



DELHI PUBLIC SCHOOL, (JOKA) SOUTH KOLKATA
Department of Chemistry

Class: XI (Science)

Subject: Chemistry

Syllabus 2023-24

A. Periodic Assessment 1 (Marks-30):

- (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.
- (ii) **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.

B. Mid-Term Examination (Theory (Marks-70)):

- (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
- (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. Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, de Broglie's relationship, Heisenberg 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.
- (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, electronegativity, valency. Nomenclature of elements with atomic number greater than 100.

- (iv) **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.
- (v) **Organic Chemistry – Some Basic Principles and Techniques:** General introduction, classification and IUPAC nomenclature of organic compounds, Structural Isomerism – Chain Isomerism, Position Isomerism, Ring Chain, Functional Isomerism and Metamerism, Geometrical Isomerism in Alkenes.

C. Periodic Assessment 2 (Marks-30):

- (i) **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.
- (ii) **Organic Chemistry – Some Basic Principles and Techniques:** General introduction, methods of purification, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds. Structural Isomerism – Chain Isomerism, Position Isomerism, Ring Chain, Functional Isomerism and Metamerism, Geometrical Isomerism in Alkenes. 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, electrophiles and nucleophiles, types of organic reactions.

PRACTICAL EXAMINATION (Marks-30)

Practical Examination for Midterm (Marks 30):

- a. **Basic Laboratory Techniques:**
- b. **Characterization and purification of chemical substance:**
 - Determination of melting point of an organic compound.

c. Quantitative Estimation:

- Using a mechanical balance/electronic 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.

d. Qualitative Analysis: Determination of one anion and cation in a given salt.

- Cations: NH_4^+ , Pb^{2+} , Cu^{2+} , Al^{3+} , Fe^{3+} .
- Anions: CO_3^{2-} , SO_4^{2-} , NO_3^- , S^{2-} , Cl^- .

e. Investigatory Projects: The scientific investigations involving laboratory testing and collecting information from other sources. The topics will be assigned to the students in due course of time.

D. Annual Examination (Theory(Marks-70)):

- (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
- (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. Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, de Broglie's relationship, Heisenberg 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.
- (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, electronegativity, valency. Nomenclature of elements with atomic number greater than 100.

- (iv) **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.
- (v) **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.
- (vi) **Organic Chemistry – Some Basic Principles and Techniques:** General introduction, methods of purification, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds. Structural Isomerism – Chain Isomerism, Position Isomerism, Ring Chain, Functional Isomerism and Metamerism, Geometrical Isomerism in Alkenes. 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, electrophiles and nucleophiles, types of organic reactions.
- (vii) **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 U and H, 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 nonspontaneous processes, criteria for equilibrium. Third law of thermodynamics (brief introduction).
- (viii) **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).

(ix) **Hydrocarbons:**

Classification of Hydrocarbons Aliphatic Hydrocarbons:

Alkanes: Nomenclature, isomerism, conformation (ethane only), 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 H_2 , 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 monosubstituted benzene. Carcinogenicity and toxicity

PRACTICAL EXAMINATION (Marks-30)

Practical Examination for Annual Examination (Marks 30):

f. Basic Laboratory Techniques:

g. Characterization and purification of chemical substance:

- Determination of melting point of an organic compound.

h. Quantitative Estimation:

- Using a mechanical balance/electronic 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.

i. Qualitative Analysis: Determination of one anion and cation in a given salt.

- Cations: NH_4^+ , Pb^{2+} , Cu^{2+} , Al^{3+} , Fe^{3+} , Mn^{2+} , Ni^{2+} , Zn^{2+} , Co^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Mg^{2+}
- Anions: CO_3^{2-} , SO_4^{2-} , NO_3^- , S^{2-} , Cl^- , Br^- , I^- , SO_3^{2-} , NO_2^- , PO_4^{3-} , CH_3COO^-

j. Investigatory Projects: The scientific investigations involving laboratory testing and collecting information from other sources. The topics will be assigned to the students in due course of time.