

## CLASS - XII

### SUBJECT : CHEMISTRY (CHEM)

### SEMESTER – III

FULL MARKS : 35

CONTACT HOURS : 70 HOURS

### COURSE CODE : THEORY

#### Sub-topics

UNIT No.	TOPICS	CONTACT HOURS	MARKS
Unit - 1	<b>Liquid State</b> Introduction, Solubility of gases in liquids, solid solutions, Vapour pressure and Raoult's law. Colligative properties; relative lowering of vapour pressure, elevation of boiling point, depression of freezing point, osmotic pressure. Determination of molecular mass using colligative properties. Abnormal molecular mass, van't Hoff factor and calculations involving it. Colloidal solution, the difference between true solutions, colloids and suspensions; lyophilic, lyophobic, multi-molecular colloids; properties of colloids; Tyndal effect, Brownian movement, electrophoresis, coagulation, emulsions and types of emulsions.	16	08
Unit - 2	<b>p-Block Elements (Groups 15, 16, 17 and 18)</b> <b>Group 15 elements:</b> general introduction, electronic configuration, occurrence, oxidation states, Structure and reaction of $\text{NH}_3$ , $\text{HNO}_3$ , $\text{NCl}_3$ , oxides of nitrogen (structure only); Phosphorus – allotropic forms( White and Red), preparation and properties of phosphine, phosphorus halides ( $\text{PCl}_3$ , $\text{PCl}_5$ ) and oxoacids (elementary idea only) <b>Group 16 elements:</b> General introduction, electronic configuration, occurrence, oxidation states; Oxygen: classification of oxides. Preparation and properties of Ozone. Sulphur: allotropic forms (rhombic and monoclinic). Properties and uses of oxides, oxoacids and peracids of sulphur. <b>Group 17 elements:</b> General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; Compounds of halogen; preparation, structure and uses of oxides, oxoacids of halogens, interhalogen compounds. Elementary idea of pseudohalogens and polyhalides. <b>Group 18 elements :</b> General introduction, electronic configuration, occurrence, uses of noble gases. Preparation, structure and chemical reactions of $\text{XeO}_2$ , $\text{XeO}_3$ , $\text{XeF}_2$ , $\text{XeF}_4$ , $\text{XeF}_6$ , $\text{XeOF}_2$ .	18	08

UNIT No.	TOPICS	CONTACT HOURS	MARKS
Unit - 3	<b>Haloalkanes and Haloarenes</b> <b>Haloalkanes:</b> Nomenclature, nature of C-X bond, physical and chemical properties, mechanism of substitution reactions. Stability of carbocations. <i>R/S</i> and <i>D/L</i> configurations. Uses and environmental effects of – dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, <b>Haloarenes:</b> Nature of C-X bond, substitution reaction (directive influence of halogen for monosubstituted compounds only), stability of carbocations, <i>R/S</i> and <i>D/L</i> configurations. Uses and environmental effects of DDT.	10	05
Unit - 4	<b>Alcohols, Phenols and Ethers</b> <b>Alcohols:</b> Nomenclature, methods of preparation, physical and chemical properties (primary alcohols only); identification of primary, secondary and tertiary alcohols; mechanism of dehydration, uses of methanol and ethanol. <b>Phenols:</b> Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reaction, uses of phenol. <b>Ethers:</b> Nomenclature, methods of preparation, physical and chemical properties, uses.	10	05
Unit - 5	<b>Biomolecules :</b> <b>Carbohydrates</b> Classification (aldoses and ketoses), monosaccharides (glucose and fructose), <i>D/L</i> configuration, oligosaccharides (sucrose), polysaccharides (starch, cellulose) <b>Proteins</b> Elementary idea of $\alpha$ -amino acids, peptide bonds, polypeptides, structure of proteins (primary structure only), denaturation of proteins; enzymes. <b>Nucleic Acids:</b> DNA & RNA (introduction and basic concept)	08	05
Unit - 6	<b>Polymers:</b> Classification- (natural and synthetic), methods of polymerization (addition and condensation), copolymerization. Some important polymers; like polythene, nylon, polyesters, bakelite, and rubber. Biodegradable and non-biodegradable polymers	08	04

## CLASS - XII

### SUBJECT : CHEMISTRY (CHEM)

### SEMESTER – IV

FULL MARKS : 35

CONTACT HOURS : 60 HOURS

### COURSE CODE : THEORY

#### Sub-topics

UNIT No.	TOPICS	CONTACT HOURS	MARKS
Unit - 1	<b>Electrochemistry</b> Redox reactions, conductance in electrolytic solutions, specific and molar conductivity, variation of conductivity with concentration, Kohlrausch's law, electrolysis and laws of electrolysis (elementary idea), dry cell – electrolytic cells and Galvanic cells, emf of a cell, standard electrode potential, Nernst equation and its application to chemical cells, relation between Gibbs energy change and emf of a cell, fuel cells, Li-ion battery.	08	05
Unit - 2	<b>Chemical Kinetics</b> Rate of a reaction (average and instantaneous), factors affecting rate of reactions- concentration, temperature and catalyst. Order and molecularity of a reaction; rate law and specific rate constant, integrated rate equations and half-life (only for zero and first order reactions); the concept of collision theory (elementary idea, no mathematical treatment) activation energy, Arrhenius equation Catalysis, homogeneous and heterogeneous catalysis, enzyme catalysis.	10	07
Unit - 3	<b>d and f Block elements</b> General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first-row transition metals – ionic radii, ionization enthalpy, oxidation states, colour, catalytic property, magnetic property. Preparation and properties of $K_2Cr_2O_7$ and $KMnO_4$ . <b>Lanthanoids</b> Electronic configuration, oxidation states, chemical reactivity, lanthanoid contraction and its consequences, uses. <b>Actinoids</b> Electronic configuration, oxidation states, comparison with lanthanoids, uses.	10	06
Unit - 4	<b>Coordination compounds</b> Introduction, ligands, classification of ligands based on denticity and field intensity, coordination number, colour, magnetic properties and shape, IUPAC nomenclature of mononuclear coordination compounds, EAN rule, Bonding (Werner's theory, VBT and CFT), CFSE, structural-isomerism and stereo-isomerism, importance of coordination compounds (in qualitative analysis, extraction of metals and biological systems)	08	05

UNIT No.	TOPICS	CONTACT HOURS	MARKS
Unit - 5	<b>Aldehydes, Ketones and Carboxylic Acids</b> <b>Aldehydes and Ketones:</b> Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes; uses. <b>Carboxylic Acids:</b> Nomenclature, acidic nature, methods of preparation, physical and chemical properties, uses	10	05
Unit - 6	<b>Organic compounds containing Nitrogen</b> <b>Nitro compounds:</b> General methods of preparation and reduction reactions. <b>Amines:</b> Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines. <b>Cyanides and Isocyanides</b> – Nomenclature, structure, methods of preparation, chemical reactions (hydrolysis and reduction reactions only). <b>Diazonium salts:</b> Preparations, chemical reactions and importance in synthetic organic chemistry	14	07

**CLASS – XII**  
**COURSE CODE : PRACTICAL**

**FULL MARKS : 30**

<b>Evaluation Scheme for Examination</b>	<b>MARKS</b>
Potentiometric Analysis	06
Salt Analysis	08
Detection of functional groups in Organic compounds	04
Content-Based Experiment (Chemical Kinetics/Thermochemistry/ Preparation of Organic Compounds)	06
Class record, Viva and Project work	06
<b>Total</b>	<b>30</b>

**Practical Syllabus**

**A. Chemical kinetics**

- (i) Study of the rate of reaction of iodide ions with hydrogen peroxide at room temperature using different concentrations of iodide ions. (with Excel plot)
- (ii) Study of the reaction rate of hydrolysis of ester in an acidic medium (with Excel plot)

**B. Thermochemistry :**

**Any one of the following experiments :**

- (i) Enthalpy of dissolution of copper sulphate or potassium nitrate.
- (ii) Enthalpy of neutralization of strong acid (HCl) and strong base (NaOH)
- (iii) Determination of enthalpy change during interaction (hydrogen bond formation) between acetone and chloroform.

**C. Electrochemistry**

- (i) Potentiometric titration of  $\text{Fe}^{3+}/\text{Fe}^{2+}$  system with Potassium dichromate and Potassium permanganate solutions.
- (ii) Potentiometric determination of concentration of  $\text{AgNO}_3$  solution (N/100 or N/200) using standard KCl solution (N/10).

**D. Tests for the functional groups present in organic compounds:**

Unsaturation, alcoholic -OH ( $1^\circ$ ), phenolic -OH, aldehyde, ketone, carboxylic acid and primary aromatic amine groups.

**E. Preparation of Organic compounds:**

Preparation of any two of the following compounds :

- (i) Benzilic acid (From Benzil)
- (ii) Aniline yellow or 2-Naphthol aniline dye.
- (iii) Iodoform.

**F. Characteristic test of carbohydrates, fats and proteins in pure samples and their detection in given foodstuffs.****G. Qualitative analysis**

Determination of one cation and anion in a given salt.

Cations -  $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Al}^{3+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Cr}^{3+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{NH}_4^+$

Anions –  $\text{CO}_3^{2-}$ ,  $\text{S}^{2-}$ ,  $\text{SO}_4^{2-}$ ,  $\text{S}_2\text{O}_3^{2-}$ ,  $\text{NO}_2^-$ ,  $\text{NO}_3^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{PO}_4^{3-}$

(Note: Insoluble salts excluded)

**Project work – where feasible may include**

- (i) Model preparation
- (ii) Investigatory project
- (iii) Science exhibits
- (iv) Participation in science fairs
- (v) Testing purity of food articles like butter, pulse, milk etc.