UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2021/22
Subject (*)	Experimental Organic Chemistry		Code	610G01029
Study programme	Grao en Química			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Third	Obligatory	6
Language	SpanishEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Química			
Coordinador	Maestro Saavedra, Miguel Anxo	E-mail	miguel.maestro@udc.es	
Lecturers	Maestro Saavedra, Miguel Anxo Ojea Cao, Vicente Peinador Veira, Carlos Ruiz Pita-Romero, Maria	E-mail	miguel.maestro@udc.es vicente.ojea@udc.es carlos.peinador@udc.es maria.ruiz.pita-romero@udc.es	
Web				
General description	Subject dedicated to the work of Laboratory of Organic Chemistry, with special emphasis on: separation techniques, isolation and purification; reactivity, synthesis and characterization of organic compounds.			

Contingency plan	1. Changes in contents. There are no modifications. 2. Methodologies. - Teaching methodologies that are maintained: All (initial activities, supervised projects, laboratory practices and mixed test). * Teaching methodologies that are modified: All the methodologies are adapted to the hybrid or non face-to-face modality through Moodle and Teams and the programming established in the coordination calendar of the Center is maintained. - The interviews (individual or collective) of the supervised projects are mantained and will be held through Teams. Before the interviews students must prepare and hand in reports of the preparatory work through Moodle. In the interviews the experimental details (procedures and relative questions to the security in the laboratory) will be discussed and the teacher will resolve the doubts that may arise and will evaluate the preparatory work done. - In the laboratory practices, the students will prepare the laboratory notebook for the programmed experiences, including (1) corrections to the preparatory work that may be derived from the interviews, (2) description of the experimental procedures required for the preparation and purification of compounds, (3) answers to the questions of the scripts and (4) interpretations for the spectra of the compounds involved in the experiments. The laboratory notebook will be delivered through Moodle. - The Mixed Test will consist of an individual manuscript exam carried out through Moodle and, if allowed by the coordination schedules, may be performed during the school period. 3. Mechanisms for personalized attention to students. The personalized monitoring will be carried out at the request of the students and, as far as possible, at the time established for the tutorials, through email, the Moodle platform or the Teams tool. For students with part-time dedication or specific learning modalities or diversity support, personalized attention will be provided within the flexibility allowed by coordination schedules and material and human resources. 4. Modifications in the evaluation. The contributions to the final grade of the evaluable methodologies are not modified. * Evaluation observations: all the observations included in the teaching guide are kept. 5. Modifications of the bibliography or webgraphy. No modifications are made, all the necessary materials will be available in Moodle or through access to the electronic resources available in the Center Library.

Study programme competences / results	
Code	Study programme competences / results
A1	Ability to use chemistry terminology, nomenclature, conventions and units
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
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
A22	Ability to plan, design and develop projects and experiments

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		
Knowledge the characteristics and properties of organic compounds, their reactivity and the main reaction mechanisms, including stereochemical aspects	A1 A9 A23	B3 B4	
Design, plan and execute synthesis of organic molecules. Conducting processes of isolation, purification and characterization. Ability to manage the literature and finding specific information in organic chemistry.	A15 A17 A21 A22 A26	B2	
Knowledge of fundamental characteristics of organic compounds and the most important methods of preparation and structural determination of these compounds.	A9 A17 A19 A20	B3	
Carry out organic chemistry experiments independently and handling reagents safely. Manage scientific instrumentation in organic chemistry laboratory and interpret the results.	A1 A9 A10 A15 A17 A19 A20 A22	B2 B4	C1
Ability to manage literature, as well as a search of specific information in Organic Chemistry.	A15 A22	B3	C3

Contents	
Topic	Sub-topic
Presentation	Methods, programmed activities and evaluation criteria
Carbonyl group. Reduction reactions, synthesis of commercially interesting products	Experiment 1a: Vainilline reduction with sodium borohydride. Experiment 1b: Methyl diantilis synthesis.
Alkenes, alkyl halides, alcohols and epoxides. Electrophilic addition to unsaturated systems, bimilecular nucleophilic substitution ans rearrangenments.	Experiment 2: Stereospecific synthesis of anti-2-bromo-1,2-diphenylethanol from trans-stilbene.
Aromatic compounds and electrophilic aromatic substitution. Introduction to protecting groups.	Experiment 3: Synthesis of p-nitroaniline from aniline.
Carboxylic acid derivatives. Nucleophilic substitution through addition-elimination.	Experiment 4a: Synthesis of ethyl acetate. Experiment 4b: Synthesis of isoamyl acetate.
Sustainable chemistry. Reactions without solvents.	Experiment 5: Synthesis of N-(2-hydroxy-3-methoxybenzyl)-N-p-tolylacetamide.

Carbonyl compounds and reactions in alpha position.	Experiment 6a: Synthesis of dibenzalacetone ((E,E)-1,5-diphenyl-1,4-pentadien-3-one) from acetone and benzaldehyde through aldol condensation. Experiment 6b: Synthesis of ketone alfa,beta-unsaturated (6-etoxicarbonyl-3,5-diphenyl-2-cyclohexanone) through Michael reactions and aldol condensation.
Dienes. Diels-Alder reaction	Experiment 7: Synthesis of exo- and endo-7-oxabicyclo[2.2.1]hept-5-en-2,3-dicarboxy-N-phenylimide from N-phenylmaleimide
Polifunctional compounds. Multistep synthesis	Experiment 8a: Synthesis of benzylic acid from benzaldehyde. Experiment 8b: Synthesis of 3-methylcyclohexen-2-one trough Robinson annulation and decarboxylation Experiment 8c: Stereoselective reduction of benzoin adn synthesis of 4,5-diphenyl-2,2-dimethyl-1,3-dioxolan Experiment 8d: Regioselective epoxydation of (R)-carvone. Experiment 8e:Synthesis of local anesthetic benzocaine (ethyl p-aminobenzoate).
Organophosphorous compounds. Olefination reactions.	Experiment 9: Synthesis of cynnamic acid through Wittig reaction.
Heterocyclic compounds. Synthesis. Green chemistry and pharmacologicaly interesting heterocycles.	Experiment 10a: Synthesis of 6-methylquinolin through Skraup reaction. Experiment 10b: Synthesis of 1,6-dihydropyridines through Hantzsch reaction in solventless conditions. Práctica 10c: Synthesis of Fischer indole: preparation of 1,2,3,4-tetrahydrocarbazole.
Carbohydrates. Kinetic and thermodinamic control. Protecting groups. Sugars as chiral precursors.	Experiment 11a: Synthesis of beta- and alpha-D-glucose pentaacetates. Experiment 11b: Synthesis of 2,3-O-isopropyliden-L-erithrose from L-arabinose
Amino acids and peptides	Experiment 12: Synthesis of methyl N-acetyl-L-prolyl-L-phenylalaninate from its amino acids.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Introductory activities	A1 A10 A15 A21 A22 A23 A26 B2 B3 C1	2	0	2
Supervised projects	A1 A9 A10 A15 A20 A23 A26 B2 B3 B4 C1 C3	12	36	48
Laboratory practice	A1 A4 A9 A15 A16 A17 A18 A19 A20 A21 A22 A23 A24 A26 B2 B3 B4 C1	44	44	88
Mixed objective/subjective test	A1 A4 A9 A10 A15 A18 A19 A20 A21 A22 A23 B2 B3 B4 C1	2	8	10
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

Introductory activities	A session is programmed in a only group in which students will be exposed to the teaching methodology, planned activities and the evaluation criteria to be applied during the course program. Available resources will be presented on the website of matter and the dates on which the experiences and interviews will be conducted for students to organize their previous work indicated. Finally accurate information will be provided for students to start preparing for the first practice.
Supervised projects	Tutored work includes assistance to 6 classroom sessions up to 2 hours, in which he will supervise and evaluate the work of the independent student for the preparation of the labs. It will be held one interview per lab. Before the start of the interviews, students must have completed the previous work every practice in the laboratory notebook, which can be replaced in some cases by a report of the preparatory work done to be delivered to the teacher. During interviews, the teacher will resolve the doubts that may arise and will evaluate the work done. The preparation work practices should include calculations, experimental procedures and mounts necessary for the experience as well as an explanation of the mechanisms involved in the processes and solutions to questions of scripts to follow.
Laboratory practice	There will be 13 sessions of up to four hours of work, where students will do some of the planned experiments are scheduled. Prior to entering the laboratory, from a screenplay experience and bibliographic information available on the website of the subject, the student must work independently in the preparation of each experience way. During laboratory sessions, simultaneously with the completion of the experiments so, students must develop a laboratory notebook, which collect the calculations, the experimental procedures and the necessary setups. The teacher will review the laboratory notebook for each student in each practice After each practice, which may require several laboratory sessions, students must complete notebook with the results and conclusions, where the answers to the questions the script will include the structural elucidation of the compounds obtained and the data on its performance and purity.
Mixed objective/subjective test	There will be a final written exam, in order to objectively assess the degree of assimilation and the applicability of the contents of the subject by students is scheduled in May.

Personalized attention	
Methodologies	**Description**
Supervised projects Laboratory practice	6 Interviews (with a total duration of 2 hours) are scheduled in which the teacher will carry out a follow-up, orientation and evaluation of non-face-to-face work done by the student for the preparation of laboratory sessions. Students should go to the interviews with a report of the preparation work done. In addition, the student can receive personalized attention on any aspect of the subject during the teacher's tutoring schedule.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Supervised projects	A1 A9 A10 A15 A20 A23 A26 B2 B3 B4 C1 C3	Self-made work done by the student for the autonomous preparation of the laboratory practices and attendance and participation during the interviews will be assessed.	40
Laboratory practice	A1 A4 A9 A15 A16 A17 A18 A19 A20 A21 A22 A23 A24 A26 B2 B3 B4 C1	A continuous evaluation of the work in the laboratory where the interest and dedication of the students is taken into account, proper planning and organization of work, respect for the safety and skill achieved in laboratory operations will be conducted. The rating of this part includes the assessment of laboratory notebook.	30

Mixed objective/subjective test	A1 A4 A9 A10 A15 A18 A19 A20 A21 A22 A23 B2 B3 B4 C1	In a joint test, the student must explain in writing and carried out similar to the practices in the laboratory experience program. From the data provided in the statement (description and amounts of the starting materials and products structure synthesize) shall: (1) make all necessary calculations, (2) propose appropriate experimental procedures for the preparation and purification compounds, (3) describe the required assemblies and (4) propose reaction mechanisms that explain the processes involved.	30

Assessment comments
Attendance at the presentation session, the laboratory practicum, the interviews (of the supervised projects) and the mixed test are mandatory. To pass the course is necessary to obtain greater or equal to 5 out of 10 and a minimum return of 30%. Students whose average yield exceeds 4.9 points and that do not meet the minimum performance in any of the activities will be assessed as "unfit" and receive the grade of 4.9. We will only qualify as "not submitted" to students who have participated in activities that add less than 25% of the final grade.The marks obtained in interviews and in the labs will remain in the 2nd opportunity at July 2021. On the second opportunity, the students who have not passed the continuous evaluation of the practical laboratory work should take a practical laboratory test. Students who have passed the continuous assessment of practical laboratory work must complete a written mixed test to establish 30% of the grade. In the second opportunity, the students will be able to present themselves to a new evaluation of the mixed test to establish 30% of the grade. According to the academic regulations, students are evaluated on the second occasion only choose honors if the maximum number of these not completed in full at the earliest opportunity.With regard to the successive academic years, the process of teaching and learning, including assessment, refers to an academic year and thus begins again with a new academic year, including all activities and evaluation procedures that scheduled for that course.In the case of students with recognition of part-time dedication and academic exemption of assistance exemption, the professor may fully or partly exempt any member of the student body to attend the ongoing evaluation process. Students that is in this circumstance must pass a specific test that leaves no doubt about achieving the powers of matter on two occasions.

Sources of information	
Basic	- Rodríguez Yunta, M. J.; Gómez Contreras, F. (2008). Curso Experimental en Química Orgánica . Madrid. Síntesis. - Harwood, L. M.; Moody, C. J.; Percy, J. M. (1998). Experimental Organic Chemistry. Standard and microscale. Oxford. Blackwell Science. - Mohrig, J. R.; Hammond, C. N.; Morrill, T. C.; Neckers, D. C. Organic Chemistry: A Balanced Approac (1998). Experimental Organic Chemistry: A Balanced Approach Organic Chemistry: A Balanced Approach Macroscale and Microscale . New York. Freeman - Mohrig, J. R.; Hammond, C. N.; Schatz, P. F.; Morrill, T. C. (2003). Modern projects and experiments in organic chemistry miniscale and standard taper microscale . New York. Freeman - Martínez Grau, Mª A.; Csaky, A. G. (1998). Técnicas Experimentales en Síntesis Orgánica . Madrid. Síntesis.
Complementary	

Recommendations
Subjects that it is recommended to have taken before

Organic Chemistry 1/610G01026 Organic Chemistry 2/610G01027 Intermediate Organic Chemistry/610G01028
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Advanced Organic Chemistry/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.