Assam Higher Secondary Education Council

Revised Syllabus in Chemistry for H.S. 1st Year (Session 2022-23)

Distribution of Marks

S.No	UNIT	Period	Marks
1.	Some Basic Concepts of Chemistry	6	3
2.	Structure of Atom	12	6
3.	Classification of elements and periodicity in properties	16	4
4,	Chemical Bonding and Molecular Structure	16	5
5.	States of Mater :Gases and Liquids	12	4
6.	Thermodynamics	14	6
7.	Equilibrium	10	6
8.	Redox Reactions	10	3
9.	Hydrogen	12	3
10.	The s-Block Elements	16	5
11.	The p-Block Elements	16	7
12.	Organic Chemistry- Some Basic Principles and Techniques	16	10
13.	Hydrocarbons	14	8
	Total	170	70

CHEMISTRY SYLLABUS (Theory) FOR H.S. 1st Year

UNIT 1: SOME BASIC CONCEPTS OF CHEMISTRY

Nature of matter,

Laws of chemical combination,

Atomic and molecular masses,

Mole concept and molar mass,

Percentage composition,

Empirical and molecular formula,

Stoichiometry and stoichiometric calculations.

UNIT 2: STRUCTURE OF ATOM

Wave nature of electromagnetic radiation,

Particle nature of electromagnetic radiation (Planck's quantum theory and photoelectric effect), Bohr's model for hydrogen atom and its limitations,

Dual nature of matter,

Heisenberg uncertainty principle,

Orbitals and quantum numbers,

Shapes of atomic orbitals,

Energies of orbitals,

Rules for writing electronic configuration-Aufbau principle,

Hund's rule of maximum multiplicity,

Pauli Exclusion Principle,

Electronic configuration of atoms,

Stability of completely filled half-filled subshells

UNIT 3: CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES

Mendeleev's periodic law,

Modern periodic law and present form of periodic table,

Nomenclature of elements with atomic number greater than 100,

Electronic configuration of elements and periodic table,

Electronic configuration and types of elements: s-,p-,d-,f- blocks,

Periodic trends in properties of elements-atomic radii, ionic radii, covalent radii, metallic radii, van der Waal radii, ionization enthalpy, electron gain enthalpy, electronegativity, valency or oxidation states,

Anomalous behaviour of second period elements;

Periodic trends in chemical reactivity

UNIT 4: CHEMICAL BONDING AND MOLECULAR STRUCTURE

Kossel Lewis approach to chemical bonding,

Covalent bond,

Lewis structure,

Formal charge,

Ionic bond,

Polar character of covalent bond,

Covalent character of ionic bond,bond parameters,

Resonance,

VSEPR theory and molecular structure,

Valence bond theory,

Hybridisation,

Molecular orbital theory of homonuclear diatomic molecules,

Hydrogen bond

UNIT 5: STATES OF MATTER

Intermolecular forces,

The gaseous state,

The experimental gas laws-Boyle's law,

Charles' law,

Gay Lussac's law,

Avogadro's law;

Ideal gas equation,

Dalton's law of partial pressures,

Deviation from ideal gas behaviour-behaviour of real gases

UNIT 6: THERMODYNAMICS

Thermodynamic terms-system and its types, surrounding,

State functions,

Work, heat,

Extensive and intensive properties;

Internal energy and enthalpy,

First law of thermodynamics,

Work done in isothermal and adiabatic process,

Heat capacity,

Measurement of internal energy change and enthalpy change (calorimetry),

Reaction enthalpy-phase transition, formation, bond dissociation, combustion, atomisation, sublimation, ionisation,

Solution, dilution, neutralisation;

Hess's law of constant heat summation,

Second law of thermodynamics,

Entropy as state function,

Gibb's energy change and spontaneity,

Third law of thermodynamics (introduction only)

UNIT 7: EQUILIBRIUM

Equilibrium in physical process,

Equilibrium in chemical process-dynamic equilibrium,

Law of mass action and equilibrium constant,

Characteristics of equilibrium and equilibrium constant,

Homogeneous and heterogeneous equilibria,

Predicting the extent and direction of equilibrium,

Relationship between equilibrium constant k,

Reaction quotient q and Gibbs energy,

Factors affecting equilibrium-Le Chatelier' principle,

Ionic equilibrium- strong and weak electrolytes, acid, base and salts,

Ionization of acids and bases,

Degree of ionisation,

Concept of pH and pH calculation,

Common ion effect in ionisation of weak electrolytes,

Hydrolysis of salts,

Buffer solution,

Solubility equilibria of sparingly soluble salts

UNIT 8: Redox reactions:

Concept of Oxidation and Reduction

Oxidation number

Redox reactions

Balancing of redox reactions by ion-electron method and oxidation number method

UNIT 9: Hydrogen:

Position of hydrogen in the periodic table

Occurrence

Isotopes of hydrogen

Hydrides and types of hydrides (Ionic, covalent and interstitial hydrides)

Physical and Chemical properties of water

Heavy water

Hydrogen as fuels

Hydrogen peroxide (Structure, preparation, oxidizing and reducing reactions)

UNIT 10: S-Block elements:

Group 1 and Group 2 Elements

General introduction

Electronic configuration

Occurrence

Anomalous properties of the first elements of each group

Diagonal relationship

Trends in the variation of properties (Atomic and ionic radii, Ionization enthalpy, Electron gain enthalpy)

Trends in the chemical reactivity with oxygen

Hydrogen and halogens

Uses

UNIT 11: P-Block elements:

General Introduction to P-block elements

Group 13 Elements: General introduction

Electronic configuration

Occurrence

Variation of properties

Oxidation States

Trends in the chemical reactivity

Anomalous properties of the first elements of the group

Boron – physical and chemical properties

Group 14 Elements: General introduction

Electronic configuration

Occurrence

Variation of properties

Oxidation States

Trends in the chemical reactivity

Anomalous properties of the first elements of the group

Carbon – Catenation, Allotropic forms, Physical and Chemical properties

UNIT 12: Organic Chemistry - Some basic Principles and Techniques of separation and purification of Organic compounds:

General introduction

Classification and IUPAC nomenclature of Organic Compounds

Homolytic and heterolytic fission of Covalent bond

Types of Organic reagent (Electrophiles and Nucleophiles)

Electronic displacement in covalent bond (Inductive effect, Electromeric effect, Resonance or Mesomeric effect and Hyperconjugative effect)

Types of Reactive intermediates and their stabilities (Free radicals, Carbocations and Carbanions)

UNIT 13: Hydrocarbons

Classification of Hydrocarbons

Aliphatic hydrocarbons :

Alkanes - Nomenclature, Isomerism, Conformations (Ethane only), Physical properties and chemical reactions.

Alkenes – Nomenclature, Structure of ethene, Geometrical isomerism, Physical properties, Methods of preparation, Chemical reaction: Addition of Hydrogen, halogen, water, hydrogen halides (Markownikoff's and Anti Markownikoff's addition reaction), Ozonolysis, Oxidation, Mechanism of electrophilic addition reaction .

Alkynes - Nomenclature, Structure of ethyne, Physical properties, Methods of preparation, Chemical reactions: Addition of Hydrogen, halogen, water, hydrogen halides, Ozonolysis, Oxidation, polymerization of alkyne.

Aromatic hydrocarbon :

Introduction,

IUPAC nomenclature

Benzene – Resonance, Aromaticity

Preparation

Chemical properties: Electrophilic substitution reaction (Friedel Crafts Alkylation and Acylation, Nitration, Sulphonation, halogenations), Directive influence of functional group in monosubstitution of benzene

Carcinogenicity and Toxicity.

PRACTICALS

3 HOURS / 30Marks

Evaluation Scheme for Examination	Marks
Quantitative Estimation (Volumetric Analysis)	**6**
Qualitative Analysis (Salt Analysis)	**10**
Any one Experiment from B,C and D	**4**
Project Work	**5**
Class Record and Viva	**5**
Total Marks	**30**

SYLLABUS FOR CHEMISTRY PRACTICAL H.S. 1st year

Total Marks-30 Total Periods-60

A. Basic Laboratory Techniques

1. Cutting glass tube and glass rod
2. Bending a glass tube
3. Drawing out a glass jet
4. Boring a cork

B. Characterisation 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 to pH Change

(a) Any one 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 or universal indicator .

Comparing the pH of solutions of strong and weak acid of some concentration.

Study the pH change in the titration of a strong acid with 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 thiocynate ions by increasing decreasing the concentration of either ions.

(b) Study the shift in equilibrium between $[Co(H_2O)_6]^{2+}$ 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.

E. Qualitative Analysis

Detection of one anion and one cation in a given salt

Cations-Pb^{2+}, Cu^{2+}, Al^{3+}, Fe^{3+}, Mn^{2+}, Ni^{2+}, Zn^{2+}, Co^{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-}, $C_2O_4^{2-}$,CH_3COO^-

(Note: Insoluble salts excluded)

G. Project

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

A few suggestion projects

Checking the bacterial contamination in drinking water by testing sulphide ions.

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)

Investigation of the foaming capacity of different washing soaps and the effect of addition of sodium Carbonate on them.

Study of the acidity of different samples of the tea leaves.

Determination of the rate of evaporation of different liquids.
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 periods of work, can be chosen with the approval of the teacher.