



Teaching Guide				
Identifying Data				2022/23
Subject (*)	Chemistry		Code	730G03005
Study programme	Grao en Enxeñaría Mecánica			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	First	Basic training	6
Language	SpanishGalician			
Teaching method	Face-to-face			
Prerequisites				
Department	Química			
Coordinador	Rodríguez Guerreiro, María Jesus	E-mail	maria.guerreiro@udc.es	
Lecturers	González Rodríguez, María Victoria	E-mail	victoria.gonzalez.rodriguez@udc.es	
	Gonzalez Soto, Elena		elena.gsoto@udc.es	
	Rodríguez Guerreiro, María Jesus		maria.guerreiro@udc.es	
Web				
General description	Matter of basic training of first course, in which they give the foundations of general chemistry, inorganic, organic and applied to the engineering			

Study programme competences	
Code	Study programme competences
A4	FB4 - Capacidade para comprender e aplicar os principios de coñecementos básicos da química xeral, química orgánica e inorgánica e as súas aplicacións na enxeñaría.
B1	CB01 - Que os estudantes demostren posuír e comprender coñecementos nunha área de estudo que parte da base da educación secundaria xeral e adoita encontrarse a un nivel que, aínda que se apoia en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vangarda do seu campo de estudo
B2	CB02 - Que os estudantes saiban aplicar os seus coñecementos ao 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
B3	CB03 - Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitiren xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética
B4	CB04 - Que os estudantes poidan transmitir información, ideas, problemas e solucións a un público tanto especializado como leigo
B5	CB05 - Que os estudantes desenvolvan aquelas habilidades de aprendizaxe necesarias para emprenderen estudos posteriores cun alto grao de autonomía
B6	B3 - Ser capaz de concibir, deseñar ou poñer en práctica e adoptar un proceso substancial de investigación con rigor científico para resolver calquera problema formulado, así como de comunicar as súas conclusións ?e os coñecementos e razóns últimas que as sustentan? a un público tanto especializados como leigo dun xeito claro e sen ambigüidades
B7	B5 - Ser capaz de realizar unha análise crítica, avaliación e síntese de ideas novas e complexas
C1	C3 - Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.
C2	C4 - Desenvolverse para o exercicio dunha cidadanía aberta, culta, crítica, comprometida, democrática e solidaria, capaz de analizar a realidade, diagnosticar problemas, formular e implantar solucións baseadas no coñecemento e orientadas ao ben común.
C4	C6 - Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.
C5	C7 - Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida.

Learning outcomes	
Learning outcomes	Study programme competences



Capacity to comprise and apply the principles of basic knowledges of the general, organic and inorganic chemistry and his applications in the engineering.	A4	B1 B2 B3 B6 B7	C5
Handle the basic laws that regulate reactions: kinetic thermodynamics and equilibrium.		B5	
Solve exercises and problems in a complete and reasoned way.			C5
Properly apply theoretical concepts in the laboratory through correct and safe use.	A4	B1 B3 B7	C2 C4
Use rigorous language in chemistry. Present and interpret data and results		B4	C1 C2 C4

Contents	
Topic	Sub-topic
The following lessons develop the established contents in the Verification Memory, that are:	I.- Structure of the matter. Energy and kinetical of the chemical reactions II.- Chemical equilibrium: types and applications III.- Applications of the electrochemistry. Principles of instrumental analysis IV.- Bases of the industrial chemistry. Balances of matter V.- Organic and inorganic chemistry applied to the engineering
Lesson 1.- Basic concepts of General Chemistry:	Fundamental Principles of Chemistry. The atom: quantum mechanical description. Periodic table and periodic properties. Chemical link: types of link.
Lesson 2.- Thermochemistry:	Introduction: first principle of thermodynamics. Heats of reaction, enthalpy. Thermochemistry: Law of Hess. Calorimetry. Second principle of thermodynamics: entropy. Third principle of thermodynamics: spontaneity of the reaction.
Lesson 3.- Chemical Kinetics:	The rate of reaction. The rate law. Determination of the rate of reaction. Order of reaction. The collisions and of the state of transition theories. Activation energy. Reaction mechanisms. Catalysis: Catalysts.
Lesson 4.- Chemical equilibrium in gaseous phase:	Nature of the chemical equilibrium. The equilibrium constant: applications. Heterogeneous equilibria. Factors that affect chemical equilibrium: Le Châtelier's principle. Relation between equilibrium constants. Effect of changes in the temperature on the equilibrium constant.
Lesson 5.- Acid-base equilibria:	Acid-base definitions. Autoionization of water. Concept of pH: determination. Dissociation of acids and bases. Acid-base properties of the salts. Acid-base reactions. Buffer solutions. Acid-basic titrations: indicators.
Lesson 6.- Oxidation-reduction (redox) equilibria:	Methods of balancing redox equations. Electrochemical foundations: galvanic cells. Free energy and voltage of the battery. The Nernst equation. Redox titrations.
Lesson 7.- Applications of the electrochemistry:	Primary commercial cells and accumulators. Fuel cells. Electrolytic cells. Industrial applications of the electrolysis: electrodeposition. Metallic corrosion.
Lesson 8.- Principles of Instrumental Analysis:	Analytical Chemistry: concept and division. Classification of quantitative analytical methods. Instrumental analytical methods: classification. Parameters of validation of an analytical method. Evaluation of results.
Lesson 9.- Principles of Organic Chemistry:	Functional groups. Homologous series. Isomery. Determination of molecular structures.
Lesson 10.- Saturated, unsaturated and aromatic hydrocarbons:	Classification. Saturated hydrocarbons: naming, sources, synthesis and properties. Alkenes and alkynes: structure, nomenclature, synthesis and properties. Aromatic compounds: structure, nomenclature, obtaining and properties. Benzene.



Lesson 11.- Other organic compounds:	Compounds of functional groups with simple link: alkyl halides, alcohols, phenols, ethers and amines. Compounds of functional groups with multiple links: carbonyl group compounds, carboxylic acids and his derivatives.
Lesson 12.- Bases of the Industrial Chemistry. Balances of matter:	Introduction to the balance of matter. Processes without chemical reaction.
Lesson 13.- Organic Chemistry applied to the engineering:	Oil. Natural gas. Biomass. Natural and synthetic polymers.
Lesson 14.- Inorganic Chemistry applied to the engineering:	Metallurgy. Semiconductors. Industrial synthesis of an inorganic compound (industry of the chloride of sodium).

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student's personal work hours	Total hours
Laboratory practice	A4 A4 B3 B5 B3 C5	10	5	15
Mixed objective/subjective test	A4 A4 B1 B2 B5 B1	4	6	10
Guest lecture / keynote speech	A4 A4 C1 C2 C4 C2 C4	30	39	69
Problem solving	A4 A4 B2 B4 B5	18	18	36
Supervised projects	A4 B6 B7 B7 C1	2	16	18
Personalized attention		2	0	2
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Laboratory practice	Understanding reading of the practice. Realise the experimental work. Pose and resolve the numerical calculations associated as well as the questions that pose. Examine and value the results. Draft and present the final report of the practices.
Mixed objective/subjective test	Tests written used for the evaluation of the learning of the student.
Guest lecture / keynote speech	Has a expositive function complemented with the use of audiovisual means and the introduction of some questions headed to the students, with the purpose of transmit knowledges and facilitate the learning. The student takes aim, poses doubts and questions.
Problem solving	Presentation and resolution of exercises bulletins. The student, of individual form or in group, poses doubts and /or questions, participating of active form in the classroom.
Supervised projects	It involves the realization of directed studies that each group must expose in the classroom and deliver to the teacher for correction.

Personalized attention	
Methodologies	Description



Problem solving Supervised projects Laboratory practice	In the personalized attention will treat to amend possible deficiencies in the previous chemical training of the student and to resolve doubts and punctual questions that, usually, prevent him the general follow-up of the matter. It will realize a follow-up of the work of the student in the laboratory, will take in consideration his suggestions and will loan him help to clear the doubts. In the problem solving and seminar sessions in small group will loan them help to clear concepts and resolve possible doubts. In the preparation of the supervised projects will facilitate them the assistance that require for his preparation and exhibition. The student with recognition of part-time dedication and academic dispensation of attendance exemption will be attended in tutoring hours (by appointment).
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Assessment			
Methodologies	Competencies	Description	Qualification
Mixed objective/subjective test	A4 A4 B1 B2 B5 B1	In the middle of the term there will be an eliminatory partial exam of the subject taught up to that moment (theory and problems). At the end of the four-month period, a second partial exam will be held to eliminate the rest of the subject that has not been included in the first partial exam (theory and problems). Students who have not passed the partial exam(s) will be able to be examined in the global exam of January of first opportunity (theory and problems).	70
Problem solving	A4 A4 B2 B4 B5	Resolution of exercise reports, questionnaires and ability to explain them in the classroom.	10
Supervised projects	A4 B6 B7 B7 C1	Realization and exposition in the classroom of two directed activities, one in the Inorganic Chemistry part and the other in the Organic Chemistry part.	10
Laboratory practice	A4 A4 B3 B5 B3 C5	Completion, active participation in the internship, delivery of the report. Ability to work collaboratively.	10

Assessment comments

In order to be evaluated, students must have completed at least 75% of the practical laboratory classes.

In order to add the points of the different activities to the grade of the exam, a minimum of 2.5 points must be obtained.

For the evaluation of the second opportunity, the same continuous evaluation activities can be carried out as during the course, except for the laboratory practices, and in their place, questionnaires via Moodle and/or exams can be taken.

The student with recognition of part-time dedication and academic dispensation of exemption from attendance will be evaluated by the grade obtained in the final exam (80%) and the completion of tutored work (20%).

Advance call (December): It will be evaluated in the same way as the rest of the calls (January and July).

Implications of plagiarism: the fraudulent performance of the tests or evaluation activities will directly imply the grade of "0" in the subject in the corresponding call, thus invalidating any grade obtained in all evaluation activities for the extraordinary call.

Anuncio anticipado (diciembre): Se evaluará de la misma forma que el resto de anuncios, excepto que no se contabilizará la actividad "resolución de problemas". La prueba objetiva se evaluará con 8,0 puntos y se requerirá una nota mínima de 3,5 puntos para sumar las notas del resto de actividades (prácticas de laboratorio y proyectos tutelados). Implicaciones del plagio: la realización fraudulenta de las pruebas o actividades de evaluación implicará directamente la calificación de "0" en la materia en la convocatoria correspondiente, invalidando así cualquier calificación obtenida en todas las actividades de evaluación para la convocatoria extraordinaria.

Sources of information

Basic	- BERMEJO, F.; PAZ, M.; BERMEJO, A.; PAZ, A. (1996). 1000 Problemas Resueltos de Química General y sus Fundamentos Teóricos. Madrid Paraninfo, S. A. - RECLAITIS, G. V. (1991). Balances de materia y energía. México. McGraw-Hill/Interamericana - QUIÑOÁ, E.; RIGUERA, R. (2004). Cuestiones y Ejercicios de Química Orgánica. Madrid. McGraw-Hill/Interamericana de España, S. A. U. - CHANG, R.; GOLDSBY, K. A. (2017). Química. México. McGraw-Hill/Interamericana Editores, S. A. de C. V. - VIAN, A. (1999). Introducción a la Química Industrial. Barcelona. Reverté, S. A. - SKOOG, D. A.; HOLLER, F. J.; NIEMAN, T. A. (2000). Principios de Análisis Instrumental. Madrid. McGraw-Hill/Interamericana de España, S. A. U. - LINSTROMBERG, W. W. (1979). Química Orgánica. Barcelona. Reverté, S.A. - PRIMO, E. (1994). Química Orgánica Básica y Aplicada. Barcelona. Reverté, S.A - PETER, K.; VOLLHARDT, C.; SCHORE, N. E. (2000). Química Orgánica. Estructura y función. Barcelona. Omega. - PETRUCCI, R. H.; HERRING, F. G.; MADURA, J. D.; BISSONNETTE, C. (2011). Química General. Principios y Aplicaciones Modernas . Madrid. Pearson Educación, S. A.
Complementary	- SOLOMON, T. W. G. (1999). Fundamentos de Química Orgánica. México. Limusa Noriega - LÓPEZ, J. A. (2000). Problemas de Química General. Cuestiones y Ejercicios. Madrid. Pearson Educación-Prentice Hall - BERMEJO, F.; BERMEJO, P.; BERMEJO, A. (1991). Química Analítica General, Cuantitativa e Instrumental. Madrid. Paraninfo, S. A. - COTTON, F. A.; WILKINSON, G. (1991). Química Inorgánica Básica. México. Limusa - VEGA, J. C. (2000). Química Orgánica para estudiantes de Ingeniería. México. Alfaomega. - WILLIS, C. J. (1993). Resolución de Problemas de Química General. Barcelona. Reverté, S. A. - SKOOG, D. A.; WEST, D. M.; HOLLER, F. J., CROUCH, S. R. (2005). Fundamentos de Química Analítica. Madrid. Thomson

Recommendations

Subjects that it is recommended to have taken before

Subjects that are recommended to be taken simultaneously



Calculus /730G03001
Engineering Drawing/730G03002
Physics I /730G03003
Computing/730G03004
Linear Algebra/730G03006

Subjects that continue the syllabus

Materials Science/730G03007
Thermodynamics /730G03014
Environmental Engineering/730G03017
Materials Engineering/730G03030

Other comments

The importance of ethical principles related to the values of sustainability and gender equality in personal and professional behavior should be taken into account. "To help achieve a sustainable immediate environment and meet the objective of action number 5: "Healthy and environmentally and socially sustainable teaching and research" of the "Green Campus Ferrol Action Plan": The delivery of the documentary work carried out in this area: - Request them in virtual format and/or computer support - They will be done through Moodle, in digital format without the need to print them - If necessary, they will be done on paper: - No plastics will be used - Double-sided printing will be done. - Use recycled paper. - Avoid printing drafts. We will try to transmit to the students the importance of the ethical principles related to the values of sustainability so that they apply them not only in the classroom but also in their personal and professional behavior. The gender perspective should be incorporated in this subject so that the work delivered by students and the material prepared should use a non-sexist language. Facilitate the full integration of students who, for physical, psychological or socio-cultural reasons, experience difficulties in gaining adequate, equal and adequate access to university life.

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.