Teaching Guide				
Identifying Data				2016/17
Subject (*)	Química Orgánica 2		Code	610G01027
Study programme	Grao en Química			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Second	Obligatoria	6
Language	SpanishEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Química Fundamental			
Coordinador	Ojea Cao, Vicente	E-mail	vicente.ojea@udc.es	
Lecturers	García Romero, Marcos Daniel Martinez Cebeira, Monstserrat Ojea Cao, Vicente Riveiros Santiago, Ricardo Ruiz Pita-Romero, Maria	E-mail	marcos.garcia1@udc.es monserrat.martinez.cebeira@udc.es vicente.ojea@udc.es ricardo.riveiros@udc.es maria.ruiz.pita-romero@udc.es	
Web				
General description	Following Organic Chemistry 1, Organic Chemistry 2 is the second course of general organic chemistry. During the second semester of the course, the student will go further studying the structure and reactivity of organic functional groups. Prof Pérez Sestelo is charged of the teaching in english.			

Study programme competences	
Code	Study programme competences
A1	Ability to use chemistry terminology, nomenclature, conventions and units
A4	Knowledge of main types of chemical reaction and characteristics of each
A6	Knowledge of chemical elements and their compounds, synthesis, structure, properties and reactivity
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
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
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
B7	Effective workplace communication
C1	Ability to express oneself accurately in the official languages of Galicia (oral and in written)

Learning outcomes			
Learning outcomes	Study programme competences		
Recognize and use the terminology of organic chemistry including nomenclature, rules and units.	A1	B7	C1

Know the main organic reactions, mechanisms, features and stereochemical outcome.	A1 A4 A6 A9 A10 A14	B3	C1
Knowing the structure, properties and chemical reactivity of organic compounds	A1 A4 A6 A9 A14	B3 B4 B7	C1
Study the main procedures to synthetize organic compounds and their application in the resolution of synthetic problems	A1 A4 A6 A9 A14 A15 A21	B2 B3 B4	C1
Carry out standard operations of laboratory for the preparation, separation and purification of organic compounds, handling of materials, reagents and waste in a safe form	A1 A17 A19 A20 A21 A23 A26	B2 B3 B4 B7	C1
Apply the spectroscopy and spectrometric methods for the determination of the structure of organic compounds	A1 A9 A15	B2 B3 B4	C1

Contents	
Topic	**Sub-topic**
Chapter 1. Alkenes and alkynes.	Alkenes: nomenclature, structure and properties. Reactivity: Catalytic hydrogenation. Electrophilic addition reactions. Addition of hydrogen halides, halogens, water, oxymercuration, formation of halohydrins, and hydroboration. Alkene epoxidation and hydroxylation. Oxidative cleavage of alkenes. Radical halogenation. Polymerization. Alkynes: nomenclature, structure and properties. Preparation by elimination reactions and by using acetylides. Reductions and electrophilic addition reactions.
Chapter 2. Conjugate systems	Allylic systems: resonant forms, electronic structure and reactivity: radical halogenation and substitution reactions Dienes: electronic structure and reactivity: electrophilic addition and Diels-Alder reaction.
Chapter 3. Benzene and aromaticity	Aromatic compounds: nomenclature, electronic structure and properties: Hückel rule. Electrophilic aromatic substitution on benzene: halogenaton, nitration, sulfonation and Friedel¡-Crafts reactions. Orientation in the Electrophilic aromatic substitution on benzene derivatives. Reduction of aromatic compounds. Nucleophilic substitution reactions of aryl halides.

Chapter 4. Aldehydes and ketones	Nomenclature, structure and properties. Nucleophilic addition reaction: hydration, hemiacetals, ketals thioketals, imines, enamines and cyanohydrins. Addition of organometallic reagents. The Wittig reaction. Reduction of carbonilyc compounds. Oxidation reactions of aldehydes and ketones.
Chapter 5. Carboxylic acids	Nomenclature, structure and properties. Nucleophilic substitution at the carboxylic carbon: addition-elimination mechanism. Formation of esters, acyl halides, amides and anhydrides. Reaction of carboxylic acids with organometallic reagents. Reduction of carboxylic acids.

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Laboratory practice	A1 A9 A17 A19 A20 A23 A26 B3 B4 B7 C1	20	20	40
Guest lecture / keynote speech	A1 A4 A6 A9 A10 A14	17	34	51
Seminar	A1 A4 A6 A9 A10 A14 A15 A21 B2 B3 B7	7	14	21
Workshop	A4 A6 A9 A10 A14 A15 A21 B2 B3 B4 B7 C1	8	24	32
Mixed objective/subjective test	A1 A4 A6 A9 A10 A14 A15 A21 B2 B3 C1	4	1	5
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
Laboratory practice	The student will perform experimental procedures in the laboratory related with the theoretical contents of the matters Organic Chemistry 1 and Organic Chemistry 2, and will adquire skills in the preparation, separation, purification and structural determination of organic compounds. During the practices the student will have to elaborate a written report of the laboratory work, describing the stoichiometric calculations, reaction and work-out procedures, interpretation of the spectral data and answers to the questions posed in the scripts.
Guest lecture / keynote speech	In this activity, the contents of the subject will be presented by the teacher stimulating the student participation. Students should prepare before classes according to the teacher's instructions.
Seminar	In the sessions of seminar the students will participate actively in the analysis and the resolution of the problems. The bulletins of problems to resolve will be available in the web (moodle) prior to the development of the seminars.
Workshop	The workshops constitute sessions of work organised in reduced groups of students. In these sessions the students will perform oral exposures (with graphic support in the blackboard or by means of a presentation) over specific problems of the bulletins, on which they will have previously written a short report, that should be delivered to the professor at the begining of the sessions
Mixed objective/subjective test	In order to evaluate the knowledge and skills acquired during the course, a written test is programed in accordance with the calendar of the Centre. In this test the students will have to resolve questions and problems on the contents of the matter, that will be analogous to those posed during the seminars, workshops and laboratory practices

Personalized attention	
Methodologies	Description

Seminar Workshop Guest lecture / keynote speech Laboratory practice	The student will have the help of the professor for the resolution of the doubts that pose him during the study of the contents and in the preparation of the reports of laboratory and workshops. For the students with partial-time dedication or of specific modalities of learning or of support to the diversity the personalised attention will be facilitated inside the flexibility that allow the schedules of coordination and the material and human resources.

Assessment			
Methodologies	Competencies	Description	**Qualification**
Workshop	A4 A6 A9 A10 A14 A15 A21 B2 B3 B4 B7 C1	The attendance to the workshops, participation and quality of the oral exposures and written reports will be evaluated. Special attention should be paid to the employment of the nomenclature for the functional groups and reaction processes	15
Laboratory practice	A1 A9 A17 A19 A20 A23 A26 B3 B4 B7 C1	The activities programed in the lab are mandatory to pass the course. Its assessment will be performed taking into account the attitude to learning, the experimental work done in the lab and the laboratory notebook.	15
Mixed objective/subjective test	A1 A4 A6 A9 A10 A14 A15 A21 B2 B3 C1	In order to evaluate the knowledge and skills acquired during the course, a written test is programed in accordance with the calendar of the Centre. In this test the students will have to resolve questions and problems on the contents of the matter, that will be analogous to those posed during the seminars, workshops and laboratory practices.	70

Assessment comments

The attendance to all the activities included on the evaluation (laboratory practices, workshops and mixed test) is mandatory to pass the course. Thus, in order to ease the presence of the students on the workshops and laboratory practices, that it will be eased within the flexibility allowed by the coordination schedule and the material and human resources available. Students participating in a number of assessed activities not exceeding 15% may qualify as a ?No presentado?.

To pass the subject it will be necessary to obtain a grade on the mixed text equal or higher than 4 and to achieve, summed up all the grades of the different activities, a minimum mark of 5 out of 10. Therefore, for the students with an average score higher than 5 but that have not reached a 4 in the mixed test, the subject will appear as ?Suspensa? (not passed), with a mark of 4,5 in the record. Once the mixed test of the 1º opportunity is finished, all the students that have required it would have the chance to perform an oral exercise, with analogous activities to those developed within the workshop sessions, with the aim of re-evaluate the initial qualification of the workshops.

In the case of not pass the subject on the 1st opportunity, the qualifications obtained for the laboratory practices will be kept on the 2nd opportunity. Hence, the qualification of the mixed test obtained on the 2nd opportunity will substitute that obtained on the 1st opportunity. Conversely, the qualification obtained for the activity ?workshops? obtained on the 1st opportunity can be preserved for the 2nd opportunity or, alternatively, replaced by the grade obtained on an oral exercise, with analogous activities to those developed within the workshop sessions, with the aim of re-evaluate the initial qualification of the workshops.

Those students evaluated on the 2ª opportunity will only obtain the maximum grade of ?Matrícula de honor? if the maximum number of these grades has not been obtained on the first opportunity by other students.

For the students with part time dedication or of specific modalities of learning or of support to the diversity, the realisation of the workshops and practices will be facilitated within the flexibility allowed by the coordination schedule and the material and human resources available. If those students have not been able to complete the practices by properly-justified reasons, the grade of this activity will not diminish his/her qualification, as the mixed test (both on the 1st and 2nd opportunity) will include questions related to the practices and will contribute with an 85% to the final mark. Furthermore, following the mixed test both on the 1st or 2nd opportunity, all the students that have required it would have the chance to perform an oral exercise, with analogous activities to those developed within the workshop sessions, with the aim of re-evaluate the initial qualification of the workshops (a 15% of the final grade).

On the successive academic courses, the process of education-learning, included the evaluation, refers to an academic course, and therefore it would re-start with a new course, including all the activities and procedures of evaluation that are programmed for that course.

Sources of information

Basic	- K.P.C. Vollhardt and N.E.Schore (2007). Química Orgánica: estructura y función. Omega - K.P.C. Vollhardt and N.E.Schore (2011). Organic Chemistry: structure and function. W H Freeman - L.G. Wade, Jr (2004). Química Orgánica. Pearson - L.G. Wade, Jr (2013). Organic Chemistry. Prentice Hall - (). . Ademais da bibliografía recomendada, a maioría dos libros de Química Orgánica xeral son útiles para seguir os contidos da materia. Recoméndase aos alumnos que descargen e impriman as presentacións de contidos dispoñibles en moodle antes de asistir ás leccións maxistrais, coa intención de que poidan tomar notas das explicacións do profesor sobre os devanditos materiais.
Complementary	- J. Clayden, N. Greeves, S. Warren (2012). Organic Chemistry. Oxford University Press

Recommendations
Subjects that it is recommended to have taken before
Química 3/610G01009 Química 4/610G01010 Química Orgánica 1/610G01026
Subjects that are recommended to be taken simultaneously
Laboratorio de Química/610G01032
Subjects that continue the syllabus
Ampliación de Química Orgánica/610G01028 Experimentación en Química Orgánica/610G01029
Other comments
The contents and the competencies to be adquired in the laboratory of Organic Chemistry 2 and in Laboratory of Chemistry are closely related, and both courses should be followed in the same term