



## IDENTIFYING DATA

### Organic chemistry II

Subject	Organic chemistry II			
Code	V11G200V01504			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish			
Department	Organic Chemistry			
Coordinator	Gómez Pacios, María Generosa			
Lecturers	Fall Diop, Yagamare Gómez Pacios, María Generosa			
E-mail	ggomez@uvigo.es			
Web				
General description	Machine translation into english of the original teaching guide The course Organic Chemical II is designed to deepen in the knowledge of the properties and reactivity of functional groups. After the study of nucleophilic substitution and elimination reactions, the reactivity of bi-functional carbonylic compounds will be approached. Finally, the radical and peryclic reactions will be studied.			

## 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
A2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C2	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: types of chemical reactions and its main characteristics
C8	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: main techniques for structural determination, including spectroscopy
C10	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: properties of aliphatic, aromatic, heterocyclic and organometallic compounds
C11	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: nature and behavior of functional groups in organic molecules
C12	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: structural features of chemical elements and their compounds, including stereochemistry
C13	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: main synthetic routes in organic chemistry, including interconversions of functional groups and the formation of carbon-carbon and carbon-heteroatom bonds
C19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
C20	Evaluate, interpret and synthesize data and chemical information
C23	Present oral and written scientific material and scientific arguments to a specialized audience
D1	Communicate orally and in writing in at least one of the official languages of the University
D3	Learn independently
D4	Search and manage information from different sources
D5	Use information and communication technologies and manage basic computer tools
D8	Teamwork

D9 Work independently

D12 Plan and manage time properly

D13 Make decisions

D14 Analyze and synthesize information and draw conclusions

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**Learning outcomes**

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Expected results from this subject	Training and Learning Results		
Explain the reactivity of the organic compounds through the different mechanisms of reaction: replacement, elimination, addition and addition-elimination.	A1	C2	D1
	A2	C10	D3
	A3	C11	D4
	A5	C12	D5
		C13	D9
		D12	
		D13	
		D14	
Describe in detail the mechanisms of transformation of the organic compounds using the formalism of arrows.		C2	D1
		C11	D3
			D4
			D5
			D8
			D9
			D12
			D13
			D14
Complete diagrams of reaction of organic compounds adding reactive and/or the conditions of reaction.		C2	D1
		C13	D3
			D4
			D5
			D8
			D9
			D12
			D13
			D14
Propose sequences of simple reaction.		C12	D1
		C13	D3
			D4
			D5
			D8
			D9
			D12
			D13
			D14
Differentiate, according to the conditions of reaction and the *sustratos used, the mechanisms of replacement *nucleófila *SN1 and *SN2.		C2	D1
		C11	D3
		C12	D4
		C13	D5
			D8
			D9
			D12
			D13
			D14
Apply the processes of replacement *nucleófila on carbons *sp3 in the obtaining of organic compounds with simple links.		C2	D1
		C11	D3
		C12	D4
		C13	D5
			D8
			D9
			D12
			D13
			D14

*Predecir The possible competition between the processes of replacement *nucleófila and elimination for a *sustrato given.	C11	D1	
	C12	D3	
	C13	D4	
		D5	
		D8	
		D9	
		D12	
		D13	
		D14	
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	Apply the reactivity of *enoles and *enolatos.	C11	D1
		C12	D3
		C13	D4
			D5
		D8	
		D9	
		D12	
		D13	
		D14	
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Apply the processes of elimination in the preparation of organic compounds with multiple links.		C11	D1
		C12	D3
		C13	D4
			D5
		D8	
		D9	
		D12	
		D13	
		D14	
	<hr/>		
	Apply the reactivity of the composed alpha-*dicarbonílicos (*enolización, acidity, *alquilación in alpha, *alquilación in beta, *descarboxilación) in organic synthesis.	C10	D1
		C11	D3
		C12	D4
		C13	D5
		D8	
		D9	
		D12	
		D13	
		D14	
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Design the synthesis of compounds *bifuncionales using the reaction of condensation *aldólica, the reaction of *Reformatsky and the condensation of *Claisen.		C11	D1
		C12	D3
		C13	D4
			D5
		D8	
		D9	
		D12	
		D13	
		D14	
	<hr/>		
	Apply the reaction of *Knoevenagel and the procedures of synthesis *acetilacética and synthesis *malónica.	C11	D1
		C13	D3
			D4
			D5
		D8	
		D9	
		D12	
		D13	
		D14	
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Design the synthesis of derivatives of the compounds *carbonílicos alpha,beta-*insaturados by means of reactions of addition 1,2 and 1,4.		C11	D1
		C13	D3
			D4
			D5
		D8	
		D9	
		D12	
		D13	
		D14	

Apply the basic reactivity of the organic radicals.

C2 D1  
C11 D3  
C13 D4  
D5  
D8  
D9  
D12  
D13  
D14

Apply the reactions \*pericíclicas to the organic synthesis.

C2 D1  
C11 D3  
C13 D4  
D5  
D8  
D9  
D12  
D13  
D14

(\*)Characterize \*compuestos organic \*sencillos from \*sus \*datos espectroscópicos.

C8 D1  
C11 D3  
C19 D4  
C20 D5  
C23 D8  
D12  
D13  
D14

## Contents

### Topic

1. Nucleophilic substitution reactions	Bimolecular nucleophilic substitutions (SN2). Unimolecular nucleophilic substitutions (SN1). Kinetic, mechanisms, stereochemistry aspects. SN2 and SN1 competition. Transformations of functional groups through SN2 and SN1 processes.
2. Elimination Reactions.	Reactions of elimination. Bimolecular Elimination (E2). Unimolecular Elimination (E1). Base conjugated unimolecular elimination (E1cB). Intramolecular elimination (Ei). Mechanisms. Substitution and elimination competition. Application of elimination reactions in organic synthesis.
3. Oxidation-reduction reactions.	Oxidation-reduction reactions. Oxidation reactions of alcohols. Oxidation reactions of carbonyl compounds. Oxidative rupture of alkenes and alkynes. Reduction of aldehydes and ketones. Reduction of carboxylic acids, esters and nitriles.
5. Radical reactions.	Structure, stability and reactivity of radicals. Halogenation of alkanes. Radical addition of HBr to alkenes. Radical halogenation of allylic and benzylic systems. Polymerization of alkenes.
4. Reactivity in alpha position of carbonyl compounds.	Reactivity in alpha position of carbonyl groups. Enols and enolates: general reactivity. Reactions of ketones and esters enolate anions. Enolate anion reactions with carbonyl compounds: aldol, Claisen, Dieckmann and Reformatsky reactions.
5. Bifunctional Compounds.	Reactivity of 1,2-Bifunctional compounds: pinacol rearrangement, benzoin condensation, acyloin condensation, benzyl acid rearrangement, enolization. Reactions of beta-dicarbonyl compounds: malonic synthesis, acetoacetic ester synthesis, Knoevenagel reaction. Reactions of alpha-beta unsaturated carbonyl compounds: reactions with electrophiles, reactions with nucleophiles, carbanion addition (Michael reaction), Robinson annulation.
6. Pericyclic reactions.	General characteristics. Clasification. Electrocyclic reactions. Cycloaddition reactions. Sigmatropic reactions. Diels-Alder reaction. 1,3-Dipolar cycloadditions.

## Planning

	Class hours	Hours outside the classroom	Total hours
Supervised work	2	2	4
Lecturing	24	0	24
Seminars	24	0	24
Short answer tests	4	0	4
Essay questions exam	3	8	11

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

<b>Methodologies</b>	
	Description
Supervised work	The student, of individual form or in group, will prepare a short exhibition on a subject *relacionado with the matter. This activity includes the research of information, editorial and presentation of the work.
Lecturing	The sessions *magistrales will consist in the exhibition by part of the professor of the fundamental appearances of each subject. Before each session, the student will have to work the material that the professor will facilitate him through the platform FEAR, related with the content that will treat in each session.
Seminars	The students, with the support of the professor, will resolve exercises and questions previously proposed in Bulletins, related with the theoretical contents. A selection of the exercises will be delivered regularly to the professor for his evaluation.

### **Personalized attention**

<b>Methodologies</b>	<b>Description</b>
Seminars	The professors will devote a time to attend the needs and queries of the students related with the study and the resolution of exercises on the subjects linked with the matter. The day of the presentation the professors will inform on his time availability for this.
Supervised work	The students will realise a work on a subject that *eligirán of a series proposed by the professors, once finalised, in hours of seminar will expose it and will answer to the questions that formulate him the professors and/or the students. The professors will be able to *asesorar to the student in the election and development of the subject, in the distribution, *busqueda bibliographic and presentation

### **Assessment**

	Description	Qualification	Training and Learning Results
Supervised work	It will value the preparation and presentation of a work on a subject proposed by the professor related with the theoretical content of the *asignatura.	5	C2 D1 C8 D3 C10 D4 C11 D5 C12 D9 C13 D12 C19 D13 C20 D14 C23
Seminars	In the classes of seminar will value the participation and the resolution of the previously proposed problems by the professor. A selection of the exercises will be resolved individually in the classroom and delivered regularly to the professor for his evaluation.	10	C2 D1 C8 D3 C10 D4 C11 D5 C12 D8 C13 D9 C19 D12 C20 D13 C23 D14
Short answer tests	They will realise two proofs of short answer: the first when finalising the Subject II and the second when finalising the Subject IV. The first will constitute 20% of the total qualification, and the second 15%.	40	C2 D1 C8 D3 C10 D4 C11 D5 C12 D9 C13 D12 C19 D13 C20 D14 C23
Essay questions exam	It will consist in a global proof on all the contents of the matter. It will be necessary to reach a minimum of 4 points on 10 in this proof to surpass the matter and to take into account the rest of the elements of evaluation. It will realise when finalising he *cuatrimestre.	45	C2 D1 C8 D3 C10 D4 C11 D5 C12 D9 C13 D12 C19 D13 C20 D14 C23

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**Other comments on the Evaluation**

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**IMPORTANT NOTES:**

1. In the long proof final will evaluate the whole of the \*asignatura. It will be necessary to reach in this proof a minimum of 4 points on 10 to surpass the matter and to take into account the rest of the elements of evaluation.
2. A selection of the exercises of the bulletins will be resolved individually in the classroom and delivered regularly to the professor for his evaluation. Those students that by fault of assistance to class, do not deliver a minimum of 80% of these exercises, will not be able to present to the final proof.

CONDITION OF PRESENTED/To: The participation of the student in any one of the proofs written will involve the condition of presented/to and therefore the allocation of qualification.

**EVALUATION IN THE ANNOUNCEMENT OF JULIO:**

1. Punctuation obtained by the student during the course: Máximo 3.0 points.

It will keep the qualification obtained by the student during the course in works \*tutelados (maximum 0.5 points), proofs of short answer (maximum 2.5 points).

2. Proof written: Máximo 7.0 points.

It will realise a proof of long answer on all the contents of the matter to which will assign a maximum of 7.0 points on 10.

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**Sources of information**

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**Basic Bibliography****Complementary Bibliography**

Vollhardt, K.P.C. y Schore, N.E., **Química Orgánica**, 5<sup>a</sup>,

Wade, L.G., **Química Orgánica**, 5<sup>a</sup>,

Yurkanis Bruice, P., **Química Orgánica**, 5<sup>a</sup>,

Ege, S., **Organic Chemistry: Structure and reactivity**, 5<sup>a</sup>,

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**Recommendations**

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**Subjects that continue the syllabus**

Organic chemistry III/V11G200V01704

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**Subjects that are recommended to be taken simultaneously**

Structural Determination/V11G200V01501

Chemical engineering/V11G200V01502

Analytical chemistry II/V11G200V01503

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**Subjects that it is recommended to have taken before**

Chemistry: Chemistry 1/V11G200V01105

Chemistry: Chemistry 2/V11G200V01204

Organic chemistry I/V11G200V01304

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