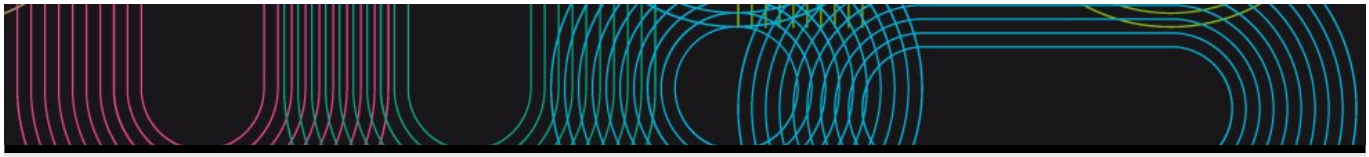

IDENTIFYING DATA				
Organic chemistry I				
Subject	Organic chemistry I			
Code	V11G201V01205			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Muñoz López, Luis Iglesias Antelo, María Beatriz			
Lecturers	Iglesias Antelo, María Beatriz Muñoz López, Luis Terán Moldes, María del Carmen			
E-mail	bantelo@uvigo.gal lmunoz@uvigo.es			
Web				
General description	In this subject, the students reach an understanding of the fundamental principles of Organic Chemistry, regarding structure and reactivity of organic compounds. Following two lessons on general concepts, the reactivity of functional groups with multiple carbon-carbon bonds (including aromatic compounds) will be studied. English Friendly subject. International students may request from the teaching staff: a) resources 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
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
C17	Know the nature and behavior of functional groups in organic molecules
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
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	
Represent the three-dimensional structure of organic molecules.	A2 A5	B1
Apply the principles of stereochemistry to the analysis of stereoisomers.	A2 A5	B1
Distinguish the most usual reactions in Organic Chemistry.	A2 A5	B1

Establish the influence of the structure and the chemical characteristics of the functional groups present in a molecule in its reactivity.	A2 A5	B1	C17	
Explain the reactivity of organic compounds with multiple carbon-carbon bonds through an electrophilic addition mechanism.	A2 A5	B1	C17	
Explain the reactivity of aromatic compounds through an electrophilic substitution mechanism.	A2 A5	B1	C17	
Apply the rules for safety and health in laboratory work and carry out the treatment and correct elimination of the waste generated.			C25	
Appropriately write and describe the experiments in the laboratory notebook, so that they can be reproduced.		B2 B3		D3

Contents

Topic	
Lesson 1. Conformational analysis. Stereochemistry	Conformational analysis in cyclic compounds. Configurational stereoisomerism.
Lesson 2. Reactivity of organic compounds	Acid-base reactivity of organic compounds. Reaction mechanisms: stepwise reactions. Energetic profile of a reaction. Heterolytic bond cleavage. Ionic reactions. Reaction intermediates: carbanions. Redox reactivity of organic compounds. Formal states of oxidation.
Lesson 3. Addition reactions to carbon-carbon multiple bonds	Structure and general reactivity of functional groups with carbon-carbon multiple bonds: alkenes and alkynes. Hydrogenation: homolytic bond cleavage; concerted reactions. Electrophilic addition reactions to alkenes. Addition of HX; reaction intermediates: carbocations; regioselectivity; electrophiles and nucleophiles. Hydration reactions; orientation and stereochemistry. Addition of halogens. Dihydroxylation reactions. Addition reactions to alkynes.
Lesson 4. Aromatic substitution reactions	Structure and general reactivity of aromatic compounds. General mechanism for the electrophilic aromatic substitution reaction. Reactions with non-carbon electrophiles. Reactions with carbon electrophiles. Electrophilic aromatic substitution reactions in substituted systems: orientation and reactivity. Modulation of the reactivity of aromatic rings.
Laboratory Practices	Application of the techniques acid-base extraction and thin layer chromatography to the separation of mixtures of compounds, their identification and characterization.

Planning

	Class hours	Hours outside the classroom	Total hours
Flipped Learning	12	24	36
Problem solving	23	48	71
Laboratory practical	14	5	19
Essay	0	6	6
Problem and/or exercise solving	1	5	6
Problem and/or exercise solving	1	5	6
Problem and/or exercise solving	1	5	6

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

Methodologies

	Description
Flipped Learning	Some learning activities will take place out of the classroom. Afterwards, in the classroom, with the presence of the teacher, other processes of knowledge acquisition and practice will be facilitated. Prior to the class sessions, a selection of materials (audiovisual, written etc.) will be available to the students, through the virtual classroom. This material must be employed for the preparation of the class session. Additionally, the students will be expected to carry out some simple tasks applying the concepts reviewed in the previously mentioned material. Detailed information and delivery terms for the tasks will be communicated by the teaching staff in advance. In the class session, different activities will be carried out in order to review, clarify and apply the studied concepts. Some of these activities will be handed for assessment.
Problem solving	Problem solving class sessions will be devoted to solving practical exercises applying the concepts developed in the flipped learning class sessions. The students will carry out individually some activities, that will be handed for assessment.

Laboratory practical	Laboratory practical work will be directed to ensure that students are capable of handling chemicals safely, evaluating any specific risks associated with their use and with the use of laboratory procedures, including their environmental repercussions. Laboratory experiments will be carried out, individually, in 3,5 h class sessions. The students will find, in advance, in the virtual classroom, the material needed for the preparation of the experiments. Work with this material could include performing and delivering some tasks, prior to the class session. During the experiments, students will elaborate a laboratory notebook recording all observations pertinent to the experiment. After completion of the experiment, students will complete the work that will be indicated at the time.

Personalized assistance

Methodologies	Description
Flipped Learning	During the preparation of the flipped learning sessions, besides using supporting bibliographic material, students will be tutored by the teaching staff. Tutoring sessions can take place in person or by telematic means (email, videoconference, forums in the virtual classroom etc.), by previous appointment. For tutoring sessions request see: https://quimica.uvigo.es/gl/docencia/profesorado/luis-munoz-lopez/
Problem solving	For preparation of the problem solving class sessions and/or to answer their questions, students will be tutored by the teaching staff. Tutoring sessions can take place in person or by telematic means (email, videoconference, forums in the virtual classroom etc.), by previous appointment. For tutoring sessions request see: https://quimica.uvigo.es/gl/docencia/profesorado/maria-beatriz-iglesias-antelo/; https://quimica.uvigo.es/gl/docencia/profesorado/luis-munoz-lopez/
Laboratory practical	For preparation of the laboratory class sessions and/or to answer their questions, students will be tutored by the teaching staff. Tutoring sessions can take place in person or by telematic means (email, videoconference, forums in the virtual classroom etc.), by previous appointment. For tutoring sessions request see: https://quimica.uvigo.es/gl/docencia/profesorado/maria-beatriz-iglesias-antelo/; https://quimica.uvigo.es/gl/docencia/profesorado/luis-munoz-lopez/; https://quimica.uvigo.es/gl/docencia/profesorado/maria-carmen-teran-moldes/
Tests	**Description**
Problem and/or exercise solving	For preparation of the exams and/or to answer their questions, students will be tutored by the teaching staff. Tutoring sessions can take place in person or by telematic means (email, videoconference, forums in the virtual classroom etc.), by previous appointment. For tutoring sessions request see: https://quimica.uvigo.es/gl/docencia/profesorado/maria-beatriz-iglesias-antelo/; https://quimica.uvigo.es/gl/docencia/profesorado/luis-munoz-lopez/; https://quimica.uvigo.es/gl/docencia/profesorado/maria-carmen-teran-moldes/
Essay	For preparation of the essay and/or to answer their questions, students will be tutored by the teaching staff. Tutoring sessions can take place in person or by telematic means (email, videoconference, forums in the virtual classroom etc.), by previous appointment. For tutoring sessions request see: https://quimica.uvigo.es/gl/docencia/profesorado/maria-beatriz-iglesias-antelo/; https://quimica.uvigo.es/gl/docencia/profesorado/luis-munoz-lopez/

Assessment

	Description	Qualification	Training and Learning Results			
Flipped Learning	Participation and resolution by the student of all the tasks proposed by the teaching staff in relation to the flipped learning sessions will be evaluated.	15	A2 A5	B1	C17	
Problem solving	As part of the continuous evaluation, participation and resolution by the student of the individual tasks proposed by the teaching staff in the problem solving sessions will be evaluated. Those tasks will conclude with the elaboration of a portfolio and its evaluation.	20	A2 A5	B1	C17	D3
Laboratory practical	Assistance to practical classes is mandatory. Laboratory work will be evaluated as APT or NON APT. The following aspects will be considered: previous and/or subsequent work, development of the experimental work and laboratory notebook. In order to pass the subject, students must obtain an APT mark in the laboratory practical work.	0		B2	C25	D3
Essay	As part of the continuous evaluation, students will carry out group assignments. Those will be global application activities of the knowledge and skills developed in the subject.	20	A2 A5	B1 B2 B3	C17	D3
Problem and/or exercise solving	Students must take a test covering contents of the first topics: 15% of the final qualification. A minimum mark of 3.0 points out of 10.0 must be achieved.	15	A2 A5	B2 B3	C17	D3
Problem and/or exercise solving	Students must take a test covering ALL THE CONTENTS OF THE SUBJECT: 25% of the final qualification. A minimum mark of 4.0 points out of 10.0 must be achieved.	25	A2 A5	B2 B3	C17	D3

Problem and/or exercise solving	Students must take a written test regarding the experimental part of the subject: 15% of the final qualification. A minimum mark of 4.0 points out of 10.0 must be achieved.	15	A2 B2 C17 D3 A5 B3 C25

Other comments on the Evaluation

In this subject, BASIC learning results will be defined that will be necessary for the students to achieve in order to pass it.

In case of doubt about the acquisition of learning results by the students, additional oral evaluation tests may be carried out.

In order to pass the subject in January, it will be required:

- Achieve mention **APT** in the evaluation of the laboratory practical.
- Achieve a **minimum mark of 3 points out of 10** in test 1.
- Achieve a **minimum mark of 4 points out of 10** in the global test and the written test for the experimental part.

If any of the previous conditions is not fulfilled, the final mark for the subject will be the mark obtained for the tests multiplied by 0.55 (55%).

- Achieve a minimum mark of 5.0 in the weighted addition of the marks for all the sections.

The final grade for the students who pass the subject could be standardized so that the highest mark can reach a value of up to 10 points.

STUDENTS OF 2ND AND SUBSEQUENT ENROLLMENT: Those students who were evaluated as APT during any previous course will be awarded the APT mention for the monitoring of the laboratory practical in the current academic course, not being necessary the completion of the experimental work again. However, they must take the written test for the experimental part in order to achieve the mark for the experimental part of the subject in the current academic course.

EVALUATION IN JULY: The marks obtained for the sections flipped learning, problem solving, laboratory practical and essay will be kept. Two tests can be retaken: a global test (40% of the final mark) **and/or** a written test for the experimental part (15% of the final mark). The student must achieve a minimum mark of 4 points out of 10 so that the results of these tests will be taken into account in the global mark of the subject.

The final mark will be the weighted addition of the marks for all the sections, as long as all the required minima are reached. If this is not the case, the final mark for the subject will be the mark obtained for the exams multiplied by 0.55 (55%).

GLOBAL EVALUATION OPTION: In order to pass the subject, students must carry out the laboratory practical work, achieving an APT mark, and a minimum mark of 5 out of 10 points in the written test for the experimental part (20% of the final mark). In addition, they must also obtain a minimum mark of 5 out of 10 points in a global exam (80% of the final mark).

Sources of information

Basic Bibliography

Klein, D., **Química Orgánica**, Editorial Médica Panamericana, 2013

Wade, L.G., **Química Orgánica - libro electrónico**, 9ª edición, Pearson-Educación, 2017

Wade, L.G., **Química Orgánica**, 9ª edición, Pearson-Educación, 2017

Csákÿ, A.G.; Martínez Grau, M.A., **Técnicas experimentales en síntesis orgánica**, 2ª edición, Síntesis, 2012

Complementary Bibliography

Carey, F., **Química Orgánica**, 9ª edición, McGraw-Hill Interamericana, 2014

Vollhardt, K.P.C.; Schore, N.E., **Química Orgánica**, 5ª edición, Edicións Omega, 2007

Clayden, J.; Greeves, N.; Warren, S., **Organic Chemistry**, 2ª edición, Oxford University Press, 2012

Yurkanis Bruice, P., **Fundamentos de Química Orgánica**, 3ª edición, Pearson, 2015

Dobado, J.A.; García, F.; Isac, J.I., **Química Orgánica. Ejercicios comentados**, Garceta, 2012

Quiñoá, E.; Riguera, R., **Cuestiones y ejercicios de Química Orgánica**, 2ª edición, McGraw-Hill Interamericana, 2004

Quiñoá, E.; Riguera, R., **Nomenclatura y representación de los compuestos orgánicos**, 2ª edición, McGraw-Hill Interamericana, 2005

Palleros, D.R., **Experimental Organic Chemistry**, John Wiley and Sons, 2000

Recommendations

Subjects that continue the syllabus

Organic chemistry II/V11G201V01210

Subjects that are recommended to be taken simultaneously

Biochemistry/V11G201V01201
Analytical Chemistry I: Principles of Analytical Chemistry/V11G201V01202
Physical chemistry I: Chemical thermodynamics/V11G201V01203
Inorganic chemistry I/V11G201V01204

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