Universidad Zaragoza

Academic Year/course: 2023/24

27212 - Analytical Chemistry II

Syllabus Information

Academic year: 2023/24
Subject: 27212 - Analytical Chemistry II
Faculty / School: 100 - Facultad de Ciencias
Degree: 452 - Degree in Chemistry
ECTS: 12.0
Year: 3
Semester: Annual
Subject type: Compulsory
Module:

1. General information

The subject Analytical Chemistry II, together with Analytical Chemistry I, forms the fundamental block of Analytical Chemistry in the Degree. This subject provides theoretical and practical skills related to the fundamentals and practical application of spectrometric techniques (atomic and molecular) as well as instrumental separation techniques (mainly chromatography). From these two subjects the student will be able to select and adequately use the working methodology for the resolution of analytical problems involving quantitative organic and inorganic analysis in different fields: industry, environment and health.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations Agenda 2030 (https://www.un.org/sustainabledevelopment/es/): Goals 3, 4, 5, 6, 7, 7, 8, 9, 12, 13, 14 and 15.

In order to take Analytical Chemistry II it is mandatory to have taken Analytical Chemistry I.

2. Learning results

In order to pass this subject, students shall demonstrate they have acquired the following results:

- Understands the scientific fundamentals and discriminate the most common experimental modalities of the main quantitative instrumental techniques of analysis.
- They has a general and transversal vision of the techniques and methods of instrumental analysis most used in today's laboratories and relates the theoretical knowledge from different disciplines with the resolution of real cases and to the obtaining of analytical information.
- They safely and efficiently uses standard analytical instrumentation.
- Develops the necessary criteria to apply the theoretical knowledge acquired to the planning and correct execution of an analysis, complying with good measurement practices in the resolution of simple analytical problems.
- Is able to extract, process and evaluate analytical information from an experimental determination.

3. Syllabus

Topic 1. Introduction to Instrumental Analysis.

Topic 2. Basic concepts of chromatography.

Topic 3. Gas chromatography.

Topic 4. High Performance Liquid Chromatography.

Topic 5. Mass Spectrometry as a detection technique in Chromatography. GC-MS and HPLC-MS.

Topic 6. Introduction to spectrometric techniques.

Topic 7. Introduction to Atomic Spectrometry.

Topic 8. Atomic Absorption Spectrometry.

Topic 9. Atomic Emission Spectrometry: Flame, Arc and spark and Plasmas.

Topic 10. Inductively Coupled Plasma Mass Spectrometry.

Topic 11. Molecular absorption spectrophotometry: UV-visible and infrared

Topic 12. Molecular luminescence: Fluorescence and Chemiluminescence

4. Academic activities

The methodology to be followed is based on four aspects:

- 60 hours of participative master classes
- 20 hours of problem/seminar classes. Both numerical problems and case studies will be presented and solved , which may include, among others, the discussion of official methods of analysis or the comparison of instrumentation from

different companies
- 40 hours of practical laboratory classes, which will include a series of previous activities of preparation for the practical, directed study, virtual practices, as well as subsequent activities related to the presentation of results and the drafting of reports
- 15 hours of supervised work

5. Assessment system

FIRST SEMESTER

1.- Theoretical-practical test (PTP): theory (T = 60 %) + problems (P = 40 %).

Requirements: T > 3.5 for access to P evaluation; Average (T and P) > 4.5 compensable

2.- Progressive Evaluation (PE); PE < 4.0 to PTP Extended PTP (PTPb)

3.- Laboratory (PL): 40 % laboratory input tests; 20 % attitude; 40 % practical report.

If PL < 4.5 the students have to take a practice exam

4.- Semester grade

a. EP passed; PTP x 0.5 + EP x 0.3 + PL x 0.2 or PTP^a x 0.8 + PL x 0.2 b.
b. EP failed; PTP^b x 0.8 + PL x 0.2

[a] PTP^a is obtained by discounting PTP by means of the expression PTP^a=PTP + (EP-4.0)/3.0

[b] PTP^b is a more extensive test than PTP

SECOND SEMESTER

1.- Theoretical-practical test (PTP): questions of different types; problem questions will be worth double.

2.- Progressive Evaluation (PE). 30 % (short tests, various activities)

3.-Laboratory evaluation (PL). 20 %. Includes:

- Preliminary tests
- Report (script, attitude in the laboratory)

4.- Grade= the best of 0.5*PTP + 0.3*EP + 0.2*PL and 0.8*PTP + 0.2*PL

To pass it is essential that the PTP grade ≥5/10, the PL grade≥5/10 and the overall semester grade ≥5/10. If PL < 4,5/10 the student must pass a practice exam.

Compensation:

* If PTP > 4 (out of 10) it will be combined with EP.

* If PL > 4.5 (out of 10) it will be added to the previous grades

FINAL GRADE: Average grade for both semesters.

There is no compensation between semesters.