BASIC CHEMISTRY – A BRIDGE COURSE TO UNDER GRADUATE LEVEL

COURSE CODE: CH1GCMBR01

Total Instructional Hours: 35 Hrs

Course Objectives

To provide an introduction to basic concepts in inorganic, organic, physical and analytical chemistry to under graduate students.

1. Inorganic Chemistry (9 hr)

1.1Atomic structure 2hr

Atomic orbitals and concept of atomic orbitals, shaped of s, p and d orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity, Afbau principle, electronic configuration of elements up to atomic number 20.

1.2 Introduction to chemical bonding 3hr

Types of chemical bonds with suitable examples, Hydrogen bonding- inter and intramolecular hydrogen bonding, abnormal behaviour of water molecule

1.3 Introduction to co-ordination Chemistry 3 hr

Ligands, types, hapticity with suitable examples, chelate effect, Werner's theory, isomerism in co-ordination compounds, nomenclature

1.4 Metallurgy 1 hr

Basic metallurgical operations, Pulverization, calcination, roasting and refining

2. Organic Chemistry (9 Hrs)

2.1 Introduction to Organic chemistry 2 Hrs

Importance of organic chemistry, general classification of organic compounds, -Homologous series, functional groups, IUPAC nomenclature of organic compounds (Alkanes, alkenes, alkynes, alcohols, aldehydes, ketones, ethers, acids, esters, amines).

2.2 Qualitative analysis of organic compounds 2Hrs

Detection of elements- Lassaigne's test, analysis of carbohydrate, hydrocarbon, carboxylic acid, amide, amine, nitro compounds, aldehyde, ketone, ester.

2.3 Basic concepts in organic reactions 5Hrs

Modern concept of bonding in organic molecules, SP^3, Sp^2 and SP hybridization in carbon by taking methane, ethane, ethene, benzene and ethyne as examples.

Bond fission- homolytic fission and heterolytic fission, formation of reaction intermediates (carbocations, carbanions and free radicals, 1^0,2^0 and 3^0), electron displacement effects, stability of reaction intermediates

Reagents and reactions in organic chemistry-Nucleophiles (OH^-,X^-) electrophiles (NO_2^+,SO_3) and free radicals (Cl^-)

Types of organic reactions with one example for each-Substitution reactions -Electrophilic substitution, Nucleophilic substitution, Addition reactions, Elimination reaction, Rearrangement.

3. Physical chemistry (9 Hrs)

3.1 States of matter 3 Hrs

Characteristics of three states of matter liquefaction of gases- critical temperature- different molecular velocities.

Vapour pressure, elementary ideas of surface tension and viscosity of liquids.
Electrical and magnetic properties of solid substances-Band theory of solids, Semi-conductors (n and p-type semi-conductors.)

Colligative properties of dilute solutions- abnormal molecular mass.

3.2 Electrochemistry 2 Hrs

Difference between electro chemical cell and electrolytic cells, Laws of electrolysis
Batteries-types, Galvanic cell, Fuel cell- Corrosion

3.3 Chemical Kinetics and Surface Chemistry 3 Hrs

Rate of chemical reaction- Basic idea about collision theory of reaction- Arrhenius equation

Adsorption vs Absorption-, adsorbent, adsorbate-types of adsorption- Catalysis - homogeneous and heterogeneous, enzyme catalysis

3.4 Thermodynamics 1 Hr

Extensive and intensive thermodynamic properties – First and Second Laws of TD- Heat capacity and specific heat capacity

4. Analytical Chemistry (8 hr)

4.1 Basic concepts in Analytical Chemistry 5 hr

Mole concept, Calculation of molecular weight, Molar volume, oxidation, reduction, oxidation number and valency, variable valency, calculation of oxidation state

Normality, molarity, molality, mole fraction and parts per million, Equivalent weight and molecular weight calculations.

Normality equation, quantitative dilution problems, Primary and secondary standards Application in qualitative analysis, solubility product and common ion effect

4.2 Chemistry Lab – general awareness 3hr

Safety in chemistry lab, introduction to laboratory glass wares, pipette, burette, standard flask, separating funnel, funnel, titration experiment and preparation of standard solution

References

1. Principles of physical chemistry, B. R. Puri, L.R. Sharma, Madan S. Pathania
2. Principles of Inorganic Chemistry, B.R. Puri, L.R. Sharma, K.C. Kalia
3. A text book of Organic Chemistry, Arun Bahl, B.S. Bhal
4. Vogel's textbook of Quantitative Chemical Analysis, Pearson Education. Ltd.