



Maharashtra State Board of Secondary & Higher Secondary School, Pune

Department of Chemistry

Subject: Chemistry (55)

Standard: Twelve

Faculty: Science

Syllabus

XII Chemistry (Theory & Practical)

Theory Index

Sr. No.	Unit/Topic	Marks (without option)	Marks (with option)
1	Solid State	03	05
2	Solutions	04	06
3	Ionic Equilibria	04	06
4	Chemical Thermodynamics	06	08
5	Electrochemistry	05	07
6	Chemical Kinetics	04	06
7	Elements of Groups 16, 17 and 18	06	08
8	Transition and Inner Transition Elements	06	08
9	Coordination Compounds	05	07
10	Halogen Derivatives	05	07
11	Alcohols, Phenols and Ethers	04	06
12	Aldehydes, Ketones and Carboxylic Acids	06	08
13	Amines	03	04
14	Biomolecules	03	04
15	Introduction to Polymer Chemistry	03	04
16	Green Chemistry and Nanochemistry	03	04
	Total	70	98

Syllabus

Chapter No.	Area	Units and Subunits
1.	Physical Chemistry	1. Solid State Introduction, Types of solids, classification of crystalline solids, crystal structure, cubic system, packing efficiency, crystal defects or imperfections, electrical properties of solids, magnetic properties of solids.
2.		2. Solutions Introduction, types of solutions, capacity of solution to dissolve solute, solubility, vapour pressure of solutions of liquids in liquids, colligative properties of nonelectrolyte solutions, vapour pressure lowering, relative molecular mass of non-volatile substances, boiling point elevation, depression in freezing point, colligative properties and determination of molar mass, osmosis and osmotic pressure, colligative properties of electrolytes.
3.		3. Ionic Equilibria Introduction, types of electrolyte, acids and bases, ionization of acids and bases, autoionization of water, the pH scale, hydrolysis of salts, buffer solutions, solubility product, common ion effect.
4.		4. Chemical Thermodynamics Introduction, terms used in thermodynamics, nature of heat and work, expression for pressure-volume (PV) work, concept of maximum work, internal energy (U), first law of thermodynamics, enthalpy (H), enthalpies of physical transformations, thermochemistry, spontaneous (irreversible) process.
5.		5. Electrochemistry Introduction, electric conduction, electrical conductance of solution, electrochemical cells, electrolytic cell, galvanic or voltaic cell, electrode potential and cell potential, thermodynamics of galvanic cells, reference electrodes, galvanic cells useful in day to day life, fuel cells, electrochemical series (electromotive series).
6.		6. Chemical Kinetics Introduction, rate of reactions, rate of reaction and reactant concentration, molecularity of elementary reactions, integrated rate equations, zero order reactions, half life period of a reaction, pseudo first order reaction, integrated rate law for gas phase reactions, collision theory of bimolecular reactions, temperature dependence of reaction rates, effect of a catalyst on the rate of reaction.
7.	Inorganic Chemistry	7. Elements of Groups 16, 17 and 18 Introduction, occurrence of elements of groups 16, 17 and 18, electronic configuration of elements of groups 16, 17 and 18, atomic and physical properties of elements of groups 16, 17 and 18, p-block group 16 elements (anomalous behaviour of oxygen), p-block group 17 elements (anomalous behaviour of fluorine and chlorine), chemical properties of elements of groups 16, 17 and 18, oxoacids, oxygen and compound of oxygen, p-block group 18 elements (concept of group 18 elements)
8.		8. Transition and Inner Transition Elements Introduction, position in the periodic table of transition and inner transition elements, electronic configuration of transition and inner transition elements, oxidation states of first transition series, physical properties of first transition series, trends in atomic properties of the first transition series, preparation of potassium permanganate (KMnO ₄), chemical properties of KMnO ₄ , uses of KMnO ₄ , preparation of potassium dichromate (K ₂ Cr ₂ O ₇), chemical properties of K ₂ Cr ₂ O ₇ , common properties of d-block elements, extraction of metals, inner transition (f-block) elements: lanthanoids and actinoids, properties of f-block elements, properties of lanthanoids, applications of lanthanoids, properties of actinoids, applications of actinoids, postactinoid elements.
9.		9. Coordination Compounds Introduction, types of ligands, terms used in coordination chemistry, classification of complexes, IUPAC nomenclature of coordination compounds, effective atomic number (EAN) rule, isomerism in coordination compounds, stability of the coordination compounds, theories of bonding in complexes, applications of coordination compounds.

10.	Organic Chemistry	10. Halogen Derivatives Introduction, classification of halogen derivatives, nomenclature of halogen derivatives, methods of preparation of alkyl halides, physical properties, optical isomerism of halogen derivatives, chemical properties, reaction with active metals, uses and environmental effects of some polyhalogen compounds, introduction to haloalkanes and haloarenes (nomenclature), hydrocarbons: alkanes, reactions of haloalkanes- elimination reactions.
11.		11. Alcohols, Phenols and Ethers Introduction, classification of alcohols, phenols and ethers, nomenclature of alcohols, phenols and ethers, alcohols and phenols (methods of preparation, physical and chemical properties), ethers (methods of preparation, physical and chemical properties.), uses of alcohols, phenols and ethers.
12.		12. Aldehydes, Ketones and Carboxylic Acids Introduction, classification of aldehydes, ketones and carboxylic acids, nomenclature of aldehydes, ketones and carboxylic acids, preparation of aldehydes and ketones, preparation of carboxylic acids, physical properties of aldehydes, ketones and carboxylic acids, polarity of carbonyl group, chemical properties and chemical reactions of aldehydes, ketones and carboxylic acids, uses of aldehydes, ketones and carboxylic acids.
13.		13. Amines Introduction, classification of amines, nomenclature of amines, preparation of amines physical properties of amines, basicity of amines, reactions of arene diazonium salts, reaction with arenesulfonyl chloride, electrophilic aromatic substitution in aromatic amines.
14.	Applied Chemistry	14. Biomolecules Introduction- Principal molecules of the living world, carbohydrates (classification, nomenclature, preparation of glucose, structure of glucose), proteins (amino acids, peptide linkage, polypeptides structure of proteins, enzymes), nucleic acids (nucleotides, structure of DNA, ribonucleic acid (RNA), DNA double helix, types of RNA molecules, biological functions of nucleic acids).
15.		15. Introduction to Polymer Chemistry Introduction, classification of polymers, some important polymers (rubber, polythene, teflon, polyacrylonitrile, polyamide polymers, polyesters, phenol- formaldehyde and related polymers, Buna-S rubber, neoprene, viscose rayon), preparation of Polytetrafluoroethene (Teflon), molecular mass and degree of polymerization of polymers, biodegradable polymers, commercially important polymers.
16.		16. Green Chemistry and Nanochemistry Introduction, concept of sustainable development, principles of green chemistry, the role of green chemistry, introduction to nanochemistry, characteristic features of nanoparticles synthesis of nanomaterials, nanotechnology, applications of nanomaterials, nanoparticles and nanotechnology.

Practical Index

Sr. No.	Practical's Name
Quantitative estimation (Long experiment)	
1	To determine the concentration in terms of molarity of KMnO_4 by titrating it against (0.1 M) standard solution of oxalic acid.
2	To determine the concentration in terms of molarity of KMnO_4 by titrating it against (0.1 M) standard solution of ferrous ammonium sulphate.
Chemical kinetics (Long experiment) (Any two)	
3	To study the effect of concentration on rate of reaction between $\text{Na}_2\text{S}_2\text{O}_3$ and HCl .
4	To study the effect of temperature on rate of reaction between $\text{Na}_2\text{S}_2\text{O}_3$ and HCl .
5	To study the rate of reaction between KIO_3 and $\text{Na}_2\text{S}_2\text{O}_3$ using starch as an indicator.
Electrochemistry	
6	Study of variation of cell potential of cell $\text{Zn} \text{Zn}^{2+} \text{Cu}^{2+} \text{Cu}$ with change in concentration of electrolyte CuSO_4 and ZnSO_4 at room temperature.
Thermochemistry (Short experiment) (Any three)	
7	To determine enthalpy of dissolution of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ in water at room temperature.
8	To determine enthalpy of neutralization of HCl and NaOH .
9	To determine enthalpy change of displacement of Cu from CuSO_4 by Zn .
10	To determine enthalpy change during the interaction between acetone and chloroform.
Inorganic preparations (Short experiment) (Any two)	
11	To prepare a pure sample of ferrous ammonium sulphate.
12	To prepare a pure sample of potash alum.
13	To prepare a pure sample of potassium trioxalatoferrate (III) complex.
Organic preparations (Short experiment) (Any two)	
14	To prepare dibenzalacetone.
15	To prepare 2-naphthol aniline dye.
16	To prepare acetanilide from acetyl chloride.
17	To prepare p-nitro acetanilide from acetanilide.
Identification of functional group (Any four compounds)	
18	Test for functional group present in given organic compound.
Characteristic tests of carbohydrates, proteins, fats and oil in pure samples and their detection in given food stuffs. (Any one of each)	
19	Characteristic tests of carbohydrate, proteins, fats and oils.
Qualitative analysis for two acidic radicals (Any three water soluble salt mixture)	
Detection of two acidic radicals qualitatively from given inorganic salt mixture.	
20	The given inorganic salt mixture no.1 contains following two acidic radicals. i() ii()
21	The given inorganic salt mixture no.2 contains following two acidic radicals. i() ii()
22	The given inorganic salt mixture no.3 contains following two acidic radicals. i() ii()

Qualitative analysis for two basic radicals (Any three water soluble salt mixture)	
Detection of two basic radicals qualitatively from given inorganic salt mixture	
23	The given inorganic salt mixture no.1 contains following two basic radicals. i() ii()
24	The given inorganic salt mixture no.2 contains following two basic radicals. i() ii()
25	The given inorganic salt mixture no.3 contains following two basic radicals. i() ii()
List of Activities (Any four)	
1	Preparation of phthalic anhydride from phthalic acid.
2	Preparation of succinic anhydride from succinic acid
3	Preparation of methyl salicylate.
4	Measurement of e.m.f. of commercial cells by using voltmeter. (Any four cells)
5	Identification of Resin identification code (RIC) on given different plastic materials. (Any two plastic material)
6	Preparation of 100 mL 0.1 M standard solution of ferrous ammonium sulphate. (Mohr's salt)