Universitat Autònoma de Barcelona

2022/2023

Chemistry for Physicists

Code: 100147
ECTS Credits: 6

Degree	Type	Year	Semester
2500097 Physics	FB	1	1

Contact

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Use of Languages

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

Teachers

Miquel Moreno Ferrer
Mireia Garcia Viloca

Prerequisites

There are no official prerequisites, however, it is highly advisable that the student has taken chemistry during high school.

Objectives and Contextualisation

The general goal of the subject is that students gain interest in natural chemical phenomena, i. e. in the study of matter and its transformations and the notion that these processes are based on general laws of physics.

In addition, another goal is to widen the acquired knowledge and hence the job perspectives.

The partial goals of the subject are the following ones:

1) To understand the fundamental role of thermodynamics in the study of chemical reactions.

2) To understand the chemical change, its characteristics and the ability to determine the direction of its spontaneous evolution.

3) To understand the importance of kinetics in the chemical change and to know its variables and the laws that determine it.

Competences

- Communicate complex information in an effective, clear and concise manner, either orally, in writing or through ICTs, and before both specialist and general publics
- Develop strategies for analysis, synthesis and communication that allow the concepts of physics to be transmitted in educational and dissemination-based contexts

- Develop the capacity for analysis and synthesis that allows the acquisition of knowledge and skills in different fields of physics, and apply to these fields the skills inherent within the degree of physics, contributing innovative and competitive proposals.
- Use critical reasoning, show analytical skills, correctly use technical language and develop logical arguments
- Work independently, have personal initiative and self-organisational skills in achieving results, in planning and in executing a project

Learning Outcomes

1. Apply knowledge of the structure of matter to explain the properties and reactivity of simple and complex substances.
2. Apply the principles of thermodynamics and kinetics in chemical processes.
3. Communicate complex information in an effective, clear and concise manner, either orally, in writing or through ICTs, in front of both specialist and general publics.
4. Identify different types of chemical reactions and determine the concentrations of the substances involved in the equilibrium.
5. Identify the factors determining the speed of chemical reactions.
6. Manage the information, planning and organization of individual and cooperative work in solving chemical problems.
7. Present and discuss with colleagues the same ideas on the nature of chemical processes studied.
8. Use critical reasoning, show analytical skills, correctly use technical language and develop logical arguments
9. Work independently, take initiative itself, be able to organize to achieve results and to plan and execute a project.

Content

Tema 1: Ideal gases

Tema 2: Principles of Termodynamics

Tema 3: Termodynamic relations

Tema 4: Termodynamics systems. Termochemistry

Tema 5: Spontaneous processes and equilibrium

Tema 6: Phase diagrams of one-component systems

Tema 7: Ideal solutions

Tema 8: Equilibria in the chemical reactions

Tema 9: Ionic equilibria

Tema 10: Basic concepts of chemical kinetics

Tema 11: Complex reactions. Reaction mechanisms

Methodology

The center of the learning process is the student's work. The student learns by working, and the mission of the teaching staff is to help him/her in this task (1) by providing information or showing him/her the sources where they can be obtained and (2) by accompanying his/her steps so that the learning process can be carried out effectively. In line with these ideas, and in accordance with the objectives of the subject, the development of the course is based on the following activities:

Theoretical classes:

The student acquires the scientific-technical knowledge of the subject by attending classes and participating in the construction of their own knowledge. In these, the explanations on the part of the teacher will alternate with posing questions and fostering discussion between the students. In order to complement them, it is necessary to study the topics of the subject. In the final classes 15 minute will be reserved so as the students may answer the survey about the course.

Classes of problems and exercises:

These sessions have a double mission, on the one hand, the scientific-technical concepts previously worked on in the theoretical classes are complemented by means of the resolution of problems. On the other hand, from the critical discussion of the exercises carried out, these classes are the natural forum in which to discuss the development of the work carried out by the student contributing the necessary knowledge to carry it out, or indicating where and how they can be acquired. The mission of the problem class is to act as a bridge between theoretical classes and autonomous work, promoting the capacity for analysis, critical reasoning, and problem-solving.

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.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Problems classes	15	0.6	1, 2, 5, 8
Theory classes	30	1.2	4, 5, 8
Type: Supervised			
Preparation of theory contents	6	0.24	7, 6
Type: Autonomous			
Problem solving	39.5	1.58	1, 2, 6, 4, 5, 8
Study of theory fundamentals	50.5	2.02	6

Assessment

In this subject, there will be a continuous evaluation. The final grade will be distributed among the following concepts:

- Evidences 20% (not recoverable)

- Partial Exams 80% (2 in total)

In order to pass the subject, the weighted mean of the two partial exams and the delivered evidences must be at least equal to 5.0. In addition, a minimum of 4 to each of the two partial exams is needed have presented all the works.

- Final examination of recovery 80%. Optional. It includes the whole subject matter, with the aim of recovering the subject or improving the final grade. The grade of the final exam will replace the grade obtained from the combination of the two partial exams. It should be noted that only 80% of the subject can be recovered, corresponding to the grade of partial examinations. The marks of the works to be delivered cannot be

recovered. In order to take the final exam, the student must have taken at least 1 partial exam and all the works must have been handed in.

Non-evaluated result

A student will be considered to have obtained the non-evaluated qualification if the number of activities carried out during the whole subject is less than 50% of all the programmed activities of the subject.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evidences	20%	0	0	3, 7, 6, 8, 9
Final exam	80%	3	0.12	1, 2, 8
Partial exams	80%	6	0.24	1, 2, 4, 5

Bibliography

Most pertinent references

Chang, R. *Physical Chemistry for the Biosciences.* University Science Books, 2004

Atkins, P. W. *The Elements of Physical Chemistry*, Oxford University Press, 1996

Levine, I. N. *Physical Chemistry* 6th Edition, McGraw Hill, 2009.

Chang, R. *Physical Chemistry for chemical and biological sciences*, University Science Books, 2000.

Atkins, P. W. *Physical Chemistry,* 8th Edition, Oxford University Press (2006)

Globally, any general physical chemistry book can be readily used as a reference for this general course.

Software

There is no specific software to be used in this course