CLASS 11

A. Some Basic Concepts of Chemistry

1. Law of definite proportions.
2. Law of multiple proportions.
3. Law of reciprocal proportions.
4. Gay Lussac's law of gaseous volumes.
5. Equivalent weight
6. Normality
7. Molarity
8. Molality
9. Mole fraction

B. Structure of Atom

1. Types of spectra: emission and absorption spectra. Band and line spectra to be discussed.
2. Postulates of Bohr's theory
3. Merits of Bohr's atomic model
4. Hydrogen spectra.
5. Calculations based on Rydberg's formula.
6. Defects in Bohr's Model.
7. Quantum numbers; shape, size and orientation of s, p and d orbitals only (no derivation).
8. Aufbau principle
9. Pauli's exclusion principle
10. Hund's rule of maximum multiplicity
11. Electronic configuration of elements in terms of s, p, d, f subshells.
12. De Broglie's equation. Numericals.
13. Heisenberg's Uncertainty Principle. Numericals.
14. Electronic configuration of elements and ions in terms of s, p, d, f subshells and stability of half-filled and completely filled orbitals.

C. Classification of Elements and Periodicity in Properties

1. Atomic radius
2. Ionic radius
3. Ionisation enthalpy
4. Electron gain enthalpy
5. Electronegativity
6. Metallic and non-metallic characteristics.
7. Screening effect and shielding effect

D. Chemical Bonding and Molecular structure

1. Failure of octet rule, due to either incomplete octet or exceeding of octet with suitable examples.
2. Fajan's rules: statements, conditions for electrovalency and covalency. Polar and non polar bonds should be correlated with Fajan's rules.
3. Valence Shell Electron Pair Repulsion (VSEPR) Theory
4. Hybridisation and shapes of molecules
5. Molecular orbital theory: O_2 molecule. Relative stabilities of O_2, O_2^-, O_2^{2-}, O_2^+ and N_2, N_2^+, N_2^-, N_2^{2-}.
6. Co-ordinate or dative covalent bond: chlorous acid, chloric acid, perchloric acid, ammonium ion, hydronium ion, nitric acid, ozone.
7. Inter-molecular hydrogen bonding in detail taking hydrogen fluoride, water and ice and ethanol into

account. Intramolecular hydrogen bonding.

E. States of Matter: Gases and Liquids

1. Intermolecular interactions (van der Waals forces), types of van der Waals forces, melting and boiling points.
2. Boyle's law
3. Charles' law
4. Absolute temperature
5. Avogadro's law and Avogadro's constant. Relationship between the mole and Avogadro's number.
6. Dalton's law
7. Graham's law of diffusion.
8. Ideal gas equation PV = nrt
9. Van der Waals' equation $(P + a/V^2)$ (V-b)= RT for one mole of a gas. (numericals not required).The pressure correction and volume correction may be explained. Significance and units of 'a' and 'b' (van der Waals' constant).
10. Liquefaction of gases, critical temperature.

F. Chemical Thermodynamics

1. Internal energy
2. Work done
3. Heat
4. State function and path function
5. Mathematical statement of the first law.
6. Significance of first law of thermodynamics.
7. Enthalpy
8. Hess' Law
9. Entropy
10. Statement of Second Law in terms of entropy
11. Gibb's free energy of the system.
12. Relationship between change in Gibb's free energy and equilibrium constant of a chemical reaction.

G. Chemical Equilibrium.

1. Irreversible and reversible reactions.
2. Characteristics of chemical equilibrium; dynamic nature.
3. Law of mass action
4. K_c,K_p. Relationship between K_p and K_c;
5. Characteristics of equilibrium constant
6. Units for equilibrium constant
    a. Synthesis of ammonia by Haber's process.
    b. The dissociation of dinitrogen tetra oxide.
    c. Hydrolysis of simple esters.
    d. The contact process for the manufacture of sulphuric acid.
7. Le Chatelier's Principle. Statement
    a. Change of concentration.
    b. Change of temperature.
    c. Change of pressure.
    d. Effect of catalyst.

e. Addition of inert gas.

H. Ionic equilibrium

1. Ostwald's dilution law
2. Arrhenius, Brönsted-Lowry and Lewis concept of acids and bases,
3. Ionic product of water – definition, ph, poh, pk_w of solutions.
4. Ph indicators and their choice in titrimetry.
5. Common ion effect
6. Salt hydrolysis
7. Buffer solutions:Henderson equation.
8. Solubility product

I. Redox Reactions

1. Oxidation number
2. Oxidation and reduction in terms of change in oxidation number.
3. Balancing of redox reactions in acidic and basic medium by oxidation number and ion- electron method.

J. Hydrogen

1. Soft and hard water, and removal of hardness of water, heavy water.
2. Hydrogen peroxide:
   a. Preparation from peroxide
   b. Structure
   c. Reaction with KI, PbS, acidified $FeSO_4$, acidified $KMnO_4$ and chlorine.

K.S-Block Elements (Alkali and Alkaline Earth Metals)

1. Atomic and ionic radii
2. Electropositive /electronegative character
3. Ionisation enthalpy
4. Reducing/oxidising nature.
5. Sodium chloride - uses.
6. Sodium hydroxide - only the principle of preparation by Castner-Kellner cell. Uses.
7. Sodium carbonate – principal and equation of Solvay's process. Uses.
8. Sodium thiosulphate - preparation from sodium sulphite and its reaction with iodine, dilute acids and silver nitrate. Uses.
9. Calcium oxide - preparation from limestone; reaction with water, carbon dioxide and silica. Uses.
10. Calcium hydroxide – preparation from calcium oxide and uses.
11. Calcium carbonate – preparation from calcium hydroxide and uses.
12. Plaster of Paris - preparation from gypsum. Uses.

L.Some p -Block Elements

1. Lewis acid character of boron halides
2. Amphoteric nature of aluminium, alums.
3. Boric acid – preparation and action of heat.
4. Aluminium: Reactions with acids and alkalies.
5. Alums – preparation and uses.
6. Silicon carbide - preparation from silica. Uses.
7. Silicones - general method of preparation. Uses.

M.Organic Chemistry - Some Basic Principles and Techniques.

1. IUPAC nomenclature of Aliphatic, alicyclic and aromatic compounds.

2. Chain isomerism
3. Positional isomerism
4. Functional isomerism
5. Metamerism
6. Tautomerism
7. Geometrical isomerism
8. Optical isomerism
9. Detection of elements (qualitative analysis) such as carbon, hydrogen, nitrogen, halogens and sulphur.
10. Estimation of carbon, hydrogen, nitrogen, halogens, sulphur and phosphorous:
11. Substitution, addition, elimination reactions
12. Free radicals, carbocation, carbanion
13. Electrophiles and nucleophiles
14. Inductive, electromeric, mesomeric effect and hyperconjugation
15. Free radicals and polar mechanisms

N. Hydrocarbons

1. General methods of preparation ofalkanes:
    a. From sodium salts of carboxylic acids
    b. Decarboxylation and Kolbe's electrolytic method
    c. From alcohols
    d. Alkyl halides (Wurtz reaction).
    e. From aldehydes and Grignard's Reagent.
2. Reaction with chlorine,oxygen in presence of catalyst (formation of alcohol, aldehyde, and carboxylic acid). Uses of alkanes.
3. General methods of preparation of alkenes :
    a. Dehydration of alcohols
    b. Dehydrohalogenation of alkyl halides (from vicinal dihalides)
    c. Kolbe's electrolytic method and from alkynes.
4. Addition reactions (hydrogen, halogens, hydrogen halides, sulphuric acid, water).
5. Oxidation: complete combustion, hot and cold alkaline $kmno_4$ (Baeyer's reagent)
6. Ozonolysis.
7. Saytzeff's rule
8. General methods of preparations of alkynes.
    a. Manufacture of ethyne by calcium carbide and from natural gas.
    b. Dehydrohalogenation and Kolbe's electrolytic method.
9. Addition reactions (hydrogen, halogens, hydrogen halides and water)
10. Acidic nature of alkynes, formation of acetylides.

10. Oxidation: complete combustion, hot and cold alkaline $kmno_4$ (Baeyer's reagent), ozonolysis.
11. Polymerisation. Uses of alkynes.
12. Distinguishing test between Alkane, Alkene and Alkyne.

O. Aromatic Hydrocarbons

1. Benzene: Preparation from sodium benzoate and from phenol.
2. Electrophilic substitution reactions with mechanism (halogenation, nitration, sulphonation).
3. Alkylation, acetylation – Friedel Crafts reaction.
4. Directive influence (o-, p-, and m-) of substituents in electrophilic and nucleophilic substitutions.
5. Oxidation: catalytic oxidation, reaction with ozone.
6. Addition reactions with hydrogen, chlorine, bromine.
7. Pyrolysis (formation of bi-phenyl). Uses.