



## IDENTIFYING DATA

### Organometallic Chemistry

Subject	Organometallic Chemistry			
Code	V11G201V01404			
Study programme	Grado en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Talavera Nevado, María			
Lecturers	Talavera Nevado, María			
E-mail	matalaveran@uvigo.es			
Web				
General description	<p>In this subject we'll study the properties of the compounds that have, at least, one bond between a transition metal and a carbon atom. We'll also study their applications in different processes of organic synthesis catalyzed by transition metals.</p> <p>English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English</p>			

## Training and Learning Results

Code			
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		
B1	Ability for autonomous learning		
B3	Ability to manage information		
B4	Ability for analysis and synthesis		
C38	Relate the structural bases of organometallic compounds with their physical, spectroscopic and chemical properties		
C39	Select the appropriate techniques and procedures for problems of structural elucidation, synthesis, isolation and purification of organometallic compounds		
D2	Capacity for teamwork		

## Expected results from this subject

Expected results from this subject	Training and Learning Results		
Define organometallic compound.		C38	
Rationalize the information provided by the usual spectroscopic techniques for the characterization of the different types of organometallic compounds.	A3	B1 B3 B4	C38 C39
Identify the main types of organometallic reactions.		B1	C38
Propose methods of synthesis for the different types of organometallic compounds.	A3	B1 B3 B4	C38 C39
Predict the stability and reactivity of the different types of organometallic compounds.	A3	B1 B3 B4	C38
Describe the most important catalytic cycles.	A3	B1	C38
Carry out in the laboratory the preparation, characterization and study of organometallic compounds.	A3		C38 C39 D2

## Contents

Topic	
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Subject 1. Introduction	Definition. History. Ranking. Types of ligands. Rule of the 18 electrons.
Subject 2. Organometallic compounds with type L Carbonyls, phosphines, carbenes and carbenes. ligands (I).	
Subject 3. Organometallic compounds with type L Pi complexes: Alkenes, alkynes, polyenes and arenes. ligands (II).	
Subject 4. Organometallic compounds with type L Sigma complexes: Dihydrogen, silanes, boranes and alkanes. ligands (III).	
Subject 5. Organometallic compounds with type XHydrides, alkyls, aryls and vinyls. ligands.	
Subject 6. Organometallic compounds with carbon LnX ligands.	Alyls and cyclopentadienyls.
Subject 7. Types of organometallic reactions (I).	Ligand substitution reactions.
Subject 8. Types of organometallic reactions (II).	Reactions of oxidative addition and reductive elimination.
Subject 9. Types of organometallic reactions (III).	Reactions of migratory insertion and elimination.
Subject 10. Types of organometallic reactions (IV).	Reactions of nucleophilic and electrophilic attack to coordinated ligands.
Subject 11. Organometallic catalysis.	General comments. Relevant catalytic cycles.

## Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	24	48	72
Problem solving	12	24	36
Laboratory practical	14	14	28
Essay questions exam	1	4	5
Essay questions exam	1	8	9

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

## Methodologies

	Description
Lecturing	Students, in a single group, will receive 24 hours of expository classes in which the teacher will present the most relevant aspects of each topic.
Problem solving	Students, in a single group, will receive 12 hours of seminar classes that will be dedicated to solving doubts or questions that arise in the development of each topic, and to the resolution of questions, exercises and problems proposed by the teacher.
Laboratory practical	Laboratory practices will be carried out in which the theoretical knowledge acquired will be applied. The practices will be carried out in 4 sessions of 3.5 hours and the students must reflect and interpret what is observed in the corresponding laboratory notebook.

## Personalized assistance

Methodologies	Description
Lecturing	Students will be able to consult all kinds of doubts related to the subject during the tutorial hours.
Problem solving	Students will be able to consult all kinds of doubts related to the subject during the tutorial hours.
Laboratory practical	Students will be able to consult all kinds of doubts related to the subject during the tutorial hours.

## Assessment

	Description	Qualification	Training and Learning Results
Problem solving	In addition to resolving practical exercises that allow to the students settle the knowledges on the subjects developed in the classes of theory, and to resolve all the exposed doubts, the classes of seminar, will use to carry out the continuous evaluation of the students. This process of continuous evaluation will make through the resolution of exercises inside and out of the classroom related with the contents of the matter as well as the resolution of short questions proposals by the professor. The global note of all the exercises will have to surpass the 3 on 10 to be taken into account in the final note.	20	A3 B1 C38 B3 C39 B4

Laboratory practical	The assistance to the face-to-face practical classes is compulsory. The evaluation in the practices of laboratory will consist of a part based in the behaviour and skill by direct observation of the/to professor/to as well as of the previous and back work to the experimental work. It needs a 5 on 10 to pass the course. Those students that have the practices approved in the previous course will be able to request not to repeat them in the current course keeping the qualification obtained.	15	A3 B1 C38 D2 B3 C39 B4
Essay questions exam	A short proof on the contents of the first part of the course. It will demand a minimum note of 3.5 points out of 10 to pass the course	25	B1 C38 B3 C39 B4
Essay questions exam	A final proof in which it will have a global evaluation of the course and will cost 40% of the final note. It requires a 4 on 10 to pass the course	40	B1 C38 B3 C39 B4

### Other comments on the Evaluation

#### Requirements for passing the course

- Pass the laboratory practicals with a grade equal to or higher than 5 out of 10.
- A mark of 5 out of 10 in the global qualification of all the methodologies/tests in continuous assessment or exclusively in the final exam in the second opportunity for non-continuous assessment.

#### Development of continuous evaluation

- The specific competences of the subject related to the competences of the degree will be evaluated explicitly in deliverable exercises and written tests. The basic, general and transversal competences will be assessed implicitly in the marking of the exercises.
- In order to take them into account in the final grade, a score higher or equal to that detailed in the description of each test will be required.
- Students who do not pass the subject at the end of the term will have to take a written test in the final evaluation period in July. This test will be worth 40% of the mark and will replace the results of the end of term test. The marks for the rest of the activities are not recoverable.

#### Non-continuous evaluation

The choice of the non-continuous assessment modality implies the renunciation of the right to continue the assessment of the remaining activities of the continuous assessment modality and of the grade obtained up to that moment in any of the tests that have already taken place.

In the case of choosing the non-continuous evaluation or not achieving the minimum mark required for continuous assessment, the student may take a test at the end of the term in which he/she will have to solve questions related to all the specific competences of the subject except the practicals. This test will be different in length to the one taken by those who opt for continuous assessment and the grade obtained will be the final grade for the subject without taking into account the grade for the practicals. A 5 out of 10 will be required to pass the course.

### Sources of information

#### Basic Bibliography

Housecroft, C. E.; Sharpe, A. G., **Inorganic Chemistry**, 5, Harlow: Pearson Education, 2018  
 Crabtree, R. H., **The organometallic chemistry of the transition metals**, 6, Wiley, 2014

#### Complementary Bibliography

Spessard, G. O., **Organometallic chemistry**, 3, Oxford University Press, 2015  
 Astruc, D., **Química organometálica con ejercicios corregidos**, 1, Reverté, 2003  
 Elschenbroich, Ch., **Organometallics**, 3, Wiley-VCH, 2006  
 Haiduc, I., **Basic organometallic chemistry**, 1, Walter De Gruyter, 1985  
 Toreki, R., **The Organometallic Hypertext Book**, <http://www.ilpi.com/organomet/index.html>, 2016

### Recommendations