



IDENTIFYING DATA

Organic chemistry I

Subject	Organic chemistry I			
Code	V11G201V01205			
Study programme	(*)Grao 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			
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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) materials and bibliographic references in English,			
	b) tutoring sessions in English,			
	c) exams and assessments in English.			

Competencies

Code	
A1	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	Autonomous learning ability
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

Learning outcomes

Expected results from this subject	Training and Learning Results	
Represent the three-dimensional structure of organic molecules.	A1	B1
	A5	
Apply the principles of stereochemistry to the analysis of stereoisomers.	A1	B1
	A5	
Distinguish the most usual reactions in Organic Chemistry.	A1	B1
	A5	

Establish the influence of the structure and the chemical characteristics of the functional groups present in a molecule in its reactivity.	A1 A5	B1	C17
Explain the reactivity of organic compounds with multiple carbon-carbon bonds through an electrophilic addition mechanism.	A1 A5	B1	C17
Explain the reactivity of aromatic compounds through an electrophilic substitution mechanism.	A1 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: heats of hydrogenation and stability of alkenes and dienes; 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.
Practice 1	Thin layer chromatography. Determination of the appropriate eluent for a separation.
Practice 2	Liquid-liquid extraction. Application to the separation of compounds with different acid-base characteristics.

Planning

	Class hours	Hours outside the classroom	Total hours
Flipped Learning	12	24	36
Problem solving	24	48	72
Laboratory practical	14	5	19
Problem and/or exercise solving	2	15	17
Essay	0	6	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 some activities, individually or in groups, 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.
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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.
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.
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.
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.
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.

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.	10	A1	B1	C17	A5
Problem solving	Participation and resolution by the student of all the tasks proposed by the teaching staff in relation to the problem solving sessions will be evaluated.	25	A1	B1	C17	A5
Laboratory practical	Assistance to practical classes is mandatory. In this section of the course, it will be evaluated that students are capable of safely handling chemicals, including the evaluation of any specific risks associated with their laboratory use. This will be assessed as APT or NO APT. The following aspects will be considered: possible previous work, development of the experimental work, laboratory notebook, final work.	0		B2	C25	D3
Problem and/or exercise solving	Short test: 20%. It will cover content corresponding to the first two lessons. Global test: 30%. It will cover all the content of the subject. In this test, student acquisition of competences and skills related to the theoretical aspects of the subject will be evaluated.	50	A1	B1	C17	A5
Essay	Students will carry out an assignment related to the laboratory experiments. This work must be adjusted to the parameters specified by the teaching staff. Besides its delivery for evaluation, oral presentation of the final work could be required.	15	A1	B2	C25	D3
			A5	B3		

Other comments on the Evaluation

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

- Achieve mention **APT** in the evaluation of the laboratory work.
- Achieve a **minimum mark of 3 points out of 10** in the short test.
- Achieve a **minimum mark of 4 points out of 10** in the global test.

If any of the previous conditions is not fulfilled, the final mark for the subject will be the mark obtained for the exams (problem and/or exercise solving) section multiplied by 0.5 (50%).

- Achieve a minimum mark of 5.0 in the weighted addition of the marks for all the sections (flipped learning, problem solving, essay, problem and/or exercise solving [exams]).

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.

The participation of the student in any of the acts of evaluation for the subject will involve the condition of *presentado/a* and, therefore, the assignment of a mark. The acts of evaluation that will be considered are: assistance to laboratory practices (25% or more) or the delivery of reports/exercises (25% or more) or taking any examination.

EVALUATION IN JULY

The exams (problem and/or exercise solving) section can be repeated in July, in the following way:

- **Exams (50%).** It will be carried out a global test in which the competences acquired in the theoretical aspects of the subject will be evaluated. The student must achieve a **minimum mark of 4 points out of 10** so that the result of this test will be taken into account in the global mark of the subject. This result will substitute the marks obtained for the two theoretical tests carried out during the semester (short test and global test).

The final mark will be the weighted addition of the marks for all the sections (flipped learning, problem solving, essay, problem and/or exercise solving [exams]), 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 (problem and/or exercise solving) section multiplied by 0.5 (50%). In case that this mark was lower than the one obtained in the end of semester evaluation, the official mark will be this last one.

Sources of information

Basic Bibliography

Klein, D., **Química Orgánica**, ISBN: 9788498351699, Editorial Médica Panamericana, 2013

Vollhardt, K.P.C.; Schore, N.E., **Química Orgánica**, ISBN: 9788428214315, 5ª edición, Edicións Omega, 2007

Wade, L.G., **Química Orgánica**, ISBN: 9786073238472, 9ª edición, Pearson-Educación, 2017

Complementary Bibliography

Carey, F., **Química Orgánica**, ISBN: 9786071512109, 9ª edición, McGraw-Hill Interamericana, 2014

Clayden, J.; Greeves, N.; Warren, S., **Organic Chemistry**, ISBN: 9780199270293, 2ª edición, Oxford University Press, 2012

Yurkanis Bruice, P., **Fundamentos de Química Orgánica**, ISBN: 9788483229798, 3ª edición, Pearson, 2015

Dobado, J.A.; García, F.; Isac, J.I., **Química Orgánica. Ejercicios comentados**, ISBN: 9788415452201, Garceta, 2012

Palleros, D.R., **Experimental Organic Chemistry**, ISBN: 9780471282501, John Wiley and Sons, 2000

Quiñoá, E.; Riguera, R., **Cuestiones y ejercicios de Química Orgánica**, ISBN: 9788448140151, 2ª edición, McGraw-Hill Interamericana, 2004

Quiñoá, E.; Riguera, R., **Nomenclatura y representación de los compuestos orgánicos**, ISBN: 9788448143633, 2ª edición, McGraw-Hill Interamericana, 2005

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

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the Universidade de Vigo

establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

In case a change of the teaching mode takes place, from face-to-face to distance or blended learning, teaching methodologies will be modified as it follows:

* Teaching methodologies modified

Flipped learning: Student's autonomous work would not be modified, but in person class sessions with the teaching staff would be substituted by synchronous distance work sessions, using the tools of the Universidade de Vigo (virtual classroom and/or Remote Campus).

Problem solving sessions: In person class sessions would be substituted by synchronous distance work sessions, using the tools of the Universidade de Vigo (virtual classroom and/or Remote Campus).

Laboratory sessions: In person class sessions would be substituted by synchronous or non synchronous distance work sessions, using the tools of the Universidade de Vigo (virtual classroom and/or Remote Campus).

* Non-attendance mechanisms for student attention (tutoring)

Students will be tutored by the teaching staff. Tutoring sessions will be carried out by telematic means (email, videoconference, forums in the virtual classroom etc.), by previous appointment.

=== ADAPTATION OF THE ASSESSMENT ===

In the event of a change in the teaching mode, all the assessment systems described in the teaching guide will remain. With the following modifications:

* Tasks related to the flipped learning sessions

The task format could be modified and this would be informed to the students in advance. The tools of the Universidade de Vigo (virtual classroom and/or Remote Campus) will be used. Nevertheless, this part of the assessment will keep the same weight in the evaluation of the subject.

* Tasks related to the problem solving sessions

The task format could be modified and this would be informed to the students in advance. The tools of the Universidade de Vigo (virtual classroom and/or Remote Campus) will be used. Nevertheless, this part of the assessment will keep the same weight in the evaluation of the subject.

* Exams (Problem and/or exercise solving)

The in person exams will be substituted by synchronous or non synchronous distance exams, supplemented by oral presentations, using the tools of the Universidade de Vigo (virtual classroom and/or Remote Campus). Nevertheless, this part of the assessment will keep the same weight in the evaluation of the subject.

* Essay

The task format could be modified and this would be informed to the students in advance. The tools of the Universidade de Vigo (virtual classroom and/or Remote Campus) will be used. Nevertheless, this part of the assessment will keep the same weight in the evaluation of the subject.
