COURSE DATA

DATA SUBJECT

Code: 34240
Name: Chemistry
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1105 - Degree in Physics	Facultat de Física	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1105 - Degree in Physics	Chemistry	BASIC

COORDINATION

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SUMMARY

The subject Chemistry is a core subject that is taught in the first course of the graduate degree in Physics during the first semester. In the plan of studies it consists of a total of 6 ECTS credits.

With this course it is intended that a student essentially dives into those knowledge of chemistry that has been gaining in the courses of bachelor and that, in certain aspects, be complete. It is related to other subjects taught in the first year Physics I, Physics II and Introduction to Experimental Physics.

The descriptors proposed in this subject are nomenclature, the formulation and the stoichiometry, electronic structure and periodic table, chemical bonding, intermolecular forces, classification of solids, chemical kinetics , equilibrium in chemical reactions: acid- base, solubility and redox and introduction to organic chemistry.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

Physics and Chemistry taught at Highschool

COMPETENCES / LEARNING OUTCOMES

1105 - Degree in Physics

Ability to collect and interpret relevant data in order to make judgements.

Communication Skills (written and oral): Being able to communicate information, ideas, problems and solutions through argumentation and reasoning which are characteristic of the scientific activity, using basic concepts and tools of physics.

Foreign Language skills: Have improved command of English (or other foreign languages of interest) through: use of the basic literature, written and oral communication (scientific and technical English), participation in courses, study abroad via exchange programmes, and recognition of credits at foreign universities or research centres.

Learning ability: be able to enter new fields through independent study, in physics and science and technology in general.

Modelling & Problem solving skills: be able to identify the essentials of a process / situation and to set up a working model of the same; be able to perform the required approximations so as to reduce a problem to an approachable one. Critical thinking to construct physical models.

Physics general culture: Be familiar with the most important areas of physics and with those approaches which span many areas in physics, or connections of physics with other sciences.

Problem solving: be able to evaluate clearly the orders of magnitude in situations which are physically different, but show analogies, thus allowing the use of known solutions in new problems .

Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.

Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.

Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.

Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.

Theoretical understanding of physical phenomena: have a good understanding of the most important

physical theories (logical and mathematical structure, experimental support, described physical phenomena).

To know how to apply the knowledge acquired to professional activity, to know how to solve problems and develop and defend arguments, relying on this knowledge.

DESCRIPTION OF CONTENTS

1. Electronic structure of atoms and periodic table

Bohr's model. Introduction to quantum mechanics. Wave model for the hydrogen atom. Quantum numbers. Hydrogenic atomic orbitals. Effective nuclear charge. Electron configurations. Periodic table. Ionization energy. Electron affinity. Metals, nonmetals and metalloids.

2. Chemical bonding

Basic concepts. Lewis symbols. Covalent and ionic bonding. Bond polarity and electronegativity.

3. Molecular geometry and bonding theories

Moleculars shapes. The VSEPR model. Located covalent bond model. Hybrid orbitals. Molecular orbital model.

4. Intermolecular forces, liquids ans solids

A molecular comparison of liquids and solids. Intermolecular forces. van der Waals and London forces. Hidrogen bonding. Influence on the physical properties of the compounds. Classification of solids. Molecular sòlids. Covalent solids. Ionic solids.

5. Metals

General of metallic bonding. Compact packings. Periodic trends of metallic properties. Electron-sea model of metallic bonding. Band theory of electric conductivity. Electric conductors, semiconductors and insulators. Magnetism in transition metals.

6. Chemical reactions in aqueous solution

Review of basic organic-inorganic formulation and nomenclature. Stoichiometry problems: Mole Concept. Limiting reactants. Gases. Solutions. Properties of aqueous solutions. Strong and weak electrolytes. Concentrations of solutions. Solubility and precipitation. Solubility product constant. Effect of temperature on solubility. Acid-base reactions.

7. Termochemistry

Enthalpy. Enthalpies of reaction. Hess's law. Enthalpy of formation.

8. Chemical kinetics

Reaction rates: factors that affect reaction rates. Reaction order and stoichiometry. The Arrhenius equation.

9. Chemical equilibrium

The Chemical equilibrium. The equilibrium constant. Heterogeneous equilibria. Gibbs free energy. Relation between Gibbs energy and equilibrium constant. Spontaneous. Modification of equilibrium conditions: Le Châtellier's principle. Variation equilibrium constant with temperature: van't Hoff equation.

10. Electrochemistry

Oxidation-reduction reactions. Balancing redox equations. Voltaic cells and their emf. Standard reduction potentials. Electrochemical series. Nernst equation. Relation between cell potential and equilibrium constant. Batteries. Electrolysis.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	15,00
Theory	45,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	0,00
Preparation of lessons	75,00
Preparation for assessment activities	15,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

The development of the subject is structured concerning two axes: the sessions of theory and the

tutorships.

The classes of theory include an overview of the topic and all key concepts for the understanding of them. During these sessions it will be explained to the student a series of problems-type in order to identify the essential elements of approaching and solving the problems of this subject. In them, the exposure of the subject will be held by the teacher to the whole group.

The tutorials scheduled during the semester are 15 sessions. In them, the teacher guides students to deal by themselves with similar or more complex problems than those presented in theory. Once the work is completed, the problems will be corrected and analyzed by the students themselves on the board.

EVALUATION

The following evaluation systems will be used:

• Tests consisting of written exams.

• Continuous assessment of the activities and questionnaires through the Aula Virtual.

• Continuous assessment of each student based on classroom activities, participation and degree of involvement in the teaching-learning process.

The assessment of student learning will take into account all aspects stated in the methodology section of this guide. Students who do not attend class regularly must choose the mode B.

FIRST CALL

Mode A

Final grade: consisting of three parts:

• Tests consisting of written exams (70%).

• Continuous assessment of the activities and questionnaires through the Aula Virtual (25%).

• Continuous assessment of each student based on classroom activities, participation and degree of involvement in the teaching-learning process (5%).

The grade of the written exam must be equal to or greater than 4.5 in order to average. The minimum overall grade to pass the subject is 5.0.

Mode B (only those students who have passed in previous courses the virtual questionnaires through the Aula Virtual and the continuous evaluation will be able to take advantage of this mode):

Students may choose to be evaluated solely by means of an exam about the items covered in the lectures, tutorials and seminars, so that the teacher could assess whether the student has acquired skills and knowledge related to the subject. The minimum exam grade to pass the subject is 5.0.

SECOND CALL

In the second round, the same way that the first one will be followed.

REFERENCES

Basic:

- QUÍMICA: LA CIENCIA CENTRAL, T. L. Brown, H. E. Lemay, Jr, B. E. Bursten, C. J. Murphy y P. Woodward. Pearson, 11º ed., 2009.

Additional:

- QUÍMICA GENERAL, R.H. Petrucci, W.S. Harwood, F.G. Herring, Ed. Pearson Educación (Prentice Hall), 2003.
- QUÍMICA, R. Chang, Ed. Mc Graw Hill, 10ª ed., 2010.
- INTRODUCCIÓN A LA NOMENCLATURA DE SUSTANCIAS QUÍMICAS, W.R. Peterson., Ed. Reverte, 2010.