

## Class XII (Theory)

One Paper

Time: 3 Hours

70 marks

Unit No.	Title	Marks
Unit I	Solid State	4
Unit II	Solutions	5
Unit III	Electrochemistry	5
Unit IV	Chemical Kinetics	5
Unit V	Surface Chemistry	4
Unit VI	General Principles and Processes of Isolation of Elements	3
Unit VII	p -Block Elements	8
Unit VIII	D -and f -Block Elements	5
Unit IX	Coordination Compounds	3
Unit X	Haloalkanes and Haloarenes	4
Unit XI	Alcohols, Phenols and Ethers	4
Unit XII	Aldehydes, Ketons and Carboxylic Acids	6
Unit XIII	Organic Compounds containing Nitrogen	4
Unit XIV	Biomolecules	4
Unit XV	Polymers	3
Unit XVI	Chemistry in Everyday Life	3
	Total:	70

### Unit I: Solid State

(Periods 12)

Classification of solids based on different binding forces: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea), Crystal Lattices and unit cells, calculation of density of unit cell, packing in solids, voids, number of atoms per unit cell in a cubic unit cell, point defects, electrical and magnetic properties.

### Unit II: Solutions

(Periods 12)

Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, colligative properties - relative lowering of vapour pressure, elevation of boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass.

### Unit III: Electrochemistry

(Periods 14)

Redox reactions, conductance in electrolytic solutions, specific and molar conductivity, variations

of conductivity with concentration, Kohlrausch's Law, electrolysis and law of electrolysis (elementary idea), dry cell -electrolytic cells and Galvanic cells, lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, fuel cells.

#### Unit IV: Chemical Kinetics (Periods 12)

Rate of a reaction (Average and instantaneous), factors affecting rate of reaction: concentration, temperature, catalyst order and molecularity of a reaction, rate law and specific rate constant, integrated rate equation and half life (only for zero and first order reactions), collision theory (elementary idea, no mathematical treatment).

#### Unit V: Surface Chemistry (Periods 8)

Adsorption - physisorption and chemisorption, factors affecting adsorption of gases on solids, colloids distinction between true solutions, colloids and suspension; lyophilic, lyophobic multimolecular and macromolecular colloids; properties of colloids; Tyndall effect, Brownian movement, electrophoresis, coagulation, emulsion - types of emulsions.

#### Unit VI : General Principles and Processes of Isolation of Elements (Periods 8)

Principles and methods of extracting - concentration, oxidation, reduction - electrolytic method and refining; occurrence and principles of extraction of aluminium, copper, zinc and iron.

#### Unit VII: p -Block Elements (Periods 14)

Group -15 Elements: General introduction, electronic configuration, occurrence, oxidation states, trends in physical and chemical properties; compounds of nitrogen: preparation and properties of ammonia and nitric acid, Phosphorous - allotropic forms, compounds of phosphorous: preparation and properties of phosphine, halides ( $PCl_3$ ,  $PCl_5$ ) and oxoacids (elementary idea only).

Group 16 Elements: General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties, simple oxides, Ozone, Sulphure -allotropic forms; compounds of sulphure: sulphuric acid: industrial process of manufacture, properties and uses, oxoacids of sulphure (Structures only).

Group 17 Elements: General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; compounds of halogens, hydrochloric acid, interhalogen compounds, oxoacids of halogens (structures only).

Group 18 Elements: General introduction, electronic configuration, occurrence, trends in physical and chemical properties, uses.

#### Unit VIII: d and f Block Elements (Periods 14)

General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals - metallic character, ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic properties, interstitial compounds, alloy formation, preparation and properties of  $K_2Cr_2O_7$  and  $KMnO_4$ .

Lanthanoids - Electronic configuration, oxidation states and lanthanoid contraction.

Actinoids - Electronic configuration, oxidation states.

### Unit IX: Coordination Compounds (Periods 12)

Coordination compounds - Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds. Bonding, isomerism, importance of coordination compounds (in qualitative analysis, extraction of metals and biological system).

### Unit X : Haloalkanes and Haloarenes. (Periods 12)

Haloalkanes: Nomenclature, nature of C -X bond, physical and chemical properties, mechanism of substitution reactions.

Haloarenes: Nature of C -X bond, substitution reactions (Directive influence of halogen in monosubstituted compounds only)

Uses and environmental effects of - trichloromethane, tetrachloromethane, iodoform.

### Unit XI: Alcohols, Phenols and Ethers (Periods 12)

Alcohols: Nomenclature, methods of preparation, physical and chemical properties( of primary alcohols only), identification of primary, secondary and tertiary alcohols, mechanism of dehydration, uses of methanol and ethanol.

Phenols: Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols.

Ethers: Nomenclature, methods of preparation, physical and chemical properties, uses.

### Unit XII: Aldehydes, Ketones and Carboxylic Acids (Periods 12)

Aldehydes and Ketones: Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes: uses.

Carboxylic Acids: Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.

### Unit XIII: Organic compounds containing Nitrogen (Periods 10)

Amines: Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines.

Cyanides and Isocyanides - will be mentioned at relevant places in context.

Diazonium salts: Preparation, chemical reactions and importance in synthetic organic chemistry.

### Unit XIV: Biomolecules (Periods 12)

Carbohydrates - Classification (aldoses and ketoses), monosaccharides (glucose and fructose), oligosaccharides (sucrose, lactose, maltose), importance.

Proteins -Elementary idea of ? - amino acids, peptide bond, polypeptides, proteins, structure of proteins - primary, secondary, tertiary structure and quaternary structures (qualitative idea only), denaturation of proteins.

Vitamins - Classification and functions.

Nucleic Acids: DNA and RNA.

### Unit XV: Polymers

(Periods 8)

Classification - natural and synthetic, methods of polymerization (addition and condensation), copolymerization, some important polymers: natural and synthetic like polythene, nylon polyesters, bakelite, rubber.

### Unit XVI: Chemistry in Everyday life

(Periods 8)

Chemicals in medicines - analgesics, tranquilizers antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines.

Chemicals in food - preservations, artificial sweetening agents.

Cleansing agents- soaps and detergents, cleansing action.

## Practicals

Evaluation Scheme for Examination	Marks
Volumetric Analysis	10
Salt Analysis	6
Content Based Experiment	4
Class record and viva	5
Investigatory Project	5
<b>Total</b>	<b>30</b>

### PRACTICALS SYLLABUS

- A. Surface Chemistry (Periods 6)
- (a) Preparation of one lyophilic and one lyophobic sol  
 Lyophilic sol - starch, egg albumin and gum  
 Lyophobic sol - aluminium hydroxide, ferric hydroxide, arsenous sulphide.
- (b) Study of the role of emulsifying agents in stabilizing the emulsion of different oils.
- B. Chemical Kinetics (Periods 4)
- (a) Effect of concentration and temperature on the rate of reaction between sodium thiosulphate and hydrochloric acid.
- (b) Study of reaction rates of any one of the following:
- (i) Reaction of iodide ion with hydrogen peroxide at room temperature using different concentration of iodide ions.
- (ii) Reaction between potassium iodate, (KIO<sub>3</sub>) and sodium sulphite: (Na<sub>2</sub>SO<sub>3</sub>) using starch solution as indicator (clock reaction).
- C. Electrochemistry (Periods 2)
- Variation of cell potential in  $Zn/Zn^{2+} || Cu^{2+}/Cu$  with change in concentration of electrolytes (CuSO<sub>4</sub> or ZnSO<sub>4</sub>) at room temperature.
- E. Chromatography (Periods 2)
- i) Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of R<sub>f</sub> values.
- ii) Separation of constituents present in an inorganic mixture containing two cations only (constituents having large difference in R<sub>f</sub> values to be provided).
- F. Preparation of Inorganic Compounds
- i) Preparation of double salt of ferrous ammonium sulphate or potash alum.

- ii) Preparation of potassium ferric oxalate.
- G. Preparation of Organic Compounds (Periods 4)
- Preparation of any two of the following compounds
- i) Acetanilide
- ii) Di-benzal acetone
- iii) p-Nitroacetanilide
- iv) Aniline yellow or 2-Naphthol aniline dye.
- v) Iodoform.
- H. Tests for the functional groups present in organic compounds: (Periods 6)
- Unsaturation, alcoholic, phenolic, aldehydic, keton, carboxylic and amino (Primary) groups.
- I. Characteristic tests of carbohydrates, fats and proteins in pure samples and their detection in given food stuffs. (Periods 4)
- J. Determination of concentration/ molarity of  $\text{KMnO}_4$  solution by titrating it against a standard solution of: (Periods 8)
- i) Oxalic acid,
- ii) Ferrous ammonium sulphate
- (Students will be required to prepare standard solutions by weighing themselves).
- K. Qualitative analysis (Periods 14)
- \* Determination of one cation and one anion in a given salt.
- Cation -  $\text{Pb}_{2+}$ ,  $\text{Cu}_{2+}$ ,  $\text{As}_{2+}$ ,  $\text{Al}_{3+}$ ,  $\text{Fe}_{3+}$ ,  $\text{Mn}_{3+}$ ,  $\text{Zn}_{2+}$ ,  $\text{Co}_{2+}$ ,  $\text{Ni}_{2+}$ ,  $\text{Ca}_{2+}$ ,  $\text{Sr}_{2+}$ ,  $\text{Ba}_{2+}$ ,  $\text{Mg}_{2+}$ ,  $\text{NH}_4^+$
- Anions -  $\text{Co}_{3-}$ ,  $\text{S}^{2-}$ ,  $\text{SO}_{3-}^{2-}$ ,  $\text{SO}_{4-}^{2-}$ ,  $\text{NO}_2^-$ ,  $\text{NO}_3^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{PO}_{4-}^{3-}$ ,  $\text{C}_2\text{O}_4^{2-}$ ,  $\text{CH}_3\text{COO}^-$
- (Note: Insoluble salts excluded)

## PROJECT

Scientific investigations involving laboratory testing and collecting information from other sources.

A few suggested Projects.

- Study of the presence of oxalate ions in guava fruit at different stages of ripening.
- Study of quantity of casein present in different samples of milk.
- Preparation of soybean milk and its comparison with the natural milk with respect to curd formation, effect of temperature, etc.
- Study of the effect of potassium bisulphate as food preservative under various conditions (temperature, concentration, time etc.)
- Study of digestion of starch by salivary amylase and effect of pH and temperature on it.

- Comparative study of the rate of fermentation of following materials: wheat flour, gram flour, potato juice, carrot juice etc.
- Extraction of essential oils present in Saunf (aniseed), Ajwain (carum), Illaichi (cardamom).
- Study of common food adulterants in fat, oil, butter, sugar, turmeric powder, chilli powder and pepper.

Note: Any investigatory project, which involves about 10 periods of work, can be chosen with the approval of the teacher.

#### Recommended Textbooks.

1. Chemistry Part -I, Published by NCERT,2007
2. Chemistry Part -II, Published by NCERT, 2007