

RATIONAL

Higher secondary is the most crucial stage of school education because at this juncture specialized discipline based, content-oriented courses are introduced. Students reach this stage after 10 years of general education and opt for chemistry with a purpose of pursuing their career in basic sciences or professional courses like medicine, engineering, technology and study courses in applied areas of science and technology at tertiary level. Therefore, there is a need to provide learners with sufficient conceptual background of Chemistry, which will make them competent to meet the challenges of academic and professional courses after the higher secondary stage.

The new and updated curriculum is based on disciplinary approach with rigor and depth taking care that the syllabus is not heavy and at the same time it is comparable to the international level. The knowledge related to the subject of chemistry has undergone tremendous changes during the past one decade. Many new areas like synthetic materials, bio-molecules, natural resources, industrial chemistry are coming in a big way and deserve to be an integral part of chemistry syllabus at senior secondary stage. At international level, new formulations and nomenclature of elements and compounds, symbols and units of physical quantities floated by scientific bodies like IUPAC and CGPM are of immense importance and need to be incorporated in the updated syllabus. The revised syllabus takes care of all these aspects. Greater emphasis has been laid on use of new nomenclature, symbols and formulations, teaching of fundamental concepts, applications of concepts in chemistry to industry/technology, logical sequencing of units, removal of obsolete content and repetition etc.

OBJECTIVES

The board objectives of teaching Chemistry at Senior Secondary Stage are to help the learners:

- To promote understanding of basic facts and concepts in chemistry while retaining the excitement of chemistry.
- To make students capable of studying chemistry in academic and professional courses (such as medicine technology) at tertiary level.
- To expose the students to various emerging new areas of chemistry and apprise them with their relevance in their future studies and their application in various spheres of chemical sciences and technology.
- To equip students to face various, changes related to health, nutrition, environment, population, weather, industries and agriculture.
- To develop problem solving skills in students.
- To expose the students to different processes used in industries and their technological applications.
- To apprise students with interface of chemistry with other disciplines of science such as physics, biology, geology, engineering etc.
- To acquaint students with different aspects of chemistry used in daily life.
- To develop an interest in students to study chemistry as a discipline.

COURSE STRUCTURE THEORY

One Paper

Time: 3 Hours

60 Marks

Unit No.	Title
Chapter- I	Solutions
Chapter- II	Electrochemistry
Chapter-III	Chemical Kinetics
Chapter-IV	d- and f-Block Elements
Chapter-V	Coordination Compounds
Chapter-VI	Haloalkanes and Haloarenes
Chapter-VII	Alcohols, Phenols and Ethers
Chapter-VIII	Aldehydes, Ketones and Carboxylic acids
Chapter- IX	Amines
Chapter-X	Biomolecules
	Total

Unit I: Solutions

Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, Raoult's law, 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, Van't Hoff factor.

Unit II: Electrochemistry

Redox reactions, 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, conductance in electrolytic solutions, specific and molar conductivity ,variations of conductivity with concentration, Kohlrausch's Law, electrolysis and law of electrolysis (elementary idea), drycell-electrolytic cells and Galvanic cells, lead accumulator, fuel cells, corrosion

Unit III: Chemical Kinetics

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 equations and half-life (only for zero and first order reactions), concept of collision theory (elementary idea, no mathematical treatment), activation energy, Arrhenius equation.

Unit IV: d and f Block Elements

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, chemical reactivity and lanthanoid contraction and its consequences

Actinoids-Electronic configuration, oxidation states and comparison with lanthanoids

Unit V: Coordination Compounds

Coordination compounds - Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds. Bonding, Werner's theory, VBT, and CFT; structure and stereoisomerism, importance of coordination compounds (in qualitative analysis, extraction of metals and biological system)

Unit VI: Haloalkanes and Haloarenes

Haloalkanes: Nomenclature, nature of C–X bond, physical and chemical properties, optical rotation 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 - dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT.

Unit VII: Alcohols, Phenols and Ethers

Alcohols: Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only), identification of primary, secondary and tertiary alcohols, mechanism of dehydration, uses with special reference to 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 VIII: Aldehydes, Ketones and Carboxylic acids

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 IX: Amines

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

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

Unit X: Biomolecules

Carbohydrates - Classification (aldoses and ketoses), monosaccharides (glucose and fructose), D-L configuration oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen); Importance of carbohydrates.

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; enzymes. Hormones - Elementary idea excluding structure

Vitamins-Classification and functions

Nucleic Acids: DNA and RNA

PRACTICAL

EVALUATION SCHEME FOR EXAMINATION	MARKS
Volumetric Analysis	05
Salt Analysis	04
Content Based Experiment	03
Class Record and Viva	03
Investigatory Project	05
Total	20 Marks

PRACTICAL SYLLABUS

A. Chemical Kinetics

- (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 and with hydrogen peroxide at room temperature using different concentration of iodide ions.
 - (ii) Reaction between potassium iodate, KIO_3 and sodium sulphite : ($\text{Na}_2 \text{SO}_3$) using starch solution as indicator (clock reaction).

B. Thermo chemistry

- (a) 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. Electro chemistry

Variation of cell potential in $\text{Zn}/\text{Zn}^{2+} \parallel \text{Cu}^{2+}/\text{Cu}$ with change in concentration of electrolytes (CuSO_4 or ZnSO_4) at room temperature.

D. Chromatography

- (i) Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of R_f values.
- (ii) Separation of constituents present in an inorganic mixture containing cations only (constituents having wide difference in R_f values to be provided)

E. Preparation of Inorganic Compounds

- (i) Preparation of double salt of ferrous ammonium sulphate or potash alum.
- (ii) Preparation of potassium ferric oxalate.

F. Preparation of Organic Compounds

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

G. Test for the functional groups present in organic compounds:

Unsaturation, alcoholic, phenolic, aldehydic, ketonic, carboxylic and amino (primary groups)

- H. Study of Carbohydrates, fats and proteins in pure form and detection of their presence in given food stuffs.
- I. Determination of concentration/molarity of KMnO_4 solution by titrating it against a standard solution of :
 - (i) Oxalic acid
 - (ii) Ferrous ammonium sulphate.(Students will be required to prepare standard solutions by weighing themselves)

J. Qualitative analysis

- Determination of one cation and one anion in a given salt
Cations- Pb^{2+} , Cu^{2+} , As^{3+} , Al^{3+} , Fe^{3+} , Mn^{2+} , Zn^{2+} , Co^{2+} , Ni^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Mg^{2+} , NH_4^+
Anions- CO_3^{2-} , S^{2-} , SO_3^{2-} , SO_4^{2-} , NO_2^- , NO_3^- , Cl^- , Br^- , I^- , PO_4^{3-} ; $\text{C}_2\text{O}_4^{2-}$, CH_3COO^-

(Note Insoluble salts excluded)

PROJECT:

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

A Few suggested Projects

Study of 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 (anised), Ajwain (carum), Illaichi (cardomam).

Study of common food adulterants in fat, oil, butter, sugar, turmeric powder, chilli powder and pepper.

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

Prescribed book:-

Chemistry

Published by HPBOSE Dharamshala