

COURSE GUIDE

2021/22

Faculty 215 - Faculty of Chemistry

Cycle Not Applicable

Degree GQUIMI20 - Bachelor's Degree in Chemistry

Year Fourth year

COURSE

26141 - Organic Synthesis and Biomolecules

Credits, ECTS: 6

COURSE DESCRIPTION

The goal is to complement basic concepts of Organic Chemistry acquired during the previous courses with a focus on synthesis, also correlating its significance during the development of new pharmacologically and biologically active compounds.

A selection of modern synthetic strategies and methods will be presented, focusing on heterocyclic compounds. The principles of bioactivity at the molecular level will also be introduced using some relevant examples. The subject will be complemented with aspects of structural elucidation of bioactive compounds and stereochemical concepts

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The subject should help in gaining the following competences:

[M3.10] The ability to interpret structural analysis and apply principles of organic reactivity to the synthesis of pharmacologically and biologically interesting molecules.

[M3.11] The capacity for designing, planning and carrying out experimental work, as well as to use instrumental techniques for solving problems of chemical nature.

[M3.12] The ability for data searching using network services in the chemistry and related areas.

[M3.13] The ability to present orally chemical concepts and processes; also to write properly technical reports in the chemistry area using either Basque, Spanish or English languages.

The following transversal competences of the Module will also be acquired:

[M3.T1] The skills of observation, analysis and synthesis with a critical perspective.

[M3.T2] The ability of learning and autonomous work.

[M3.T3] To be able to manage, organize and plan chemical processes based on quality criteria and environmental concerns.

[M3.T4] To be able to translate chemical concepts to other disciplines; to realize of their impact in industry and technology development of our society.

The coordination, both horizontal and vertical, of the subject within the Module and the Degree will be supervised by the Commission of Coordination of the Degree.

CONTENIDOS TEÓRICO-PRÁCTICOS

Advanced NMR ¹H, ¹³C and other nuclei spectroscopy. NOE and two-dimensional spectroscopy.

Synthesis of molecules of therapeutic interest. Aliphatic and carbocyclic systems. Aromatic and (partially) saturated heterocycles. Mono- and polycyclic heterocycles. Principles of combinatorial synthesis.

Drugs and chirality. General strategies for the synthesis of enantiomerically pure drugs. The Chiral Pool approach.

Catalytic methods: Enzymes, organometallic compounds, organocatalysis.

Drugs related to Natural Products: Nucleosides and analogs. Esteroids. -Lactam antibiotics. Peptides and peptidomimetics. Prostaglandins.

TEACHING METHODS

M: The main concepts and additional learning orientations will be presented during lectures.

S: Seminars consist of exercises, including relevant examples; complementary examples will be posted on Moodle.

GA: Classroom practices consists of some training in the use of Organic Chemistry related software and presentation of a report by each student.

BIBLIOGRAFÍA

Basic bibliography

1. A. Delgado, C. Minguillón, J. Juglar, INTRODUCCIÓN A LA SÍNTESIS DE FÁRMACOS, Ed. Síntesis, 2002.
2. S. Warren, P. Wyatt, ORGANIC SYNTHESIS: THE DISCONNECTION APPROACH, 2nd Edition, Ed. Wiley, 2009.
3. P. Cardá, E. Falomir, SÍNTESIS TOTALES: RETROSÍNTESIS Y MECANISMOS, Universidad Jaime I, 2008.
4. R. M. Silverstein, F. X. Webster, D. Kiemle, SPECTROSCOPIC IDENTIFICATION OF ORGANIC COMPOUNDS, John Wiley & Sons, 2005.
5. J. Clayden, N. Greeves, S. Warren, ORGANIC CHEMISTRY, 2nd edition, Ed. Oxford, 2012.

Detailed bibliography

1. E. Francotte, W. Lindner (Eds.), CHIRALITY IN DRUG RESEARCH, Ed. Wiley-VCH, 2006.
2. F. A. Carey, R. J. Sundberg, ADVANCED ORGANIC CHEMISTRY, PART B: REACTIONS AND SYNTHESIS, Ed. Springer, 2007.
3. J. Fischer, C.R. Ganellin (Eds.), ANALOGUE-BASED DRUG DISCOVERY, Ed. Wiley-VCH, 2006.
4. E.J. Corey, B. Czako, L. Kürti, MOLECULES AND MEDICINE, Ed. Wiley, 2007.
5. H. Friebolin, BASIC ONE- AND TWO-DIMENSIONAL NMR SPECTROSCOPY, Ed. VCH, 1991.

Journals

The Journal of Organic Chemistry: <http://pubs.acs.org/journal/jocea>
Organic Letters: <http://pubs.acs.org/journal/orlef7>
European Journal of Organic Chemistry: <http://www3.interscience.wiley.com/journal/27380/home>
Tetrahedron: <http://www.sciencedirect.com/science/journal/00404020>
Tetrahedron Letters: <http://www.sciencedirect.com/science/journal/00404039>
Organic and Biomolecular Chemistry: <http://www.rsc.org/Publishing/Journals/Ob/Index.asp>
The Journal of Chemical Education: <http://jchemed.chem.wisc.edu/>
The Journal of Medicinal Chemistry: <http://pubs.acs.org/journal/jmcmar>
ChemMedChem: <http://www.wiley-vch.de/publish/dt/journals/newJournals/2452/>

Web sites of interest

Organic Chemistry Portal: <http://www.organic-chemistry.org/>
Organic Resources Worldwide: <http://www.organicworldwide.net/>
Chemical and Engineering News: <http://www.ucm.es/info/rsequim/geqo/>
Bases de datos de compuestos orgánicos: <http://pubchem.ncbi.nlm.nih.gov/>, <http://www.chemspider.com/>

OBSERVATIONS