UAB
Universitat Autònoma de Barcelona

Chemical Reactivity

Code: 106800
ECTS Credits: 6

2025/2026

Degree	Type	Year
Nanoscience and Nanotechnology	FB	1

Contact

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

It is recommended that those students who have not studied Chemistry in High School to attend the chemical courses that the Faculty of Science organizes at the beginning of September.

Objectives and Contextualisation

The general objectives of the subject are to establish the fundamental concepts that allow understanding chemical reactions and to be able to relate them with other more specific subjects of the Degree of Nanoscience and Nanotechnology. These bases will allow the student to identify and apply the principles and their meaning to solve real world problems in a systematic and fast way and increase their critical and learning abilities.

The subject offers the students the fundamental principles of chemistry, their applications and qualitative and quantitative reasoning. Examples of the real world and more specifically of the field of Nanoscience will be given. The following areas will be emphasized: thermochemistry, homogeneous and heterogeneous equilibria, chemical kinetics, and basic electrochemistry.

Learning Outcomes

1. CM03 (Competence) Determine relevant parameters and magnitudes associated with chemical equilibrium and reactivity.

2. CM04 (Competence) Work collaboratively in teams to solve problems and practical cases in general chemistry.
3. CM05 (Competence) Work autonomously to plan the work involved in supervised activities.
4. KM07 (Knowledge) Identify the concepts, principles and theories of thermochemistry, homogeneous and heterogeneous equilibria, chemical kinetics and electrochemistry.
5. SM05 (Skill) Gather, analyse and adequately represent data and observations in the field of general chemistry, using magnitudes, units and terminology associated with basic chemical concepts.
6. SM07 (Skill) Accurately carry out calculations based on simple chemical reactions from a thermodynamic and kinetic point of view in order to predict their evolution.
7. SM08 (Skill) Safely handle instruments and materials typically found in a general chemistry laboratory.

Content

1. Thermochemistry: Reaction heat and calorimetry. Work-energy. First law of thermodynamics. Heats of reaction: ΔU and ΔH. Hess' Law. Standard enthalpies of formation. Calorimetric techniques.

2. Principles of chemical equilibrium: Concept of chemical equilibrium, expressions and relationships between the equilibrium constants. The reaction quotient Q. Modifications of the equilibrium conditions: Le Châtelier's principle. Examples.

3. Spontaneity and equilibrium: Spontaneity and Entropy. Second law of thermodynamics: Gibbs Energy. Relationship between Gibbs energy and equilibrium constant. Prediction of chemical change. ΔG^{o} and K_{eq} depending on the temperature.

4. Introduction to chemical kinetics: Reaction rate and temperature. Rate measurement. Rate equations and order of reaction. Reaction rate and temperature. Catalysis.

5. Acids and Bases (I): Review of Arrhenius theory. Bronsted-Lowry theory. Self-ionization of water and pH scale. Strong acids and strong bases. Weak acids and weak bases. Polyprotic acids. Ions as acids and bases. Lewis' acids and bases.

6. Acids and Bases (II): Common ion effect in acid-base equilibria. Buffer solutions. Indicators. Neutralization reactions and titration curves. Polyprotic acid solutions. Calculations.

7. Solubility and complexation: Solubility product and solubility. Common ion effect. Total and partial precipitation. Solubility and pH. Complexation equilibrium.

8. Electrochemistry: Redox reactions. Electrode potential and standard electrode potential. Relationship between E, ΔG^{o} and K_{eq}. Energy variation with the concentration: Nernst equation. Corrosion

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Exercises lessons	14	0.56	
Laboratori instructions reading	8	0.32	
Laboratory Practices (experimental part)	6	0.24	
Theoretical Lessons	30	1.2	

Type: Autonomous		
Study and exercise solving	86	3.44

The subject Chemical Reactivity consists of two types of supervised activities, theoretical lessons and problem classes, which are distributed throughout the course.

Theoretical lessons.
Through the teacher's presentations, the student must acquire the specific knowledge of this subject and complement it with the study of each topic treated with the help of the material that the teachers can provide to the student through of the Virtual campus and the recommended bibliography. The theoretical lessons will be open to the participation of the students, who will be able to ask the teacher the questions and clarifications they consider necessary.

Exercises lessons.
The aim of this supervised activity is to solve problems and questions that have previously been posed to the students through the Virtual Campus and that they have previously had to solve, in groups or individually Due to the reduced number of students in class during this activity, the aim is to stimulate students' participation in the discussion of alternatives to solve the problems, taking advantage of this to consolidate the knowledge acquired at the theory lessons and during the autonomous work.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evidences	10% of final grade	4	0.16	CM03, CM05, KM07, SM05, SM07
Practices rerport writing	20% of the final grade	2	0.08	CM03, CM04, SM05, SM07, SM08

CONTINUOUS ASSESSMENT

The final grade for the course is obtained from the exam scores, the student's continued work (evidence of learning), and laboratory practices.

Final course grade = 0.10 x (continuous work grade) + 0.70 x (average grade of the partial exams) + 0.20 x (laboratory practices grade)

To pass the course, the final grade must be $\geq$ 5.0 (out of 10) and the following two conditions must be met:

1) The exam score for each partial must be $\geq$ 4.5 (out of 10)

2) The grade for the laboratory practices must be $\geq$ 5.0 (out of 10)

Students who fail the course due to not meeting either of the two conditions above, regardless of whether their final grade is greater than or equal to 5.0, will receive a maximum final grade of 4.5, and the course will be considered failed.

To attend any partial exam, it is essential to bring an identification document (ID or university card) with a recent, high-quality photograph.

Using unauthorized methods during a course exam (cheating or communicating with a classmate, using cell phones, using smart watches, etc.) will result in a failing grade for the entire course.

Continuous work (10%):

1) Evidence will be collected from each student throughout the semester (problems solved individually or in groups, self-assessments on the virtual campus, short tests in class, quizzes, etc.).

2) The grade for the continued work will be the average of the grades for the evidence collected throughout the course. Failure to attend an evidence session results in a zero for that evidence.

Class attendance will be factored into the final grade, as per the instructors' guidelines.

Exams (70%):

1) An exam will be held at the end of each part of the subject(1st partial exam and 2nd partial exam).

2) Retake exams will be offered for both parts of the course (second-choice exams). To participate in retake exams, students must have previously been assessed on a set of activities worth at least two-thirds of the total course grade. Students who do not require retake exams may perform the retake exams to improve their course grade.

- For students taking these second-choice (make-up) exams, the grade for the block exam will be the one they obtain in this second-choice exam.

- For students taking these second-choice exams (grade improvement), the block exam grade will be:

- equal to that of the second-choice exam, if the second-choice exam score **>** the midterm exam score
- equal to the average of the partial exam and the second-choice exam, if the second-choice exam score **<** the partial exam score.

Practices (20%):

The final grade of the laboratory practices will be calculated from the lab reports.

If the subject is failed, but the laboratory grade is higher than 6.0, it will not be mandatory to repeat the laboratory practices in the following year and the laboratory grade will be maintained, provided that 75% of the same practices are maintained as the previous year in which the subject was failed.

Anyone involved in an incident that could have serious safety consequences may be removed from the laboratory and fail the course.

SINGLE ASSESSMENT

Within the regulatory period established by the University, students may request the single assessment, waiving the continuous assessment option. Students who opt for this single assessment option must take a final exam consisting of an exam covering the entire theoretical syllabus and problems from the course. This exam will have two subtests corresponding to the sections of the course (equivalenttothe first and second partial exams, respectively) and will be held on the day the continuous assessment studentstake the second partial exam. The student's grade will be:

Final course grade = 0.80 x (average grade of the final exam blocks of the subject) + 0.20 x (laboratory practices grade)

To pass the course, the final grade must be $\geq$ 5.0 (out of 10) and the following two conditions must be met:

1) The exam score for each block must be $\geq$ 4.5 (out of 10)

2) The grade for the laboratory practices grade must be ≥ 5.0 (out of 10)

If the final course grade does not reach 5.0, students may take a second-option exam for the entire course. This exam will also consist of two tests from the theory sections, and the same passing requirements will apply (a minimum of 4.5 in each section). This second-option exam will coincide with the retake exam date for students who opt for continuous assessment.

Using unauthorized methods during a course exam (cheating or communicating with a classmate, using cell phones, using smart watches, etc.) will result in a failing grade for the current course.

To attend any partial exam, it is essential to bring an identification document (ID or university card) with a recent, high-quality photograph.

Students who do not pass the subject so that the grade for one of the sections is <4.5, regardless of whether the final grade for the course is greater than or equal to 5.0, will obtain a maximum final grade of 4.5, considering the subject failed.

Rating of "NOT ASSESSED":

The rating of "NOT ASSESSED" will be obtained in the following cases:

- There is no grade for laboratory practices (attendance at practical classes is mandatory).
- When the student has not participated in any of the assessment activities of one of the partial exams into which the subject is divided (exams and continuous work).

Bibliography

Textbook:
- "Química General". Ralph Petrucci, Wiliam Harwood, Geoffrei Herring. Prentice-Hall (Pearson) 10a Edició, 2011. ISBN: 9788483226803
https://bibcercador.uab.cat/permalink/34CSUC_UAB/avjcib/alma991006206279706709

Other support books:
- "Química", Raymond Chang, Kenneth A. Goldsby. 11a Edició. Editor MacGraw Hill, 2013. ISBN 978-6071509284
- "Principios de Química", P. Atkins i L. Jones, Médica Panamericana, 3ª edició, 2006. ISBN 950-06-0080-3
- "Equilibrios iónicos y sus aplicaciones analíticas" Manuel Silva, José Barbosa. Ed. SINTESIS, 2002. ISBN: 9788497560252

Software

None

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	1	Catalan/Spanish	second semester	afternoon

(PAUL) Classroom practices	2	Catalan/Spanish	second semester	afternoon
(PLAB) Practical laboratories	1	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	2	Catalan/Spanish	second semester	morning-mixed
(TE) Theory	1	Catalan/Spanish	second semester	afternoon