

COURSE GUIDE

2023/24

Faculty 215 - Faculty of Chemistry

Cycle .

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:

(SS) M03CM10: The ability to interpret structural analysis and apply principles of organic reactivity to the synthesis of pharmacologically and biologically interesting molecules.

(SS) M03CM11: The capacity for designing, planning and carrying out experimental work, as well as to use instrumental techniques for solving problems of chemical nature.

(SS) M03CM12: The ability for data searching using network services in the chemistry and related areas.

(SS) M03CM13: 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:

(SS) M03CM17: The skills of observation, analysis and synthesis with a critical perspective.

(SS) M03CM18: The ability of learning and autonomous work.

(SS) M03CM19: To be able to manage, organize and plan chemical processes based on quality criteria and environmental concerns.

(SS) M03CM20: 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

Outline

1.- Introduction: Organic Chemistry and Biomolecules. Nomenclature and Reactivity of heterocycles.

2.- Rational organic synthesis. Retrosynthesis. Synthons and synthetic equivalents. Synthetic strategies. Protecting groups. Stereocontrol and asymmetric synthesis.

3.- Advanced synthetic methodologies. Pericyclic reactions. Catalysis. Organometallic compounds in organic synthesis.

4.- Synthetic biomolecules. Principles in pharmaceutical chemistry. Synthesis and properties of representative drugs.

Practical lessons

1.- Molecular editors (ChemDraw)

2.- Software to handle chemical information

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.

TYPES OF TEACHING

| Types of teaching | M | S | GA | GL | GO | GCL | TA | TI | GCA |
|---|----|----|----|----|----|-----|----|----|-----|
| Hours of face-to-face teaching | 36 | 12 | 12 | | | | | | |
| Horas de Actividad No Presencial del Alumno/a | 54 | 18 | 18 | | | | | | |

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 60%
- Exercises, cases or problem sets 20%
- Individual assignments 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

General Regulations adopted by UPV/EHU (BOPV of March, 2017) concerning the assessment of students achievement in the Degrees given by UPV/EHU will be applicable. For more information, see section 2 of such Regulations, articles 8, 9 and 12.

A) CONTINUOUS ASSESSMENT

Continuous assessment will be applied during the ordinary call only, with the following parts and percentages:

- (1) Exercises, case studies and problems carried out during the semester: 20%
- (2) Written individual report and its viva voice presentation: 20%
- (3) Written exam: 60%

If someone does not make/present any of the items (1) to (3) above, the item will be rated cero.

Students have the option to renounce a call by informing in writing the professor in charge of the subject. Requests need to be submitted one month in advance to the end of the lecturing period. Should this action be taken the subject will be rated as NOT PRESENTED (thee call will not get extinct).

B) ASSESSMENT BY SINGLE FINAL EXAMINATION

Assessment by a single examination is feasible only if the student submits on time a renounce to the continuous assessment. Requests need to be submitted in writing to the professor in charge of the subject during the first 9 weeks of the semester.

The single Final examination will account for 100% of the grading.

If someone does not make the Final exam, the grading will be NOT PRESENTED and the call will not get extinct.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Special call will consist of a single Final Examination which will account for 100% of the grading, unless the student makes explicit he or she wants to keep ratings of parts (1) (20%) and (2) (20%) for averaging (only if averaging upgrades).

If someone does not make such Final exam, the grading will be NOT PRESENTED and the call will not get extinct.

MANDATORY MATERIALS

At least one book among the basic titles listed below is highly recommended. The professor in charge of the subject will give additional directions.

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