

Basic Chemistry II

Code: 105033
ECTS Credits: 8

Degree	Type	Year	Semester
2502444 Chemistry	FB	1	2

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Teachers

Ramón Yáñez López
Mireia García Viloca

Prerequisites

There are no official prerequisites. However, at the time of beginning the subject, students must know the fundamental concepts corresponding to the Baccalaureate Chemistry subjects: formulation, stoichiometry, thermodynamics and ionic equilibria (acid-base, precipitation and redox).

For those students who consider that their level of knowledge in these contents is not appropriate, a propaedeutic course is offered (information: faculty of sciences).

Objectives and Contextualisation

The subject's objective is double. The first objective of this introductory course is to standardize the level of the students, in all the knowledge that is part of the chemistry subjects of pre-university studies.

Based on this knowledge, the second objective is to provide the students with the necessary tools for a correct understanding of the subjects of subsequent courses. In particular, and among other knowledge, the subject should provide the student with the capacity to:

- calculate the thermodynamic state functions and the understanding of their relationship with chemical reactions and chemical equilibrium;
- perform calculations in acid-base ionic equilibria, precipitation and complexation;
- understand spontaneous and non-spontaneous electrochemical processes.

Competences

- Adapt to new situations.

- Apply knowledge of chemistry to problem solving of a quantitative or qualitative nature in familiar and professional fields.
- Be ethically committed.
- Communicate orally and in writing in ones own language.
- Have numerical calculation skills.
- Learn autonomously.
- Manage the organisation and planning of tasks.
- Manage, analyse and synthesise information.
- Obtain information, including by digital means.
- Propose creative ideas and solutions.
- Reason in a critical manner
- Resolve problems and make decisions.
- Show an understanding of the basic concepts, principles, theories and facts of the different areas of chemistry.
- Show initiative and an enterprising spirit.
- Show motivation for quality.

Learning Outcomes

1. Adapt to new situations.
2. Be ethically committed.
3. Calculate changes in thermodynamic functions for a process and relate them with the corresponding thermodynamic variables.
4. Calculate the cell potentials for redox reactions and predict spontaneity from these potentials.
5. Communicate orally and in writing in ones own language.
6. Describe the complex ion concept its formulation and nomenclature.
7. Describe the concept of chemical equilibrium and the factors that can modify it.
8. Describe the concept of solubility and the variables that affect it.
9. Describe the concepts of electrochemical cells, galvanic batteries and electrolytic cells.
10. Describe the three principles of thermodynamics and the associated thermodynamic functions.
11. Determine concentrations of acid and bases from acid-base estimations.
12. Determine the velocity equation of an elementary process.
13. Have numerical calculation skills.
14. Identify the acid or Brønsted-base nature of chemical compounds in solution.
15. Identify the kinetic parameters of a chemical reaction, relate these to the reaction mechanism, and describe its dependence on temperature.
16. Identify the principal functional organic groups and describe their most important physical and chemical properties.
17. Identify the processes of reduction and oxidation in a redox reaction and equalise the corresponding chemical equation.
18. Learn autonomously.
19. Manage the organisation and planning of tasks.
20. Manage, analyse and synthesise information.
21. Name and formulate the organic and inorganic chemical compounds.
22. Obtain information, including by digital means.
23. Perform calculations of complexation and solubility equilibriums.
24. Predict the basic physical and chemical properties of organic compounds on the basis of the functional groups that they present.
25. Properly calculate the pH of aqueous dissolutions of acids, bases, as well as of mixtures of acids, bases and acids and bases.
26. Properly predict the spontaneity of a reaction from the functions of thermodynamic state.
27. Propose creative ideas and solutions.
28. Reason in a critical manner
29. Resolve problems and make decisions.
30. Show initiative and an enterprising spirit.
31. Show motivation for quality.
32. Work properly with chemical equations and the main magnitudes of matter.

33. Work properly with equilibrium constants and predict the effect of disturbance on chemical processes in equilibrium.

Content

BLOCK I. Thermodynamics and kinetic

Unit 1. Principles of thermodynamics

Unit 2. Thermochemistry

Unit 3. Chemical equilibrium

Unit 4. Kinetic

BLOCK II. Homogeneous and heterogeneous equilibrium

Unit 5. Homogeneous equilibrium in solution

Unit 6. Heterogeneous equilibrium

Unit 7. Electrochemistry

Methodology

The course consists of two types of supervised activities, theoretical classes and problem classes, which are distributed throughout the course in an approximate ratio of 3 to 1.

Theoretical classes

Through the exhibitions of the teacher the student must acquire the own knowledge of this subject and complement them with the study of each subject 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 classes will be open to the participation of the students, who will be able to raise to the professor the questions and clarifications that consider necessary.

Problem classes

The objective of this supervised activity is to solve problems and questions that have previously been raised to students through the Virtual Campus and that have had to be resolved previously, in a group or individually. Due to the smaller number of students in this type of classes, it is intended to stimulate the participation of students in the discussion of the alternatives to solve the problems, taking advantage of it to consolidate the knowledge acquired in the theory classes and in the study staff

Seminars

Final sessions of each block to raise specific doubts regarding the theoretical concepts or their application to problems.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Problem classes	20	0.8	1, 21, 18, 3, 25, 4, 5, 30, 31, 11, 12, 19, 20, 14, 16, 17, 2, 22, 26, 24, 27,

Seminars	2	0.08	1, 18, 5, 30, 31, 7, 10, 15, 16, 2, 27, 28, 29, 13
Theory classes	52	2.08	3, 25, 4, 31, 7, 6, 8, 9, 10, 11, 12, 14, 15, 17, 2, 22, 26, 27, 28, 23, 33
Type: Autonomous			
Study and completion of exercises	120	4.8	1, 21, 18, 3, 25, 4, 30, 31, 7, 6, 8, 9, 10, 11, 12, 19, 20, 14, 15, 16, 17, 2, 22, 26, 24, 27, 28, 23, 13, 33, 32

Assessment

The final grade of the subject is obtained from the exam notes and the continuous work of the student (learning evidences).

Weighted average of the exams of the subject = $0.50 \times \text{note exam block I} + 0.50 \times \text{note exam block II}$

Final mark of the course = $0.85 \times \text{weighted average mark of the exams of the subject} + 0.15 \times \text{note continuous work}$

To pass the subject, the following two conditions must be fulfilled:

- 1) The final grade of the subject should be ≥ 5.0
- 2) The mark of the examination of each block must be ≥ 3.0

Students who do not pass the subject because the grade of one of the two blocks is < 3.0 , regardless of whether the final grade is greater or equal to 5.0, they will obtain a maximum final grade of 4.5 considering- if the subject is suspended.

The notes of the students approved may be increased in the final minutes up to 1.0 points in order to achieve the distribution between approved, notable, excellent and MH that the professors consider appropriate.

Continued work:

- 1) Evidence of each student will be collected in each of the two blocks throughout the semester (problems solved individually or in groups, self-assessments on the virtual campus, short tests in class, tests, etc ...).
- 2) The note of the continuous work will be the average of the notes of the evidences collected throughout the course. The fact of not appearing to evidence implies a zero in that evidence.

Exams:

- 1) An examination will be carried out at the end of each block (examination of block I and examination of block II).
- 2) At the end of the semester will be offered examinations of recovery of the two blocks (exams of second option).

- To participate in the recovery, the students must have been previously evaluated in a series of activities whose weight equals to a minimum of two thirds of the total grade of the subject.

- Students who have not obtained a minimum score of 3.0 in the final grade of the subject (examinations of the two blocks and the continuous work) may not be presented to the recovery exams.

There is the possibility that students who do not need it will be presented to second-choice exams to improve the qualification of the course.

For all students to submit to these second-choice exams (recovery or improvement), the block exam will be:

- a) equal to that of the second option exam, if the note of the second option exam > course examination note,
- b) equal to the average of the block exam and the second option exam, if the note of the second option of the option < course exam notes.

Use unauthorized methods during one of the examinations of the subject (copy or communicate with a colleague, use of cell phones, use of smart clocks, etc ...) will be penalized with a "suspense" rating in the global course of the current course.

To attend an examination of any block it is essential to bring an identification document (ID or university card) with a recent and good quality photograph.

"Not evaluable"

The subject will be described as "Not evaluable" when the student has not participated in any of the assessment activities of one of the blocks in which the subject is divided (exams and continuous work).

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Block I exam	42,5%	2	0.08	1, 21, 18, 3, 30, 31, 10, 12, 19, 15, 16, 2, 22, 26, 24, 27, 28, 29, 33, 32
Block II exam	42,5%	2	0.08	1, 21, 25, 4, 30, 31, 6, 8, 9, 11, 19, 20, 14, 16, 17, 2, 22, 27, 28, 23, 29, 32
Learning evidences	15%	2	0.08	21, 3, 25, 4, 7, 6, 8, 9, 10, 11, 14, 17, 26, 24, 29, 33, 32
Recovery exam	85%	0	0	1, 21, 3, 25, 4, 5, 31, 7, 6, 8, 9, 10, 11, 19, 20, 14, 15, 16, 17, 26, 24, 27, 28, 23, 29, 13, 33, 32

Bibliography

Textbook:

- QUIMICA GENERAL: PRINCIPIOS Y APLICACIONES MODERNAS, R. H. Petrucci, F. G. Herring, J.D. Madura i C. Bissonnette , Pearson Educación SA, 10ª edició, Madrid 2011 (ISBN: 978-84-8322-680-3).

Other support books:

- PRINCIPIOS DE QUÍMICA, P. Atkins i L. Jones, Médica Panamericana, 3ª edició, 2006.

- QUÍMICA, R. Chang, McGraw-Hill, 9ª edició, 2010.

- Physical Chemistry for the Biosciences, Chang, R. University Science Books, 2005. (Edició traduïda: Físicoquímica para las ciencias químicas y biológicas, 3a edición, MacGraw-Hill, 2008).

- Principios de Físico-química, Ira N. Levine, McGraw-Hill 6ª edició, 2014.