29915 - Chemical Experiments

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	435 - Bachelor's Degree in Chemical Engineering
ECTS	6.0
Year	2
Semester	Second semester
Subject Type	Compulsory
Module	---

1.General information

1.1.Introduction

Experimental Chemistry is a mandatory subject of 6.0 ECTS credits.

It's a chemistry course that develops through a series of laboratory sessions dealing respectively of analytical and physical-chemical methods, as well as methods of organic and inorganic synthesis, thus covering all aspects of chemistry, always from a point of view experimental.

1.2.Recommendations to take this course

Highly recommended to have studied the subjects Chemistry I (29904), II (29909) and III (29914).

1.3.Context and importance of this course in the degree

This course is scheduled in the spring season corresponding to second year (sophomore) of chemical engineering map degree. At this time, they have already taken the subjects of Chemistry I, II (Analytical Chemistry and Physical Chemistry) y III (Inorganic and Organic Chemistry), and therefore, he/she knows the basic principles of chemistry, laws governing reactions and has a general knowledge of the behavior of the elements and their main compounds. Moreover, it's necessary to consider that the Experimental Chemistry must provide the concepts that will be needed to carry out successfully courses in later years. Both, mandatory subjects such as Materials Engineering, Environmental Engineering, Industrial Chemistry, Separation Operations, Reactor Design and Experimental Chemical Engineering (I and II) as well as those included in the elective modules.

1.4.Activities and key dates

Final planning of several activities to develop in this course will be established once the University of Zaragoza and EINA will approved the academic calendar and will be available on the website of the EINA.

2.Learning goals

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2.1.Learning goals

For passing this subject, students should demonstrate the following results...

To apply properly to the theoretical / practical concepts in the development of chemical analysis and chemical processes in the laboratory.

To use a rigorous language in chemistry field.

To present and interpret correctly data and results.

2.2.Importance of learning goals

The knowledge of experimental techniques and its theoretical basis in the different fields of Chemistry (Analytical Chemistry, Physical Chemistry, Inorganic Chemistry and Organic Chemistry) will provide students the ability to discriminate the techniques and chemical methods most suitable to be used in the design and control of facilities and processes, both in their future studies as his/her career as a chemical engineer.

The correct interpretation and processing of data and experimental results, as well as its clear and orderly presentation, are essential to establish habits of rigor in these tasks that are not unique in chemistry lab. Specifically in the field of chemistry will enable students to make correct reports if they are requested for that, as well as evaluate the correctness of those will receive.

3.Aims of the course and competences

3.1.Aims of the course

The subject and its expected results respond the following approaches and goals:

The course completes the student training in chemistry since, the theoretical/practical knowledge acquired in the courses Chemistry I, II and III adds the knowledge and skills of the chemical laboratory in all its facets.

Expected goals for the student.

1. To know and to acquire the necessary skills in handling instruments and chemical reagents both as regards the principal basic operations of a chemistry lab as some of the experimental methods used specifically in Analytical Chemistry, Physical Chemistry, Inorganic Chemistry and Organic Chemistry.

2. To reach a better understanding of the theoretical and practical knowledge in the areas of Analytical Chemistry, Physical Chemistry, Inorganic Chemistry and Organic Chemistry previously acquired, through its application to laboratory processes which to show them some of the relevant practical applications of this knowledge.

3. To be able to perform the interpretation and / or appropriate mathematical treatment of results and present them in a clear and orderly manner.

3.2.Competences

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To pass this course, students will be more competent to...

- Generic skills

* C04 To solve problems and make decisions with initiative, creativity and critical thinking.

* C11 To learn continuously and develop independent learning strategies.

- Specific skills

* C30 To calculate the physico-chemical parameters of systems and chemical reactions with special emphasis on the chemical equilibrium in solution and its application to the analysis.

* C31 To develop chemical processes according to the characteristics of the elements and to the organic and inorganic compounds.

4.Assessment (1st and 2nd call)

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

Students must be demonstrating that it has achieved the intended learning outcomes through the following evaluation activities:

This subject is considered an exception to the continuous assessment system in accordance with Article 9. Item 4, of UZ evaluation rules. This system allows students to get the 100% of the grade in the first call. This first call exclude overall assessment test. Thus, attendance at laboratory sessions scheduled during the academic year will be mandatory.

The evaluation will be conducted separately for the four areas involved in the subject (Analytical Chemistry, Physical Chemistry, Inorganic Chemistry and Organic Chemistry).

The numerical rating to the subject will be the result of apply the average value to the numerical rating obtained in each of the areas (Analytical Chemistry, Physical Chemistry, Inorganic Chemistry and Organic Chemistry), provided the following condition is satisfied: having overcome (note equal or higher than 5.0) in, at least, two areas, and to have compensable rating (4.0 or higher) in a maximum of two areas. To pass the course, the average value should be equal or greater to 5.0.

In all cases, tracing of each laboratory sessions will be performed with the goal of assessing the session preparation, the lab session development, and the presentation and interpretation of results of the results obtained in the laboratory practices

At the end of practical sessions of each knowledge area, each area might take a written examination about subject taught. The obligatoriness (or not) of carry out this exam will be communicated to students in the first session lab.

In case of conducting the examination, the note will be calculated using the following formula:

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Note = (0.3 × Note exam) + (0.7 × Note lab)

A minimum grade of 3.0 is required on the exam to apply the formula. If the note is not reached, the student will be considered suspended in the part corresponding to that area.

In the second call a theoretical and practical exam will be conducted.

For those students who are presented to other calls different to the first, the EINA will schedule, in the exam period established to such effect, a global exam. This global test will account for 100% of the student's grade and will have a theoretical and practical character.

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

Student's practical work at chemical laboratory. Previously of lab's session, students will know the practice's topic and the procedure described in the practices' manual must be read and understood. Besides, they must be completed preliminary questions, if it's required.

Practice's manuals will be available at the Moodle course of the subject, prior to the date of the practical sessions. Students will work both, individually or teams, with support and supervision from the teacher when necessary.

5.2.Learning tasks

Chemistry laboratory classes: each chemical area will teach 5 sessions of 3 h as maximum time. It would be possible to organize a previous session, classroom or laboratory depending of chemical areas, with the objective of developed a brief description of working in a chemical laboratory.

Moodle 2.0 Course.

Academic support and supervision.

Possibility of receiving a Course on Information Management for freshman students (organized and conducted by the Hypatia library).

5.3.Syllabus

Analytical Chemistry area:

Joint opening session: class schedule, documentation, prerequisites of laboratory access in terms of (a) safety policy and (b) academics criteria, further requirements to the realization of practical sessions, evaluation criteria and brief explanation of the practice sessions to perform successful course requirements. (1 h)

Practice 1. Analytical determinations based on acid-base equilibria. (max. 3 h)

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Practice 2. Analytical determinations based on complexation equilibria. (max. 3 h)

Practice 3. Analytical determinations based on the use of classical gravimetry. (max. 3 h)

Practice 4. Analytical determinations based on the use of electrical methods of analysis. (max. 3 h)

Practice 5. Analytical determinations bases on the use of optical methods of analysis (max. 3 h)

Physical Chemistry area:

Practice 1: Conductimetric titrations

Practice 2: Corrosion

Practice 3: Vapor -liquid equilibrium of a pure substance

Practice 4: Liquid-liquid equilibrium of a binary system

Practice 5: Phase equilibrium of a ternary liquid system

Practice 6: Determination of the surface tension of several liquids by the ring method

By reasons of length of the practices, the practices 4 and 6 will be carried out in the same session

Inorganic Chemistry area: 5 sessions, select by teachers, including the following

Practice 1: Preparation of lead compounds using Pb 3 O 4 as starting material.

Practice 2: Halogens: Synthesis of Br 2 and I 2 . Study of their oxidizing power.

Practice 3: Preparation of ferrosilicon.

Practice 4: Production of CO 2 . Preparation of NaHCO 3 and Na 2 CO 3 via the Solvay process.

Practice 5: Preparation of the cis and trans isomers of the coordination complex, bisglycinatecopper(II)·H 2 O.

Practice 6: Preparation of a silver mirror.

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Practice 7: Preparation of silica gel.

Practice 8: Preparation of copper salts.

Organic Chemistry area:

Practice 1: Separation of organic compounds. Acid-base reactions.

Practice 2: SN1 versus SN2 reactions.

Practice 3: Esterification reactions.

Practice 4: Organic reduction reactions.

Practice 5: Synthesis of organic colorants. Column chromatography.

5.4.Course planning and calendar

The practice sessions are held in the laboratory according to schedule established by the EINA and will be published prior to the start date of the course (schedules available on the EINA website).

Each professor will inform about his tutoring hours.

Study time, time of student work off lab, and evaluation time: 22.5 hours for each involved chemical area.

Practical sessions will be planned depending on the enrolled student's number and will be announced in good time **.**

5.5.Bibliography and recommended resources

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BB	2.1 Libro de guiones de prácticas de Físico-Química. Departamento de Química Física
BB	2.2 Prácticas de química-física / J.M. Wilson ... [et al.] ; traducción, Celso Gutiérrez Losa . Zaragoza : Acribia, D.L. 1966
BB	2.3 Garland, Carl W.. Experiments in physical chemistry / Carl W. Garland, Joseph W. Nibler, David P. Shoemaker . 8th ed. Boston [etc.] : McGraw-Hill, 2009
BB	2.4 Curso experimental en Química Física / Juan José Ruiz Sánchez ... [et al.] .

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BB	3.1 Experimentación en química. Departamento de Química Inorgánica
BB	3.2 Schlessinger, Gert G. Preparación de compuestos inorgánicos en el laboratorio / por Gert G. Schlessinger . 1a ed. en español México D.F. : Compañía Editora Continental, 1965
BB	3.4 Normas de Seguridad en un Laboratorio Químico. Departamento de Química Inorgánica
BB	3.5 Greenwood, Norman Neill. Chemistry of the elements / N. N. Greenwood and A. Earnshaw . 2nd ed., repr. with corr. Amsterdam [etc.] : Elsevier Butterworth Heinemann, 2008
BB	4.1 Martínez Grau, María Angeles. Técnicas experimentales en síntesis orgánica / Mª Angeles Martínez Grau, Aurelio G. Csákà¿ . [1ª reimpr.] Madrid : Síntesis, D.L. 2001
BB	4.2 Rodríguez Yunta, María Josefa. Curso experimental en química orgánica / Mª Josefa Rodríguez Yunta, Fernando Gómez Contreras . Madrid : Síntesis, D.L. 2008
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BC	1.2 Skoog, Douglas A. Principios de análisis instrumental / Douglas A. Skoog, F. James Holler, Stanley R. Crouch ; traductor, María Bruna Josefina Anzures ; revisión técnica Francisco Rojo Callejas, Juan Alejo Pérez Legorreta . 6ª ed. México, D. F. : Cengage Learning, cop. 2008
BC	1.3 Guiteras, Jacinto. Curso experimental en química analítica / Jacinto Guiteras, Roser Rubio, Gemma Fonrodona . Madrid : Síntesis, D.L. 2003
BC	1.4 Hamilton, Leicester F.. Cálculos de química analítica / Leicester F. Hamilton, Stephen G. Simpson, David W. Ellis ; traducción Luis Rodríguez Terán ; revisión técnica José Luis Morales . 2a.ed, reimp. México [etc.] : McGraw-Hill, 1992

LISTADO DE URLs:

	The preparation and characterization of the geometric isomers of a coordination complex: cis- and trans-bis-glycinato copper(II) monohydrates. Paul O'Brien

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