

27221 - Spectroscopy and Molecular Properties

Syllabus Information

Academic year: 2023/24

Subject: 27221 - Spectroscopy and Molecular Properties

Faculty / School: 100 - Facultad de Ciencias

Degree: 452 - Degree in Chemistry

ECTS: 6.0

Year: 4

Semester: First semester

Subject type: Compulsory

Module:

1. General information

This subject will complete the student's chemical-physical training acquired in the Fundamental Module. Its main objective focuses on the student learning the essential concepts and principles of molecular symmetry and spectroscopy, photochemistry, and polymers. To this end, the student will acquire a solid base of knowledge and skills that will enable them to analyse and interpret the results obtained. The handling of experimental techniques as well as the corresponding data treatments will be studied in depth.

These approaches and objectives are aligned with the Sustainable Development Goals (SDGs) of the 2030 Agenda of the United Nations, and aim to contribute to the achievement, specifically Goal 3, 4, 7, 9 and 13.

2. Learning results

- Acquire spatial vision to locate the elements of symmetry and classify simple molecules in the point group of symmetry to which they belong.
- Apply knowledge of symmetry in solving simple problems in physical chemistry.
- Understand the primary photophysical and photochemical processes that a molecule excited by light absorption can undergo and the concept of quantum yield.
- Understand the origin of spectroscopic phenomena in radiation-matter interaction and the rationale for the fundamental techniques of molecular spectroscopy. Apply the acquired knowledge of symmetry.
- Distinguish the type of information provided by the different techniques of molecular spectroscopy that are going to be treated in this subject and their limitations.
- Skilfully handle basic experimental techniques in spectroscopy as well as the corresponding data processing and reporting.
- Acquire a basic knowledge of chemical-physical aspects of polymers.

3. Syllabus

Theory

1. Molecular Symmetry
2. Photochemistry
3. Molecular Spectroscopy. Interaction of electromagnetic radiation and matter. Selection rules.
4. Microwave spectroscopy
5. IR Spectroscopy
6. Raman spectroscopy
7. Electronic spectroscopy
8. Magnetic resonance spectroscopy
9. Polymers

Practices

- Three practices related to the molecular spectroscopy syllabus
- A practice related to the topic of polymers

4. Academic activities

- Master classes: 31 hours
- Problems: 15 hours

- Laboratory practices: 14 hours
- Preparation of reports: 9 hours
- Personal study. 75 hours
- Assessment tests. 6 hours

5. Assessment system

Evaluation of the theoretical part of the subject

- E1 (minimum 5 out of 10). Written test with theoretical-practical questions on the first part of the syllabus (symmetry, photochemistry and basic concepts of molecular spectroscopy) to be taken at the end of the explanation of these topics.
- E2 (minimum 5 out of 10). Written test with theoretical-practical questions related to the whole subject to be taken at on the dates of the official calls for exams. Students who have passed the E1 test may only take the questions of the second part of the syllabus.

The grade for the theoretical part(**T**) of the subject will be:

- For students who have passed E1 : $T = 0.2 \cdot E1 + 0.80 \cdot E2$
- For students taking the full E2 test: $T = E2$

Evaluation of the practical part of the subject

- **P** (minimum 5 out of 10). Evaluation of laboratory work and practice reports Students who do not pass the P test will take a theoretical-practical test on the dates of the official calls.

Final grade

The final grade on the transcript(**C**) for students who pass the subject will be: **$C = 0.9 \cdot T + 0.1 \cdot P$**

The final grade on the transcript(**C**) for students who do not pass the subject will be: $C = T$ (if $T < 5$) or $C = P$ (if $P < 5$)

The passed parts of the subject ($E1 > 5$ and/or $P > 5$) will be kept throughout the academic year.