

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

Code	34206
Name	Organic chemistry laboratory I
Cycle	Grade
ECTS Credits	6.0
Academic year	2016 - 2017

Study (s)

Degree	Center	Acad. year	Period
1108 - Degree in Chemistry	Faculty of Chemistry	2	Second term

Subject-matter

Degree	Subject-matter	Character
1108 - Degree in Chemistry	9 - Organic chemistry	Obligatory

Coordination

Name	Department
PARRA ALVAREZ, MARGARITA	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 or 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

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

Other requirements

The work to be performed at the Laboratory of Organic Chemistry I is based on the knowledge adquired 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

1108 - Degree in Chemistry

- Develop capacity for analysis, synthesis and critical thinking.
- Show inductive and deductive reasoning ability.
- Demonstrate leadership and management skills, entrepreneurship, initiative, creativity, organization, planning, control, leadership, decision making and negotiation.
- Solve problems effectively.
- Demonstrate ability to work in teams both in interdisciplinary teams and in an international context.
- Demonstrate a commitment to ethics, equality values and social responsibility as a citizen and as a professional.
- 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.
- Interpret the variation of the characteristic properties of chemical elements according to the periodic table.
- 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.
- Ability to recognise chemical elements and their compounds: preparation, structure, reactivity, properties and applications.
- Demonstrate knowledge of the principles, procedures and techniques for the determination, separation, identification and characterisation of chemical compounds.
- Demonstrate knowledge and understanding of essential facts, concepts, principles and theories related to the areas of chemistry.
- Solve qualitative and quantitative problems following previously developed models.
- 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.
- Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.
- Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.
- 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

- 1 Demonstrate knowledge of the main aspects of organic nomenclature and terminology. (CE1)
- 2 Understand the structural properties and reactivity of compounds and of organic functional groups and apply this knowledge to solve synthetic and structural problems. (CG8, CG10, CE2, CE4, CE6, CE7, CE23, CE26)
- 3 Elucidate the structure of simple organic compounds using spectroscopic techniques. (CE8, CE19)
- 4 Explain phenomena and processes related to organic chemistry in an understandable manner. (CG1, CG2, CE13)
- 5 Obtain and use bibliographic and technical information related to organic compounds. (CG7, CE16, CT3)
- 6 Write and present one's work in the native language. (CT1)
- 7 Perform tasks assigned as a member of a team effectively and from a gender perspective. (CG3, CG5)
- 8 Demonstrate knowledge of sustainable methods in organic chemistry. (CE25)



- 9 Demonstrate ability to manipulate chemical reagents and organic compounds safely. (CE17)
10 Demonstrate ability to plan and carry out experimentally simple synthesis of organic compounds safely and using proper techniques. (CG3, CE18, CE21)
11 Demonstrate ability to write a laboratory notebook with rigor. (CT1, CE16)
12 Interpret data from observations and measurements made in the laboratory in terms of their significance and the theories that underpin them. (CE20, CE22, CE24)
13 Make decisions with rigor. (CG3, CG6, CG9)
14 Demonstrate critical thinking. (CG1)
15 Demonstrate independent learning. (CG8)
16 Solve problems with rigor. (CG4, CG10, CE14, CE15)
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DESCRIPTION OF CONTENTS

1. Seminar

INTRODUCTION. Objectives. Space. Security. Material. Compounds. Basic language. Waste. Preparation of experimental work: Finding, interpreting and organizing 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. Nucleophilic substitution reaction

Nucleophilic substitution reaction: Synthesis of a liquid alkyl halide.

4. Oxidation reactions

Oxidation reaction: Oxidation of an alcohol.

5. Reduction reaction

Reduction reaction: Reduction of a carbonyl compound.

6. Fischer Esterification Reaction

Fischer Esterification Reaction: Synthesis of a liquid ester.

7. Aldol condensation reaction

Aldol condensation reaction.

8. Synthetic sequence

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

**WORKLOAD**

ACTIVITY	Hours	% To be attended
Laboratory practices	48,00	100
Tutorials	12,00	100
Study and independent work	90,00	0
TOTAL	150,00	

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: Labeling commercial physical, chemical, origin, uses and safety Proper handling of solids and liquids. Specimen labeling, 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: through 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 evaluation of learning takes place continuously evaluating the following sections:

a) **WORK AND LABORATORY RESULTS (40%).** Taking into account the observation of safety rules, attitude, preparation, work in the laboratory and the results and analysis.

To do this you must consider the following general rules:

1. **ASSISTANCE SEMINAR INTRODUCTION IS ESSENTIAL FOR FURTHER DEVELOPMENT OF PRACTICES.**

2. You must know and respect the general rules and safety indicated.

3. Must necessarily be provided by: Bata, safety goggles, rubber gloves, pencil and calculator.

4. It must be in possession of the book / s with the experimental work properly trained. The notebooks will be reviewed by the teacher before the practice session and / or the notebook has to respond to some written questions.

5. Both at the beginning of the practice session as the end must perform general tasks assigned to count the material and the workplace.

6. The sessions do not recover. The non-performance of more than two practice sessions involve the loss of qualification for the laboratory work and results. The absences and punctuality must be properly justified and the justification will be evaluated by the teacher.

b) Seminar (10%) will be assessed the preparation, drafting and presentation of the work assigned, and the same compression and the ability to answer questions that are formulated either by the teacher or other students.

c) written exams (50%) may be of two types:

Examination Questions: consist of practical questions related to the experiences that have hitherto been directly related to them or to show both the global knowledge of the student as his writing ability. Them, try to evaluate the research, collecting and organizing information for the student and determine whether to master it. It also aims to establish the relationship with the available knowledge of the subject of Organic Chemistry I and II.

Practical Exams: carry out experimental work not scheduled in the appropriate level of difficulty of the subject.

In the evaluation of the second round, there will be kept the qualification obtained in the continued evaluation (point 1-" direct Evaluation of the Teacher and Point 2-" Seminars of Organic Chemistry and Tutorships ") of the first round and it(he,she) will proceed to evaluate again the part corresponding to the Point 3 - "Examinations"-

REFERENCES



Basic

- Martínez Grau M^a A. y Csáky A. G. TÉCNICAS EXPERIMENTALES EN SÍNTESIS ORGÁNICA Ed. Síntesis, 1998.
- Durst, H.D. y Gokel, G.W. "QUÍMICA ORGÁNICA EXPERIMENTAL", Ed. Reverté (1985).
- Furniss, B.S.; Hannaford, A.J. Smith, P.W.G., Tatchel, I. A.R. "VOGEL's TEXTBOOK OF PRACTICAL ORGANIC CHEMISTRY.", Ed. Longman (1989).
- Harwood, L.M. y Moody, C.J. "EXPERIMENTAL ORGANIC CHEMISTRY", Ed. Blackwell Sci. Publ. (1989).
- Palleros, D.R. EXPERIMENTAL ORGANIC CHEMISTRY. John Wiley and Sons (2000)
- ChemBioOffice Ultra, PerkinElmer (CambridgeSoft)

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)