

CHEMISTRY (+1) (2025-2026)

RATIONALE

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 rigour 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 broad 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

Unit I	Some basic Concepts of Chemistry
Unit II	Structure of Atom
Unit III	Classification of Elements and Periodicity in Properties
Unit IV	Chemical Bonding and Molecular Structure
Unit V	Thermodynamics
Unit VI	Equilibrium
Unit VII	Redox Reactions
Unit VIII	Organic Chemistry - some basic Principles and Techniques
Unit IX	Hydrocarbons

Unit I: Some Basic Concepts of Chemistry

General Introduction: Importance and scope of Chemistry.

Nature of matter, laws of chemical combination, Dalton's atomic theory: concept of elements, atoms and molecules.

Atomic and molecular masses, mole concept and molar mass, percentage composition, empirical and molecular formula, chemical reactions, stoichiometry and calculations based on stoichiometry.

Unit II: Structure of Atom

Discovery of Electron, Proton and Neutron, atomic number, isotopes and isobars. Thomson's model and its limitations. Rutherford's model and its limitations, Developments leading to Bohr's model Bohr's model and its limitations, concept of shells and sub shells, dual nature of matter and light, de Broglie's relationship, Heisenberg's uncertainty principle, concept of orbitals, quantum numbers, shapes of s, p and d orbitals, rules for filling electrons in orbitals - Aufbau principle, Pauli's exclusion principle and Hund's rule, electronic configuration of atoms, stability of half-filled and completely filled orbitals.

Unit III: Classification of Elements and Periodicity in Properties

Significance of classification, brief history of the development of periodic table, modern periodic law and the present form of periodic table, periodic trends in properties of elements - atomic radii, ionic radii, inert gas radii, Ionization enthalpy, electron gain enthalpy, electro negativity, valency. Nomenclature of elements with atomic number greater than 100.

Unit IV: Chemical Bonding and Molecular Structure

Valence electrons, ionic bond, covalent bond, bond parameters, Lewis structure, polar character of covalent bond, covalent character of ionic bond, valence bond theory, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridization, involving s, p and d orbitals and shapes of some simple molecules, molecular orbital theory of homonuclear diatomic molecules (qualitative idea only), Hydrogen bond.

Unit V: Chemical Thermodynamics

Concepts of System and types of systems, surroundings, work, heat, energy, extensive and intensive properties, state functions.

First law of thermodynamics - internal energy and enthalpy, heat capacity and specific heat,

measurement of ΔU and ΔH , Hess's law of constant heat summation, enthalpy of bond dissociation, combustion, formation, atomization, sublimation, phase transition, ionization, solution and dilution. Second law of Thermodynamics (brief introduction)
Introduction of entropy as a state function, Gibb's energy change for spontaneous and non-spontaneous processes, criteria for equilibrium.

Third law of thermodynamics (brief introduction).

Unit VI: Equilibrium

Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium - Le Chatelier's principle, ionic equilibrium- ionization of acids and bases, strong and weak electrolytes, degree of ionization, ionization of poly basic acids, acid strength, concept of pH, hydrolysis of salts (elementary idea), buffer solution, Henderson Equation, solubility product, common ion effect (with illustrative examples).

Unit VII: Redox Reactions

Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions, in terms of loss and gain of electrons and change in oxidation number, applications of redox reactions.

Unit VIII: Organic Chemistry-Some Basic Principles and Techniques

General introduction, methods of purification, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds. Electronic displacements in a covalent bond: inductive effect, electromeric effect, resonance and hyper conjugation. Homolytic and heterolytic fission of a covalent bond: free radicals, carbocations, carbanions, electro philes and nucleophiles,

types of organic reactions.

Unit IX: Hydrocarbons

Classification of Hydrocarbons

Aliphatic Hydro carbons:

Alkanes-Nomenclature, isomerism, conformation (ethaneonly), physical properties, chemical reactions including free radical mechanism of halogenation, combustion and pyrolysis.

Alkenes - Nomenclature, structure of double bond (ethene), geometrical isomerism, physical properties, methods of preparation, chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markovnikov's addition and peroxide effect), ozonolysis, oxidation, mechanism of electrophilic addition.

Alkynes-Nomenclature, structure of triple bond (ethyne), physical properties, methods of preparation, chemical reactions: acidic character of alkynes, addition reaction of-hydrogen, halogens, hydrogen halides and water.

Aromatic Hydrocarbons:

Introduction, IUPAC nomenclature, benzene: resonance, aromaticity, chemical properties: mechanism of electrophilic substitution. Nitration, sulphonation, halogenation, Friedel Craft's alkylation and acylation, directive influence of functional group in mono substituted benzene.

Carcinogenicity and toxicity.

PRACTICALS

EVALUATION SCHEME FOR EXAMINATION

- Volumetric Analysis
- Salt Analysis
- Content Based Experiment
- Class Record and Viva
- Investigatory Project

Total

MARKS

05Marks

04Marks

03Marks

03Marks

05Marks

20 Marks

PRACTICALS SYLLABUS

A. Basic Laboratory Techniques

- (a) Cutting a glass tube and glass rod .
- (b) Bending of a glass tube
- (C) Draw out , a glass jet .
- (d) Boring a Cork .

B. Characterization and Purification of chemical substance

- 1 . Determination of melting point of organic compound
- 2 . Determination of boiling point of organic compound
- 3 . Crystallization involving impure sample of anyone of the following Alum , copper sulphate , Benzoic acid .

C. Experiments related of pH change

(a) Anyone of the following experiments : Determination of pH of some solutions obtained from fruit juices , solutions of known and varied concentrations of acids . bases and salts using pH paper or universal indicator Comparing the pH of solutions of strong and weak acid of same concentration . Study the pH change in the titration of a strong base using universal indicator

(b) Study of pH change by common - ion effect in case of weak acids and weak bases .

D. Chemical equilibrium

One of the following experiments :

(a) Study the shift in equilibrium between ferric ions and thiocyanate ions by increasing / decreasing the concentration of either ions .

(b) Study the shift in equilibrium between $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ and chloride ions by changing the concentration of either of the ions.

E. Quantitative estimation

- using a chemical balance .
- Preparation of standard solution of oxalic acid .
- Determination of strength of a given solution of sodium hydroxide by titrating it against standard solution of oxalic acid .
- Preparation of standard solution of sodium carbonate .
- Determination of strength of a given solution of hydrochloric acid by titrating it against standard sodium carbonate solution .

F. Qualitative analysis

Determination of one anion and one cation in a given salt

Cations - Pb^{2+} , Cu^{2+} , As^{3+} , Al^{3+} , Fe^{3+} , Mn^{2+} , Zn^{2+} , Co^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Mg^{2+} , NH_4^+

Anions - CO_3^{2-} , S^{2-} , SO_3^{2-} , HO_2^{1-} , NO_3^{-1} , Cl^- , Br^- , I^- , PO_4^{3-} , $\text{C}_2\text{O}_4^{2-}$, CH_3COO^-

(Note : Insoluble salts excluded)

(G) Detection of nitrogen , sulphur , Chlorine

Bromine and iodine in an organic compound

PROJECT :

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

A Few suggested Projects

Checking the bacterial contamination in drinking water by testing sulphide ion

Study of the methods of purification of water .

Testing the hardness , presence of iron , fluoride , chloride etc. depending upon the regional variation in drinking water and the study of causes of presences of these ions above permissible limit (if any) .

Study of the acidity of different samples of the tea leaves

Study of the effect of acids and bases on the tensile strength of fibers . Analysis of fruit and vegetable juices for their acidity

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