



PROGRAMS AND BIBLIOGRAPHY

Subject	
Code	Name
QG101	Chemistry I

Vector

OF:S-5 T:004 P:000 L:000 O:000 D:000 HS:004 SL:004 C:004 AV:N EX:S FM:75%

Pre requirement

None

Summary

Atomic structure, Periodic Properties of the Elements. Chemical bond; structure and properties of substances. Basics of physical chemistry: thermodynamics, chemical equilibrium and electrochemical cells.

Program

1. International unit system
2. Units for energy, mass, time, space, volume, pressure, temperature, density and velocity.
3. Stoichiometry and concept of mol. Molecular weight and chemical formula. Balancing Chemical Equations. Calculations based on chemical equations. Calculations with limiting reactants.
4. Atomic structure and periodic table. The electric nature of matter. Electron charge. Atomic nucleus. The Periodic law. The electron spin and the Pauli exclusion principle. Electronic configuration of the elements.
5. The chemical bond and Lewis symbols. Covalent bond. Polar molecules and electronegativity. Oxidation and reduction. Oxidation number. Chemical compounds and nomenclature. Ionic bond. Factors that influence the formation of ionic compounds. Crystalline solids. Defects in crystals. Band theory of solids. Molecular orbital theory.
6. Metals, nonmetals and metalloids. Trends in metallic character. Chemical properties.
7. Metalloids and nonmetals. Compounds with oxygen and nonmetals. Oxoacids and oxoanions. Polymeric oxoacids and oxoanions.
8. Chemical reactions in aqueous solution. Terminology in solutions. Electrolytes. Chemical equilibrium. Ionic reactions. Acids and bases in aqueous solutions. Double replacement reactions. Oxidation-reduction reactions. Balancing. Molarity. Equivalent weight. Normality.
9. Properties of solutions. Types of solutions. Units of concentrations. The dissolution process. Heat of solution. Solubility and temperature. Fractional crystallization.
10. Chemical equilibrium and the law of mass action. Equilibrium constant. Kinetics and equilibrium. Thermodynamics and equilibrium. Relationship between K_p and K_c . Heterogeneous equilibrium. Le Chatelier-Braun principle. Equilibrium calculations.
11. Acids and bases in water. Definitions. Acid and base strength. Autoionization of water and pH. Weak electrolyte dissociation. Buffer solutions. Hydrolysis. pH indicators.

12. Solubility. Solubility product. Common ion and solubility.
13. Thermochemistry and ΔH . Specific heat. First law of thermodynamics. Spontaneity of reactions. ΔG and ΔS . Second law of thermodynamics.
14. Rate of reactions. Catalysis.
15. Relationship between properties and structure.
16. Oxidation and reduction.
17. Polymers.

Bibliography

- P. Atkins & L. Jones, Chemical Principles: The quest for insight, 2a ed., W.H. Freeman, 2002.
- J.C. Kotz & P. Treichel Jr., Chemistry & Chemical Reactivity Saunders College Publishing, 4a ed., 1999.

Evaluation criteria

For grading policy, see: Regimento Geral de Graduação, Seção I – Normas Gerais, Capítulo V – Da Avaliação do Aluno na Disciplina. Students are required to attend 75 % of the lectures. For further details, see: Regimento Geral de Graduação, capítulo VI, seção X, artigo 72.