



1. General information

Course: MOLECULAR INORGANIC CHEMISTRY

Type: CORE COURSE

Degree: 409 - CHEMISTRY

Center: 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY

Year: 3

Main language: Spanish

Use of additional
languages:

Web site:

Code: 57317

ECTS credits: 6

Academic year: 2022-23

Group(s): 20 23

Duration: First semester

Second language: English

English Friendly: Y

Bilingual: N

Lecturer: GEMA DURA GRACIA - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
Edificio San Alberto Magno (primer piso)	QUÍMICA INORG., ORG., Y BIOQ.		Gema.Dura@uclm.es	

Lecturer: SANTIAGO GARCIA YUSTE - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
Edificio San Alberto Magno (primer piso)	QUÍMICA INORG., ORG., Y BIOQ.	3477	santiago.gyuste@uclm.es	

Lecturer: AGUSTIN LARA SANCHEZ - Group(s): 20 23

Building/Office	Department	Phone number	Email	Office hours
Edificio San Alberto Magno	QUÍMICA INORG., ORG., Y BIOQ.	3499	agustin.lara@uclm.es	Monday and Wednesday from 5:00 p.m. to 7:00 p.m. You must contact the Professor to request an appointment and avoid the concurrence of people for security reasons.

Lecturer: ELENA VILLASEÑOR CAMACHO - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
Edificio San Alberto Magno (primer piso)	QUÍMICA INORG., ORG., Y BIOQ.	926052133	elena.villasenor@uclm.es	

2. Pre-Requisites

It is recommended that you have completed and approved the subject of Inorganic Chemistry

3. Justification in the curriculum, relation to other subjects and to the profession

This subject is part of the subject Inorganic Compounds along with the subject Inorganic Chemistry of the Solid State that is taught in the second semester within the Modules of Chemistry.

The course is the basis for understanding inorganic compounds with molecular structures such as coordination compounds and organometallic compounds. These compounds are of special importance for the understanding of many catalytic processes of industrial interest where they act as catalysts such as olefin metathesis processes, hydrogenation of unsaturated substrates, carbonylation... In addition, the pharmaceutical industry and a molecule of special importance for living beings. Alive are compounds of this type such as hemoglobin, chlorophyll... This warns us of the importance of the subject for the formation of a Chemist, since most chemical reactions involve inorganic molecular compounds.

4. Degree competences achieved in this course

Course competences

Code	Description
CB02	Apply their knowledge to their job or vocation in a professional manner and show that they have the competences to construct and justify arguments and solve problems within their subject area.
CB04	Transmit information, ideas, problems and solutions for both specialist and non-specialist audiences.
E03	Handle chemicals safely and with respect to the environment
E06	Know the structural properties of chemical compounds, including stereochemistry, as well as the main structural research techniques
E07	Relate macroscopic properties with those of atoms, molecules and non-molecular chemical compounds
E09	Know the kinetics of chemical change, including catalysis and reaction mechanisms
E15	Know how to handle the standard chemical instrumentation and be able to elaborate and manage standardized procedures of work in the laboratory and chemical industry
G01	Know the principles and theories of Chemistry, as well as the methodologies and applications characteristic of analytical chemistry, physical chemistry, inorganic chemistry and organic chemistry, understanding the physical and mathematical bases that require
G02	Be able to gather and interpret data, information and relevant results, obtain conclusions and issue reasoned reports on scientific, technological or other problems that require the use of chemical tools
G03	Know how to apply the theoretical-practical knowledge acquired in the different professional contexts of Chemistry
T05	Organization and planning capacity
T07	Ability to work as a team and, where appropriate, exercise leadership functions, fostering the entrepreneurial character

T10	Ability to use specific software for chemistry at user level
T11	Ability to obtain bibliographic information, including Internet resources

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Know the fundamental concepts of Coordination Chemistry and Organometallic Chemistry.

Train the student for autonomous work and learning, as well as for personal initiative.

Train the student to search for information, its analysis, interpretation and use for practical purposes.

Apply and interpret some techniques of structural determination or study of properties of molecular and solid inorganic compounds

Apply advanced techniques of preparation of molecular and solid inorganic compounds.

Know fundamental aspects of thermodynamic and kinetic type of complexes and organometallic compounds

Know systematically the main families of organometallic compounds and their reactivity

6. Units / Contents

Unit 1: Fundamental concepts in coordination chemistry

Unit 2: Thermodynamic and kinetic in coordination compounds

Unit 2.1 Thermodynamic factors in coordination chemistry

Unit 2.2 Types of reactions and reaction mechanisms

Unit 3: Basics Organometallic Chemistry.

Unit 3.1 Classification of organometallic compounds.

Unit 3.2 General stability of organometallic compounds.

Unit 3.3 Types of ligands.

Unit 3.4 Effective atomic number rule

Unit 4: Types of reactivity in organometallic compounds.

Unit 5: Synthesis, structure and properties of organometallic compounds.

Unit 5.1 Organometallic compounds with sigma and pi bond metal carbon.

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Combination of methods	E06 E07 G01 G03	1.2	30	N	-	Master lessons and case resolution
Class Attendance (practical) [ON-SITE]	Combination of methods	E03 E15 G03 T05	0.8	20	Y	Y	
Problem solving and/or case studies [ON-SITE]		G02 G03 T10 T11	0.24	6	Y	N	
Study and Exam Preparation [OFF-SITE]		E06 E07 E15 G01 G02 G03	1.2	30	N	-	
Writing of reports or projects [OFF-SITE]	Self-study	G03 T05 T07 T10 T11	1.2	30	N	-	
Other off-site activity [OFF-SITE]		E06 E07 E15 G01 G02 G03	1.2	30	N	-	
Final test [ON-SITE]	Assessment tests	E06 E07 E15 G01 G02 G03	0.08	2	Y	Y	
Mid-term test [ON-SITE]	Assessment tests	E06 E07 E15 G01 G02 G03	0.08	2	Y	N	
Total:			6	150			
Total credits of in-class work: 2.4			Total class time hours: 60				
Total credits of out of class work: 3.6			Total hours of out of class work: 90				

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Final test	70.00%	80.00%	70% corresponds to the exams carried out in the partial and final test, that is, to the grade obtained in these tests
Laboratory sessions	20.00%	20.00%	Continuous evaluation through the monitoring of the acquisition of practical knowledge (laboratory) and the evaluation of the laboratory notebook that will include the answers to different questions raised.
Assessment of problem solving and/or case studies	10.00%	0.00%	Resolution of case studies in the classroom, demonstrating the acquisition of the corresponding competences. It will be added to the first section
Total:	100.00%	100.00%	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:

Continuous assessment:

Final numerical rating from 0 to 10 depending on current legislation.

The final qualification will be the result of continuous evaluation through the monitoring of acquisition of theoretical and practical knowledge demonstrate the acquisition of the skills. At the end of the first part of the subject (Coordination Chemistry) a progress test will be carried out, which if it is passed will serve as part of the note of the final exam.

The laboratory practices are compulsory and to pass the course the final grade for the practices must be greater than or equal to 5 points out of 10.

The final rating of the subject will be calculated as a result of the following actions:

(a) final examination (70%), (b) laboratory session (20%) and (c) resolution of case studies in the classroom (10%).

The subject cannot be passed if the laboratory sessions has not been completed and passed and if it does not pass the final exam

Non-continuous evaluation:

Final numerical rating from 0 to 10 depending on current legislation.

The final rating shall be the result of an assessment demonstrating the acquisition of the relevant skills.

The laboratory practices are compulsory and to pass the course the final grade for the practices must be greater than or equal to 5 points out of 10.

The final grade of the subject will be calculated as a result of the following actions:

final evaluation (80%) y (b) conducting (laboratory) (20%).

The subject cannot be approved if the laboratory classes has not been completed and passed and if it does not pass the final evaluation.

Specifications for the resit/retake exam:

Same as the ordinary call

Specifications for the second resit / retake exam:

Same as the ordinary call

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	30
Class Attendance (practical) [PRESENCIAL][Combination of methods]	20
Problem solving and/or case studies [PRESENCIAL][]	6
Study and Exam Preparation [AUTÓNOMA][]	30
Writing of reports or projects [AUTÓNOMA][Self-study]	30
Other off-site activity [AUTÓNOMA][]	30
Final test [PRESENCIAL][Assessment tests]	2
Global activity	
Activities	hours
Class Attendance (practical) [PRESENCIAL][Combination of methods]	20
Writing of reports or projects [AUTÓNOMA][Self-study]	30
Problem solving and/or case studies [PRESENCIAL][]	6
Other off-site activity [AUTÓNOMA][]	30
Class Attendance (theory) [PRESENCIAL][Combination of methods]	30
Study and Exam Preparation [AUTÓNOMA][]	30
Final test [PRESENCIAL][Assessment tests]	2
Total horas: 148	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Bochmann, Manfred	Organometallics 1 : complexes with transition metal-carbon	Oxford University Press		0-19-855750-7	2003	
Crabtree, Robert H.	The organometallic chemistry of the transition metals	John Wiley and Sons		0-471-66256-9	2005	
J. Ribas Gispert	Química de la Coordinación	Universidad de Barcelona			2000	
Purcell, Keith F.	Química inorgánica	Reverté		84-291-7478-8 (o.c.)	1979	
Alexander Von Zelewsky	Stereochemistry of Coordination Compounds	Wiley and Sons. Oxford			1996	
Bochmann, Manfred	Organometallics 2 : complexes with transition metal-carbon	Oxford University Press		0-19-855813-9	2004	