COURSE DATA

Data Subject	
Code	34207
Name	Organic chemistry laboratory II
Cycle	Grade
ECTS Credits	6.0
Academic year	2018 - 2019

Study (s)

Degree	Center	Acad. year	Period
1110 - Degree in Chemistry	Faculty of Chemistry	3	First term

Subject-matter

Degree	Subject-matter	Character
1110 - Degree in Chemistry	9 - Organic Chemistry	Obligatory

Coordination

Name	Department
ZARAGOZA CARDELLS, RAMON JOSE	325 - Organic Chemistry

SUMMARY

Organic Chemistry is the branch of chemistry that studies the structure and reactivity of carbon compounds, generally known as organic molecules. Among these molecules we found most of the essential compounds for life as lipids, carbohydrates, proteins or nucleic acids as well as other natural products with more specific activity or more restricted origin. A large group of organic compounds, either natural or synthetic, have pharmacological activity and are the basis of medicines. On the other hand, pesticides, fertilizers and herbicides have changed agriculture, preservatives have contributed to modify our eating habits and many organic substances are also organic molecules with which we come into direct contact such as gasolines, glues, paints or textile fibers. Neverthels, not all organic compounds are fully beneficial; many of them that are harmful to health or to the environment and therefore, it is necessary to continue preparing compounds with better properties to replace those that present problems.
Knowledge of the physical characteristics, structure and reactivity of organic compounds is aimed to opening new paths for obtaining compounds that maintain all their beneficial characteristics but that produce minimal contamination or do not present undesirable side effects.
The subject Organic Chemistry Laboratory II is a compulsory subject in the 5th semester of the Degree in Chemistry, which aims to strengthen the student's skills in laboratory work in general, particularly in the peculiarities of a laboratory of Organic Chemistry. Going one step further, it is intended that the student be able to adapt a synthetic strategy aimed at the preparation of an organic compound. For the realization

of this laboratory, the student should rely on the knowledge acquired in the subjects of Organic Chemistry I and II, taught during the 3rd and 4th semester and in the Organic Chemistry Laboratory I that are taken during the second year of the Degree in Chemistry.
The following objectives are intended to be achieved in this subject:

• Strengthen the knowledge of the student on safety standards, handling of materials and reagents, waste treatment in a laboratory of Organic Chemistry, and on the bibliographic search and data analysis.
• Strengthen the knowledge of the student in the preparation, development and recording of experimental work in Organic Chemistry (Lab Notebook).
• To promote the necessary critical spirit in any scientific activity.
• Perform different synthesis of organic products.
• Introducing the student to multi-step synthesis

• Introducing the student to synthesis design.
• Performing isolations of organic products from their natural sources.
• Develop the student's ability to solve problems that may arise in a laboratory of Organic Chemistry.
• Develop the student's ability to analyze the results obtained and draw conclusions.
• Develop the student's ability to describe the preparation of a compound.
• Enhance the student's skills for teamwork.
• Encourage both oral and written expression.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

The study and use of the Laboratory of Organic Chemistry II is based on the knowledge acquired in the subjects of Laboratory of Organic Chemistry I, Chemical Laboratory I and Chemical Laboratory II, as well as the subject of Organic Chemistry I and Organic Chemistry II. It is also convenient to take the subject of Organic Chemistry III that is taught simultaneously, as some of the experiments that have been proposed are directly related to the contents of the program.

OUTCOMES

1108 - Degree in Chemistry

- Develop capacity for analysis, synthesis and critical thinking.
- Show inductive and deductive reasoning ability.
- Solve problems effectively.

- Learn autonomously.
- Demonstrate the ability to adapt to new situations.
- Acquire a permanent sensitivity to quality, the environment, sustainable development and the prevention of occupational hazards.
- Demonstrate knowledge of the main aspects of chemical terminology, nomenclature, conventions and units.
- Demonstrate knowledge of the main types of chemical reaction and their main characteristics.
- Demonstrate knowledge of the principles of thermodynamics and kinetics and their applications in chemistry.
- Demonstrate knowledge of the principles, procedures and techniques for the determination, separation, identification and characterisation of chemical compounds.
- Recognise and analyse new problems and plan strategies to solve them.
- Evaluate, interpret and synthesise chemical data and information.
- Handle chemicals safely.
- Carry out standard experimental procedures involved in synthetic and analytical work, in relation to organic and inorganic systems.
- Handle the instrumentation used in the different areas of chemistry.
- Interpret data from observations and measurements in the laboratory in terms of their significance and the theories that underpin them.
- Evaluate the risks in the use of chemicals and laboratory procedures.
- Relate theory and experimentation.
- Recognise and evaluate chemical processes in daily life.
- Understand the qualitative and quantitative aspects of chemical problems.
- Develop sustainable and environmentally friendly methods.
- Relate chemistry with other disciplines.
- Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.
- Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.
- Express oneself correctly, both orally and in writing, in any of the official languages of the Valencian Community.
- Have basic skills in the use of information and communication technology and properly manage the information obtained.

LEARNING OUTCOMES

- To demonstrate knowledge of the main aspects of terminology and organic nomenclature.

- To understand the structural properties and reactivity of compounds and functional organic groups by applying them to the solution of synthetic and structural problems.

- To elucidate the structure of organic compounds by spectroscopic techniques.

- To write and expose correctly in the native language

- To acquire and use bibliographic and technical information related to organic compounds.

- To write and expose in the native language with correction

- To carry out the assigned tasks as a team member with gender perspective

- To effectively perform the tasks assigned as a member of a team with a gender perspective

- To show skill to manipulate chemicals and organic compounds safely

- Demonstrate knowledge of sustainable methodologies in organic chemistry.

- To show ability to plan and carry out experimentally the synthesis of simple organic compounds using the proper techniques.

- To be able to rigorously elaborate a report of a laboratory practice.

- Understand data from observations and measurements in the laboratory and interpret them.

- To make decisions with rigor.

- To demonstrate critical reasoning

- To demonstrate autonomous learning.

- To solve problems with rigor.

Finally,

Demonstrate an ethical and responsible conduct in the exercise of their professional work, values that are transmitted by teachers and researchers of the University, as a generator and transmitter of scientific knowledge.

DESCRIPTION OF CONTENTS

1. Introduction to the lab

Study and management of different literature sources

2. Synthesis 1. Synthetic sequence

Synthetic sequence: development of a synthetic sequence in different steps.

3. Synthesis 2. Synthesis of a luminescent compound

Synthesis of a luminescent compound.

4. Synthesis 3. Synthesis using Wittig reaction

Synthesis using Wittig reaction

5. Isolation of a natural product using advanced techniques.

Isolation of a natural product through the use of advanced techniques (steam drag, fractional distillation ...)

6. Synthesis 4: Synthesis using an organometallic compound

Synthesis using an organometallic compound

7. Study of kinetic and thermodynamic control in organic reactions

Study of kinetic and thermodynamic control in organic reactions

WORKLOAD

ACTIVITY	Hours	% To be attended
Laboratory practices	48,00	100
Tutorials	12,00	100
Development of group work	10,00	0
Study and independent work	80,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The development of the subject is structured around different axes:

a) Preparation of the experience to be carried out and preparation of the laboratory notebook. The student must remember and update everything he learned in the laboratory of Organic Chemistry I, regarding this topic. Once defined the objective of the experience to be done with the materials and information provided by the teacher, the student must prepare each of the experiences following the scheme indicated in the LQOI reference booklet, as well as perform the necessary calculations.

This prior preparation is required before entering the laboratory. We especially emphasize the preparation of the work plan to be carried out and the expected result in each of the operations (using a flow diagram), which aims at a greater understanding of the experience and is very useful in the subsequent work in the laboratory.

The teacher can review the material prepared by the student before carrying out the experimental work and if it is not appropriate to limit his/her access to the laboratory until the preparation is complete, since the objective is for the student to understand "what and why" he/she is doing, and how he/she can correct or adapt the procedure in case of error or if the expected results do not coincide with those observed.

b) Work in the laboratory. The experiences are designed in such a way that basically they student will need more than one laboratory session to complete the work. So, the student must learn to distribute his time and organize himself.

In order to enhance the responsibility of the student in the proper functioning of the laboratory and teamwork, small tasks will be assigned weekly so that the student contributes to the proper functioning of the laboratoryt. Depending on the number of students per group, the experiences will be carried out individually or in pairs. In this last case some aspects will be introduced in some practices to carry out individually.

An important part in laboratory work is the laboratory notebook.

The student must analyze both the results obtained in the laboratory and the calculations made. The results obtained will be analyzed, determining the problems and how they have been solved or could be solved. Therefore, this stage is aimed to develop the analytical capacity of the student, enhance the exchange of information and teamwork.

c) Seminars. All laboratory sessions require a previous change of opinions where the teacher and the students can solve the specific doubts of that day's work. It is the teacher's job at this stage to foster a positive attitude in the student's scientific work, for which a 0.5-hour seminar has been left at the beginning of each session.

A seminar (1.5h) has been designed, at the beginning of the subject to introduce the most common bibliographic sources in Organic Chemistry and how to search and select the information available.

EVALUATION

Given the close contact that is maintained between teacher and student throughout the course, learning evaluation will be carried out by the teacher in a continuous basis. The following different sections will be evaluated:

a) LABORATORY WORK AND RESULTS: (40%). The observation of safety standards, attitude, preparation, work in the laboratory and the results obtained as well as their analysis will be taken into account.

The duration of each experimental session will be 4.5 hours and the sessions are not recovered, so the lack of attendance and punctuality must be duly justified. **The lack of attendance of two sessions of practices will suppose the loss of the qualification corresponding to the Laboratory Work and Results.**

It is an indispensable condition that the student is in possession of the laboratory notebook duly completed at the beginning of the session . The notebooks may be reviewed by the teacher at any time.

The general tasks assigned for the proper functioning of the laboratory as well as a revision of the material per work place must be carried out both at the beginning and at the end of the experimental session.

b) SEMINARS (10%): A seminar consisting of an introduction and explanation of the experiment to be performed will be carried out by the students, at the beginning of each work session. The mark obtained in this section will consider both the preparation, presentation and the answers to the questions that are made.

c) EXAMINATIONS (50%): A minimum of 4 points out of 10 must be obtained in this section in order to consider it for the final qualification.

Second call

If the student does not pass the first call, he/she will be evaluated in a second call. In this case, the qualifications obtained in the first call in sections a: laboratory work results and b: seminars, will be maintained and the part corresponding to section c: exams will be evaluated again.

REFERENCES

Basic

- MARTINEZ GRAU, M. A.; CSAKY, A. Técnicas experimentales en síntesis orgánica. Madrid: Ed. Síntesis, 1998.
- DURST, H.D.; GOKEL, G. W. Química Orgánica experimental. Madrid: Reverté, 1985.
- FURNISS, B.S.; HANNAFORD, A. J.; SMITH, P.W.G.; TATCHELL, A.R. Vogel's textbook of practical organic chemistry. Ed. Longman, 1989.
- PALLEROS, D. R. Experimental Organic Chemistry. John Wiley and Sons, 2000.
- Furniss B. S., Hannaford A. J., Smith P. W. G., Tatchell A. R. Vogels. TEXTBOOK OF PRACTICAL ORGANIC CHEMISTRY Ed. Longman Scientific & Technical 1989.
- "ChemBioOffice Ultra, PerkinElmer (CambridgeSoft) Amplia selección de aplicaciones y funcionalidades que permite estudiar, dibujar, formular, modelar y editar estrcutras moleculares químicas y biológicas.
- Manuales del Laboratorio de Química I y Laboratorio de Química II (Grado en Química, primer curso)
- Manuales del Laboratorio de Química Orgánica I (Grado en Química, segundo curso)
- HARWOOD, L.M.; MOODY, C. J. Experimental Organic Chemistry. Blackwell Sci. Publ., 1989.
- Compromiso ético con el Código Europeo de conducta http://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020-ethics_code-of-conduct_en.pdf

Additional

- Características de los compuestos (datos físicos, químicos, seguridad etc.):
  a) Inst. Nacional de Seguridad e Higiene en el Trabajo (Ministerio de Trabajo e Inmigración)
  b) Catálogo SIGMA-ALDRICH (Casa Comercial)
  c) CHEMnetBASE reúne una serie de Bases de datos como:
  1. Combined Chemical Dictionary (CCD)
  2. The Handbook of Chemistry & Physics
  d) Index Merck (libro que se puede encontrar en la biblioteca)