

**COURSE DATA****Data Subject**

<b>Code</b>	36455
<b>Name</b>	Organic Chemistry Laboratory I
<b>Cycle</b>	Grade
<b>ECTS Credits</b>	4.5
<b>Academic year</b>	2023 - 2024

**Study (s)**

<b>Degree</b>	<b>Center</b>	<b>Acad. year</b>	<b>Period</b>
1110 - Degree in Chemistry	Faculty of Chemistry	2	Second term
1929 - D.D. in Physics-Chemistry	Double Degree Program Physics and Chemistry	3	Second term
1934 - D.D. in Chemistry-Chemical Engineering	Faculty of Chemistry	2	Second term

**Subject-matter**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
1110 - Degree in Chemistry	9 - Organic Chemistry	Obligatory
1929 - D.D. in Physics-Chemistry	3 - Tercer Curso (Obligatorio)	Obligatory
1934 - D.D. in Chemistry-Chemical Engineering	2 - Segundo curso	Obligatory

**Coordination**

<b>Name</b>	<b>Department</b>
PICHER URIBES, MARÍA TERESA	325 - Organic Chemistry

**SUMMARY**

Organic chemistry deals with the study of the structure and reactivity of compounds of carbon, usually known as organic molecules. It is easy to understand the importance of organic compounds if we consider that among them are the vast majority of compounds essential to life as lipids, sugars, proteins or nucleic acids. In addition to these substances, which are involved in the primary metabolism of living beings, there are other organic compounds that possess pharmacological activity and are the basis of drugs. In addition, there are these substances, pesticides, fertilizers, herbicides, preservatives, dyes, scents, perfumes, plastics, rubbers, varnishes, paints, coatings, adhesives, textile fibers, fuels and many other types of materials essential for modern life and are also organic molecules.



The continuous advancement of discipline within a sustainable framework to the environment, is enabling the development of new compounds and organic materials that keep-improving the quality of life we enjoy today, present less risk to health or have a lower environmental impact than other previously designed compounds.

The number of new organic substances that are described every year is very high and if we want to understand the very different properties, applications, and potential problems in the use of organic compounds, the knowledge of the factors that determine its structure and its reactivity is essential. That kind of knowledge is determined in a manner in this sense, Organic Chemistry I Laboratory and experimental is a compulsory subject of 4th semester of the degree in chemistry which allows the student to acquire skills in laboratory work, in general, and in particular, seat and deepen the knowledge of the basics of working in the laboratory of organic chemistry and the manipulation of organic compounds. For the realization of this laboratory is based on the know-how acquired in the laboratories of Chemistry I and II (first course) (see section VIII: prior knowledge) and the subjects of theoretical Organic Chemistry I (3rd semester) and Organic Chemistry II (4th semester, simultaneously with the laboratory).

The objectives to be achieved in this subject can be summarized in the following points:

- that the student learn and observe the safety rules and operate with fluent material, apparatus and reagents used in a laboratory of Organic Chemistry.
- that the student learn and follow the various methods of waste treatment
- that the student learn the bibliographical sources unfolding fluently in the search for information by selecting it and collecting and properly.
- that the student learn how to prepare, develop, and properly record an experimental work in Organic Chemistry and to analyze the results obtained.
- the student learn both the basis and the possibilities of the standard techniques in Organic Chemistry.
- that the student know about and perform the characterization and identification of organic compounds.
- that the student carry out getting different organic compounds, either by a direct transformation (a stage) or by a synthetic sequence (synthesis by stages).
- that the student develop the critical spirit necessary in any scientific activity.
- that the student acquire the experience necessary to correctly interpret any experimental procedure as well as prepare and develop an experimental procedure simple face and solving the problems that may arise, analyzing the results obtained and conclusions are drawn.
- that the student know express themselves properly both orally and in writing
- enhance the skills of the student to work in a team.
- that the student will be able to relate the acquired knowledge to everyday life.

## PREVIOUS KNOWLEDGE

### Relationship to other subjects of the same degree

**1110 - Degree in Chemistry V2-2018 :**

**1929 - Double Degree in Physics and Chemistry :****1934 - Programa de doble Grado Química-Ingeniería Química\_2023 :**

R5-OBLIGATION TO PURSUE THE COURSE SIMULTANEOUSLY

36453 - Organic Chemistry I

36453 - Organic Chemistry I

36453 - Organic Chemistry I

**Other requirements**

The work to be performed at the Laboratory of Organic Chemistry I is based on the knowledge acquired in the courses General Chemistry I and II, Organic Chemistry I and Organic Chemistry II (the latter given simultaneously with the laboratory).

From a practical point relies on the knowledge must be acquired in the laboratories of Chemistry I and II. For more details see Guide Department.

**OUTCOMES****1110 - 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

The previous section includes the competences contained in the document VERIFICA. This subject addresses part of the learning results of the matter Organic Chemistry that allow to acquire specific knowledge of chemistry, cognitive skills and general skills recommended by the EUROPEAN CHEMISTRY THEMATIC NETWORK (ECTN) for the Chemistry Eurobachelor® Label. The following table lists the learning outcomes acquired in the subject Laboratory of Organic Chemistry I related to the competences of the degree in Chemistry.

SPECIFIC KNOWLEDGE OF CHEMISTRY	
The learning process should allow the degree graduates to demonstrate:	
	<b>Competences of the subject Laboratory of Organic Chemistry I that contemplate the learning outcomes EUROBACHELOR®</b>





Major aspects of chemical terminology, nomenclature, conventions and units.	Demonstrate knowledge of the main aspects of chemical terminology, nomenclature, conventions and units..(CE1)
The major types of chemical reaction and the main characteristics associated with them.	Demonstrate knowledge of the main types of chemical reaction and their main characteristics.(CE4)
The principles and procedures used in chemical analysis and the characterisation of chemical compounds.	Demonstrate knowledge of the principles, procedures and techniques for the determination, separation, identification and characterisation of chemical compounds.(CE8)  Handle the instrumentation used in the different areas of chemistry.(CE19).  Understand the qualitative and quantitative aspects of chemical problems..(CE24).  Develop sustainable and environmentally friendly methods.(CE25)
The principal techniques of structural investigations, including spectroscopy	Ability to recognise chemical elements and their compounds: preparation, structure, reactivity, properties and applications..(CE7).  Handle the instrumentation used in the different areas of chemistry.(CE19).  Demonstrate knowledge of the principles, procedures and techniques for the determination, separation, identification and characterisation of chemical compounds.(CE8)

**COMPETENCES AND COGNITIVE SKILLS**

**The learning process should allow the degree graduates to demonstrate:**

**Competences of the subject** Laboratory of Organic Chemistry I **that contemplate the learning outcomes EUROBACHELOR®**



Ability to demonstrate knowledge and understanding of the facts, concepts, principles and fundamental theories related to the topics mentioned above.	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories related to the areas of chemistry..(CE13).
Ability to apply this knowledge and understanding to the solution of common qualitative and quantitative problems.	Solve qualitative and quantitative problems following previously developed models..(CE14). Recognise and analyse new problems and plan strategies to solve them..(CE15). Understand the qualitative and quantitative aspects of chemical problems..(CE24).

<b>COMPETENCES AND COGNITIVE SKILLS RELATED TO THE PRACTICE OF CHEMISTRY</b>	
<b>The learning process should allow the degree graduates to demonstrate:</b>	
	<b>Competences of the subject Laboratory of Organic Chemistry that contemplate the learning outcomes EUROBACHELOR®</b>
Capacities to handle chemical products safely, taking into account their physical and chemical properties, including any risk associated with their use.	Handle chemicals safely..(CE17). Evaluate the risks in the use of chemicals and laboratory procedures..(CE21).
Capabilities necessary to perform standard laboratory procedures as well as to use instrumentation in synthetic and analytical works, in both cases in relation to both organic and inorganic systems.	Carry out standard experimental procedures involved in synthetic and analytical work, in relation to organic and inorganic systems..(CE18). Relate theory and experimentation..(CE22). Understand the qualitative and quantitative aspects of chemical problems..(CE24).
Capacities to monitor, observe and	Handle the instrumentation used in the different



measure the chemical properties, facts or changes, and perform their registration (collection) and documentation in a systematic and reliable way.	areas of chemistry.(CE19).  Relate theory and experimentation..(CE22).  Recognise and evaluate chemical processes in daily life..(CE23).  Understand the qualitative and quantitative aspects of chemical problems..(CE24).
Ability to interpret data derived from observations and laboratory measurements in terms of their relevance, and relate them to the appropriate theory.	Relate theory and experimentation..(CE22).  Recognise and evaluate chemical processes in daily life..(CE23).  Understand the qualitative and quantitative aspects of chemical problems..(CE24).
Ability to perform risk assessments of the use of chemical substances and laboratory procedures.	Understand the qualitative and quantitative aspects of chemical problems..(CE24).  Develop sustainable and environmentally friendly methods.(CE25).  Evaluate the risks in the use of chemicals and laboratory procedures..(CE21).
<b>GENERAL COMPETENCES</b>	
<b>The learning process should allow the degree graduates to demonstrate:</b>	
	<b>Competences of the subject Laboratory of Organic Chemistry that contemplate the learning outcomes EUROBACHELOR®</b>
Ability to apply practical knowledge to solve problems related to qualitative and quantitative information.	Solve problems effectively..(CG4).  Solve qualitative and quantitative problems following previously developed models..(CE14).



	<p>Relate theory and experimentation..(CE22).</p> <p>Recognise and evaluate chemical processes in daily life..(CE23).</p> <p>Understand the qualitative and quantitative aspects of chemical problems..(CE24).</p>
Competences in information management, in relation to primary and secondary sources, including information retrieval through on-line searches.	<p>Demonstrate ability to communicate information, ideas, problems and solutions to both specialist and non-specialist audiences and using information technology, as appropriate..(CG6).</p> <p>Have basic skills in the use of information and communication technology and properly manage the information obtained.(CT2).</p>
Interpersonal skills to interact with other people and get involved in team work.	Demonstrate the ability to adapt to new situations..(CG9).

Regarding the Sustainable Development Goals (SDGs), it is expected that students will be able to know in this subject how to apply the knowledge learned to guarantee an inclusive, equitable, and quality education and promote learning opportunities for everyone (SDG 4). To acquire a special sensitivity for sustainable management of water (SDG 6), raw materials and energy sources (SDG 7), as well as for an environmentally friendly and sustainable development (SDGs 11, 12, 13, 14 and 15), in addition to being able to design, select and/or develop efficient chemical products, processes and/or analytical methodologies (SDG 7) that minimize their impact on the environment (SDGs 14 and 15), using alternative raw materials and reducing wastes (SDG 11).

## DESCRIPTION OF CONTENTS

### 1. Seminar

INTRODUCTION: Objectives. Lab. Security. Material. Compounds. Basic Language. Waste.  
Preparation of experimental work: Research, interpretation and organization of the information.



**2. Separation, purification, characterization and identification of the components of mixtures**

Separation, purification, characterization and identification of the components of a mixture: Application of basic laboratory techniques: liquid-liquid extraction, filtration, crystallization, melting, simple distillation, distillation in Rotavapor, CCF.

**3. Isolation of a product from different sources.**

Isolate a product from different sources (natural and synthetic) and compare the results.

**4. Making a Soap.**

Saponification of an oil and elaboration of a soap. Soap tests (water hardness, fat dissolving capacity ...)

**5. Nucleophilic substitution reaction and / or elimination.**

Synthesis using nucleophilic substitution reactions and / or elimination.

**6. Obtaining a dye.**

Synthesis of a dye azoic and dyed different fibers.

**WORKLOAD**

ACTIVITY	Hours	% To be attended
Laboratory practices	38,00	100
Tutorials	7,00	100
Study and independent work	67,50	0
<b>TOTAL</b>	<b>112,50</b>	

**TEACHING METHODOLOGY**

Before the first experimental session will be held an introductory seminar. ASSISTANCE REQUIRED FOR THIS SEMINAR WILL BE ABLE TO MAKE THE PRACTICE.

This seminar will cover the following topics:

The Laboratory of Organic Chemistry and Applied Organic Chemistry: Objectives and limitations of the experimental work in organic chemistry.



Laboratory Safety: Safety and compliance; Use blankets, fire extinguishers and so on. Use of Showcases, Exits and emergency protocol.

Organization of laboratory work: Standards and timing.

Material and equipment: material per job, common, in addition, use of catalogs, English names, handling and safety (broken material, use a vacuum and so on.) Cleaning and drying, scale of work.

Reagents and products: Labelling commercial physical, chemical, origin, uses and safety Proper handling of solids and liquids. Specimen labelling, storage and destruction of waste.

Lab notebook and / or Laboratory notebook.

To deliver the products and results

The experimental work in progress: How to take efficient advantage of the time. When can you stop?

Where is the product?. Safety: What to do if....?

The different parts in which the subject is organized are:

a) Teaching material: trough the "Aula Virtual" it will be delivered to the students the convenient pedagogic material.

b) Preparation of experience to perform: **PREPARATION PREVIOUS EXPERIMENTAL WORK IS REQUIRED TO ACCESS THE LABORATORY.** After defining the objectives the student must carry out the preparation of each of the experiences compiling relevant information from the sources indicated by the teacher and ordering them appropriately. The teacher can review the material prepared and limit access to the laboratory if it is not appropriate.

Of special note in this section:

1. Knowledge of the characteristics and safety of compounds and techniques involved.
2. Preparation and analysis of the separation scheme that allows greater understanding of the experience and the factors that contribute to a good result. This analysis allows the student to understand what it does and why and correct or adjust the procedure in case of error or if the expected results do not coincide with expectations.

Optionally you may want to prepare a scheme of work to be done in order to have a clear idea of the different operations carried out, order them and details to take special care to obtain good results.

c) Seminars: In addition to the Introductory Seminar before each session will be held a short seminar.

These seminars will take place either by the teacher presentations or by students working in small groups. Devoted to:



1. Presentation and discussion of the experience to make and resolve doubts about the work carried out.
  2. Analysis of the results obtained in previous sessions, identifying problems and how they were resolved or could be solved in order to develop the student's analytical skills, enhance information sharing and teamwork.
- d) Work in the laboratory. Depending on the number of students per group experiences are carried out individually or in pairs. In the latter case it is advisable to introduce some practical ways to accomplish individually.

In order to enhance the student's responsibility in the functioning of the laboratory and teamwork small weekly tasks were allocated for students to contribute to a smooth operation.

The experiences are designed so that in general can be performed during a laboratory, although the drying of solid compounds to calculate yield and characterization should be performed in a later session.

The core of the laboratory work is the immediate registration of the same in the notebook. The teacher can check the newspaper to check this point.

## EVALUATION

The assessment of the apprenticeship will be conducted continuously, taking into account the following sections:

### a) LABORATORY WORK AND RESULTS (50%):

Your performance will be evaluated based on the observation of the following criteria: adherence to general rules and safety regulations, attitude, preparation of experiments, work and handling in the laboratory, and the analysis of obtained results.

#### General Rules:

Attendance at the introductory seminar is **mandatory** for participation in subsequent practices.

Students are expected to be familiar with and adhere to the general and safety regulations of the laboratory. Failure to comply with safety rules may result in expulsion from the laboratory.

Students must come to the laboratory prepared with a lab coat, safety goggles, rubber gloves, spatula or spoon, pencil, and calculator.

Students must have a well-prepared lab notebook, which includes written answers to any questions assigned for the laboratory work. The teacher may review the notebooks before the start of the practice session.

At the beginning and end of each practice session, students are responsible for completing assigned general tasks and cleaning their work area.



Each experimental session will last for 4.5 hours, including seminars. Missed sessions will not be made up, so attendance and punctuality are crucial. **Failure to attend more than two practical sessions will result in a loss of qualification for the Laboratory Work and Results department.**

The answers to questions before or after the practice, either in the lab notebook or those raised by the teacher, will be considered in the evaluation.

Practical exam: The professor may conduct a practical exam to further assess your performance. This exam will involve carrying out an unplanned experimental task of similar difficulty to the ones conducted during regular practices.

b) SEMINARS (10%): Your preparation, writing, and presentation of the assigned work will be assessed, along with your understanding of the subject matter and your ability to answer questions posed by the professor or other students.

c) WRITTEN EXAM (40%): This exam will consist of practical-type questions related to the experiments conducted throughout the course. It will test your overall knowledge and your ability to express yourself in writing. Additionally, it aims to evaluate your research efforts, information compilation, and organization skills, as well as your ability to establish connections with the knowledge acquired in Organic Chemistry I and Organic Chemistry II. The written exam will be common to all groups and will be held on the official date established in the Degree exam calendar. To be eligible for the remaining percentage, a minimum score of 4 out of 10 is required in this section.

In the second call evaluation, the grade obtained in the continuous evaluation of the first call (Point a)-“Laboratory work and results” and (Point b)-“Seminars” will be maintained. Point c – “Written exam” will be re-evaluated.

### Final warning

Copying or plagiarism of any assignment that is part of the evaluation will make it impossible to pass the course, and the student will be subject to the appropriate disciplinary procedures.

Please note that, according to Article 13 d) of the University Student Statute (RD 1791/2010, December 30), *"it is the duty of a student to refrain from using or cooperating in fraudulent procedures in evaluation tests, in the work performed or in official University documents"*.

## 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.
- HARWOOD, L.M.; MOODY, C. J. Experimental Organic Chemistry. Blackwell Sci. Publ., 1989.
- PALLEROS, D. R. Experimental Organic Chemistry. John Wiley and Sons, 2000.
- "ChemBioOffice Ultra, PerkinElmer (CambridgeSoft) Àmplia selecció de aplicacions y funcionalitats que permete estudiar, dibuixar, formular, modelar y editar estructures moleculars químiques y biològiques.
- Manuales del Laboratorio de Química I y Laboratorio de Química II (Grado en Química, primer curso)

#### 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)