

Academic Year/course: 2022/23

27235 - Organic Chemistry Insights

Syllabus Information

Academic Year: 2022/23

Subject: 27235 - Organic Chemistry Insights

Faculty / School: 100 - Facultad de Ciencias

Degree: 452 - Degree in Chemistry

ECTS: 5.0

Year: 4

Semester: Second semester

Subject Type: Optional

Module:

1. General information

1.1. Aims of the course

The subject and their expected results respond to the following statements and objectives:

- Explore the interrelation between structure, properties and reactivity of organic compounds.
- Educate the student in synthetic strategies of interest for the design and preparation of compounds and materials organic.
- Have an integrated view of the reaction mechanisms in organic chemistry.
- Manage primary and secondary sources of utility in organic chemistry.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (<https://www.un.org/sustainabledevelopment/es/>), in such a way that the acquisition of the results of learning provides training and competence to contribute to some extent to its achievement:

- (2) Zero Hunger
- (3) Good Health and Well-being
- (4) Quality Education
- (6) Clean Water and Sanitation
- (7) Affordable and Clean Energy
- (9) Industry, Innovation and Infrastructure
- (11) Sustainable Cities and Communities
- (12) Responsible Consumption and Production
- (13) Climate Action

1.2. Context and importance of this course in the degree

The course delves into the more advanced concepts of organic chemistry. Its contents complete those acquired in the organic chemistry I and organic chemistry II exams in order to give a complete and specialized education in organic chemistry education.

It is complementary with other optional exams such as Chemistry Organometallic (27234), Homogeneous Catalysis (27232) and Industrial organic chemistry (27237).

1.3. Recommendations to take this course

It is recommended to have passed the subjects of Organic Chemistry I and Organic Chemistry II.

2. Learning goals

2.1. Competences

Once the course is completed, the student will be more competent to...

- Acquire precise knowledge of the concepts and fundamentals of organic chemistry.
- Learn about and handle concepts such as: synthetic equivalent, protecting groups, investment of polarity and in general the problem of selectivity in a reaction in organic chemistry.
- Propose reasonable synthetic procedures for the preparation of organic compounds
- Solve problems and questions proposed, as well as defend the results critically
- Generate possible ideas and options for action before the organic chemistry-related problems.
- Properly handle all kinds of current bibliography
- Express themselves orally and in writing in a clear and precise way. Use with precision and property-specific vocabulary and terminology
- Connect the organic chemistry with other areas and disciplines.

2.2. Learning goals

The student, to overcome this subject, shall demonstrate the following results...

- Handle all general concepts, previously studied, on stereochemistry and reactivity of organic functions, using specific vocabulary and terminology accurately and property.
- Determine relationships of isomerism between organic molecules, establishing relationships of topicidad between atoms and functional groups.
- Difference different types of organic reactions in view of reagents and products.
- Meet new reactions of synthetic interest.
- Propose reaction mechanism based on the proposed intermediate.
- Design moderately complex organic synthesis using a retrosynthetic analysis.
- Set the most suitable protective groups for the most important functional groups
- Understand and establish methods to predict the selectivity in stereoselective reactions
- Understand the principle of catalysis and its application to metal catalysis and organocatalysis.

2.3. Importance of learning goals

The course learning outcomes are fundamental to acquire adequate specialization in organic chemistry that allows address complex problems directly related to the design of synthetic routes of products of a certain complexity and to the elucidation of reaction mechanisms. Also, they will provide the knowledge necessary for efficient catalytic systems in organic reactions and will offer the possibility of complementing the knowledge acquired in other disciplines related to organic chemistry.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

The student has to demonstrate that he has achieved the learning outcomes expected. He must pass with 5/10 points in one of two alternative modalities of evaluation:

CONTINUOUS ASSESSMENT

The knowledge assessment will be carried out continuously in each of the parts that make up the course.

- Active participation in classes, resolution of practical questions (15%)
- Elaboration and presentation of a bibliographic work (20%)
- Written exam (65%)

In order to be evaluated by the continuous assessment system, the student will have had to carry out all the proposed activities and have delivered them when so requested. The written exam will take place in the examination period of the June call, on the dates stipulated by the Facultad. The mark of this exam will be modulated with that of the activities carried out throughout the course according to the percentage indicated.

GLOBAL ASSESSMENT

In this global examination system, only the final exam results will be taken into account and previous continuous assessment results will not be considered.

When both modalities can be applied to the student, the grade obtained in the course will always be the highest of both of them.

The number of calls for official exams to which enrollment entitles (2 per enrollment) as well as the consumption of said calls will be adjusted to the Rules of Permanence in Undergraduate Studies and Rules of Assessment of Learning. The general

criteria for the design of the tests and the grading system will also be adjusted to this last regulation, and in accordance with the same, the time, place and date on which the review will be carried out will be made public when the qualifications are published.

Said regulations can be consulted at: <http://wzar.unizar.es/servicios/coord/norma/evalu/evalu.html>

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as theory sessions, practical exercises and a bibliographic work.

Students are expected to participate actively in the class throughout the semester.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials, including a discussion forum.

Further information regarding the course will be provided on the first day of class.

4.2. Learning tasks

This is a 5 ECTS course (50 hours in the classroom, 125 hours of total dedication of student) organized as follows:

? **Lectures:** 30 hours in the classroom.

? **Practice sessions:** 20 hours. Students are expected to participate in the practical solutions when lecturer made some examples. Moreover, they will be able to solve, individually or in small groups, some exercises proposed by the lecturer.

Lecture notes and a set of problems will be available for the students. At the end of each topic, some of the problems will be solved in class by the teacher and the rest will be done individually. The lecturer will also assign, from those unsolved problems, some of them to resolve individually, which they will submit to the teacher.

? **Assignments** (15 hours). In an individual way, students will prepare an essay (which includes bibliographical research, analysis, summary, scientific rigor, coherence of expression and citations). They will submit a written copy at the end of the course and will do an oral presentation in the classroom.

? **Autonomous work** (55 hours): Time devoted to study the course contents and prepare the sessions

? **Final written test and other assessments** (5 hours)

4.3. Syllabus

Topic 1. Organic synthesis. Synthesis and functional groups interconversion. Chemoselectivity and protective groups. Regioselectivity. Stereoselectivity. Introduction to disconnection approach (retrosynthetic analysis)

Topic 2. Ring closure and opening reactions.

Topic 3. Concerted and pericyclic reactions.

Topic 4. Organic reactions mediated by transition metals. Hydroformylation. Alilacion Nucleophilic. Cross-coupling.

Topic 5. Synthesis of enantiomeric pure compounds. Enantiomeric resolutions by crystallization. Chromatographic resolutions. Normal kinetic resolutions (KR) and parallel (PKR). Dynamic kinetic resolution (DKR). Dynamic kinetic asymmetric transformation (DYKAT).

Topic 6. Stereoselective and stereospecific synthesis. Asymmetric synthesis. Catalysis in Organic Chemistry. Asymmetric Metal Catalysis. Asymmetric Organocatalysis.

4.4. Course planning and calendar

Class schedules, classroom and the calendar of exams will be published on the website <https://ciencias.unizar.es>

At the first weeks of the course, the works will be assigned to the students. They have to be sent to the teacher and exposed to the class at the end of the course. The delivery will be done by email in any of the PDF, PPT(X) or DOC(X) formats and it will be not necessary to present them in printed form. The date of delivery and presentation shall be before the final test. It will be announced in advance in the ADD.

Everything related to activities related to continuous assessment (assignment of exercises, deadline and exposition date of the work) will also be published in the ADD.

4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=27235>