

CHEMISTRY

Distribution of Marks:

Part-I (Class-XI)

Theory Marks: 85

Part-II (Class-XII)

Theory Marks: 85

Practical: 30

Total : 200

Marks: 85	PART –I (CLASS-XI)	Time: 3:00 Hours
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CHAPTER:1	Periodic Table and Periodic Properties
1.1	Historical Background
1.2	Modern Periodic Table-Main Features
1.3	Metals, Non-Metals and Metalloids
1.4	Blocks In Periodic Table
1.5	Families In Periodic Table
1.6	Periodic Arrangement And Electronic Configuration
1.7	Periodicity Of Properties
1.8	Reactions of Sodium And Magnesium
1.9	Trends in Bonding In Oxides and Chlorides Of Period 3
1.10	Variation In oxidation Number In Oxides And Chlorides
CHAPTER:2	Atomic Structure
2.1	Atomic Number, Proton Number And Nucleon Number; Identity Of an Element
2.2	Effect Of Electric Field On Fundamental Particles
2.3	Experimental Evidences For The Electronic Configuration
2.4	Quantum Numbers
2.5	Shapes Of Atomic Orbitals
2.6	Electronic Configuration
2.7	Electronic Configuration And The Periodic Table
2.8	Electronic Configuration Of IONS and Free Radicals
2.9	Electronic Configuration And The Formation Of Semiconductors
CHAPTER:3	Chemical Bonding
3.1	Types Of Bonding
3.2	Electronegativity And the Type of Bond
3.3	Intermolecular Forces
3.4	Bond Energy And Bond Length
3.5	A Comparison Among IONIC, Covalent, Metallic Bonds and Intermolecular Forces
3.6	Valence Bond Theory (VBT)
3.7	Atomic Orbital Hybridization
3.8	Valence Shell Electron Pair Repulsion Model (VSEPR)
3.9	Molecular Orbital Theory(MOT)
CHAPTER:4	Stoichiometry
4.1	Concept Of Mole
4.2	Relationship Between Mole, Molar Mass And Avogadro's Number
4.3	Molar Volume
4.4	Molar Mass And Density Of gases
4.5	Molar Concentration
4.6	Stoichiometric Relationships
4.7	Limiting And Excess Reactant
4.8	Theoretical Yield And Actual Yield
4.9	Importance Of Stoichiometry in Production And Dosage Of Medicine
CHAPTER:5	States and Phases of Matter
5.1	Properties Of Gases
5.2	Ideal Gas Equation
5.3	Properties of Liquids
5.4	Intermolecular Forces
5.5	Surface Tension Of Liquids

5.6	Viscosity Of Liquids
5.7	Evaporation
5.8	Vapour Pressure
5.9	Boiling Point
5.10	Energetics Of Phase Changes
5.11	Solids
5.12	Types of Solids
5.13	Liquid Crystals
CHAPTER:6	Chemical Energetics
6.1	Enthalpy Change
6.2	Energy Profile Diagram
6.3	Standard Enthalpy Changes
6.4	Bond Energy (Bond Dissociation Energy) And Enthalpy Changes
6.5	Enthalpy Change Of Reaction (ΔH_r) And Chemical Bonds
6.6	Measurement Of Enthalpy Change Of a Reaction
6.7	Enthalpy Change And Calorie Content Of Food
6.8	HESS' LAW Of Heat Summation
6.9	Energetics Of Solution
6.10	Born-Haber Cycle
6.11	Entropy
6.12	The Free Energy Change, ΔG
CHAPTER:7	Reaction Kinetics
7.1	Collision Theory
7.2	Rate Of Reaction
7.3	Factors Affecting Rate Of a Chemical Reaction
7.4	Rate Law, Rate Constant And Order Of Reaction
7.5	Determination Of Rate Constant
7.6	Reaction Mechanism
CHAPTER:8	Chemical Equilibrium
8.1	Macroscopic Events And Microscopic Events
8.2	Reversible Reactions, Microscopic Events And Dynamic Equilibrium
8.3	Relation Between Macroscopic and Microscopic Events
8.4	Dynamic Equilibrium Between Two Physical States
8.5	Conditions For Equilibrium
8.6	Characteristics Of Chemical Equilibrium
8.7	Types of Equilibrium
8.8	Equilibrium Constant And Position of equilibrium
8.9	Relationships Between Various Equilibrium Constants
8.10	Position Of Equilibrium And Reaction Conditions
8.11	LE-CHATELIER'S Principle
8.12	The Effect Of Change Of Concentrations
8.13	The Effect Of Change In Pressure Or Volume
8.14	The Effect Of Change In Temperature
8.15	Effect Of Catalyst On Equilibrium
8.16	Industrial Applications Of Chemical Equilibrium
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9.1	Bronsted-Lowry Concept
9.2	Lewis Concept Of Acids And Bases
9.3	IONIC Product Of Water
9.4	pH And pOH
9.5	Ionization Constants Of Acids(K_a)
9.6	Common Ion Effect
9.7	Buffer Solutions
9.8	Solubility Product
9.9	Salt Hydrolysis
9.10	Acid-Base Indicators
CHAPTER:10	ELECTROCHEMISTRY
10.1	Oxidation, Reduction, And Redox Reactions

- 10.2 Oxidation Number And Its Significance
- 10.3 Disproportionation Reaction
- 10.4 Oxidizing Agent (Oxidant) And Reducing Agent (Reductant)
- 10.5 Balancing Of redox Equations By Oxidation Number Method
- 10.6 Electrolytic Cell
- 10.7 Redox Reactions In Electrolysis
- 10.8 Mass Of a Substance Deposited During Electrolysis
- 10.9 Amount of Substance Produced During Electrolysis
- 10.10 Avogadro's Constant by The Electrolytic Method
- 10.11 Electrode Potentials
- 10.12 Standard Hydrogen Electrode (SHE)
- 10.13 Standard Electrode Potential(E°)
- 10.14 Measuring Standard Electrode Potentials
- 10.15 Electrochemical Cell (Galvanic Cell)
- 10.16 Applications Of (E°) Values
- 10.17 Variation Of (E°) With ION Concentration
- 10.18 Nernst Equation
- 10.19 Activity Series Of Metals
- 10.20 Feasibility Of Redox Reaction From Activity Series Or Reaction Data
- 10.21 Photovoltaic Cells
- 10.22 Winkler Method, BOD and DO
- CHAPTER:11 Hydrocarbons
 - 11.1 Aliphatic And Aromatic Hydrocarbons
 - 11.2 Nomenclature
 - 11.3 Reaction Mechanism And Modes Of Bond Breaking
 - 11.4 Unreactive Nature Of Alkanes Towards Polar Reagents
 - 11.5 Reactions Of Alkanes
 - 11.6 Alkenes
 - 11.7 Structure And Reactivity Of Alkenes
 - 11.8 Reactions OF Alkenes
 - 11.9 Conjugated Dienes
 - 11.10 Isomerism
 - 11.11 Organic Redox Reactions
- CHAPTER:12 Nitrogen and Sulfur
 - 12.1 Reactivity Of Nitrogen(N_2)
 - 12.2 Ammonia(NH_3)
 - 12.3 Oxides Of Nitrogen
 - 12.4 Sources Of Oxides Of Nitrogen
 - 12.5 Role Of NO & NO_2 In Smog & Pan Formation
 - 12.6 Catalytic Converter
 - 12.7 Intrification and Denitrification
 - 12.8 Sulfur
 - 12.9 Stability of Oxidation States Of Sulfur
 - 12.10 Reactions Of Sulfur
 - 12.11 Uses Of Sulfur And Its Compounds
 - 12.12 Role Of Sulfur In Organic Synthesis
 - 12.13 Sulfuric Acid(H_2SO_4)
- CHAPTER:13 Halogens
 - 13.1 Volatility of Chlorine, Bromine And Iodine
 - 13.2 Trend In Volatility Of The Halogens
 - 13.3 The Bond Strength Of Halogen Molecules
 - 13.4 Relative Reactivities Of The Halogens as Oxidizing Agents
 - 13.5 Reactions Of the halogens With Hydrogen
 - 13.6 Relative Thermal Stabilities Of Hydrogen Halides In Terms Of their Bond strength
 - 13.7 Relative Reactivity Of Halide IONS as Reducing Agents
 - 13.8 Reactions Of Halides With Aqueous Silver Ion Followed By Aqueous Ammonia

- 13.9 Reactions Of Halides (X^-) With Concentrated Sulfuric Acid
- 13.10 Reactions Of Chlorine With Cold and Hot Aqueous Sodium Hydroxide
- 13.11 Use of Chlorine In Water Purification
- CAPTER:14 Atmosphere
- 14.1 Layers Of The Atmospheres
- 14.2 Air Pollutants
- 14.3 Sources Of Air Pollution
- 14.4 Sources Of Air Pollutants
- 14.5 Impact of Human Activities On Atmosphere
- 14.6 Effects Of Air Pollutants
- 14.7 Greenhouse Effect and Global Warming
- 14.8 Air Quality
- 14.9 Air Quality and Human Health
- 14.10 Air Pollution And Health Risk
- 14.11 Methods & Techniques To Measure & Monitor Air Quality
- 14.12 Experiments and Data Collection To Test Hypothesis About Air Quality
- 14.13 Analyze Data And Interpret Air Quality
- 14.14 Strategies Used To Reduce Air Pollution
- 14.15 Laws and Regulations Related To Atmosphere
- 14.16 Econmics, Social & Political Issues
- CHAPTER:15 Basic Separation Techniques
- 15.1 Methods of Separation Of Mixures
- 15.2 Crystallization
- 15.3 Separation Through Distillation
- 15.4 Chromatography
- 15.5 How to Check The Purity Of The Product?
- CHAPTER:16 Lab Safety and Practical Skills
- 16.1 General Instructions To the Students
- 16.2 Common Types Of Hazards In a Laboratory
- 16.3 Waste Disposal System For Chemicals
- 16.4 First aid In Laboratory
- 16.5 Acid-Base titration
- 16.6 Tests for Indentification Of anions
- 16.7 Test For Indentification of Basic Radicals

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Marks: 85	PART –II(CLASS-XII)	Time: 3:00 Hours
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- CHAPTER:1 PERIODIC CLASSIFICATION OF ELEMENTS AND PERIODICITY**
 Introduction: Historical Background, Improvements in Mendeleev's Periodic Table
 The Modern Periodic Table: Group and Periods, Some More Families in the Periodic Table, Block in the Periodic Table, Metals, Non-metals and Metalloids
 Periodic Trends in Physical Properties: Atomic Size, Ionization Energy, Electron Affinity, Metallic and Non-Metallic Character, Melting and Boiling Points, Oxidation State, Electrical Conductance, Hydration Energy
 Periodic Relationship in compounds
 The Position of Hydrogen
- CHAPTER:2 BLOCK ELEMENTS**
 Introduction: Electronic Configurations of s-Block Elements, Occurrence of Alkali Metals, Occurrence of Alkaline-Earth Metals, Peculiar Behaviour of Lithium, Peculiar Behaviour of Beryllium
 General Behaviour of Alkali Metals
 Trends in Chemical Properties of Alkali Metals, Trends in Chemical Properties of Alkaline-Earth Metals, General Trends in Properties of Compounds of Alkali and Alkaline-Earth Metals
 Commercial Preparation of Sodium by Downs Cell
 Commercial Preparation of Sodium Hydroxide by the Diaphragm cell
 Role of Gypsum in Agriculture and Industry
 Role of Gypsum in Agriculture, Role of Gypsum in Industries
 Role of Lime in Agriculture and Industry
 Role of Lime in Agriculture, Role of Lime in Industries
- CHAPTER:3 GROUP IIIA AND GROUP IVA ELEMENTS**
 Group IIIA Elements: Occurrence (Boron and Aluminium), Peculiar Behaviour of Boron
 Compounds of Boron: Borax (Sodium Tetraborate $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$), Boric Acids,
 Reactions of aluminium: Reaction with Air, Reaction with Non-Metals, Reaction with Acids and Alkalies
 Group IVA Elements: Occurrence of Carbon, Peculiar Behaviour of Carbon
 Compounds of Carbon and Silicon
 Oxides of Silicon, Silicates and their Uses, Silicones
 Semiconductors
 Uses of Lead Compounds in Paints
 Lead Suboxide, Pb_2O , Lead Monoxide (Litharge, Massicot) PbO , Triplumbic Tetra Oxide, (red lead, minium), Pb_3O_4 , Lead Dioxide, PbO_2 , white Lead, Lead Chromate (PbCrO_4)
- CHAPTER:4 GROUP VA AND VIA ELEMENTS**
 Group VA Elements: Introduction, General Characteristics
 Nitrogen And Its Compounds: Occurrence, Oxides of Nitrogen, Oxyacids of Nitrogen
 Phosphorus and its Compounds: Occurrence, Allotropes of Phosphorus, Halides of Phosphorus, Oxides of Phosphorus, Oxyacids of Phosphorus
 Group VIA Elements: Group VIA Elements, General Characteristics, Occurrence, Comparison of Oxygen and Sulphur,
 Sulphuric Acid (H_2SO_4): Manufacture of Sulphuric Acid, Properties, Uses of Sulphuric Acid
- CHAPTER:5 THE HALOGENS AND THE NOBLE GASES**
 Introduction
 Occurrence
 Peculiar Behaviour of Fluorine
 Oxidizing Properties

	Compounds of Halogens: Hydrides (hydrogen halides, HX), Oxides of Halogens, Reactions of Chlorine with Cold and Hot NaOH, Oxyacids, Bleaching Powder, (Ca(OCl)Cl)
	Commercial Uses of Halogens and Their Compounds
	Noble Gases: Introduction, Compounds of Xenon, Fluorides of Xenon, Xenon Oxyfluorides, Oxides of Xenon, Applications of the Noble Gases
CHAPTER:6	TRANSITION ELEMENTS
	Introduction: Typical and Non-Typical Transition Elements
	Properties of Transition Elements: General characteristics
	Complex Compounds: Components of Complex Compounds, Chelates, Nomenclature, Geometry of Complexes
	Iron: Commercial Forms of Iron, Wrought Iron, Manufacture of Wrought Iron from Cast Iron, Steel, Manufacture of Steel, Open Hearth Process, Bessemer's Process
	Corrosion: Electrochemical Theory, Prevention from Corrosion, Tin Plating or Coating Iron with Tin (cathode coating), Galvanizing or Zinc Coating (anode coating)
	Chromates and Dichromates: Potassium Chromate (K_2CrO_4), Properties, Potassium Dichromate ($K_2Cr_2O_7$), Properties
	Potassium Permanganate ($KMnO_4$): Properties
CHAPTER:7	FUNDAMENTAL PRINCIPLES OF ORGANIC CHEMISTRY
	Introduction: Modern Definition of Organic Chemistry
	Some Features of Organic Compounds
	Importance of Organic Chemistry
	Sources of Organic Compounds: Coal, Natural Gas, Petroleum
	Cracking of Petroleum
	Reforming
	Classifications of Organic Compounds
	Functional Group
	Hybridization of Orbitals and The Shapes of Molecules
	Isomerism: Types of Isomerism
CHAPTER:8	ALIPHATIC HYDROCARBONS
	Introduction
	Nomenclature: Common or Trivial Names, IUPAC Names, Nomenclature of Alkenes, Nomenclature of Alkynes
	Alkanes or Paraffins: General Methods of Preparations, Physical Properties, Reactivity of Alkanes, Reactions, Uses of Methane
	Alkenes: General Methods of Preparation, Physical Properties, Reactivity of a π -bond, Reactions of Alkenes, Uses of Ethene
	Alkynes: General Methods of Preparation, Physical Characteristics, Reactivity of Alkynes, Reactions, Uses of Ethyne, Comparison of Reactivities of Alkanes, Alkenes and Alkynes
CHAPTER:9	AROMATIC HYDROCARBONS
	Introduction
	Nomenclature
	Benzene: Structure of Benzene, Straight Chain Structures Ruled Out, Kekule's Structure, X-Ray Studies of Benzene Structure, Modern Concepts about the Structure of Benzene Atomic Orbital Treatment of Benzene, The Stability of Benzene, The Resonance Method
	Preparation of Benzene
	Reactions of Benzene: General Pattern of Reactivity of Benzene towards Electrophiles, Electrophilic Substitution Reactions, Reactions in which Benzene Ring is involved, Orientation in Electrophilic Substitution reactions
	Comparison of Reactivities of Alkanes, Alkenes and Benzene
CHAPTER:10	ALKYL HALIDES
	Introduction
	Nomenclature of Alkyl Halides
	Methods of Preparation of Alkyl Halides

- Reactivity of Alkyl Halides
Reactions of Alkyl Halides: Nucleophilic Substitution Reactions, Mechanism of Nucleophilic Substitution Reactions, Elimination Reactions
Grignard Reagent
- CHAPTER:11 ALCOHOLS, PHENOLS AND ETHERS
Introduction
Alcohols: Nomenclature of Alcohols, Industrial Preparation of Alcohols, Physical Properties, Reactions of Alcohols, Reactions in which C — O Bond is Broken, Reactions involving the Cleavage of O — H bond, Some other Reactions of Alcohols
Distinction Between Primary, Secondary and Tertiary Alcohols
Uses of Alcohols
Phenol: Preparation of Phenol, Physical Properties, Reactions of Phenol, Acidic behaviour of Phenol, Reactions of Phenol due to -OH Group, Reactions of Phenol due to Benzene Ring
Ethers: Nomenclature, Preparation of Ethers, Physical Properties, Chemical Reactivity
- CHAPTER:12 ALDEHYDES AND KETONES
Introduction
Nomenclature
Preparation of Aldehydes and Ketones
Reactivity of Carbonyl Group
Reactions of Carbonyl Compounds: Nucleophilic addition Reactions, Reduction Reactions, Oxidation Reactions
Identification of Carbonyl Compounds
Uses
- CHAPTER:13 CARBOXYLIC ACIDS
Introduction
Nomenclature of Carboxylic Acids: Common or Trivial names, The IUPAC Nomenclature
General Methods of Preparation
Physical Characteristics
Reactivity of Carboxyl Group
Reactions of Carboxylic Acids
Acetic Acid: Laboratory Methods, Manufacture of Acetic Acid, Physical Characteristics, Reactions of Acetic Acid, Uses of Acetic Acid
Amino Acids: Essential and Non-essential Amino Acids, Nomenclature of Amino Acids, Structure of Amino Acids, Acidic and Basic Characters of Amino Acids, Synthesis of Amino Acids, Reactions of Amino Acids, Test of Amino Acids, Peptides and Proteins
- CHAPTER:14 MACROMOLECULES
Introduction
Structure of Polymers
Types of Polymers
Polymerization Process
Brief Description of Synthetic Polymers
Biopolymers
Carbohydrates, Classification of Carbohydrates, Proteins, Classification of Proteins, Structure of Proteins, Denaturation of Proteins, Importance of Proteins, Lipids, Sources of Fats and Oils, Structure and Composition of Fats and Oils, Classification, Physical Properties, Chemical Properties, Saponification Number, Rancidity of Fats or Oils, Iodine Number, Acid Number, Steroids, Importance of Lipids, Enzymes, Classification of Enzyme, Properties of Enzymes, Factors Affecting Enzyme Activity, Importance of Enzymes, Nucleic Acids, Components of Nucleic Acids
- CHAPTER:15 COMMON CHEMICAL INDUSTRIES IN PAKISTAN
Introduction
Fertilizers: Early History, What are Fertilizers

Elements Essential for Plant Growth: Micro-nutrients (Trace elements), Macro-nutrients, Requirement of a Fertilizer, Essential Qualities of a Good Fertilizer

Classification of Fertilizers: Nitrogenous Fertilizers, Phosphatic Fertilizers, Potassium Fertilizers, Fertilizer Industry in Pakistan

Cement: Early History, Definition, Raw Materials, Manufacturing Process of Cement, Wet Process, Setting of Cement, Cement industry in Pakistan

Paper Industry: Early History, Definition, Brief Description of the Process, Pulping Processes, Neutral Sulphite Semi Chemical Process

CHAPTER:16 ENVIRONMENTAL CHEMISTRY

Introduction: Components of the Environment

Types of Pollution: Air Pollution, The Effects of Polluted Air on Environment, Water Pollution

Factors Affecting the Quality of Water: Purification of Water

Solid Waste Management: Effects of Dumping Waste in Sea and Rivers, Landfill, Incineration of the Municipal Solid Waste, Treatment of Industrial Waste, Incineration of Industrial and Hazardous Waste, Recycling of Waste

CONTENTS OF PRACTICAL FOR CLASS XII (PART-II)

1. Preparation of copper ammine complex.
2. Prepare a pure sample of glucosazone.
3. Preparation of a pure sample of iodoform.
4. Preparation of aspirin.
5. Estimation of barium in the given sample solution gravimetrically.
6. Find out the elements present in given organic compound.
7. Write the tests for identification of following functional groups in the given organic compound. (i) Carboxylic acid (ii) Aldehyde (iii) Phenol
8. Preparation of some important solutions used as reagents
9. Acid radical's classification
10. Salt analysis (Groups and radical identification)
11. Scheme for dilute sulphuric acid group
12. Scheme for conc. sulphuric acid group
13. Scheme for special group
14. Detection of the radicals of dilute acid group
15. Detection of the radicals of concentrated acid group
16. Detection of the radicals of special group
17. List of basic radicals
18. Analysis for basic radicals
19. Dry tests for the basic radical
20. Scheme for detection of the radicals of Group-I
21. Scheme for detection of the radicals of Group-II
22. Scheme for detection of the radicals of Group-III
23. Scheme for detection of the radicals of Group-IV
24. Scheme for detection of the radicals of Group-V
25. Scheme for detection of the radicals of Group-VI
26. Detection of the radicals of Group-I
27. Detection of the radicals of Group-II
28. Detection of the radicals of Group-III
29. Detection of the radicals of Group-IV
30. Detection of the radicals of Group-V
31. Detection of the radicals of Group-VI

Theory Periods CHEMISTRY XII

Chapter	Content	Periods	Weightage
1	Periodic classification of elements	12	6%
2	s-Block elements	8	4%
3	Group III and IV elements	8	4%
4	Group V and VI elements	10	5%
5	The halogens and noble gases	10	5%
6	The transition elements	12	6%
7	Fundamental principles of organic chemistry	10	5%
8.	Aliphatic hydrocarbons	10	5%
9	Aromatic hydrocarbons	8	4%
10	Alkyl halides	8	4%
11	Alcohol, phenols and ethers	10	5%
12	Aldehydes and ketones	8	4 %
13	Carboxylic Acids and their derivatives	6	3%
14	Macromolecules	8	4%
15	Common chemical industries	8	4%
16	Environmental chemistry	14	7%
	Total	150	75%

Recommended Book: Chemistry Part-II

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