

Chemistry Syllabus for 1st & 2nd year / A - Level

Chapter 1: Stoichiometry

1.1: Mole

1.2: Representative Particles (Avogadro's Number))

- Representative particles
- Avogadro's Number
- More on Avogadro's Number
- Stoichiometry
- Mole-Mass Calculations
- Calculating Moles from Mass
- Calculating Mass from Moles
- Calculating Mass in Grams and Moles
- Mole-Mass Calculations
- Mole-Particle Calculations
- More on Mole-Particle Calculations
- Calculating Mass in Grams of a Single Atom
- Calculating Number of Ions in the Compounds
- Calculating Number of Particles from Mass
- Calculating Mass and Moles of an Element from a Compound
- Molar Gas Volume
- Calculations of Molar Gas Volume

1.3: Percentage Composition

- The Empirical Formula from the Percentage Composition
- Calculating Percentage Composition

1.4: Excess and Limiting Reactants

- Limiting Reactants
- Importance of Limiting Reactants
- More on Importance of Limiting Reactants
- Calculating Limiting and Excess Reactants

1.5: Theoretical, Actual and Percent Yield

- Percentage Yield
- More on Yield
- Calculation of Percentage Yield

Chapter 2: Atomic Structure

2.1: Discharge tube experiments

- Atom and its structure
- Discovery of Electron(Cathode rays)
- Properties of Cathode rays
- More on Properties of Cathode rays
- Discovery of Proton
- Properties of positive rays
- Discovery of Neutron
- Properties of Neutron
- Measurement of e/m Value of Electron
- Measurement of Charge on Electron-Millikan's Drop Method
- More on Measurement of Charge on Electron
- Mass of Electron
- Properties of Fundamental Particles
- Rutherford's Atomic Model
- Advantages and Defects in Rutherford's Atomic Model

2.2: Bohr's Atomic Model and its Applications

- Bohr's Atomic Theory
- Derivation of Radius of Revolving Electron in n th Orbit
- More on Derivation of Radius of Revolving Electron in n th Orbit
- The energy of Revolving Electron
- More on Energy of Revolving Electron
- The energy of Electron in n th Orbit
- Calculations of Frequency of Photons by Bohr's Theory
- Calculations of Wave Numbers of Photons by Bohr's Theory
- Defects of Bohr's Atomic Model
- More on Defects of Bohr's Atomic Model
- Hydrogen Spectrum
- More on Hydrogen Spectrum
- Calculation of Energy for Lithium-ion
- Lyman Series
- Balmer Series
- Paschen Series
- Brackett series
- Pfund series

- Calculation of Wave Number of Spectral series

2.3: Plank's Quantum Theory

- Planck's Quantum Theory
- More on Planck's Quantum Theory
- Conversion of Energy to Wavelength, Frequency and Wave Number

2.4: X-rays

- X-Rays
- Types of X-rays
- Study of X-Rays by Moseley
- Importance of Moseley's Law
- Uses of X-Rays

2.5: The Quantum Numbers and Orbitals

- Quantum Numbers
- Principal Quantum Numbers (n)
- Azimuthal Quantum Numbers (l)
- Magnetic Quantum Numbers (m)
- Spin Quantum Numbers (s)
- Quantum Numbers of Electrons
- Calculation of Combination of Quantum Numbers
- Shape of s-Orbitals
- Shapes of p-Orbitals
- Shapes of d-Orbitals

2.6: Electronic Configurations

- (n+1) Rule
- Aufbau Principle
- Pauli's Exclusion Principle and Hund's Rule
- Magnetic properties

Chapter 3: Theories of Covalent Bonding and Shapes of Molecules

3.1: Shapes of Molecules

- Shapes of Molecule

3.2: Theories of Covalent Bonding

- Valence Shell Electron Pair Repulsion Theory
- Molecules Containing Two-Electron Pairs (AB₂ Type) and AB₃ Type
- AB₂E and AB₃ Type With Multiple Bonds
- AB₄ Type With No Lone Pairs AB₃E₁ Type and AB₂E₂
- Molecules Containing Five Electron Pairs (AB₅ Type)
- Molecules Containing Six Electron Pairs (AB₆ Type)
- Valence Bond Theory
- More on Valence Bond Theory
- Formation of H₂ Molecule
- Formation of Cl₂ Molecule
- Formation of HF molecule
- Formation of O₂ molecule
- Formation of N₂ molecule
- Strength of Sigma and Pi Bonds
- Ground and the Excited State of Carbon
- Sp³ Hybridization
- More on Sp³ Hybridization
- Bonding and Structure of Ammonia
- Bonding and Structure of Water
- sp²-Hybridization; Bonding and Structure of Boron Trifluoride
- Sp² Hybridization
- Sp Hybridization
- Bonding and Structure of Beryllium Dichloride
- Molecular Orbital Theory
- Head on approach and sideways Approach
- Relative Energies of the Molecular Orbitals
- MOT Diagrams for O₂ and F₂
- MOT Diagrams for Be₂, B₂ and N₂
- Molecular Orbital Structure of He₂
- Molecular Orbital energy level Diagrams of Li₂
- Comparison between VBT and MOT

3.3: Bond Energy(Bond Enthalpy)

- Bond Energy
- Ionic Character and Bond Energy
- More on Ionic Character and Bond Energy
- Bond Length
- More on Bond Length
- Dipole Moment

- Dipole Moments and Molecular Structure; Percentage Ionic Character

3.4: Effect of Bonding on the Properties of Compounds

- Metallic Solids
- Giant Molecules
- Energetics of Solution

Chapter 4: Gases

4.1: Kinetic Molecular Theory of Gases

- Kinetic Molecular Theory of Gases
- More on Kinetic Molecular Theory of Gases
- The motion of Particles of a Gas

4.2: Absolute Temperature scale on the Basis of Charle's Law

- Charles's Law
- Experimental Verification of Charles's Law
- Explanation of Charle's Law from Kinetic Molecular Theory of Gases
- Units of Pressure
- Determining Pressure of a Gas
- Derivation of Absolute Zero
- Graphical Explanation of Charles' Law
- Kinetic Interpretation of Temperature
- Boyle's Law of Gases
- Experimental Verification of Boyle's Law
- Graphical Explanation of Boyle's Law

4.3: Avogadro's Law

- Avogadro's Law

4.4: Ideal Gas Equation

- General Gas Equation
- Ideal Gas Constant R
- Density of an Ideal Gas

4.5: Deviation from Ideal Gas Behaviour

- Causes for Deviations from Ideality

4.6: Van der Waal's Equation

- Van der Waals Equation for Real Gases; Volume Correction
- Pressure Correction

4.7: Daltons Law of Partial Pressure and its Applications

- Dalton's Law of Partial Pressures
- Applications of Dalton's Law of Partial Pressures

4.8: Graham's Law of Diffusion and Effusion

- Diffusion and Effusion in Gases
- Effect of Molecular Mass on the Rate of Diffusion
- Demonstration of Graham's Law

4.9: Liquefaction of Gases

- General Principle of Liquefaction
- Joule Thomson Effect
- Linde's Method of Liquefaction of Gases

4.10: Fourth state of Matter - The Plasma

Plasma

Chapter 5: Liquids

5.1: Kinetic Molecular Interpretation of Liquids

- Postulates of Kinetic Molecular Theory of Liquids
- Shape and Volume of Liquids
- Compressibility and Ease of Flow of Liquids
- Evaporation in Liquids and its Uses
- Evaporation
- Dissolving, Filtering and Evaporating

5.2: Intermolecular forces(Van der Waal's Forces)

- Intermolecular Forces
- Dipole-Dipole Interactions
- Dipole-Induced Dipole Forces
- London Dispersion Forces
- Hydrogen Bonding in Paints, Dyes and Textile Materials
- Function of Soaps

- The solubility of Hydrogen-Bonded Molecules

5.3: Physical properties of Liquids

- Vapour Pressure
- Effect of Temperature on Vapour Pressure
- Boiling Point and External Pressure
- Boiling Points of Liquids
- Evaporation
- Viscosity
- Surface tension
- Anomalous Behaviour of Water
- More on Anomalous Behaviour of Water

5.4: Energetics of Phase Changes

- Molar Heat of Fusion
- Molar heat of Vaporisation
- Molar heat of Sublimation
- Energy Changes and Intermolecular Attractions
- Liquid Crystals

Chapter 6: Solids

6.1: Kinetic Molecular Interpretation of Solids

- Kinetic Interpretation of Crystalline Solids
- Shape and Volume of Solids
- Compressibility and Ease of Flow of Solids
- Melting
- Rigidity and Melting point of Solids

6.2: Types of Solids

- Amorphous Solids
- Crystalline Solids
- Differences Between Amorphous and Crystalline Solids

6.3: Properties of Crystalline Solids

- Properties of Crystalline Solids
- Anisotropy
- Symmetry and Habit of a Crystal

- Isomorphism
- Polymorphism
- Transition Temperature
- Concept of Allotropy

6.4: Crystal Lattice

- Crystal Lattice
- Unit Cell
- Structure of Sodium Chloride
- Structure of Metals

6.5: Properties of Different Types of Solids

- Factors that affect the Shape of an ionic Solid
- Lattice Energy
- Comparison of Ionic and Covalent Crystals
- Low Density and High Heat of Fusion of Ice
- Metallic Solids
- Comparison of Molecular Crystals and Metallic Solids
- Hygroscopic Substances

Chapter 7: Chemical Equilibrium

7.1: Reversible Reaction and Dynamic Equilibrium

- Reversible Chemical Reactions
- Dynamic Chemical Equilibrium
- Equilibrium Constant K_c and its Units
- Types of Equilibrium
- Determination of Equilibrium Constant by Physical Method
- Determination of Equilibrium Constant by Chemical Method
- Calculating the Equilibrium Constant for Reversible Reaction
- Calculate the Equilibrium Concentration
- Applications of Equilibrium Constants; Direction of Reaction
- Extent of Reaction
- Relationship Between K_p and K_x
- Relationship Between K_p and K_n
- Relationship Between K_c , K_p , K_x and K_n

7.2: Factors Affecting Equilibrium

- Le-Chatelier's Principle; Effect of Change in Concentration

- Effect of Change in Pressure or Volume
- Effect of Change in Temperature
- Effect of Catalyst on Equilibrium Constant

7.3: Industrial Application of Le chatelier's Principle

- The Haber's Process
- More on Haber process

7.4: Solubility Product and Precipitation Reactions

- Solubility Product

7.5: Common Ion Effect

- Common Ion Effect
- Some Examples of Common Ion Effect

Chapter 8: Acids Bases and Salts

8.1: Acidic, Basic and Amphoteric Substances

- General Properties of Acids
- General Properties of Bases
- Amphoteric Compounds

8.2: Bronsted-Lowry Concepts for Acids and Bases

- Bronstead-Lowry Concept of Acids
- Bronstead-Lowry Concept of Bases

8.3: Conjugate acid-Base Pairs

- Conjugate Acid-Base Pairs

8.4: Strength of Acids and Bases

- Strength of Acids and Bases
- The Ion Product of Water
- pH, pOH and pK_w
- Process of Titration
- Acid-Base Titration
- pK_a and pK_b
- Relationship between K_a and K_b

8.5: Lewis Definition of Acid and Bases

- Lewis Concept of Acids

- Lewis Concept of Bases

8.6: Buffer Solution and their Applications

- Buffer Solutions
- Buffer Action
- Calculation of pH of a Buffer
- More on Calculation of pH of a Buffer
- Buffer Capacity

8.7: Salt Hydrolysis

- Hydrolysis
- More on Hydrolysis
- Levelling Effect

Chapter 9: Chemical Kinetics

9.1: Chemical Kinetics

- Introduction to Reaction Kinetics

9.2: Rates of Reaction

- Instantaneous and Average Rate
- Specific Rate Constant or Velocity Constant
- Order of Reaction
- Half-Life Period
- More on Effect of Concentration on Speed of Reaction
- Factors Affecting Rates Of Reactions, Nature of Reactants
- Effect of Concentration on Speed of Reaction
- Effect of Particle Size on Speed of Reaction
- Effect of Temperature on Speed of Reaction
- More on Effect of Temperature on Speed of Reaction
- Arrhenius Equation
- Rate Determining Step

9.3: Collision Theory, Transition State and Activation Energy

- Activation Energy
- More on Activation Energy
- Energy profile Diagram for Exothermic Reactions
- Energy profile Diagram for Endothermic Reactions

- The energy of Activation and Transition State Theory
- More on Energy of Activation and Transition State Theory

9.4: Catalysis

- Catalysts
- Types of Catalysis, Homogeneous and Heterogeneous Catalysis
- Characteristics of Catalyst
- Activation of Catalyst, Negative Catalyst and Autocatalyst
- Enzymes

Chapter 10: Solutions and Colloids

10.1: General Properties of Solutions

- Hydrophilic and Hydrophobic Molecules
- Types of Solutions on the Basis of Physical States
- Solutions of Solids in Liquids
- Solutions of Completely Miscible and Practically Immiscible Liquids
- Partially Miscible Liquids
- Phenol-Water System
- Hydration Energy of Ions
- Hydration
- Hydrolysis
- More on Hydrolysis
- Energetics of Solution
- Water of Hydration
- Introduction to Solubility
- Solubility and Solute-Solvent Interactions
- The Effect of Temperature
- The Effect of Pressure

10.2: Concentration Units

- Percentage Mass/Mass
- Percentage Mass/Volume
- Percentage Volume/Mass
- Percentage Volume/Volume
- Determining Molarity from Percentage by Mass of Solution
- Molarity and Preparation of Molar Solution
- Molality
- Mole Fraction

- Interconversion of Various Concentration Units of Solutions
- More on Interconversion of Various Concentration Units of Solutions

10.3: Raoult's Law

- Raoult's Law
- Raoult's Law When Both Components are Volatile
- More on Raoult's Law When Both Components are Volatile

10.4: Colligative Properties of Solutions Containing Non-Electrolyte Solutes

- Lowering of Vapour Pressure
- Causes of Boiling Point Elevation and Freezing Point Depression
- Elevation of Boiling Point
- More on Elevation of Boiling Point
- Measurement of Boiling Point Elevation
- Depression of Freezing Point of a Solvent by a Solute
- Measurement of Freezing Point Depression
- Applications of Boiling Point Elevation and Freezing Point Depression
- Osmosis and Osmotic Pressure
- Reverse Osmosis

10.5: Colloids

- Colloids
- Properties of Colloids
- More on Properties of Colloids
- Types of Colloids
- Comparison of Solution, Suspension and Colloid

Chapter 11: Thermochemistry

11.1: Energy in Chemical Reactions

- System and Surroundings
- Properties of the System and State Function
- work and Heat
- Exothermic Reactions
- Endothermic Reactions
- Some Examples of Endothermic and Exothermic Reactions
- Enthalpy

11.2: Thermodynamics

- Introduction to Thermochemistry

11.3: Internal Energy

- Internal Energy and Heat

11.4: First Law of Thermodynamics

- First Law of Thermodynamics

11.5: Standard States and Standard Enthalpy Changes

- Condition for Standard Heat of Reaction
- Enthalpy of Formation
- Enthalpy of Combustion
- Enthalpy of Atomization
- Enthalpy of Neutralization
- Bond Dissociation Energy

11.6: Heat Capacity

- Heat Capacity

11.7: Calorimetry

- Calorimetry
- Estimation of Heat of Reaction from Experimental Data
- Estimation of Energy Available from Food(Bomb Calorimeter)

11.8: Hess's Law

- Hess's Law of Constant Heat Summation
- Verification of Hess's Law

11.9: Born-Haber Cycle

- The Born-Haber Cycle

Chapter 12: Electrochemistry

12.1: Oxidation-Reduction Concepts

- Introduction to Electrochemistry
- Oxidation and Reduction Reactions
- Oxidation State

- More on Oxidation State
- Finding out the Oxidation Numbers
- Identifying Substances Which are Oxidized or Reduced
- Identifying Oxidizing and Reducing Agents from the Reactions
- Balancing of Redox Equations by Oxidation Number Method
- More on Balancing of Redox Equations by Oxidation Number Method
- Balancing Equation Using Oxidation Number Method
- Balancing of Redox Equations by Ion-Electron Method
- Balancing of Redox Equations in Acidic Medium by Ion-Electron Method

12.2: Electrode, Electrode Potential and Electrochemical Series

- Galvanic Cell and its construction
- Working of the Cell
- Electrode Potential
- Standard Hydrogen Electrode
- Measurement of Electrode Potential
- Electrochemical Series
- The Reactivity Series of Metals
- Prediction of Feasibility of a Chemical Reaction
- Calculation of the Voltage or emf of Cells
- Metals and Non-metals as Reducing and Oxidising Agents
- Relative Chemical Reactivity of Metals
- The reaction of Metals with Dilute Acids
- Displacement of One Metal by Another from its Solution
- 12.3: Types of Electro-Chemical Cells (Practice Test)
- Electrolytic Cells
- Construction of an Electrolytic Cell
- Working of Electrolytic cell
- Faraday's First Law of Electrolysis
- Faraday's Second Law of Electrolysis
- Calculating the Amount of Silver Deposited
- Calculations of Electrolysis of Molten NaCl
- Dry Cell
- Nickel Cadmium Cell
- Lead-Storage Battery
- Discharging of Lead Battery
- Charging of Lead Battery
- Fuel Cells
- More on Fuel Cells

- Rusting of Iron
- Prevention of Corrosion
- Electroplating
- Silver Plating

Chapter 13: s- And p-Block Elements

13.1: Period 3 (Na to Ar)

- Trend of Atomic Size and Atomic Radius in Periodic Table
- Trends in Atomic Radius of 3rd Period Elements
- The trend of Ionization Energy in Periodic Table
- Trends in First Ionization Energy of 3rd Period
- Trends in Electronegativity of 3rd Period
- Effect of Temperature on Vapour Pressure
- Trends in Melting points and Boiling points of 3rd Period
- Reactions of 3rd Period Elements with Water
- Reactions of 3rd Period Elements with O₂
- Reactions of 3rd Period Elements with Chlorine
- Physical Properties of Oxides of 3rd Period Elements
- more on Physical Properties of Oxides of 3rd Period Elements
- Acid-Base Behaviour of Oxides of 3rd Period Elements
- More on Acid-Base Behaviour of Oxides of 3rd Period Elements

13.2: Group 1 Elements (Alkali Metals)

- Trend of Melting, Boiling Points & Density in Group I
- Trends in Chemical Properties of Alkali Metals
- Effect of heat on Group I Hydrogen Carbonates
- Flame Tests of Alkali Metals

13.3: Group 2 Elements (Alkaline Earth Metals)

- Trends in Atomic Radius and First Ionization Energy of Group II Elements
- Trends in Electronegativity, Melting & Boiling points of Group II Elements
- Trends in Chemical Properties of Alkaline-Earth Metals
- More on Trends in Chemical Properties of Alkaline-Earth Metals
- Properties of Alkali and Alkaline Earth Metals Hydroxides
- Properties of Alkali and Alkaline Earth Metals Carbonates
- More on Properties of Alkali and Alkaline Earth Metals Carbonates
- Properties of Alkali and Alkaline Earth Metals Nitrates

- Properties of Alkali and Alkaline Earth Metals Sulphates
- Peculiar Behaviour of Beryllium
- 13.4: Group 4 Elements (Carbon Family) (Practice Test)
- Inert pair Effect in Formation of Ionic Bond
- The reaction of Group-IV A Elements Chlorides with water
- Group-IV A Elements Oxides
- Physical Properties of Carbon dioxide
- Physical Properties of Carbon monoxide
- Properties of Silica

13.5: Group 7 Elements (Halogens)

- Occurrence of Halogens
- Bond Enthalpies in Halogens
- Bond Enthalpies in Hydrogen Halides
- Relative Reactivities of the Halogens as Oxidizing Agents
- More on Relative Reactivities of the Halogens as Oxidizing Agents
- Halide Ions as Reducing agents

Chapter 14: d- and f- Block Elements (Transition Elements)

14.1: General Features

- Introduction to the Transition Elements
- Binding Energies of Transition Elements
- More on Binding Energies of Transition Elements
- Oxidation State of Transition Elements
- Catalytic Properties of Transition elements
- Paramagnetism of Transition Elements
- More Characteristics of Transition Elements

14.2: Coordination Compounds

- Components of Complex Compounds
- More on Components of Complex Compounds
- Nomenclature of Complex Compounds
- More on Nomenclature of Complex Compounds
- Geometry of Complexes

14.3: Chemistry of Some Important Transition Elements

- Oxidation states of Vanadium
- Vanadium as Catalyst in Contact Process

- Oxidation states of Chromium
- Properties of Potassium Chromate
- Properties of Potassium Dichromate
- More on Properties of Potassium Dichromate
- Oxidation states of Manganese
- Properties of Potassium Permanganate
- More on Properties of Potassium Permanganate
- Oxidation states of Iron
- Iron as Catalyst in Haber's Process
- Iron ion in the Reaction between Persulphate ions and iodide ions
- Reaction of Hexaaqua iron (II) and Hexaaqua Iron (III)
- Reaction of the Iron ions with Carbonate and thiocyanate ions
- Oxidation states of Copper
- Reactions of Hexaaqua Copper (II) ions

Chapter 15: Organic Compounds

15.1: Sources

- Features of Organic Compounds
- More on Features of Organic Compounds
- Coal
- Natural Gas
- Petroleum
- Plants and Natural Products Chemistry
- Partial and Total Synthesis

15.2: Coal as a source of Organic Compounds

- More on Destructive Distillation of Coal
- Conversion of Coal to Petroleum

15.3: Characteristics of Organic Compounds

- Features of Organic Compounds
- More on Features of Organic Compounds

15.4: Uses of Organic Compounds

- Importance of Organic Chemistry

15.5: New Allotrope of Carbon: Bucky Ball

- Bucky Balls

15.6: Functional groups and Homologous Series

- Functional Groups
- More on Functional Groups
- Classification of Organic Compound
- Types of Acyclic Compounds
- Types of Cyclic Compounds

15.7: Detection of Elements in Organic Compounds

- Detection of Elements in Organic Compounds
- More on Detection of Elements in Organic Compounds

Chapter 16: Hydrocarbons

16.1: Types of Hydrocarbons

- Introduction to Hydrocarbons

16.2: Alkanes and Cycloalkanes

- Common and IUPAC names
- Nomenclature of Alkyl Groups
- Nomenclature of Alkanes
- More on Nomenclature of Alkanes
- Nomenclature of Alkenes
- Nomenclature of Alkynes
- Nomenclature of Cycloalkanes
- Physical properties of Alkanes
- sp^3 Hybridization
- More on sp^3 Hybridization
- Reactivity of Alkanes
- Reactivity of Cycloalkanes

16.3: Radical Substitution Reactions

- Homolytic and Heterolytic Fission
- Halogenation of Alkanes
- More on Halogenation of Alkanes

16.4: Oxidation of Organic Compounds

- Combustion of Alkanes

16.5: Alkenes

- Nomenclature of Alkenes
- Sp² Hybridization
- Dehydrohalogenation of Alkyl Halides
- Dehydration of Alcohols
- More on Dehydration of Alcohols
- Addition of Hydrogen in Alkene
- More on Addition of Hydrogen in Alkene
- Addition of Hydrogen Halides in Alkene
- More on Addition of Hydrogen Halides in Alkene
- Addition of Sulphuric Acid in Alkene
- Addition of Halogens in Alkene
- Addition of Hypohalous Acid (HOX) in Alkene
- Addition of Oxygen in Alkene
- Ozonolysis of Alkene
- More on Ozonolysis of Alkene
- Polymerisation of Alkenes
- Conjugation in Alkene

16.6: Isomerism

- Optical Activity
- Optical Isomerism
- Optical Isomerism in Tartaric Acid
- Isomerism
- Structural Isomerism
- Position Isomerism
- Functional group Isomerism
- Metamerism
- Tautomerism
- Cis-trans Isomerism or Geometrical Isomerism
- Geometrical Isomerism in Cyclic compounds

16.7: Alkynes

- Nomenclature of Alkynes
- Reactivity of Alkynes
- Sp Hybridization
- Physical properties of Alkynes
- Dehydrohalogenation of Vicinal Dihalides

- Dehalogenation of Tetrahalides
- Acidic Nature of Alkynes
- Hydrogenation of Ethyne
- Addition of Halogen Acids in Alkynes
- Addition of Water in Alkynes
- Addition of Halogens in Alkynes
- Ozonolysis of Alkynes

16.8: Benzene and Substituted Benzene

- Nomenclature of Monosubstituted Benzene
- Nomenclature of Disubstituted Benzene
- Physical Properties of Benzene
- Structure of Benzene
- Benzene, Molecular Formula
- X-Ray Studies of benzene Structure
- The Stability of Benzene
- Resonance
- Reactivity of Benzene Towards Electrophiles
- Halogenation of Benzene
- Halogenation of Alkyl benzene
- Nitration of Benzene
- Sulphonation of Benzene
- Friedel-Crafts Reaction, Alkylation
- Friedel-Crafts Reaction, Acylation
- Reduction of Benzene
- Halogenation of Benzene in the Presence of Light
- Combustion of Benzene
- Catalytic Oxidation of Benzene
- Ozonolysis of Benzene
- ortho and para Directing Groups
- Meta-Directing Groups
- Relative Stability of Arenium Ion
- More on ortho and para Directing Groups
- Making Polysubstituted Benzenes

Chapter 17: Alkyl Halides

17.1: Alkyl Halides

- Introduction to Alkyl Halides

- Nomenclature of Alkyl Halides
- Preparation of Alkyl Halides From Alcohols
- Structure of Alkyl Halides
- Reactivity of Alkyl Halides
- Nucleophilic Substitution Reactions
- Nucleophilic Substitution Bimolecular(SN2)
- Nucleophilic Substitution Unimolecular(SN1)
- β -Elimination Reactions
- E1 Mechanism
- E2 Mechanism
- Wurtz Reaction
- Reduction of Alkyl Halides
- The reaction of Alkyl halide with Sodium Lead Alloy(Na4Pb)

17.2: Organometallic Compounds

- Preparation of Grignard Reagent
- Reactivity of Grignard Reagent
- Reactions of Grignard Reagent with CNCl , Alcohols and CO_2
- Reactions of Grignard Reagent with Methanal and Ethanal
- Reactions of Grignard Reagent with Propanone and Epoxide
- The reaction of Grignard Reagent with Esters

17.3: Amines

- Amines and its Nomenclature
- Preparation of Amines
- The reaction of Amines with Aldehydes and Ketones
- Preparation of Diazonium Salts

Chapter 18: Alcohols, Phenols and Ethers

18.1: Alcohols

- Introduction to Alcohols, Phenols and Ethers
- Classification of Alcohols
- Nomenclature of Alcohols
- Structure and Acidity of Alcohol
- Hydrolysis of Alkyl Halides
- The reaction of RMgX with Aldehyde and Ketone
- Reactions of Grignard Reagent with Propanone and Epoxide
- Catalytic Reduction of Aldehyde and Ketone

- Reduction of Carboxylic Acids and Esters
- Lucas Test
- Reactions of Alcohols in which C-O Bond is Broken
- Oxidative Cleavage of 1,2 Diols(Glycols)
- The Sulphur Analogues(Thiols RSH)

18.2: Phenols

- Nomenclature of Phenols
- Structure of Phenols
- Acidic Behaviour of Phenol
- Reactions of Phenol Due to -OH Group
- Preparation of Phenol
- Preparation of Phenol from Air Oxidation of Cumene
- Preparation of Phenol from Hydrolysis of Aryl Diazonium Salts
- Reactivity of Phenol
- Halogenation & Hydrogenation of Phenol
- Nitration of Phenol
- Oxidation of Phenol
- Difference Between Alcohol and Phenol

18.3: Ethers

- Nomenclature of Ethers
- Preparation of Ethers
- The mechanism for Alcohol Condensation to Give an Ether
- Chemical Reactivity of Ethers
- The reaction of Ethers with Halogen Acids and Acetyl Chloride

Chapter 19: Aldehydes and Ketones

19.1: Nomenclature

- Nomenclature of Aldehydes
- Nomenclature of Ketones

19.2: Physical Properties

- Introduction to Aldehydes and Ketones

19.3: Structure

- Structure of the Carbonyl Group

19.4: Preparation of Aldehydes and Ketones

- Ozonolysis of Alkene
- Addition of Water in Alkynes
- More on Addition of Water in Alkynes
- More on Oxidation of Alcohols
- Friedel-Crafts Reaction, Acylation

19.5: Reactivity of Carbonyl Group

- Reactivity of Carbonyl Group

19.6: Reactions of Aldehydes and Ketones

- Aldol Condensation
- Cannizaro's Reaction
- Reactions of Carbonyl compounds with Hydroxylamine
- Reactions of Carbonyl compounds with Hydrazine
- Oxidation of Aldehydes
- Oxidation of Ketones

Chapter 20: Carboxylic Acids and Functional Derivatives

20.1: Nomenclature

- Nomenclature of Carboxylic Acids

20.2: Physical Properties

- Physical Properties of Carboxylic Acids

20.3: Structure

- Structure of Carboxylic acid

20.4: Acidity

- The acidity of Carboxylic acid

20.5: Preparation of Carboxylic Acids

- Preparation of Carboxylic Acids from Grignard Reagents
- Preparation of Carboxylic Acids from Nitriles
- Preparation of Carboxylic Acids by Hydrolysis of Esters
- Oxidation of Alkyl Benzene

20.6: Reactivity

- Reactivity of Carboxyl Group

20.7: Reactions of Carboxylic Acids

- Formation of Acid Anhydride
- Reduction of Carboxylic Acids and Esters
- Friedel-Crafts Reaction, Acylation
- Reactions of Amides
- Reactions of Nitriles
- Reactions of Nitriles with Grignard Reagents

Chapter 21: Biochemistry

21.1: Carbohydrates

- Carbohydrates
- Classification of Carbohydrates, Monosaccharides
- Disaccharides
- Polysaccharides
- Starch
- Cellulose
- Glycogen

21.2: Proteins

- Protein
- Classification of Proteins

21.3: Enzymes

- Enzymes
- Properties of Enzymes

21.4: Lipids

- Lipids
- Sources of Lipids
- Structure and Composition of Fats and Oils
- Classification of Lipids
- Chemical Properties of Lipids

21.5: Nucleic acids

- Nucleic Acids

21.6: Minerals of Biological Significance

- Minerals

Chapter 22: Industrial Chemistry

22.1: Introduction to the Chemical Industry

- Introduction to Chemical Industries

22.2: Safety Consideration in the Process of Industries

- Safety Consideration in the Process Industries

22.3: Pesticides

- Chemical and Biological Control of Pests

22.4: Petrochemical

- Fractional Distillation of petroleum and its Importance

22.5: Synthetic Polymers

- Addition Polymerisation
- Polymerisation of Alkenes
- Some Addition Polymers
- Uses of Addition Polymers
- Condensation Polymerisation
- Nylon
- Use of Man-Made Fibres

22.8: Adhesives

- Adhesives

Chapter 23: Environmental Chemistry

23.1: Chemistry of Troposphere

- Carbon Monoxide as Pollutant
- Smog as Pollutant
- Acid Rain
- Depletion of Ozone
- Ozone Depletion due to Oxides of Nitrogen and Sulphur
- Effect of Ozone Depletion

- Role of Chlorofluorocarbons in Destroying Ozone

23.2: Chemistry of the Stratosphere

- Stratosphere
- Depletion of Ozone

23.3: Water Pollution and Water Treatment

- Detergents as Pollutant
- Water pollutants, Oxygen-Demanding Or Industrial Effluents
- Nutrient and Thermal Water Pollution

23.4: Green Chemistry

- Green Chemistry and its Goals

Chapter 24: Analytical Chemistry

24.1: Classical Methods of Analysis, Combustion Analysis:

- The Percentage Composition of Elements in a Molecule
- The Percentage Composition of Sodium Carbonate crystal
- Empirical formula
- The Empirical Formula from the Percentage Composition
- Empirical Formula from Combustion Analysis
- More on Molecular Formula

24.2: Modern methods of Analysis:

- Instrumental Methods of Analysis
- Electromagnetic Spectrum
- Infrared (IR) Spectroscopy
- More on Infrared (IR) Spectroscopy
- Ultraviolet and Visible Spectrophotometry
- More on Ultraviolet and Visible Spectrophotometry
- Nuclear Magnetic Resonance
- Position of Signals (Chemical shift)
- Atomic Emission Spectrum
- Atomic Absorption Spectrum
- Determination of Ar of Isotopes by Mass Spectrometry