



## IDENTIFYING DATA

### Industrial organic chemistry

Subject	Industrial organic chemistry			
Code	V12G350V01923			
Study programme	Degree in Industrial Chemical Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Longo González, María Asunción			
Lecturers	Deive Herva, Francisco Javier Longo González, María Asunción Sánchez Bermúdez, Ángel Manuel			
E-mail	mlongo@uvigo.es			
Web				
General description	In this course, the fundamental aspects related to the structure of organic compounds and their reactions are presented. Particular attention will be paid to polymerization methods and techniques, and to the intermediate chemicals most frequently used on an industrial scale, as well as other sectors of interest in the organic chemical industry.			

English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.

## Competencies

Code			
B3	CG3 Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.		
B4	CG4 Ability to solve problems with initiative, decision making, creativity, critical thinking and the ability to communicate and transmit knowledge and skills in the field of industrial engineering specializing in Industrial Chemistry.		
C4	CE4 Ability to understand and apply the basic knowledge of general chemistry, organic chemistry and inorganic chemistry, and their applications in engineering.		
D2	CT2 Problems resolution.		
D9	CT9 Apply knowledge.		
D10	CT10 Self learning and work.		
D16	CT16 Critical thinking.		
D17	CT17 Working as a team.		

## Learning outcomes

Expected results from this subject	Training and Learning Results		
(*)	B3	C4	D10 D16 D17
New	B3 B4	C4	D2 D9 D10 D16 D17
New	B3 B4	C4	D2 D9 D10 D16 D17

**Contents**

Topic	
1. The organic chemical industry.	1.1. Introduction and general characteristics. 1.2. Raw materials 1.3. Petrochemistry 1.4. Intermediate products and final products.
2. Fundamental concepts of organic chemistry.	2.1. Bonds, hybridisation and geometry. 2.2. Hydrocarbons. Aromaticity. Resonant structures. 2.3. Functional groups. 2.4. Intermolecular interactions 2.5. Conformations and isomery.
3. Reactivity of organic compounds.	3.1. Kinetics and mechanisms of reaction. 3.2. Homogeneous and heterogeneous catalysis. 3.3. Reactivity of organic compounds. 3.3.1. Reactivity of substrates 3.3.2. Electronic structure of reagents. 3.3.3. Reaction intermediates 3.4. Types of organic reactions.
4. Ethylene. Propylene. Intermediate and end-products. Polymerisation.	4.1. Addition reactions. 4.2. Industrial products from ethylene. 4.3. Industrial products from propylene. 4.4. Polymeric materials. Classifications. 4.4.1. Polymerisation reactions. Additions and condensations. 4.4.2. Polyethylene and polypropylene.
5. Fraction C4. Dienes and polyenes. Intermediate and end-products. Fibres and elastomers.	5.1. Butenes. 5.2. Dienes, types and characteristics. 5.3. Synthesis of Diels Alder. 5.4. Elastomers. 5.4.1. Isoprene rubbers. 5.4.2. Isobutylene rubbers. 5.4.3. 1,3-butadiene rubbers. 5.5. Fibres 5.5.1. Acrylic, polyamides and polyesters.
6. Fraction BTX. Intermediate and end-products. Resins.	6.1. Reactivity of the arenos. Benceno. 6.2. Effect of substituentes. Activators and deactivators. 6.3. Industrial derivatives of toluene. 6.3.1. Production of phenol and its derivatives. Phenolic and epoxy resins 6.3.2. Polyesters. Styrene polymers.
7. Other organic compounds of industrial interest.	7.1. Nitrogen compounds. 7.1.1. Dyazonium salts . Dyes and pigments. 7.2. Halogenated compounds. Solvents and insecticides. 7.3. Oxygene compound. Organic acids, alcohols and ketones of industrial interest. 7.4. Tensioactive agents. Types and characteristics.

**Planning**

	Class hours	Hours outside the classroom	Total hours
Problem solving	9	27.5	36.5
Laboratory practical	18	18	36
Mentored work	1.5	14	15.5
Lecturing	16	40	56
Problem and/or exercise solving	2	0	2
Presentation	2	0	2
Objective questions exam	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**

	Description
Problem solving	Throughout the course, exercises will be solved, either in the classroom or autonomously by the students, and handed out for evaluation if needed.

Laboratory practical	Laboratory practices will be carried out, and they will include questions or exercises, which must be submitted for evaluation. This activity is mandatory to pass the course.
Mentored work	Topics related to the contents of the course will be proposed to the students, so that they prepare an individual or group work on any of them.
Lecturing	It will consist of the exposition of the contents of the course, based on the proposed bibliography and the documentation provided on the FAITIC platform

### Personalized assistance

Methodologies	Description
Lecturing	Personalized attention to students will be provided for all activities in the course, in the hours scheduled for tutorials.
Problem solving	Personalized attention to students will be provided for all activities in the course, in the hours scheduled for tutorials.
Laboratory practical	Personalized attention to students will be provided for all activities in the course, in the hours scheduled for tutorials.
Mentored work	Personalized attention to students will be provided for all activities in the course, in the hours scheduled for tutorials.

### Assessment

	Description	Qualification	Training and Learning Results		
Laboratory practical	Attitude, participation and quality of the work carried out in the laboratory will be considered. In addition the student will respond to questions raised in each of the practices, and deliver the required lab reports.	20	B3 B4	C4	D9 D16 D17
Problem and/or exercise solving	Partial tests will be carried out, which will include short answer questions and problems, for the evaluation of the skills acquired in relation to the contents of the course.	30	B3	C4	D9 D16
Presentation	The quality of the contents of the delivered work will be evaluated, together with the presentation and the answers to the questions.	20	B3 B4	C4	D10 D16 D17
Objective questions exam	There will be a final exam, which will include short questions and problems, to evaluate the acquisition of the competences of the course.	30	B3 B4	C4	D2 D9 D16

### Other comments on the Evaluation

**Partial tests.** During the course there will be a partial eliminatory test, which will include short answer-questions and problems or exercises with a weight in the final grade of 30%

The attendance to laboratory sessions and / or to the partial test will imply a qualification different from Not Presented.

**Final exam 1st edition:** It will include the contents not evaluated in the partial test, with a relative weight of 30%. Each student can repeat the evaluation of the contents not passed in the partial test.

**1st Edition of the qualification record:** The final grade will be the sum of those obtained in all the tests carried out (laboratory practices, work presentation and written exams), if they have been passed with a grade equal to higher than 5.0. Otherwise, only the sum of the ratings below 5.0 will be reflected; the passed activities (laboratory and work presentation) will be reserved for the second edition of the qualification record.

**2nd Edition of the qualification record:** The grade will be calculated by adding the one reflected in the first edition of the qualification record and the one obtained in the extraordinary final exam, only if a mark equal of higher than 5.0 is obtained in the latter. Otherwise, a final qualification of Not passed will be awarded, with a numerical mark equals to that indicated in the first edition of the qualification record.

### Ethical commitment:

The student is expected to exhibit adequate ethical behavior. In the case of detecting unethical behavior (copying, plagiarism, unauthorized use of electronic devices, and others) it will be considered that the student does not meet the necessary requirements to pass the course. In this case, the overall grade in the current academic year will be Not passed (0.0). The use of any electronic device during the evaluation tests will not be allowed unless expressly authorized. The fact of introducing an electronic device not authorized in the exam room will be considered a reason for not passing the subject in this academic year and the overall rating will be Not passed (0.0).

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## Sources of information

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### Basic Bibliography

Primo Yúfera, E., **Química orgánica básica y aplicada. Tomo I y II.**, Reverté,

Harold, A. Wittcoff, **Productos químicos orgánicos industriales. Vol 1. Materias primas y fabricación.**, Limusa,

Philip S. Baley, **Química orgánica. Conceptos y aplicaciones**, Pearson,

M<sup>a</sup> José Climent Olmedo, et al., **Química orgánica. Principales aplicaciones industriales.**, Univ. Politécnica de Valencia,

Harold A. Wittcoff, **Productos químicos orgánicos industriales. Vol 2. Tecnología, formulaciones y usos.**, Limusa,

### Complementary Bibliography

Green, Mark M., **Organic chemistry principles and industrial practice.**, Wiley -VCH,

McMurry, **Química orgánica.**, Cengage,

Harold A. Wittcoff, **Industrial Organic Chemicals**, Wiley,

Issa Katime Amashta, et al., **Introducción a la ciencia de los materiales poliméricos. Síntesis y caracterización.**, Univ. País Vasco.,

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## Recommendations

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### Subjects that are recommended to be taken simultaneously

Bioelectrochemistry/V12G350V01921

Biotechnological processes and products/V12G350V01922

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

Chemistry: Chemistry/V12G350V01205

Experimentation in industrial chemistry 1/V12G350V01505

Experimentation in industrial chemistry 2/V12G350V01602

Chemical engineering 2/V12G350V01503

Industrial chemistry/V12G350V01504

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### Other comments

To enroll in this course it is necessary to have passed or be enrolled in all the subjects of the courses lower than the course in which this subject is scheduled.

In case of discrepancies, the Spanish version of this guide will prevail.

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## Contingency plan

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### Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of 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 ===

\* Teaching methodologies maintained / modified

The methodologies indicated in the guide will be maintained; in the event of a health alert, they will be carried out in remote mode, through the teaching platforms and remote campus of the universities.

Laboratory practices will be replaced by computer practices, if necessary.

\* Non-attendance mechanisms for student attention (tutoring)

Tutorials will be attended electronically (email, remote campus)

\* Modifications (if applicable) of the contents

The same contents are maintained.

\* Additional bibliography to facilitate self-learning

The bibliography provided is sufficient.

\* Other modifications

Not applicable.

=== ADAPTATION OF THE TESTS ===

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The evaluation will be carried out face-to-face except if there is a Rectoral Resolution that indicates that it must be done remotely, in which case the evaluation will be performed by using the different tools made available to lecturers.

\* Additional Information

Vulnerable students: a methodological adaptation will be carried out, providing additional specific information, for those students that can certify that they cannot access the contents by the conventional means.

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