VNIVERSITAT DE VALÈNCIA

Course Guide
34207 Organic chemistry laboratory II

COURSE DATA

Data Subject	
Code	34207
Name	Organic chemistry laboratory II
Cycle	Grade
ECTS Credits	6.0
Academic year	2012 - 2013

Study (s)

Degree	Center	Acad. year	Period
1108 - Degree in Chemistry	Faculty of Chemistry	3	First term

Subject-matter

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

Coordination

Name	Department
ABAD SOMOVILLA, ANTONIO	325 - Organic Chemistry
BLAY LLINARES, GONZALO	325 - Organic Chemistry
COSTERO NIETO, ANA MARIA	325 - Organic Chemistry

SUMMARY

Organic chemistry is the branch of chemistry that studies the structure and reactivity of compounds of carbon, generally known as organic molecules. These molecules include most of the compounds essential to life as lipids, carbohydrates, proteins or nucleic acids and other natural products from more specific activity or more restricted source. A large group of both natural and synthetic organic compounds have pharmacological activity and are the basis for medicines. On the other hand, pesticides, fertilizers and herbicides have changed agriculture, preservatives have helped change our eating habits, and also many substances with which we come into contact directly such as gasoline, glues, paints or textile fibres are organic molecules. However, not all organic compounds are beneficial; There are many of them that are harmful to health or to the environment and therefore need to continue to prepare compounds with improved properties, replacing those with problems.

Knowledge of the physical characteristics, structure and reactivity of organic compounds aims to open paths to obtain compounds that maintain all of its beneficial features but minimum polluting or do not have undesirable side effects.

The organic chemistry II laboratory course is a required subject of 5 th semester of the degree in chemistry, seeking the student secure skills in laboratory work in general, and in particular, on the peculiarities of a laboratory of organic chemistry. Advancing one step further, it is intended that the student will be able to adapt a synthetic strategy aimed at the preparation of an organic compound. For the realization of this laboratory we rely on the knowledge acquired in the subjects of Chemistry organic I and II, taught during the 3rd and 4th semester and in the laboratory of organic chemistry I offered during the second year of the degree in chemistry.

The objectives that are to achieve in this subject can be summarized in the following points:

Reinforce the knowledge of the student on standards of safety, management of material and reagents and waste treatment in an organic chemistry lab on the literature search and data analysis.

Strengthen the skills of the student in the preparation, development and registration of experimental work in organic chemistry (laboratory notebook).

Promote the necessary critical spirit in any scientific activity.

Perform different synthesis of organic products.

Start the student in the synthesis steps.

Start the student in the design of a synthesis.

Make isolates of organic products from their natural sources.

Develop the ability of the student to solve problems that may occur in a laboratory of organic chemistry.

Develop the student's ability to analyze the results and draw conclusions.

Develop the ability to describe the preparation of a compound.

Enhance skills of the student for work on computer.

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, as well as the subject of Organic Chemistry I and Organic Chemistry II. Also it is a good idea to carry the day the subject of Organic Chemistry III that is taught simultaneously, because some of the experiments that have been proposed are directly related to the contents of the program of this subject.

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.
- Toma de decisiones.
- Demonstrate ability to work in teams both in interdisciplinary teams and in an international context.
- Comunicación oral y escrita en las lenguas nativas.
- Trabajo en un equipo de carácter interdisciplinar y/o en un contexto internacional.
- Razonamiento crítico.
- Capacidad de gestión de la información.
- 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.
- Creatividad.
- Liderazgo.
- Motivación por la calidad.
- 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.

LEARNING OUTCOMES

In this subject there will be approached the following results of learning contained in the document of Degree inside the CHEMICAL ORGANIC matter:

1 .-To demonstrate knowledge of the principal aspects of terminology and organic nomenclature. (CE1)

2 .-To understand the structural properties and the reactivity of the compounds and of the functional organic groups applying them to the solution of synthetic and structural problems. (C16, C21, CE2, CE4, CE6, CE7, CE23, CE26)

3.-To elucidate the structure of the organic simple compounds, using spectroscopic technologies. (CE8, CE19)

4. - To explain in an understandable way phenomena and processes related to the Organic Chemistry. (C1, C2, C12, CE13)

5 .-To acquire and to use bibliographical information and technology referred to the organic compounds. (C13, CE16)

6.-To write and to expose in the native language with correction (C8)

7.-To realize effectively the tasks assigned as member of an equipment with perspective of kind (C7, C9, C18, C19)

8.-To demonstrate knowledge of sustainable methodologies in organic chemistry. (CE25)

9.-To demonstrate skill to manipulate chemical reagents and organic compounds safely. (CE17)

10.-To demonstrate aptitude to plan and carry out experimentally simple syntheses of organic compounds safely and using the suitable technologies. (C3, CE18, CE21)

11.-To demonstrate aptitude to elaborate a memory of a laborator practice with rigor. (C8, CE16)

12.-To interpret information proceeding from observations and measures in the laboratory in terms of his significance and of the theories that sustain it. (CE20, CE22, CE24)

13.-To take decisions with rigor. (C6, C15, C17) 14.-To demonstrate critical reasoning. (C12) 15.-To demonstrate autonomous learning. (C16) 16.-To solve problems with rigor. (C5, C20, CE14, CE15)

These results have to allow that at the end of the subject the student should acquire the capacities of:

Application of the safety procedure, and managing of material and reagents and waste treatment in a laboratory of Organic Chemistry.

Search, interpretation and application of the bibliographical information.

Preparation of an experience to realizing in the laboratory: analysis and application of experimental procedures.

Choice and utilization of the suitable material. Accomplishment of the more habitual methods of separation in Organic Chemistry.

Application of the technologies of filtration to atmospheric pressure and to emptiness.

To be able to crystallize a solid compound. To be able to determine the purity of a solid compound.

To be able to isolate of solid and liquid disueltos: managing of the rotavapor.

To be able to realize chromatographies of thin cap and column: choice of eluyentes and analysis of results. Accomplishment with fluency of the different assemblies.

To register correctly the observed experimentally.

To calculate and to interpret performances: brute performance and performance in pure product.

To face a practical problem and to try to solve it.

To adapt a synthetic process: to evaluate the advantages and disadvantages of different routes.

To be able to realize the preparation of the sample and a spectrum of IR and UV-V.

To be able to realize the preparation of the sample of RMN's spectrum.

To be able to relate the knowledge acquired with the daily life.

Likewise it will have to develop:

Aptitude to there be unrolled adequately in a laboratory of Organic Chemistry

Aptitude to face the challenges that the experimental work supposes.

Aptitude to take decisions individually.

Aptitude to be employed at equipment.

Aptitude to solve problems by means of the integrated application of the acquired knowledge.

Aptitude to express orally of a precise and clear form.

Aptitude to express in writing of an organized and concise form.

DESCRIPTION OF CONTENTS

1. Seminar 1.STUDY AND MANAGING OF DIFFERENT BIBLIOGRAPHICAL SOURCES

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2. ISOLATION OF CAFFEINE FROM DIFFERENT SOURCES:

Isolation and purification of tea caffeine.
Separation of caffeine a cafiaspirin © or © hemicraneal
Qualitative comparison with caffeine extracted from other sources: cocoa, cola, coffee.

3. SYNTHESIS 1.Tetrahidrocarbazol

Tetrahidrocarbazol

4. SYNTHESIS 2.

4-vinylbenzoic acid preparation

5. SYNTHESIS 3: Grignard reactive. Triphenylmethanol preparation

Grignard reactive. Triphenylmethanol preparation:
a) Phenyl magnesium bromide obtention
b) Reaction with benzophenone
c) UV-V study

6. STUDY OF THE KINETIC AND THERMODYNAMIC CONTROL REACTIONS

7. FREE SESSION AT THE DISCRETION OF THE TEACHER

8. SEMINAR 2: DESIGN AND IMPLEMENTATION OF A SYNTHETIC PROCESS:

Presentation of the work throughout the course.

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 course is structured around different axes:

(a) preparation of the experience carried out and development of the laboratory notebook. The student must remember and update everything what he learned in the laboratory of organic chemistry I, on this issue. Once defined the objective of the experience carried out with the material and information that will give the teacher the student, this must prepare each of the experiences according to the scheme shown in the LQOI, as well as the necessary calculations.

This preparation is essential before access to the laboratory. We especially highlight the preparation of the scheme of work carried out and result expected of each of the operations (using a flowchart), is aimed at a better 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 prior to the experimental work and if it is not appropriate to limit access to the laboratory until the preparation of this complete, since the objective is that the student understands what and why and can correct or adapt the procedure in case of error or if the results do not match what was observed.

(b) work in the laboratory. Lessons are designed in such a way that they should basically be in more than one laboratory session, by which the student must learn to distribute your time and organize.

In order to promote the responsibility of the student in the proper functioning of the laboratory and the teamwork be allocated weekly small assignments so that the student will contribute to the smooth functioning of the same.

Depending on the number of students per group experiences were carried out individually or in pairs. In the latter case will be introduced in some practical aspects to carry out individually.

An important part in the work of laboratory is the laboratory notebook.

The student must analyze the results obtained in the laboratory and in the calculations. The results obtained by identifying problems and how are fixed will analyse or they could solve. Therefore this stage aims to develop the capacity of analysis of the student, promote the exchange of information and the teamwork.

(c) Seminars. All lab sessions require an exchange of views prior where the teacher and the students will be able to resolve the specific questions the work of that day. It is the job of the teacher in this stage foster in students a positive attitude in the scientific work, for that had been left a seminar of 0.5h at the start of each session.

It has designed a seminar (2h), at the beginning of the subject, to publicize the bibliographic sources more common in Organic Chemistry and how to search for and select the information that we need.

It has designed a seminar (2h), at the end of the practical sessions, where the student will present the result of the projects awarded at the beginning of the course. This project consists in the adaptation and implementation of a synthetic process: to develop the experimental procedure, adapting it to the data found, select conditions and resources, to minimize secondary reactions, etc.

EVALUATION

The evaluation of learning will be carried out continuously by the teacher because of the close contact that will be maintained throughout the course. The different sections to be assessed are the following:

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

The duration of each experimental session will be 4.5 hours and the session do not recover, so that the truancy and timeliness must be duly justified. The non-realization of more than three practice sessions will involve the loss of the rating corresponding to the laboratory work and results.

It is prerequisite to begin a session that the student is in possession of the laboratory notebook duly completed. The books may be reviewed by the professor at any time.

Both at the beginning of the meeting of practices such as at the end should be to carry out the general tasks assigned to the proper functioning of the laboratory and shall be a count of the material per job.

B) SEMINARS (10 %): Before each session there will be a seminar that will consist of a statement on the practice to be carried out by the students. Will take into account both the preparation, presentation and the answers to the questions.

In the workshop design and implementation of a synthetic process: will take into account both the work developed as the presentation and exhibition of the same.

C) EXAM (50 %): it is necessary to obtain a minimum of 4 points on 10, in this section, to be able to add the rest of the percentages.

REFERENCES

Basic

- Mª A. Martínez Grau y A. G. Csákÿ. TÉCNICAS EXPERIMENTALES EN SÍNTESIS ORGÁNICA Ed. Síntesis, 1998.
- H.D. Durst y G.W. Gokel "QUÍMICA ORGÁNICA EXPERIMENTAL"., Ed. Reverté (1985).
- B.S. Furniss, A.J. Hannaford, P.W.G. Smith, A.R. Tatchell "VOGEL´s TEXTBOOK OF PRACTICAL ORGANIC CHEMISTRY., Ed. Longman (1989).
- L.M.Harwood y C.J. Moody "EXPERIMENTAL ORGANIC CHEMISTRY"., Ed. Blackwell Sci. Publ. (1989).
- D.R. Palleros EXPERIMENTAL ORGANIC CHEMISTRY. John Wiley and Sons (2000)
- B. S. Furniss, A. J. Hannaford, P. W. G. Smith, A. R. Tatchell Vogels. TEXTBOOK OF PRACTICAL ORGANIC CHEMISTRY Ed. Longman Scientific & Technical 1989.

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)