiedades Químicas, Toxicoloxía.
(*)Fontes da contaminación química	(*)Contaminantes naturais e antropogénicos Contaminantes emerxentes de interese desde o punto de vista ambiental e alimentario
(*)Clasificación das metodoloxías analíticas para o control dos contaminantes químicos	(*)Metodoloxías analítcas para o control de Contaminantes químicos Inorgánicos e Orgánicos
(*)Mostraxe e Preparación de mostra	(*)Técnicas de mostraxe Estudo das etapas a considerar no protocolo analítico para o control de contaminantes químicos en función da súa natureza e propiedades
(*)Control de calidade (ambiental e alimentaria)	(*)Aspectos xerais a considerar no control de calidade do Laboratorio analítico: Ferramentas de calidade
(*)Seguridade ambiental e alimentaria : lexislacion aplicable	(*) Perspectiva Europea para o control de contaminantes químicos ambientais e alimentarios Lexislación aplicable aos contaminantes químicos obxecto de estudo Armonización metodológica: Organismos involucrados

Planning	Class hours	Hours outside the classroom	Total hours
Lecturing	24	24	48

Seminars	12	12	24
Laboratory practical	14	14	28
Report of practices, practicum and external practices	0	20	20
Essay questions exam	0	6	6
Presentation	2	20	22

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

Methodologies

	Description
Lecturing	(*)Clases de 50 *min nas que se introducirá ao alumno no campo da seguridade ambiental e alimentaria, presentando os conceptos básicos relacionados coa detección e control dos contaminantes químicos naturais e *antropogenicos presentes no *medioambiente e os alimentos e os mecanismos establecidos para o seu *contro tendo en conta os aspectos lexislativos na UE .
Seminars	(*)Os alumnos, distribuídos en grupos, deberán resolver unha serie de casos prácticos (cálculos, problemas, cuestionarios etc.) . O obxectivo principal desta actividade é que os alumnos completen maneira e apliquen vos conceptos teóricos mediante a resolución dos problemas expostos.
Laboratory practical	(*) Desenvolvemento e aplicación práctica de metodoloxías analíticas para o control de contaminantes químicos seleccionados en matrices ambientais e alimentarias mediante traballo autónomo do alumno quen deberá resolver ademais unha serie de cuestións expostas polos profesores en relación ás técnicas analíticas empregadas . A resolución de cuestionarios e/ou realización de breves informes e/ou unha proba final permitirá ao alumno completar a súa formación presencial e adquirir unha visión integral da disciplina

Personalized assistance

Methodologies	Description
Lecturing	
Seminars	
Laboratory practical	

Assessment

	Description	Qualification	Training and Learning Results			
Laboratory practical	(*)Se evaluarán los informes presentados sobre el desarrollo de las practicas , los obetivos de las mismas, resultados obtenidos y discusión	15	A3 A5	B2 B3	C32	D4
Report of practices, practicum and external practices	(*)- Se evaluarán los resultados obtenidos en el cuestionario final planteado sobre la actividad práctica desarrollada (15%) -Se evaluará el desarrollo de los casos prácticos asignados (30%)	45	A3 A5	B2 B3	C32	D4
Essay questions exam	(*)se valuará la presentación oral de los casos prácticos desarrollados y la respuesta a las preguntas sobre el desarrollo de los miamos)	40	A3 A5	B2 B3	C32	D4

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

D.Barcelo, **Environmental Analysis**, ELSEVIER, 1996

ROGER N. REEVE, **ENVIRONMENTAL ANALYSIS**, JOHN WILEY &SONS, 1994

J.P.F. D MELLO, **FOOD SAFETY**, CABI PUBLISHING CAB INT., 2003

Chunlong Zhang, **Fundamentals of Environmental Sampling and Analysis**, WILEY, 2007

CRUZ, KHMELINSKII, VIEIRA, **METHODS IN FOOD ANALYSIS**, CRC PRESS, 2014

Recommendations

Subjects that it is recommended to have taken before

Analytical Chemistry I: Principles of Analytical Chemistry/V11G201V01202
Analytical Chemistry II: Optical Methods of Analysis/V11G201V01207
Analytical Chemistry III: Electroanalytical Methods and Separations/V11G201V01302
Analytical Chemistry IV: Chromatographic and Affine Methods/V11G201V01306

IDENTIFYING DATA				
Computational Chemistry				
Subject	Computational Chemistry			
Code	V11G201V01411			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Graña Rodríguez, Ana María			
Lecturers	Graña Rodríguez, Ana María			
E-mail	ana@uvigo.es			
Web				
General description	Computational Chemistry is a discipline using mathematical methods for the calculation of molecular properties or for the simulation of the molecular behaviour.			

Training and Learning Results	
Code	
A1	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
B1	Ability for auronomous learning
B2	Organization and planning capacity
C36	Know the basics and be able to use different quantum mechanical methods to be applied to systems of chemical interest
D1	Ability to solve problems

Expected results from this subject	Training and Learning Results			
Describe the main methods of calculation of the computational chemistry, knowing his applications and limitations.			C36	
Describe the elements that can contain a field of strengths of molecular mechanics.			C36	
Choose levels of quantum calculation adapted for the treatment of a chemical problem.	A1	B2	C36	
Describe fundamental algorithms employees in the calculations of computational chemistry.			C36	
Obtain properties of chemical interest doing use of computational methods (static and dynamic).		B1 B2	C36	D1

Contents	
Topic	
Subject 1. Introduction: methods of calculation in Computational Chemistry.	Molecular mechanics. Hartree-Fock methods. Post Hartree-Fock methods. Density Functional Theory. Molecular Dynamics methods. Choise of method. Choise of basis set.
Subject 2. Conformational studies.	Potential energy surface. Characterization of singular points. Optimization of geometries. Optimization of transition states. Constrained optimizations. Conduction methods. Conformational sampling. IRC methods.
Subject 3. Application to spectroscopy.	Infrared spectra. Electronic excited states UV-visible spectra. NMR spectra.
Subject 4. Applications to the calculation of energy properties.	Thermodynamics properties. Basis set superposition error. Isogyric reactions. Isodesmic reactions. Homdesmotic reactions. Gn and CBS methods.
Subject 5. Applications to the chemical reactivity.	Chemical reactivity indices. Reaction dynamics. Calculation reaction rates.
Subject 6. Models of salvation.	Continuum models of salvation. Inclusion of explicit solvent molecules. Mixed methods.
Subject 7. Applications to biomolecules.	Molecular Mechanics. Molecular Dynamics. Hybrid methods QM/MM.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	26	22	48
Practices through ICT	14	14	28

Problem solving	6	18	24
Problem and/or exercise solving	6	18	24
Essay	0	26	26

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

Methodologies

	Description
Lecturing	Exhibition by part of the professor of theoretical and practical concepts.
Practices through ICT	Computational laboratory.
Problem solving	Resolution of problems by part of the students so much in paper as with computational assistance.

Personalized assistance

Methodologies	Description
Lecturing	Students willing so could attend personal tutorials to solve doubts and/or uncertainties. To better optimise the procedure, the student is advised to previously contact her teacher.
Problem solving	Students willing so could attend personal tutorials to solve doubts and/or uncertainties. To better optimise the procedure, the student is advised to previously contact her teacher.
Practices through ICT	Students willing so could attend personal tutorials to solve doubts and/or uncertainties. To better optimise the procedure, the student is advised to previously contact her teacher.
Tests	**Description**
Problem and/or exercise solving	Students willing so could attend personal tutorials to solve doubts and/or uncertainties. To better optimise the procedure, the student is advised to previously contact her teacher.
Essay	Students willing so could attend personal tutorials to solve doubts and/or uncertainties. To better optimise the procedure, the student is advised to previously contact her teacher.

Assessment

	Description	Qualification	Training and Learning Results			
Problem solving	Report of exercises of the subjects 1 to 3.	30	A1	B1 B2	C36	D1
Problem and/or exercise solving	Report of exercises of the subjects 4 to 7.	40	A1	B1 B2	C36	D1
Essay	Delivery of an individual work about practical classes.	30	A1	B1 B2	C36	D1

Other comments on the Evaluation

Sources of information

Basic Bibliography

J. B. Foresman, A. Frisch, **Exploring Chemistry with Electronic Structure Methods**, 3, Gaussian Inc, 2015

Frank Jensen, **Introduction to computational chemistry**, 2, Wiley, 2006

Joan Bertran Rusca, Vicenç Branchadell Gallo, Miquel Moreno Ferrer, Mariona Sodupe Roure, **Química Cuántica**, 1, Síntesis, 2000

Complementary Bibliography

A. Szabo, N. S. Ostlund, **Modern Quantum Chemistry**, 1, Dover, 1996

Recommendations

Subjects that it is recommended to have taken before

Physics: Physics I/V11G201V01102
Physics: Physics 2/V11G201V01107
Mathematics: Mathematics 1/V11G201V01103
Mathematics: Mathematics 2/V11G201V01108
Physical Chemistry III: Quantum Chemistry/V11G201V01303
Physical Chemistry IV: Molecular Structure and Spectroscopy/V11G201V01307

IDENTIFYING DATA				
Química inorgánica medioambiental e bioinorgánica				
Subject	Química inorgánica medioambiental e bioinorgánica			
Code	V11G201V01412			
Study programme	Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	2c
Teaching language	Castelán Galego			
Department	Química inorgánica			
Coordinator	Rodríguez Arguelles, María Carmen			
Lecturers	Castro Fojo, Jesús Antonio Rodríguez Arguelles, María Carmen			
E-mail	mcarmen@uvigo.es			
Web				
General description	Coñecer e interpretar o papel dos metais y non metais nos procesos químicos presentes nos seres vivos e no medioambiente. Interpretar e analizar as propiedades químicas dos centros activos das metaloproteinas, mecanismos de actuación dos axentes terapeúticos e de diagnóstico			

Resultados de Formación e Aprendizaxe	
Code	
A1	Que os estudantes saiban aplicar os seus coñecementos ó seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo
A2	Que os estudantes demostren posuír e comprender coñecementos nunha área de estudo que parte da base da educación secundaria xeral e adoita atoparse a un nivel que, malia se apoiar en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vangarda do seu campo de estudo
B1	Capacidade de aprendizaxe autónomo
B5	Capacidade de adaptarse a novas situacións e adoptar decisións
C40	Adquirir coñecementos sobre a variedade de papeis que desempeñan os ions metálicos na Bioloxía. Coñecer as biomoléculas que conteñen ions metálicos
C41	Avaliar os riscos sanitarios, o impacto ambiental e socioeconómico das substancias químicas
D2	Capacidade para traballar en equipo
D4	Incorporar no exercicio profesional criterios de sustentabilidade e compromiso ambiental. Adquirir habilidades no uso equitativo, responsable e eficiente dos recursos

Resultados previstos na materia			
Expected results from this subject	Training and Learning Results		
Que os estudantes demostren posuír e comprender coñecementos nunha área de estudo que parte da base da educación secundaria xeral e adoita atoparse a un nivel que, malia se apoiar en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vangarda do seu campo de estudo Que os estudantes saiban aplicar os seus coñecementos ó seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo	A1 A2	B1 B5	
Adquirir coñecementos sobre a variedade de papeis que desempeñan os ions metálicos na Bioloxía. Coñecer as biomoléculas que conteñen ions metálicos Avaliar os riscos sanitarios, o impacto ambiental e socioeconómico das substancias químicas		C40 C41	
Capacidade para traballar en equipo			D2
Incorporar no exercicio profesional criterios de sustentabilidade e compromiso ambiental. Adquirir habilidades no uso equitativo, responsable e eficiente dos recurso			D4

Contidos
Topic
Estudo dos elementos esenciais
Estudo dos elementos tóxicos
Medio ambiente
Atmosfera
Hidrosfera

Litosfera
Contaminación radioactiva
Estudo dos elementos e compostos utilizados en terapia, diagnose e teragnose
Prácticas de laboratorio

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	24	48	72
Seminario	9	18	27
Presentación	3	30	33
Prácticas de laboratorio	14	2	16
Exame de preguntas obxectivas	2	0	2
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Lección maxistral	Exposición por parte do profesor dos contidos da materia obxecto de estudo, bases teóricas e/ou directrices dun traballo, exercicio ou proxecto a desenvolver polo estudante
Seminario	Se propondran exercicios relacionados co exposto nas clases maxistrais
Presentación	Exposición por parte do alumno, en forma individual, dun tema relacionado cos contidos da materia
Prácticas de laboratorio	Realizaranse prácticas no laboratorio relacionadas cos contidos da materia

Atención personalizada	
Methodologies	**Description**
Lección maxistral	Os profesores resolveran as dúbidas relacionadas cos temas propostos de forma presencial ou por correo electrónico
Seminario	Resolveranse dúbidas ou cuestións relacionadas cos temas propostos
Prácticas de laboratorio	Atenderanse as dúbidas relacionadas coas prácticas
Presentación	O profesorado atenderá as consultas dos alumnos relacionadas co traballo a presentar proporcionando orientación apoio e motivación no proceso de aprendizaxe. Realizásese de forma presencial ou a través do correo electrónico
Tests	**Description**
Exame de preguntas obxectivas	Resolveranse as dúbidas de forma presencial ou por correo electrónico

Avaliación						
	Description	Qualification	Training and Learning Results			
Seminario	Avaliarase a resolución de problemas ou exercicios propostos	20	A1 A2	B1 B5	C40	D2
Presentación	Avaliarase a presentación/exposición por parte dos alumnos dun tema relacionado cos contidos da materia	30	A1 A2	B1 B5	C40 C41	D2 D4
Prácticas de laboratorio	Avaliarase o traballo no laboratorio	10	A1		C40 C41	D2 D4
Exame de preguntas obxectivas	O alumno/a realizará un exame para avaliar os coñecementos adquiridos	40	A1	B1 B5	C40 C41	

Other comments on the Evaluation

Na primeira convocatoria Será necesaria unha nota mínima de 3,5 sobre 10 en cada apartado da evaluación, é dicir, seminario, prácticas de laboratorio, presentación. En caso de non superar este mínimo, a nota final da materia será a do exame de preguntas obxectivas (ponderada ao 50%)

Na segunda convocatoria só se podrá recuperar o exame de preguntas obxectivas

Bibliografía. Fontes de información

Basic Bibliography

Spiro, Thomas G; Stigliani, William M., **Química medioambiental**, 2, Pearson, 2009

Manahan S.E., **Environmental Chemistry**, 10, CRC Press, 2017

Crichton, R., **Biological inorganic Chemistry A New Introduction to Molecular Structure and Function**, 3, Elsevier, 2019

Gibbs, W., **CONCEPTS AND APPLIED PRINCIPLES OF BIOINORGANIC CHEMISTRY: VOLUME III**, 2, ML Books International, 2015

Complementary Bibliography

Baird, C.; Cann M., **Química ambiental**, 2, Reverte, 2012

Grau Ríos, Mario ; Grau Sáenz, María, **Riesgos en la industria**, 1, UNED, 2006

Domenech, X, Peral, J.; Costa López, J.; Simarro Dorado, J., **Química ambiental de sistemas terrestres**, 1, Reverté, 2012

Kaim, W.; Schwederski, B.; Klein, A., **Bioinorganic Chemistry -- Inorganic Elements in the Chemistry of Life. An Introduction and Guide**, 2, Wiley, 2013

Sigel, A.; Sigel, H.; Sigel, R.K.O., **The alcali Metal Ions: Their Role for Life**, 1, Springer, 2016

Dieguez, M.; Bäckvall, J-E.; Pàmies, O., **Artificial Metalloenzymes and MetalloDNAzymes in From Design to Applications.**, 1, Wiley, 2018

Kroneck, P.M.H.; Sosa torres, M.E., **Metals, Microbes, and Minerals: The Biogeochemical Side of Life**, 1, De gruyter, 2021

Sigel, A. Freisinger, E. Sigel, R.K.O., **Metals ions in bioimaging Techniques**, 1, De gruyter, 2021

Recomendacións

Subjects that it is recommended to have taken before

Bioquímica/V11G201V01201
Química inorgánica I/V11G201V01204
Química inorgánica II/V11G201V01209
Química inorgánica III: Química de coordinación/V11G201V01304
Química inorgánica IV: Metais de transición e estado sólido/V11G201V01309

Other comments

Coñecementos de inglés

IDENTIFYING DATA				
Therapeutic Chemistry				
Subject	Therapeutic Chemistry			
Code	V11G201V01413			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Terán Moldes, María del Carmen			
Lecturers	Teijeira Bautista, Marta Terán Moldes, María del Carmen			
E-mail	mcteran@uvigo.es			
Web				
General description	It is an introductory course in therapeutic chemistry, in which as drugs work at molecular level and processes involved in their in vivo effects will be studied. Drug discovery and design strategies, as well as stages prior to their commercialization will also be discussed. English Friendly subject. International students may request from the teachers: a) Materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
B3	Ability to manage information
B4	Ability for analysis and synthesis
C43	Know the chemical compounds with therapeutic application
D3	Ability to communicate in both oral and written form in Spanish and / or Galician and / or English

Expected results from this subject	Training and Learning Results			
Familiarize yourself with fundamental concepts of Therapeutic Chemistry	A4	B4		D3
Know the different types of pharmacological targets	A4	B3 B4		D3
Understand and be able to predict drug-target interactions	A3	B3	C43	D3
Know the different types of receptors and understand the signal transduction mechanisms.	A3 A4	B3 B4		D3
Differentiate a chemoterapeutic from a pharmacodynamic agent	A4	B4	C43	D3
Differentiate an agonist drug from an antagonist and from an inverse agonist	A4	B4	C43	D3
Relate the physicochemical properties of drugs with their pharmacokinetics.	A3	B3	C43	D3
Understand and be able to predict metabolic transformations	A3	B3	C43	D3
Know the different stages of drug development	A4	B3	C43	D3
Know and understand the strategies involved in discovering and optimizing leads	A4	B4	C43	D3
Know and understand the computational techniques of molecular modeling: docking strategies, QSAR and pharmacophore design	A4	B3	C43	D3

Contents	
Topic	
Subject 1. General aspects of Therapeutic Chemistry	1.1. Concept and objectives of Therapeutic Chemistry. 1.2. Drug nomenclature systems. 1.3. Drug classification systems.
Subject 2. Drug targets: proteins	2.1. Types of drug targets and location. 2.2. Drug-target interactions. 2.3. Transport proteins as drug targets. 2.4. Structural proteins as drug targets.

Subject 3. Drug targets: enzymes	3.1. Enzyme inhibition mechanisms. 3.2. Design of enzyme inhibitors and types of enzyme inhibitors with therapeutic application. 3.3. Isoenzymes as drug targets. 3.4. Measurement and expression of enzyme inhibition.
Subject 4. Receptors	4.1. Stucture and function of receptors. 4.2. Receptor types and signal transduction mechanisms. 4.3. Agonist, antagonist and inverse agonist drugs. 4.4. Measurement and expression of pharmacological effect.
Subject 5. Drug targets: nucleic acids and other biomolecules	5.1. Nucleic acids as drug targets 5.2. Lipids and carbohydrates as drug targets
Subject 5. Nucleic acids and other biomolecules as drug targets	5.1. Mechanisms of interaction between drugs and nucleic acids. 5.2. Lipids and carbohydrates as drug targets.
Subject 6. Pharmacokinetics and related topics	6.1. Absortion and distribution: mechanisms of transport across biological membranes. 6.2. Drug administration ways. 6.3. Drug metabolism. 6.4. Drug excretion.
Subject 7. Drug discovery and development	7.1. The process of obtaining and getting new drugs to the market. 7.2. Lead discovery and optimization strategies.
Subject 8. Rational drug design	8.1. Biochemical based drug design approaches. 8.2. Computational aided drug design: docking and QSAR strategies, pharmacophore based drug design approach.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	24	48	72
Seminars	12	18	30
Laboratory practical	14	14	28
Objective questions exam	0	6	6
Essay questions exam	2	12	14

*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. In order to better understand the content explanations, students should previously check and complete this material by using the recommended literature.
Seminars	They will devote time to discuss the most complicated aspects of the treated subjects by solving exercises and questions, using molecular modeling programs, as well as presenting review works related with the content of the subject.
Laboratory practical	Laboratory practices will be developed in 4 sessions of 3.5 h each. one session will consist of visiting a pharmaceutical company to learn about their facilities and products. Three sessions will be devoted to the synthesis and study of different peptidomimetics.

Personalized assistance

Methodologies	**Description**
Lecturing	The teachers will be available to have tutoring sessions with the students, which will be arranged in advance. In the tutoring sessions, either in person or online, such as email or the virtual campus, all queries related to the study of the contents of the subject will be answered.
Seminars	The teachers will be available to have tutoring sessions with the students, which will be arranged in advance. In the tutoring sessions, either in person or online, such as email or the virtual campus, all queries related to the study of the contents of the subject will be answered.
Laboratory practical	The teachers will be available to have tutoring sessions with the students, which will be arranged in advance. In the tutoring sessions, either in person or online, such as email or the virtual campus, all queries related to the study of the contents of the subject will be answered.
Tests	**Description**

Objective questions exam	The teachers will be available to have tutoring sessions with the students, which will be arranged in advance. In the tutoring sessions, either in person or online, such as email or the virtual campus, all queries related to the study of the contents of the subject will be answered.
Essay questions exam	The teachers will be available to have tutoring sessions with the students, which will be arranged in advance. In the tutoring sessions, either in person or online, such as email or the virtual campus, all queries related to the study of the contents of the subject will be answered.

Assessment

	Description	Qualification	Training and Learning Results
Seminars	The participation and resolution of all the tasks proposed by the teacher for the seminar classes will be qualified.	25	A3 B3 C43 D3 A4 B4
Laboratory practical	Attendance at the laboratory practical sessions will be mandatory. The laboratory work will be evaluated with a APT or NO APT. For this evaluation, compliance with the safety regulations related to the handling of chemical substances and waste removal, planning and development of proposed experiments, analysis of results and the laboratory notebook quality will be taken into account. The evaluation will be done through the systematic observation of student work. The mark of the laboratory practices will be obtained from the resolution of the tasks and works proposed by the teachers in relation to the experiments performed and the visit to the industry. To pass the subject it is essential to obtain APT at work from laboratory.	15	A3 B4 C43 D3
Objective questions exam	A short exam (one hour long) will be carried out at week five. In this exam will enter the subject explained until that moment.	20	A3 B3 C43 A4 B4
Essay questions exam	A global exam will be carried on closing date of evaluation in order to analyze the adquired competencies.	40	A3 B3 C43 A4 B4

Other comments on the Evaluation

Participation of students in any of the evaluation parts will involve the condition of presented and therefore the obtaining of a qualification.The presentation of some work in seminars, the attendance to laboratory practical (two or more sessions) or the performace of some written exams will be consiedered evaluation acts.
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 points over 10 in the global exam, as well as in seminars and laboratory practicals.
If the required minimums are not obtained, the final mark will be the weighted mark of the highest-scoring failed part (seminars, laboratory practicats or global exam).

Evaluation in the July Call
The mark achieved in seminars and laboratory practical will be manteined (maximun 40%).A written global exam about all theoretical contents of the subject will be performed (60%).In order to pass the subject (global score equal to or greater than 5) in this call, students must achieve a minimum mark of 5 points out of 10 in the written exam.
Students of subsequent enrollment
Those students who were previouly evaluated as APT will be awarded the APT mention for the monitoring of the laboratory practical, not being necessary the completion of the experimental work again. However, they must perform the tasks or works proposed by the teachers in relation to the laboratory practices in order to achieve the mark for the Laboratory practical (15%).
Non-continuous evaluation option
Students who do not wish to opt for continuous assessment must request it from the subject coordinator. This request will be made during the first three weeks of the course.To pass the subject they will have to do the work of laboratory, obtain the APT qualification, and perform a global test in which all the subject contents will be evaluated, including the laboratory practical. The minimun mark of this exam must be 5 points over 10.

Sources of information

Basic Bibliography

G. L. Patrick, **An introduction to Medicinal Chemistry**, 7th, Oxford University Press, 2023

N. K. Dunlap, **Medicinal Chemistry**, 1st, Garland Science, 2018

C. Rostron, **Drug Design and Development**, Oxford University Press, 2020

A. Delgado, C. Minguillón, J. Juglar, **Introducción a la Química Terapéutica**, 2ª, Diaz de Santos, 2003

E. Stevens, **Medicinal Chemistry: The Modern Drug Discovery Process**, 1st, Pearson Advanced Chemistry, 2013

Complementary Bibliography

C. Avendaño, **Introducción a la Química Farmacéutica**,

C. G. Wermuth, D. Aldous, P. Raboisson, D. Rogman, **The practice of Medicinal Chemistry**, 4th, Elsevier, 2015

J. M. Beale Jr, J. H. Block, **Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry**, 12th, Wolters Kluwer, 2011

Recommendations

Subjects that it is recommended to have taken before

Biology: Biology/V11G201V01101
Biochemistry/V11G201V01201
Organic chemistry I/V11G201V01205
Organic chemistry II/V11G201V01210
Organic Chemistry III: Concerted, Radical and Photochemical Reactions/V11G201V01305
Organic Chemistry IV: Design of Organic Synthesis/V11G201V01310
Stereoselective Synthesis of Bioactive Compounds/V11G201V01405

IDENTIFYING DATA				
Seguridade e hixiene industrial				
Subject	Seguridade e hixiene industrial			
Code	V11G201V01414			
Study programme	Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	2c
Teaching language				
Department				
Coordinator				
Lecturers				
E-mail				
Web				
General description				

Resultados de Formación e Aprendizaxe
Code

Resultados previstos na materia	
Expected results from this subject	Training and Learning Results

Contidos
Topic

Planificación			
	Class hours	Hours outside the classroom	Total hours
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description

Atención personalizada

Avaliación		
Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Bibliografía. Fontes de información
Basic Bibliography
Complementary Bibliography

Recomendacións

IDENTIFYING DATA				
Computing Techniques for Chemistry				
Subject	Computing Techniques for Chemistry			
Code	V11G201V01415			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Hermida Ramón, José Manuel			
Lecturers	Hermida Ramón, José Manuel			
E-mail	jose_hermida@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The subject "Computer Techniques in Chemistry" aims to introduce students to the use of advanced computer tools, based on free software, beyond office automation packages already used during the previous courses of the degree, thus expanding skills for work and/or or research. The subject is divided into four blocks in which the general aspects of the GNU/Linux operating system and how to install it, creation of documents in LaTeX with chemical applications, Fortran and Python will be considered. They will be taught combining small theoretical sessions together with practical examples that the students will verify in situ, and always supervised by the professors responsible for the subject. The evaluation will consist of carrying out some written tasks (programs and documents in LaTeX) with a weight of 50% together with the preparation of reports explaining how the aforementioned tasks have been implemented (with a weight of 30%) and systematic observation of the work done during the practical sessions in a presentation at the end of the course (20%). There will also be the possibility of not using continuous assessment with a written exam whose weight will be 100% if requested. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A1	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B1	Ability for auronomous learning
B2	Organization and planning capacity
B3	Ability to manage information
C37	Acquire basic knowledge of programming and be able to use appropriate computer packages to solve problems of chemical interest
D1	Ability to solve problems

Expected results from this subject	Training and Learning Results			
Python/Fortran program creation		B1 B2	C37	D1
Utilization of a distribution of the GNU/Linux operative system	A1 A5			
Preparation of presentations and/or text documents with *LaTeX		B2 B3	C37	

Contents
Topic

GNU/Linux operative system	- Installation of a distribution. - Graphic environment. - Introduction to the command line. - Installation of programs. - Installation and configuration of an integrated development environment.
Introduction to LaTeX	- Structure of the documents. - Common elements of all types of documents or classes. - Tools for technical texts. - Presentations (Beamer). - Applications for chemicals.
Python 3	- Structure of the source code of the programs and fundamentals of Python. - Variables and strings. - Type of data. - Syntax and basic commands. - Programming some practical examples.
Modern Fortran	- Structure of the source code of the programs and fundamentals of Fortran. - Variables and arrays. - Syntax and basic commands. - Programming some practical examples.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	12	12	24
Problem solving	12	27	39
Practices through ICT	14	28	42
Autonomous problem solving	12	27	39
Essay	2	4	6

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

Methodologies

	Description
Lecturing	Theoretical classes given through an on-screen presentation (available to students on the Moovi platform). In these classes the basic contents will be introduced, emphasizing the most important and difficult issues. Practical examples will be shown.
Problem solving	Aimed at solving problems and/or tasks and discussing them. The necessary material will be provided through the Moovi platform.
Practices through ICT	Application from what is discussed in the lecture and in the problem solving sessions to more general, but related, cases to the subject. Through the Moovi platform, the practice scripts and the work rules in the laboratory will be provided.
Autonomous problem solving	(*)Destinados á resolución de tarifas que integren os contados dados e exerciten as competencias a adquirir. A través da plataforma Moovi proporcionarase o material necesario.

Personalized assistance

Methodologies	Description
Lecturing	The student that need help will have the possibility of attend to "special tutorial sessions to solve doubts, mainly following the schedules indicated previously. To optimize the time, it is convenient that the student contacts with the professor with previously enough.
Practices through ICT	The student that need help will have the possibility of attend to "special tutorial sessions to solve doubts, mainly following the schedules indicated previously. To optimize the time, it is convenient that the student contacts with the professor with previously enough.
Problem solving	The student that need help will have the possibility of attend to "special tutorial sessions to solve doubts, mainly following the schedules indicated previously. To optimize the time, it is convenient that the student contacts with the professor with previously enough.
Autonomous problem solving	

Assessment

	Description	Qualification	Training and Learning Results
Problem solving	The students will give all the written work made in the session, such as creation of documents in LaTeX and Fortran/Python source code.	20	B1 C37 D1 B2

Practices through ICT	The students will give all the written work made in the session, such as creation of documents in LaTeX and Fortran/Python source code.	30	A1 A5	B1 B3	C37	D1
Autonomous problem solving	(*)Presentación da resolución de tarefas complexas que integren o coñecementos e competencias da materia.	30	A1	B1	C37	D1
Essay	The students will present the results of their practices made using LaTeX and explaining the design of his applications of Fortran/Python.	20	A1 A5	B1 B2 B3	C37	D1

Other comments on the Evaluation

Sources of information

Basic Bibliography

Jay LaCroix, **Learn Linux TV**, Youtube, 2022

Complementary Bibliography

Jay LaCroix, **Mastering Ubuntu Server : explore the versatile, powerful Linux Server distribution Ubuntu 22.04 with this comprehensive guide**, 4, Packt Publishing Limited, 2022

Richard Blum, Christine Bresnahan, **Linux command line and shell scripting bible**, 3, John Wiley & Sons, 2015

Collaboratively writing open-content textbook, **LaTeX**, https://en.m.wikibooks.org/wiki/LaTeX, 2022

J. Mulero, J.M. Sepulcre, **LATEX con palabras clave**, Publicacions de la Universitat d'Alacant, 2016

Collaboratively writing open-content textbook, **Python Programming**, https://en.m.wikibooks.org/wiki/Python_Programming,

Python 3 Tutorial, https://www.tutorialspoint.com/python3/,

Alberto Cuevas Álvarez, **Python 3**, RA-MA Editorial, 2016

David Beazley, Brian K. Jones, **Python Cookbook**, 3, O'Reilly, 2013

Fortran Tutorial, https://www.tutorialspoint.com/fortran/index.htm,

Collaboratively writing open-content textbook, **Fortran**, https://en.m.wikibooks.org/wiki/Fortran,

Michael Metcalf, John Reid, Malcolm Cohen, **Modern Fortran Explained (Numerical Mathematics and Scientific Computation)**, 4, Oxford University Press, 2011

William H. Press, Brian P. Flannery, Saul A. Teukolsky, William T. Vetterling, **Numerical Recipes in Fortran 77: The Art of Scientific Computing**, 2, University Press, 1992-1996

Recommendations

Subjects that it is recommended to have taken before

Mathematics: Mathematics 1/V11G201V01103
Mathematics: Mathematics 2/V11G201V01108
Chemistry: Chemistry 1/V11G201V01104
Chemistry: Chemistry 2/V11G201V01109

IDENTIFYING DATA				
Tecnoloxía do medioambiente				
Subject	Tecnoloxía do medioambiente			
Code	V11G201V01416			
Study programme	Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	2c
Teaching language				
Department				
Coordinator				
Lecturers				
E-mail				
Web				
General description				

Resultados de Formación e Aprendizaxe
Code

Resultados previstos na materia	
Expected results from this subject	Training and Learning Results

Contidos
Topic

Planificación			
	Class hours	Hours outside the classroom	Total hours
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description

Atención personalizada

Avaliación		
Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Bibliografía. Fontes de información
Basic Bibliography
Complementary Bibliography

Recomendacións

IDENTIFYING DATA				
Theory of Organic Reactions				
Subject	Theory of Organic Reactions			
Code	V11G201V01417			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish			
Department				
Coordinator	Vaz Araújo, Belén			
Lecturers	Vaz Araújo, Belén			
E-mail	belenvaz@uvigo.es			
Web				
General description	This subject aims to deepen the knowledge of all aspects related to reactivity in Organic Chemistry and reaction mechanisms. Emphasis will be placed on factors affecting the stabilities of reaction intermediates, chemoselectivity and stereoselectivity. This knowledge will allow students to predict and justify chemical behaviors. English Friendly Program: Foreign students may request from the teaching staff: a) material and bibliographical references in English for the follow-up of the subject; b) attend tutorials in English; c) assessment tests in English.			

Training and Learning Results	
Code	
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B5	Ability to adapt to new situations and to make decisions
C44	Know the main methods for the study of organic reactions mechanisms
D2	Capacity for teamwork
D3	Ability to communicate in both oral and written form in Spanish and / or Galician and / or English

Expected results from this subject	Training and Learning Results			
Understanding the principles and theories related to the main types of chemical reactions and their characteristics.	A4 A5	B5	C44	D3
Knowing the methods of studying the mechanism of an organic reaction.	A4 A5	B5	C44	D3
Knowing the methods to study and propose reaction intermediates.	A4 A5	B5	C44	D3
Rigorously apply the corresponding safety and healthy standards in the laboratory, as well as the proper treatment of the waste generated		B5	C44	D2 D3
Collect data and write in the laboratory notebook, in a clear, concise and rigorous way, the experiments carried out and the conclusions drawn.	A4 A5	B5		D2 D3

Contents	
Topic	
1. Thermodynamics and Kinetics of Organic Reactions	Thermodynamic stability. Chemical kinetics. Coordinate diagrams of reaction. Transition state theory. Arrhenius equation. Reaction rate expressions. Kinetic control and thermodynamic control. Hammond's postulate. Curtin□Hammett principle.
2. Methods for the study of Organic Reactions	Applications of chemical kinetics to the study of the mechanisms of reaction. Kinetic isotope effects. Effect of substituents. Hammett correlations.
3. Acid and base catalysis of organic reactions	Acidity and basicity in organic compounds. Specific acid catalysis. General acid catalysis. Basic catalysis.
4. Frontier Orbitals	Fukui postulate. Klopman-Salem Equation.
5. Reaction Intermediates	Radicals. Carbenes. Carbocations. Carbanions. Structure and stability of these intermediates, generation and reactivity. Reaction intermediates detection. Stereochemistry and reaction mechanisms.

Practice 1. Effect of sterics and electronics on the aldol condensation reaction. Hammett correlation.	
Practice 2. Study of the primary isotope effect in the oxidation of 1-phenylethanol	

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	24	36	60
Seminars	11	24	35
Laboratory practical	14	14	28
Problem and/or exercise solving	1	8	9
Presentation	1	4	5
Problem and/or exercise solving	1	12	13
*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 subject material will be previously provided through the Moovi platform. The teaching staff will present the contents of the subject in a structured manner. Possible doubts arising at the time of the presentation may be clarified during these presentations.
Seminars	The concepts introduced in the master sessions will be worked on through problems and questions formulated by the teaching staff. In addition, the students will work on the concepts learned in class and will solve problems and additional exercises that will be evaluated.
Laboratory practical	The laboratory work will be developed in 4 sessions of 3.5 hours. Students will have to prepare a laboratory notebook with the experiments carried out, where the conclusions derived from the experimental work will also be collected. Additionally, students will answer a series of questions about the work done in the laboratory.

Personalized assistance	
Methodologies	**Description**
Lecturing	The teacher will clarify the doubts and questions that arise during the exposition of the topics, related to the subject.
Seminars	The teaching staff will explain and resolve the questions raised by the students in relation to the exercises and problems solved in the seminar sessions.
Laboratory practical	The teaching staff will supervise and guide the development of the experiments proposed in the lab sessions. In addition, special attention will be paid to compliance with safety and healthy measures in the laboratory.
Tests	**Description**
Problem and/or exercise solving	Before each evaluation test (short tests and final exam) the teaching staff will dedicate the necessary time to answer the students' questions related to the subject.
Presentation	The teacher will supervise and guide the development of the work for its subsequent presentation in a seminar session.
Problem and/or exercise solving	

Assessment					
	Description	Qualification	Training and Learning Results		
Seminars	As part of the continuous evaluation, the participation and the resolution of the exercises proposed by the teaching staff in the classroom will be evaluated. The resolution of exercises and additional problems will also be evaluated, similar to those resolved during the seminar sessions, and which will be proposed through the Moovi platform.	20	A4 A5	C44	D3

Laboratory practical	1. It is mandatory to carry out the laboratory practices, as well as to follow the healthy and safety standards in the laboratory and the collection of residues to obtain the PASS condition. 2. In addition, it will be evaluated (20%): - the laboratory notebook - the resolution of the questions raised in relation to the practices carried out. 3. In order for students to pass the subject, they must obtain the PASS mark in the laboratory practice work.	20	A5	B5	C44	D2 D3
Problem and/or exercise solving	Two tests will be carried out: The first test on the contents of the first topics, which will mean 20% of the final grade. A minimum grade of 2.5 points out of 10.0 in this test will be required to pass the subject. In the event that the minimum required in any of the tests (first or second) is not exceeded, the final grade obtained in the subject will be the weighted grade of the global evaluation test.	20	A4 A5	B5	C44	D3
Presentation	The students will analyze and explain the research results collected in a recent research article related to the subject of the course in a seminar session. The ability to synthesize and understand the work presented will be valued, as well as the questions that are asked about the other works of the students.	10	A4 A5	B5	C44	D3
Problem and/or exercise solving	Two tests will be carried out: The second test on ALL THE CONTENTS OF THE SUBJECT, which will mean 30% of the final grade. A minimum grade of 4.0 points out of 10.0 in this test will be required to pass the subject. In the event that the minimum required in any of the previous tests is not exceeded, the final grade obtained in the subject will be the weighted grade of the global evaluation test.	30	A4 A5	B5	C44	D3

Other comments on the Evaluation

MINIMUM REQUIREMENTS: The identification of serious conceptual errors will lead to an assignment of specific activities aimed at acquiring those skills. These activities will be evaluated as part of the 20% corresponding to deliverables.

CONDITION OF PRESENTED: The participation of the student in any of the acts of evaluation of the subject will imply the condition of presented and, therefore, the assignment of a grade. Attendance at practical laboratory classes, handing in assignments and/or exercises proposed by the teaching staff, or taking a test will be considered acts of evaluation.

EVALUATION IN JULY: the grade obtained by the students during the course in problem solving, laboratory practices and assignments will be maintained. A test will be carried out on all the theoretical contents of the subject that will account for 45% of the final grade and that will replace the marks of the written tests. It will be necessary to achieve a minimum of 4 points out of 10 in this test to pass the subject and to take into account the rest of the evaluation elements. In case of having a grade of PASS in the laboratory work and having obtained a grade lower than 5 out of 10 in the evaluation of the practices, a written test of the experimental part will be done, which will mean 20% of the final grade.

STUDENTS OF 2nd AND LATER REGISTRATION: Students who have been evaluated with PASS in the laboratory work in a previous course, will be awarded the mention of PASS in the follow-up of the laboratory work in the current academic year, not being necessary to carry out the experiments again. However, a written test of the experimental part must be taken to obtain the qualification corresponding to the experimental part of the subject in the current academic year.

NON-CONTINUOUS ASSESSMENT OPTION: Students who wish not to opt for continuous assessment must request it during the first three weeks of the course from the subject coordinator. To pass the subject, you must complete the Laboratory Practices, obtain a grade of PASS in the work developed in the laboratory and a grade equal to or greater than 5 points out of 10 in the evaluation of the laboratory notebook and the questions related to the practices made. In addition, you must obtain at least 5 points out of 10 in a test in which all the contents of the subject will be evaluated. In this case, the final mark will be a maximum of 2 points for laboratory practices and a maximum of 8 points for the written test.

Sources of information

Basic Bibliography

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

Complementary Bibliography

Felix A. Carroll., **Perspectives on Structure and Mechanism in Organic Chemistry**, Wiley, 2010

Francis A. Carey, Richard J. Sundberg, **Advanced Organic Chemistry : Part A: Structure and Mechanisms**, Springer, 2007

Recommendations

Subjects that it is recommended to have taken before

Chemistry: Chemistry Lab I/V11G201V01105
Chemistry: Chemistry Lab II/V11G201V01110
Chemistry: Chemistry 1/V11G201V01104
Chemistry: Chemistry 2/V11G201V01109
Organic chemistry I/V11G201V01205
Organic chemistry II/V11G201V01210
Physical Chemistry V: Chemical Kinetics/V11G201V01308
Organic Chemistry III: Concerted, Radical and Photochemical Reactions/V11G201V01305
Organic Chemistry IV: Design of Organic Synthesis/V11G201V01310

IDENTIFYING DATA				
Materia condensada				
Subject	Materia condensada			
Code	V11G201V01418			
Study programme	Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	2c
Teaching language				
Department				
Coordinator				
Lecturers				
E-mail				
Web				
General description				

Resultados de Formación e Aprendizaxe
Code

Resultados previstos na materia	
Expected results from this subject	Training and Learning Results

Contidos
Topic

Planificación			
	Class hours	Hours outside the classroom	Total hours
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description

Atención personalizada

Avaliación		
Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Bibliografía. Fontes de información
Basic Bibliography
Complementary Bibliography

Recomendacións

IDENTIFYING DATA				
Immunochemistry				
Subject	Immunochemistry			
Code	V11G201V01419			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Magadán Mompo, Susana			
Lecturers	Magadán Mompo, Susana			
E-mail	smaga@uvigo.es			
Web				
General description	The subject of *Inmunoquímica has like aim contribute a basic knowledge on the operation of the immune system, and deepen in the use of his components for the development of technicians of *inmunodetección. Between his components stand out the antibodies, some skilled proteins in recognising numerous types of different molecules, so much of biological origin as of synthetic origin. The antibodies allow to develop diverse technicians of analysis, diagnostic and therapy by means of his union to other molecules like enzymes, particles or drugs, or even of free form. His extraordinary capacity of detection is used in fields very diverse (medicine, chemical and pharmaceutical industry, agriculture, marine field, etc.). In this subject will review also the chemistry of the components of the immune system, with the aim to know the extraordinary capacities of this system to protect us in front of pathogens, or in front of other illnesses like the cancer.			

Training and Learning Results	
Code	
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
B2	Organization and planning capacity
B4	Ability for analysis and synthesis
C49	Acquire sufficient knowledge, skills and abilities for the practice of immunochemistry in different fields
D1	Ability to solve problems
D3	Ability to communicate in both oral and written form in Spanish and / or Galician and / or English
D5	Ability to develop their professional activity based on respect for fundamental rights and equal opportunities, within the framework of professional ethics and ethical commitment

Expected results from this subject	Training and Learning Results			
Identify the cellular and molecular components that participate in the immune answers.	A3	B2	C49	D1
Know the diversity of receptors of the immune system.	A4	B4		D3
Identify the interactions of the receptors of the immune system with his *ligandos and comprise his complexity.				D5
Know the different methodologies of obtaining of antibodies for his back utilisation in the laboratory and/or therapy.				
Comprise and handle the concepts, terminology and scientific instrumentation.				
Comprise the theoretical appearances and technicians of the different essays *inmunoquímicos.				
Elaborate a procedure to carry out a technical *inmunoquímica in the laboratory.				
Apply knowledges and relative technology to the *Inmunoquímica in appearances related with the production, analysis and diagnostic of processes and biological resources and/or chemists.				
Apply the knowledge of the *Inmunoquímica to isolate, identify, handle and analyse specimens and samples of biological origin and/or chemical, as well as to characterise his constituents.				
Communicate of written and oral form a critical analysis of a scientific work in relation to the application of technical *inmunoquímicas in different fields.				

Contents
Topic

Subject 1. Historical introduction. Bases of the *Inmunoquímica	1.1. Discovery and identification of molecular components like Antibodies, Immune answer and *Antígeno. 1.2. Development of technicians like the agglutination/precipitation, neutralisation, *lisis by complement, that allowed his characterisation and understand the immunological reaction. 1.3. The importance of the *transplantes and allergy for the development of the Immunology.
Subject 2. Components Immune system. Basic concepts.	2.1. Receptors of membrane and soluble Molecules. 2.2. Cells.
Subject 3. Introduction to the Cellular Immunology	3.1. Main cellular types of the IF and his function. 3.2. Concept of phenotype and cellular differentiation. 3.3. The *CDs like markers of cellular differentiation.
Subject 4. Basic concepts of *Inmunoquímica and *Inmunogenética	4.1. The antibodies. 4.2. The *TCR and the *MHC. 4.3. Concept of *antígeno, *hapteno and *inmunógeno. 4.4. Interaction *antígeno - antibody and *TCR-peptide-*MHC. 4.5. Genetic bases of the diversity of receptors.
Subject 5. Components of the *Inmunoensayos	5.1. Obtaining of antibodies in the laboratory 5.2. Technicians of purification and *escalado 5.3. Chemical modification of the antibodies
Subject 6. Technical *Inmunoquímicas	6.1. Technical *homogéneas. Technicians of Precipitation. Agglutination. I complement. Quantification of his components. 6.1. Heterogeneous technicians. Principles of colorimetry, fluorescence, chemiluminescence and *radioactividad Technical of visualisation: optics, fluorescent, electronic, *confocal ELISA: direct, indirect, competitive , *sándwich *EIA, RIA *Inmunodetección by *Western *Blot and *Dot *Blot *Inmunoprecipitación Technical of *Inmunofluorescencia Technical enzymatic: *Inmunohistoquímica / *Inmunocitoquímica
Subject 7. *Inmunoensayos In the pharmaceutical industry	7.1. Importance in the development of medicines and clinical appearances
Practices of laboratory	1) Technical of Agglutination 2) Conjugation *antígeno / antibody 3) ELISA 4) *Dot *blot 5) Separation of cells by gradient of density

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	24	46	70
Seminars	12	10	22
Laboratory practical	14	4	18
Objective questions exam	2	25	27
Laboratory practice	0	5	5
Problem and/or exercise solving	0	8	8
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Exhibition by part of the professor of the foundations and basic principles of the *Inmunoquímica. In the development of the theoretical classes pretends that the student purchase a basic knowledge of the fundamental principles of the Immunology and his possible application in analysis, diagnostic and therapy.
Seminars	The seminars will consist in exercises, debates or tasks that reinforce the knowledges purchased during the lessons *magistrales. Besides, they will include practical cases and problems so that the students put to proof his knowledges.
Laboratory practical	The work in the laboratory is headed to to achieve competition and application in technical *Inmunoquímicas.

Personalized assistance

Methodologies	Description
Lecturing	The master sessions will be participatory. Personalized attention will be provided by the teachers responsible for each topic in the corresponding weekly tutoring hours.
Seminars	The seminars will be participatory. The responsible professor will be available to resolve the doubts related with the exercises or any theoretical or practical content.
Laboratory practical	The responsible professors will provide personalised supervision to each student during the practices of laboratory and will give the necessary support for the understanding of the aims, methodology, techniques and interpretation of results.

Assessment

	Description	Qualification	Training and Learning Results			
Objective questions exam	FINAL AND WRITTEN TEST 40% of the final mark. In this compulsory proof, the fundamental contents of the matter (masterclasses, practical laboratory and seminars) will be evaluated through OBJECTIVE QUESTIONS (test and/or short answer).	40	A3 A4	B2 B4	C49	D1 D3 D5
Laboratory practice	The capacities and skills purchased during the practices of laboratory will be EVALUATED OF CONTINUOUS FORM by means of the presentation of reports, ask type test and of short answer or resolution of problems. The evaluation of the practices will suppose 30% of the final qualification.	30	A3 A4	B2 B4	C49	D1 D3 D5
Problem and/or exercise solving	The work and the participation in the seminars will be EVALUATED OF CONTINUOUS FORM, as well as the capacity of the students to resolve problems and exercises. This part will suppose 30% of the final qualification.	30				

Other comments on the Evaluation

The assistance to all the face-to-face activities is COMPULSORY to APPROVE the matter (except the absencesproperly justified). To surpass the matter will have to obtain at least a 5 on 10 in the examination or final proof written. Of not to surpass, the qualification of the student will be the obtained in the final proof written.The no assistance the final proof written will be considered as no presented.In the following announcements, the student suspense will have to make only the Final Proof, keepingqualification obtained in the part of Continuous Evaluation (Practices of laboratory and Seminars).ASSISTANCE To PRACTICES And EVALUATION:An inferior assistance to 75% of the practical sessions, still being justified, supposes the qualification of suspense inmatter. In this case, the students would have to subject to an only examination to surpass the matter, in shape of proof written thatwould consist of two parts:-70% theoretical part .-30% practical part .To surpass the matter will have to obtain at least a 5 on 10 in the only examination.The final qualification, in this case, will suppose 70% of the qualification of the only examination and 30% of the qualification of the seminars.

Sources of information

Basic Bibliography

Complementary Bibliography

Wild D., **The Immunoassay Handbook. Theory and applications of ligand binding, ELISA and related techniques.**, 4ª, Elsevier, 2013

A. Nisonoff, **Introduction to Molecular Immunology**, 2º, Sinauer Associates Inc., 1984

Álvarez Vallina, L, **Anticuerpos Monoclonales. Realidades y perspectivas**, Editorial Complutense S.A, 2004

Álvarez-Vallina L., González-Fernández A., Magadán Mompó S. et al., **Immunotechnology and its applications**, Ediuno, 2022

Greenfield E. A., **Antibodies: A Laboratory Manual**, Cold Spring Harbor Laboratory Press, 2014

Campos Ferrer A., Muñoz Ruiz C., Rubio Pedraza G., **Manual de Prácticas de Inmunología**, Masson, 2004

Recommendations

Subjects that it is recommended to have taken before

Biology: Biology/V11G201V01101
Biochemistry/V11G201V01201

IDENTIFYING DATA				
Introdución á xestión de empresas				
Subject	Introdución á xestión de empresas			
Code	V11G201V01420			
Study programme	Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	1c
Teaching language				
Department				
Coordinator				
Lecturers				
E-mail				
Web				
General description				

Resultados de Formación e Aprendizaxe
Code

Resultados previstos na materia	
Expected results from this subject	Training and Learning Results

Contidos
Topic

Planificación			
	Class hours	Hours outside the classroom	Total hours

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

Metodoloxía docente	
	Description

Atención personalizada

Avaliación		
Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Bibliografía. Fontes de información
Basic Bibliography
Complementary Bibliography

Recomendacións

IDENTIFYING DATA				
Internships				
Subject	Internships			
Code	V11G201V01981			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Lavilla Beltrán, María Isela Peña Gallego, María de los Ángeles			
Lecturers	Lavilla Beltrán, María Isela Peña Gallego, María de los Ángeles			
E-mail	isela@uvigo.es mpena@uvigo.es			
Web	http://quimica.uvigo.es/index.php/practicas-en-empresas.html			
General description	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. 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.			

Training and Learning Results	
Code	
A1	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B1	Ability for auronomous learning
B2	Organization and planning capacity
B5	Ability to adapt to new situations and to make decisions
D2	Capacity for teamwork
D3	Ability to communicate in both oral and written form in Spanish and / or Galician and / or English
D4	Incorporate criteria of sustainability and environmental commitment into the professional exercise. Acquire skills in the equitable, responsible and efficient use of resources
D5	Ability to develop their professional activity based on respect for fundamental rights and equal opportunities, within the framework of professional ethics and ethical commitment
D6	Ability to understand the meaning and application of the gender perspective in different areas of knowledge and professional practice with the aim of achieving a more just and equal society

Expected results from this subject	Training and Learning Results		
Perform tasks to test the critical and reflexive capacity.	A1 A3 A4 A5	B1 B2 B5	D2 D3 D4 D5 D6
Take decisions and put in practice the capacity of analysis and synthesis in the resolution of practical problems.	A1 A3 A4 A5	B1 B2 B5	D2 D3 D4 D5 D6

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	Students develop activities in a context related to the exercise of a profession, during a certain period, performing the functions assigned and foreseen in the internship proposal.

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

Assessment			
	Description	Qualification	Training and Learning Results
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 (**D8 form**) considering:

(70%) The report made by the company tutor (**D5 form**) 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. The memory will have a minimum extension of 10 and a maximum of 20 pages of A4 size, including cover, index and annexes. Mminimum 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 aptitude and attitude showed by the student during the development of the activities made.

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

IDENTIFYING DATA				
Final Year Dissertation				
Subject	Final Year Dissertation			
Code	V11G201V01991			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	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	According to the memory of the Degree in Chemistry of the University of Vigo, the End of Degree project is a mandatory subject of 18 credits ECTS in the second term of the fourth course. The objective of the subject is to offer the students the opportunity to apply the knowledges, skills and competences adquired during the Degree studies. The TFG is an original work that each student will do individually under the supervision of one or two tutors. TFG subjects can correspond to experimental and/or theoretical works and/or of bibliographic reviews on subjects related with the contains in the Degree in Chemistry. The final stage of the TFG will consist in a written report and its public presentation. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A1	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A2	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B1	Ability for auronomous learning
B2	Organization and planning capacity
B3	Ability to manage information
B4	Ability for analysis and synthesis
B5	Ability to adapt to new situations and to make decisions
C1	Ability to know and understand essential facts, concepts, principles and theories related to Chemistry
C2	Use correctly chemical terminology, nomenclature, conversions and units
C3	Recognize and analyze chemical, qualitative and quantitative problems, proposing strategies to solve them through the evaluation, interpretation and synthesis of data and chemical information
C4	Use computer tools properly to obtain information, process data, perform computational calculations and calculate matter properties
C5	Present material and scientific arguments in oral and written form to a specialized audience
C6	Know the basics and tools for resolution of analytical problems and characterization of chemical substances
C7	Distinguish the main types of chemical reactions and their characteristics
C8	Know the characteristic properties of the elements and their compounds, including the relations between groups and their variations in the periodic table
C9	Know the structural aspects of chemical elements and their compounds, including stereochemistry
C10	Know the characteristics of the different states of matter and the theories used to describe them
C11	Know the principles of Thermodynamics and its applications in Chemistry
C12	Know the kinetics of chemical change, including catalysis and reaction mechanisms
C13	Know the principles and applications of electrochemistry
C14	To know the principles of quantum mechanics and its application in the description of the structure and properties of atoms and molecules

C15	Know the main techniques of structural research, including spectroscopy
C16	Know the relationship between macroscopic properties and properties of individual atoms and molecules, including macromolecules (natural and synthetic), polymers, colloids, crystals and other materials
C17	Know the nature and behavior of functional groups in organic molecules
C18	Know the properties of aliphatic, aromatic, heterocyclic and organometallic compounds
C19	Know the main synthesic routes in organic chemistry, including the interconversions of functional groups and the formation of carbon-carbon and carbon-heteroatom bonds
C20	Know the structure and reactivity of the main classes of biomolecules and the chemistry of important biological processes
C21	Know mathematical concepts based on previous ones and be able to use them in the different contexts of Chemistry
C22	Know and apply the foundations of Physics necessary to understand the theoretical and practical aspects of Chemistry that need it
C23	Know the principles and procedures of chemical engineering
C24	Know the properties and applications of materials
C25	Safely handle chemical substances, considering their physical and chemical properties, evaluating the risks associated with their use and laboratory procedures and including their environmental repercussions
C26	Perform correctly usual procedures in the laboratory, including the use of standard chemical instrumentation for synthetic and analytical work
C27	Demonstrate the ability to observe, monitor and measure chemical processes, by systematically and reliably recording them and presenting reports of the work done
C28	Interpret data derived from laboratory observations and measurements in terms of their meaning and relate them to the appropriate theory
C29	Demonstrate ability for numerical calculations and interpretation of experimental data, with correct use of units and estimation of uncertainty
C30	Ability to understand, interpret and adapt the advances in the field of Analytical Chemistry
C31	Know the control processes applied in the analytical laboratories to achieve their correct management and ensure the quality of the results
C32	Acquire basic knowledge on enviromental control and evaluation and agro-food security
C33	Know the metrology of chemical processes, including quality management
C34	Select and use different procedures for obtaining and characterizing nanomaterials and know their potential in the development of new applications
C35	Acquire theoretical and experimental knowledge in advanced aspects of Physical Chemistry
C36	Know the basics and be able to use different quantum mechanical methods to be applied to systems of chemical interest
C37	Acquire basic knowledge of programming and be able to use appropriate computer packages to solve problems of chemical interest
C38	Relate the structural bases of organometallic compounds with their physical, spectroscopic and chemical properties
C39	Select the appropriate techniques and procedures for problems of structural elucidation, synthesis, isolation and purification of organometallic compounds
C40	Acquire knowledge about the variety of roles played by metal ions in Biology. Know the biomolecules that contain metal ions
C41	Evaluate health risk, and environmental and socioeconomic impact of chemical substances
C42	Know synthetic strategies to obtain stereoselectively compounds with biological activity
C43	Know the chemical compounds with therapeutic application
C44	Know the main methods for the study of organic reactions mechanisms
C45	Apply chemical and chemical engineering knowledge to industrial processes
C46	Know the principles and procedures of environmental technology applied to the industry
C47	Know the principles and procedures of industrial health and safety
C48	Be able to determine the behavior of a material
C49	Acquire sufficient knowledge, skills and abilities for the practice of immunochemistry in different fields
C50	Know the concepts of company, institutional and legal framework of companies, and organization and management of companies
D1	Ability to solve problems
D2	Capacity for teamwork
D3	Ability to communicate in both oral and written form in Spanish and / or Galician and / or English
D4	Incorporate criteria of sustainability and environmental commitment into the professional exercise. Acquire skills in the equitable, responsible and efficient use of resources
D5	Ability to develop their professional activity based on respect for fundamental rights and equal opportunities, within the framework of professional ethics and ethical commitment
D6	Ability to understand the meaning and application of the gender perspective in different areas of knowledge and professional practice with the aim of achieving a more just and equal society

Expected results from this subject	
Expected results from this subject	Training and Learning Results

New	A1	B1	C1	D1
	A2	B2	C2	D2
	A3	B3	C3	D3
	A4	B4	C4	D4
	A5	B5	C5	D5
			C6	D6
			C7	
			C8	
			C9	
			C10	
			C11	
			C12	
			C13	
			C14	
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			C42	
			C43	
			C44	
			C45	
			C46	
			C47	
			C48	
			C49	
			C50	

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	Training and Learning Results			
Mentored work		30	A1	B1	C1	D1
			A2	B2	C2	D2
			A3	B3	C3	D3
			A4	B4	C4	D4
			A5	B5	C5	D5
					C6	D6
					C7	
					C8	
					C9	
					C10	
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					C46	
					C47	
					C48	
					C49	
					C50	

Presentation	70	A1 A2 A3 A4 A5	B1 B2 B3 B4 B5	C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18 C19 C20 C21 C22 C23 C24 C25 C26 C27 C28 C29 C30 C31 C32 C33 C34 C35 C36 C37 C38 C39 C40 C41 C42 C43 C44 C45 C46 C47 C48 C49 C50	D1 D2 D3 D4 D5 D6

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