Teaching Guide				
Identifying Data				2015/16
Subject (*)	Laboratorio de Química		Code	610G01032
Study programme	Grao en Química			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Second	Obligatoria	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Química AnalíticaQuímica Física e Enxeñaría Química 1Química Fundamental			
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Web				
General description	The aim of the subject is the practical learning for the experimental determination of basic physicochemical properties and structural elucidation by application of spectrometric, spectroscopic and electrochemical techniques			

Study programme competences / results	
Code	Study programme competences / results
A1	Ability to use chemistry terminology, nomenclature, conventions and units
A7	Knowledge and application of analytical methods
A9	Knowledge of structural characteristics of chemical and stereochemical compounds, and basic methods of structural analysis and research
A10	Knowledge of chemical kinetics, catalysis and reaction mechanisms
A12	Ability to relate macroscopic properties of matter to its microscopic structure
A14	Ability to demonstrate knowledge and understanding of concepts, principles and theories in chemistry
A15	Ability to recognise and analyse new problems and develop solution strategies
A16	Ability to source, assess and apply technical bibliographical information and data relating to chemistry
A17	Ability to work safely in a chemistry laboratory (handling of materials, disposal of waste)
A19	Ability to follow standard procedures and handle scientific equipment
A20	Ability to interpret data resulting from laboratory observation and measurement
A21	Understanding of qualitative and quantitative aspects of chemical problems
A23	Critical standards of excellence in experimental technique and analysis
A26	Ability to follow standard laboratory procedures in relation to analysis and synthesis of organic and inorganic systems
B2	Effective problem solving
B3	Application of logical, critical, creative thinking
B4	Working independently on own initiative
C1	Ability to express oneself accurately in the official languages of Galicia (oral and in written)
C3	Ability to use basic information and communications technology (ICT) tools for professional purposes and learning throughout life

Learning outcomes

Learning outcomes	Study programme competences / results		
Perform standard laboratory operations for the preparation, separation and purification of organic compounds, materials handling safely, reagents and waste.	A1 A9 A12 A14 A15 A16 A17 A20 A21 A23 A26	B2 B3 B4	C1
Applying spectroscopic and spectrometric techniques in determining the structure of organic compounds.	A1 A9 A14 A15 A16 A21	B2 B3 B4	C1 C3
Application of electrochemical and spectroscopic techniques for the determination of the basic physicochemical properties of the compounds	A1 A7 A10 A17 A19 A23 A26	B2 B4	C1 C3
Being able to apply electrochemical and spectroscopic techniques for the determination of basic physical-chemical properties of the compounds.	A14 A15 A20 A21	B2 B3	C1

Contents	
Topic	Sub-topic
1. Standard laboratory operations.	Preparation, separation and purification of chemical compounds
2. Spectrometric techniques for determining molecular structure	Application of the 1H and 13C NMR, mass spectrometry, and infrared spectroscopy for structural determination. Characteristics frequency of the main functional groups. Tables of additivity.
3. Electrochemical and spectroscopic techniques for the physicochemical characterization of compounds.	Quantitative application of electrochemical techniques: potentiometry and conductimetry. Determination of reaction rates. Determination of equilibrium constants. Quantitative and qualitative spectroscopic applications; application of Beer´s law

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A1 A9 A21 B3	4	0	4
Seminar	A1 A9 A14 A15 A16 A21 B3 C1 C3	3	4.5	7.5

Workshop	A1 A9 A14 A15 A16 A21 B2 B3 B4 C1 C3	10	15	25
Laboratory practice	A1 A7 A10 A12 A14 A16 A17 A19 A20 A21 A23 A26 B3 B4 C1	39	65.5	104.5
Practical test:	A1 A7 A14 A15 A17 A19 A20 A21 A23 A26 B2 B3 B4	2	2	4
Mixed objective/subjective test	A1 A9 A14 A15 B2 B3	2	2	4
Personalized attention		1	0	1
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	**Description**
Guest lecture / keynote speech	In the first class it will take place a general presentation of the course: objectives, contents and organization of matter. In later sessions the basics of instrumentation, calibration, and mass spectrometry fundamentals will be explained.
Seminar	General aspects of the use of the techniques of structural determination.
Workshop	Use of simulation programs and resolution of practical cases of structural determination. Proposed problems will be solved by developing strategies that integrate the different spectroscopic techniques for structural elucidation. Prior to the development of some sessions, students will work out writing solutions for some of the proposed problems.
Laboratory practice	Experiences involving the combination of various procedures and experimental techniques will be conducted (preparation, separation, structural determination, determination of basic physicochemical properties...). The student will carry out the scheduled experiments, and laboratory reports will be performed, including collected data and their discussion, as well as answers to proposed questions to achieve a deep understanding of the experiments.
Practical test:	A practical test will be performed in the laboratory, including the solution of questions about practical subjects.
Mixed objective/subjective test	Mixed test will consist of questions and problems to solve related to the topic of the lectures, workshops / seminars taught (structure determination)

Personalized attention	
Methodologies	**Description**
Laboratory practice Workshop	The student will have the teacher's help in solving doubts and questions that may arise both in the preparation of written solutions to the problems of structural determination and the preparation of reports of work performed in the laboratory.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Laboratory practice	A1 A7 A10 A12 A14 A16 A17 A19 A20 A21 A23 A26 B3 B4 C1	Organization, attitude and activity in the laboratory sessions and corresponding lab reports, which must be submitted for evaluation will be assessed.	40
Mixed objective/subjective test	A1 A9 A14 A15 B2 B3	The test will consist of questions and problems related to the topic of the lectures, workshops / seminars taught (structure determination)	30

Practical test:	A1 A7 A14 A15 A17 A19 A20 A21 A23 A26 B2 B3 B4	A practical test will be perfomed in the laboratory, including the solution of questions about practical subjects. It will be held in each group at the end of practice sessions.	20
Workshop	A1 A9 A14 A15 A16 A21 B2 B3 B4 C1 C3	Attitude and student activity during the sessions and the written resolutions of the proposed problems will be assessed.	10

Assessment comments
Attendance to all the sessions is mandatory. The final grade is obtained as the sum of the score on each part: workshop, laboratory practice and tests. To pass the course a minimum score of 5,0 (out of a possible 10) is required, with the restriction that a minimum of 4.0 (out of a possible 10) in both tests (mixed objective and practical) is mandatory. If the total sum value was equal to or greater than 5 (out of 10) but this threshold mark was not met, the final mark will be 4.5 (fail). Students who failed the practical test should be repeated in June opportunity. Any student who has attended 51% or more of sessions (workshops / seminars + lab) will be assessed. Regarding the second opportunity of evaluation, the qualifications of the proofs of July will substitute to the obtained in the test of June. The qualification of the workshops could be conserved in the opportunity of July or, in an alternative way, in the final part of the mixed test of July, the students could realize an evaluable exercise, with activities analogous to those developed in the workshops during the course. The qualifications of the labs obtained at the first opportunity will be retained for the second assessment opportunity. Students who failed the practical test should be repeated in the second July opportunity. The students tested in the second chance only choose the honors if the maximum number of these to the corresponding course has not been fully covered at the first opportunity. The teaching-learning process, including assessment, refers to a full academic year, and therefore will start a new academic year, including all activities and evaluation procedures that are planned for the course.

Sources of information	
Basic	- Hesse, M.; Meier, H.; Zeeh, B. (Traducido por Herrera Fernández, A.; Martinez Alvarez, R.; Söllhube) (1995). Métodos Espectroscópicos en Química Orgánica. Síntesis - Willard, Hobart H. (1991). Métodos instrumentales de análisis. Ed. Iberoamericana - Crews, P.; Rodríguez, J.; Jaspars, M. (2009). Organic Structure Analysis. Oxford Univ. Press - Pretch, Cleks, Seibl, Simon: (2000). Tablas para la determinación estructural por métodos espectroscópicos. Traducción 3ª Edición por Antonio Herrera y Roberto Martinez,. Verlag Ibérica - Atkins P.W., De Paula, J. (2002). Physical Chemistry.. 7ª ed., Oxford University Press, Oxford. - Levine, I. N. (2004). Fisicoquímica . 5ª ed., McGraw-Hill, Madrid. - Espenson, J. H. (2002). Chemical Kinetics & Reaction Mechanisms.. 2ª ed, McGraw-Hill. - Connors, K .A. (1987). Binding Constants. The Measurement of Molecular Complex Stability. Wiley & Sons: New York - Skoog, D. A; Holler, F. James; Nieman, Timothy A. (2001). Análisis químico cuantitativo. Reverté - Kellner, R. (2004). Analytical chemistry a modern approach to analytical science. Wiley-VCH - Gavira Vallejo, J. M.; Hernanz Gismero, A. (2007). Técnicas fisico-químicas en medio ambiente. UNED
Complementary	- George, B.; McInTyre (1987). Infrared Spectroscopy. John Wiley - McLafferty, F. W.; Turecek, F. Interpretation of Mass Spectra. (1993). Interpretation of Mass Spectra. University Science Books

Recommendations
Subjects that it is recommended to have taken before

Química 1/610G01007
Química 2/610G01008
Química 3/610G01009
Química 4/610G01010
Química Analítica 1/610G01011
Química Física 1/610G01016
Química Inorgánica 1/610G01021
Química Orgánica 1/610G01026
Subjects that are recommended to be taken simultaneously
Química Analítica 2/610G01012
Química Física 2/610G01017
Química Inorgánica 2/610G01022
Química Orgánica 2/610G01027
Subjects that continue the syllabus
Química Analítica Instrumental 1/610G01013
Química Analítica Instrumental 2/610G01014
Química Analítica Avanzada e Quimiometría/610G01015
Química Física 3/610G01018
Ampliación de Química Orgánica/610G01028
Experimentación en Química Orgánica/610G01029
Química Orgánica Avanzada/610G01030
Other comments

(*)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.