27210 - Chemistry Laboratory

Información del Plan Docente

Academic Year	2017/18
Faculty / School	100 - Facultad de Ciencias
Degree	452 - Degree in Chemistry
ECTS	12.0
Year	2
Semester	Annual
Subject Type	Compulsory
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

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

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

The learning process designed for this course is based on the following points:

This a practical course, therefore, students should participate actively in all the activities of the laboratory sessions. The main part of teaching and learning tasks will be done in the laboratory sessions, in small groups of students supervised by a teacher. Each laboratory session will last between 3 and 4 hours. Additionally, the explanation of the basic concepts about the experimental work will be done in classroom seminars, generally in large groups. Seminars will last between 1

and 2 hours.

Classroom materials will be available via Moodle. These include the calendar of activities, as well as other course-specific learning materials.

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

5.2.Learning tasks

The course includes 12 ECTS organized according to:

- Seminars (2 ECTS).

- Laboratory sessions (10 ECTS).

5.3.Syllabus

The course will address the following topics:

Seminars

1.- Basic concepts and database in Chemistry Laboratories. Security issues. Chemical products. Safety data sheets (SDS).

2.- Physicochemical methods and treatment of experimental data.

3.- Basic IR and RMN spectroscopy for structural characterization of simple organic compounds.

4.- Use of video tutorials for step-by-step instructions on basic instrumental techniques in organic chemistry.

5.- Chemical and electroanalytical methods. Practical considerations for the laboratory sessions.

Laboratory sessions

Section 1. Experimental physicochemical techniques

1) Determination of thermodynamic properties (3 sessions of 3 h each).

- Determination of the heat of combustion of a solid in a calorimetric bomb.

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- Measurement of the vapour pressure of a liquid using the isoteniscope method.

- Determination of one equilibrium constant.

2) Determination of electrochemical properties (2 sessions of 2.5 h each).

- Determination of the transport number of an ion by the movable boundary method.

- Measurement of the electromotive force of some simple and concentration batteries.

3) Kinetic of chemical reaction (3 sessions of 4 h each).

- Kinetic study of different chemical reactions in aqueous solution will be performed using spectrophotometric, polarimetric and conductimetric methods.

Section 2. Synthesis, purification y characterization of inorganic compounds

1) Preparation of some compounds of boron from borax (1 session of 3.5 h).

2) Elements of group 15: test tube experiments (1 session of 3.5 h).

3) Production of gases. Preparation of some copper salts from copper sulphate (2 sessions of 3.5 h each).

4) Preparation of some lead salts from minium (2 sessions of 3.5 h each).

5) Production of Cl 2 . Preparation of K[ICl 4]·xH 2 O (1 session of 3.5 h).

6) Preparation and purification of manganese(II) chloride (1 session of 3.5 h).

Section 3. Synthesis, purification and characterization of organic compounds

a) Purification techniques: column chromatography. Purification of the main product of a reaction mixture (1 session of 4 h).

b) Synthesis of compounds by typical organic reactions. Isolation, purification and characterization techniques in organic synthesis (5 sessions of 4 h each).

* Synthesis of tert-butyl chloride (unimolecular nucleophilic substitution, SN1)

* Oxidation of diphenylethanol to benzophenone by chromic acid.

* Nitration of bromobenzene (electrophilic aromatic substitution, SEAr)

* Elimination reactions: dehydration of alcohols (E1).

* Synthesis of phenacetin (bimolecular nucleophilic substitution, SN2).

Emphasis will be placed on the appropriate safety handling of organic compounds and proper disposal of chemical waste.

In addition, students will practice database searching of the physical properties of organic compounds and basic spectroscopic analysis, using that they have learned in previous seminars.

Section 4: Chemical and electroanalytical methods

1) Redox, EDTA, acid-base and precipitation titrations.

* Determination of sodium oxalate by redox titration with potassium permanganate (1 session of 4 h).

* Determination of chloride in sparkling waters by precipitation titration (Mohr's method) (1 session of 3 h).

* Determination of magnesium in a salt by EDTA titration (1 session of 4 h).

* Determination of hydrogen carbonate in still water by acid-base titration: use of chemical acid-base indicators and a pH electrode to find the end point (2 sessions of 3.5 h)

2) Potentiometry with Ion Selective Electrodes (ISE) and Anodic Stripping Voltammetry (ASV) (2 sessions of 3.5 h each).

The study of those conditions affecting the quality of the measurements, the proper expression of the results together with their quality evaluation will be also carried out.

5.4.Course planning and calendar

Further details concerning the group composition, calendar of the laboratory sessions and classroom seminars will be available via Moodle at the beginning of the academic year.

5.5.Bibliography and recommended resources

BB	Consult information / resources incorporated in the ADD of the subject
BB	Csák, Aurelio G.. Técnicas experimentales en síntesis orgánica / Aurelio G. Csák, Mª Angeles Martínez Grau . 2ª ed. corr. y

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BB	amp. Madrid : Síntesis, 2012 Woodfield, Brian F.. Laboratorio virtual de química general / Brian F. Woodfield, Matthew C. Asplund, Steven Haderlie ; traducción María Teresa Aguilar Ortega ; revisión técnica Gonzalo Trujillo Chávez, Adriana Gómez Macías . 3ª ed. México [etc.] : Prentice Hall, 2009