

**Chemistry Entrance Test 2022-2023
for M.Sc. Admission**

Syllabus

1. Chemical Bonding, ionic bond, metallic Bond, coordination complexes, electronic spectra, magnetism, and isomerization in coordination compounds
2. Organic structure, covalent bond, hybridization, conjugated molecules, Huckel molecular orbital theory of conjugated systems. isomerism in organic compound, stereoisomerism; conformational studies of ethane, n-butane, cyclohexane
3. Organic spectroscopic, principles and applications of UV-Visible, FTIR, NMR. Modern techniques in structural elucidation of compounds by UV-VIS, IR, & NMR Spectroscopy.
4. Kinetics and catalysis:, order & molecularity of reactions, kinetics of 0, 1st and 2nd reactions, characteristics of catalyst, types of catalysis, catalytic poison, theories of catalysis.
5. Chemical equilibrium, criteria of thermodynamic equilibrium, degree of advancement of reaction, chemical equilibria in ideal gases, concept of fugacity. Thermodynamic derivation of relation between Gibbs free energy of reaction and reaction quotient.
6. Chemistry of hydrocarbons, Chemistry of aliphatic hydrocarbon, Carbon-Carbon bonds, Formation and reactions of alkanes, Aromatic hydrocarbons, aromaticity, Hückel's rule, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples, electrophilic aromatic substitution.
7. Energetics of hybridization, equivalent and non-equivalent hybrid orbitals. Bent's rule, Resonance and resonance energy, Molecular orbital theory. Molecular orbital diagrams of diatomic and simple polyatomic molecules.
8. Acids and Bases, Brönsted-Lowry concept of acid-base reactions, solvated proton, relative strength of acids, types of acid-base reactions, levelling solvents, Lewis acid-base concept, Classification of Lewis acids, Hard and Soft Acids and Bases (HSAB) Application of HSAB principle.
9. Qualitative aspect of Ligand field and MO Theory. IUPAC nomenclature of coordination compounds, isomerism in coordination compounds. Stereochemistry of complexes with 4 and 6 coordination numbers. Chelate effect, polynuclear complexes, Labile and inert complexes.
10. Arrhenius theory of electrolytic dissociation. Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Wien effect, Debye-Falkenhagen effect, Walden's rules. Ionic velocities, mobilities and their determinations, transference numbers and their relation to ionic mobilities, determination of transference numbers using Hittorf and Moving Boundary methods.

Model Questions

1. How many covalent bonds does carbon form?
 - (a) 1
 - (b) 2
 - (c) 3
 - (d) 4 (ANS)**

2. Chloroethane reacts with sodium in presence of dry ethane. The product is
 - (a) Ethane
 - (b) Ethene
 - (c) Butane (ANS)**
 - (d) Butene

3. Which of the following spectroscopy techniques is associated with molecular emission?
 - (a) UV-Visible spectroscopy
 - (b) IR Spectroscopy
 - (c) Fluorescence spectroscopy (ANS)**
 - (d) NMR spectroscopy

4. A catalyst
 - (a) Alter the position of equilibrium in a reversible reaction
 - (b) Does not alter the position of equilibrium in a reversible reaction. (ANS)**
 - (c) It does not hasten the approach of equilibrium.
 - (d) None of the above.

5. Which compound will readily undergo sulphonation?
 - (a) Toluene (ANS)**
 - (b) Benzene
 - (c) Nitrobenzene
 - (d) Chlorobenzene