Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2026/27

Faculty 215 - Faculty of Chemistry — **Cycle** .

Degree GQUIMI20 - Bachelor's Degree in Chemistry — **Year** Fourth year

COURSE

26142 - Catalysis and Bioorganometallics — **Credits, ECTS:** 6

COURSE DESCRIPTION

In this course studies on catalytic reactions useful for the transformation of organic compounds under homogeneous reaction conditions will be developed. Organometallic complexes will be used as catalysts and examples of asymmetric catalytic reactions of interest in the preparation of medicals will be included. The student will acquire knowledge on the importance of organometallic complexes on biological systems and on medical treatments.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

In this course studies on catalytic reactions useful for the transformation of organic compounds under homogeneous reaction conditions will be developed. Organometallic complexes will be used as catalysts and examples of asymmetric catalytic reactions of interest in the preparation of medicals will be included. The student will acquire knowledge on the importance of organometallic complexes on biological systems and on medical treatments.

Students will acquire cross-skills corresponding to the Advanced Unit: Demonstrate observation, analysis and synthesis skills with a capacity for criticism and self-criticism; demonstrate a capacity for learning and for autonomous work for professional development; be able to manage, organise and plan chemical processes, applying criteria of quality and environmental conservation; relate chemistry with other disciplines and understand its impact on the industrial and technological society and the importance of the industrial chemical sector ([M03.CM17] to [M03.CM20]). Students will also reach more specific skills related to the knowledge of the main reactions that organometallic complexes may undergo, in special those involved in catalytic processes. Special interest will be devoted to industrial applications related to health, both from theoretical and experimental points of view. [M03.CM07], [M03.CM12] to [M03.CM14] (Understand the functioning and importance of homogeneous catalytic processes and their role in obtaining drugs and the biomedical applications of organometallic compounds. Possess knowledge of the network tools and services that enable searches for information in the field of chemistry and similar fields. Transmit phenomena and processes related to chemistry and similar fields in verbal presentations and/or written reports and in a comprehensible way in either of the two official languages of the Autonomous Community of the Basque Country or in English. Be able to use the information and knowledge gained from the module for training in existing or emerging fields related to chemistry)

The Degree Coordination Committee will guarantee horizontal and vertical coordination of the course both in the Unit and in the Degree.

Theoretical and Practical Contents

Introduction. Basic concepts. The catalytic cycle. Fundamental reactions in homogeneous catalysis.
Homogeneous hydrogenation. The activation of molecular hydrogen. Important catalysts. Olefin asymmetric hydrogenation.
Other homogeneous transformations of olefins. Oxidation. Asymmetric epoxidation. Metathesis.
Carbonylation reactions. Methanol carbonylation. Hydroformylation. Asymmetric hydroformylation.
Bioorganometallic chemistry and biomedical applications. Enzymatic catalysis. Anticancer agents. Diagnosis.

TEACHING METHODS

The methodology includes conferences, seminars and laboratory work. Personalized tutorials will also be available.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	40	5		15					
Horas de Actividad No Presencial del Alumno/a	60	7,5		22,5					

Legend:
M: Lecture-based — S: Seminar — GA: Applied classroom-based groups
GL: Applied laboratory-based groups — GO: Applied computer-based groups — GCL: Applied clinical-based groups
TA: Workshop — TI: Industrial workshop — GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 75%
- Laboratory work 25%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Theory 75 %. Minimum required 40 %.
Laboratory 25 %. Minimum required 40 %

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Theory 75 %. Minimum required 40 %.
Laboratory 25 %. Minimum required 40 %

MANDATORY MATERIALS

Se indicará cada curso en la Guía Docente.

BIBLIOGRAPHY

Basic bibliography

D. Astruc, ORGANOMETALLIC CHEMISTRY AND CATALYSIS, Springer, 2007
G. Jaouen (Ed.), BIOORGANOMETALLICS, Wiley-VCH, 2006

Detailed bibliography

R. H. Crabtree, THE ORGANOMETALLIC CHEMISTRY OF THE TRANSITION METALS, Wiley, 2005
R. J. Errington, ABVANCED PRACTICAL INORGANIC AND METALLORGANIC CHEMISTRY, Chapman&Hall, 1997.

Journals

Applied Organometallic Chemistry, Wiley
Journal of Molecular Catalysis A: Chemical, Elsevier
Journal of Molecular Catalysis B: Enzymatic, Elsevier
Journal of Organometallic Chemistry, Elsevier
Organometallics, ACS Publications

Web sites of interest

Se indicará cada curso en la Guía Docente.

OBSERVATIONS