

Chemistry

Calendar: 1st day semester

Contact Hours: T 30,0h; TP 30,0h; OT 7,5h

Scientific Area: Chemistry

Intended learning outcomes (knowledge, skills and competences to be developed by the students):

After this course it is expected that the student will know and understand the fundamentals of general chemistry. The student should be able to recognize the atomic structure and chemical bonds, basic foundations of chemistry, with the aim of understanding the structure of matter and its transformations, as well as understand and to know how to implement qualitative and quantitative chemical analysis, distinguishing between the different chemical equilibrium. Understand the acid-base equilibrium, knowing how to use buffer solutions, titrations and acid-base volumetry.

Although the essentially introductory character of this UC, it is intended that students acquire skills allowing them a better adaptation and understanding of problems involved in chemical processes in the subsequent UC, essential to access profession as professionals in areas of Oil Technologies.

Syllabus:

1. Atomic structure. Atomic models. The quantum theory and electronic configuration. The periodic table and the periodic properties.
2. Chemical bond. Ionic, covalent and metallic bond. Bond energy structure and bond theories.
3. Intermolecular forces. Physical properties of the solutions, types of solutions, dissolution.
4. Chemical reactions and equations. Concentration. Electrolytes.
5. Chemical equilibrium. Equilibrium disorders.
6. Acid-base equilibrium. The concept of acid and base. Constants of acidity and alkalinity. The pH scale. The pH of solutions. Buffer solutions. Acid-base titrations.
7. Complexometric equilibrium. Equilibrium in complexation reactions. Chelation. Effect of pH. Complexometric titrations.

8. Equilibrium solubility, saturated and supersaturated solution. Solubility product. Effect of temperature, common ion, pH, acid-base complex formation.
9. Redox equilibrium. Oxidation-reduction reactions. Redox titrations.
10. Chemical kinetics.

Evidence of the syllabus coherence with the curricular unit's intended learning outcomes:

To achieve the scopes of this UC, the student learn the evolution of the concept of atom and molecules.

The student interprets the geometries adopted by molecules in the light of different models. The student understands the concept of intermolecular and intramolecular bond and the influence of the different intermolecular forces in the physical state and in the properties of matter.

Also in the syllabus, is presents the various types of chemical equilibrium in a way to provide to the student capabilities to develop qualitative and quantitative chemical analysis about the different equilibrium and apply the acquired concepts in practical problems of oil technologies.

References:

1. Romão Dias, A. - Ligação Química – 1st Ed., IST Press, Lisboa, 2006.
2. Samena de Araújo, M. - Exercícios sobre Ligação Química - 1st Ed., IST Press, Lisboa, 2010.
3. Atkins, P.; Jones, L. - Chemical Principles: The Quest for Insight - 5th Ed., W. H. Freeman, New York, 2010.
4. Atkins, P.; Jones, L. - Study Guide for Chemical Principles - 5th Ed., W. H. Freeman, New York, 2010.
5. Harris, D. C. - Quantitative Chemical Analysis - 7st Ed., W. H. Freeman, New York, 2006.
6. Harris, D. C. - Quantitative Chemical Analysis: Student Solutions Manual - 7st Ed., W. H. Freeman, New York, 2006.
7. Skoog, D.; West, D.; Holler F. J.; Crouch S. R. - Fundamentals of Analytical Chemistry - 8st Ed., Brooks Cole, Belmont, 2003