Universitat Autònoma de Barcelona

2018/2019

Chemistry

Code: 102828
ECTS Credits: 9

Degree	Type	Year	Semester
2501915 Environmental Sciences	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

Alicia Roque Cordova

Prerequisites

Students must hold the basic knowledge of high school chemistry courses or those that the students can learn in the courses of Chemistry offered by the Faculty of Sciences of the Autonomous University of Barcelona:

1. Expression of the concentration

Mol concept, Molarity (M), molality (m), normality (N),% by weight or volume, etc.

2. Stoichiometry of chemical reactions

Stoichiometric calculations.

3. Basic concepts of chemical equilibrium.

Chemical equilibrium and constant equilibrium. Expressions of the equilibrium constant. Factors that affect balance.

4. Chemical formulation

Inorganic compounds and organic compounds.

5. Balance of Chemical reactions

No redox reactions. Basics of redox reactions. Balance of redox Equations.

6. Ideal gases

General concepts Law of ideal gases.

Objectives and Contextualisation

The general objective is to contact, for the first time in the undergraduate studies, with the fundamental concepts of Chemistry. It is intended to become aware of the importance of chemistry in everyday life and, in a special way, in the environment.

The most specific objectives of the subject are:

1) Structural and molecular study of matter and the world around us.

2) Macroscopic interpretation of chemical phenomena:

a. Chemical thermodynamics: chemical systems in equilibrium.

b. Chemical kinetics: how chemical changes take place and at what velocity.

3) Introduction to the properties of organic compounds and biomolecules.

Content

BLOCK I - BOND AND STRUCTURE OF THE MATTER

1. Atoms and the atomic theory

The first discoveries of chemistry. The electrons and other discoveries of atomic physics. The nuclear atom. Electromagnetic radiation. Quantum theory. The Bohr atom. Atomic spectra. Duality corpuscle wave and uncertainty principle. Wave mechanics: wave function.

2. Hydrogen atom and polyelectronic atoms

The hydrogen atom. Hydrogenide orbital concept. Representation of the orbitals. Electronic spin. Polyelectronic atoms. Electronic configurations: rules for the distribution of electrons in orbitals.

3. The periodic table

Introduction to the periodic table. Historical introduction. Electronic configuration and periodic table. Metals, not metals and their ions. Periodic properties of the atoms: atomic radius and ionic radius. Ionization potential. Electronic affinity. Electronegativity. Other properties

4. Chemical bond

Lewis structures. Concepts of resonance, bond order, formal charge and oxidation state. Molecular geometry: theory of the repulsion of electronic pairs (VSEPR). Bond: order and energy. Theory of the valence bond: hybrid orbitals. Theory of molecular orbitals. Metallic bond: theory of bands, metals, semiconductors and insulators.

5. Gases, liquids and solids

Gases. Formation of condensed phases. Intermolecular forces: hydrogen bonding, van der Waals forces. The chemical bond as an intermolecular force.

BLOCK II - THERMODYNAMICS, KINETICS AND BALANCE

6. Thermochemistry, spontaneity and balance

Basic concepts: heat, heat capacity and specific heat. Reaction heat. First principle of thermodynamics: internal energy, work and state function. Enthalpy: Hess's law, enthalpy of standard formation and standard reaction enthalpy. The problem of energy: fuels. Spontaneity. Entropy Second principle of thermodynamics: Gibbs energy, standard Gibbs energy. Energy changes in theformation of ionic crystals: reticular energy, Born-Fajans-Haber cycle.

7. Physical Balance

Solubility of gases. Vapor pressure of the solutions. Condition of phase balance. Rule of the phases. Phase diagram of a pure substance. Ideal solutions Law of Raoult. Diluted solutions Henry's Law. Colligative properties.

8. Principles of chemical equilibrium

Dissolution processes. Concept of balance, expressions and relationships between equilibrium constants. The reaction quotient Q. Modifications of equilibrium conditions: Le Châtelier principle. Balance calculations: examples. Relationship between the Gibbs energy and the equilibrium constant; prediction of the direction of a chemical change.

9. Reactions in aqueous solution

Stoichiometric calculations in aqueous solutions. Acid-base reactions. Precipitation reactions. General principles of redox reactions.

10. Introduction to chemical kinetics

Velocity of a chemical reaction. Equation of velocity and reaction order. Reaction velocity and temperature. Catalysis.

BLOCK III - ORGANIC COMPOUNDS AND BIOMOLECULES

11. Carbon chemistry

Aliphatic and aromatic hydrocarbons.- Halogenated derivatives.- Alcohols, ethers and thiols.- The carbonyl group: aldehydes and ketones.- The carboxyl group: acids and derivatives.- The amino group.- Organic compounds, pollution and toxicity.

12. Biomolecules

Chemical elements present in living beings. Biomolecules Levels of structural organization of biomolecules. Proteins: sequence, secondary and three-dimensional structure. Importance of weak interactions in aqueous medium. Nucleotides and nucleic acids: structure of DNA and organization of genetic material. Sugars and lipids as structural, reserve and functional compounds

13. Enzymes and enzymatic catalysis

Nature and function of enzymes. Effects of catalysts in chemical reactions. Enzymatic activity: concept of initial velocity. Enzymatic kinetics: Michaelis-Menten model. Regulation of enzimatic activity. Biomedical and biotechnological applications.

14. Structural characterization of biomolecules

Introduction to the techniques of purification and characterization of biomolecules. Recombinant DNA techniques.