# XI Standard CHEMISTRY

**A- THEORY**

| UNIT NO | TITLE | Suggested No. of Periods |
|---|---|---|
| | **Inorganic Chemistry** | |
| I | Chemical Calculations | 12 |
| II | Environmental Chemistry | 5 |
| III | General Introduction to Metallurgy | 5 |
| IV | Atomic Structure – I | 5 |
| V | Periodic Classification - I | 4 |
| VI | Group I s-Block elements | 5 |
| VII | Group II s-Block elements | 3 |
| VIII | p-Block elements | 10 |
| | | |
| | **Physical Chemistry** | |
| IX | Solid state I | 6 |
| X | Gaseous state | 7 |
| XI | Chemical Bonding | 7 |
| XII | Colligative Properties | 6 |
| XIII | Thermodynamics-I | 9 |
| XIV | Chemical Equilibrium – I | 6 |
| XV | Chemical Kinetics – I | 4 |
| | **Organic chemistry** | |
| XVI | Basic concepts of organic chemistry | 6 |
| XVII | Purification of organic compounds | 6 |
| XVIII | Detection and estimation of elements | 8 |
| XIX | Hydrocarbons | 10 |
| XX | Aromatic Hydrocarbons | 8 |
| XXI | Organic Halogen compounds | 8 |
| **Total No. of Periods** | | **140** |

**B- PRACTICAL**

(As Found in the last)

**UNIT I - CHEMICAL CALCULATIONS**

| Expected specific outcome of Learning | Contents in terms of concepts | Curriculum transactional strategies | Illustrations | Evaluation | Suggested no. of periods |
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| Knows about significant fig+ures, S I Units | 1.1 Significant figures | Explains significant figures and giving guidelines to find significant figures | Illustrate with examples and explain its importance | Give S.I units for the following quantities:<br>a) Mass<br>b) Temperature<br>c) Amount of Substance<br>d) Electric circuit | |
| Importance of S.I Units | 1.2 S.I Units | Giving S.I units for fundamental and derived quantities | | | |
| Recognises dimensions | 1.3 Dimensions | Solving problems using dimensional analysis | Table of all fundamental and derived quantities | | |
| Proposes concept of scientific notation<br><br>Relates scientific notation and decimal notation | 1.4 Writing number in scientific notation<br><br>1.4.1 Conversion of scientific notation to decimal notation | Explains the methods of expressing the same values in different exponents<br><br>Scientific notation to decimal notation concept importance | Explanation through number of human red blood cells<br>25,000,000,000,000<br>$2.5 \times 10^{13}$ | Express the following value in all possible exponents.<br>7864.281<br>A typical bacteria cell has a length of about $5 \times 10^{-6}$ m. Write this number in standard decimal notation. | |
| Learn about Factor Label method | 1.4.2 Factor label method | Impress a valid relationship on quality between units | Give the general formula given quantity x conversion factors = desired quantity | Convert 3.00 inches into centimeters. | |
| Learn the laboratory measurements to calculate intensive properties | 1.5 Calculations using densities and specific gravities | General formula for density and specific gravity | Calculation of density and specific gravity using the equation | The measured volume of the nail is equal to .880 $cm^3$<br>Its mass is 6.92 g calculate the density | |
| Applies knowledge to find out formula weight of compounds<br><br>Recognises the value of Avogadro's number and its significance | 1.6 Calculation of formula weight<br><br>1.7 Understanding Avogadro' s number | Method of finding formula weight of different compounds explanation with example<br><br>Value of Avogadro' s number is stated – significancies explained | Taking some important compounds and explanation of calculating formula weight | What is the formula weight of hydrated copper sulphate?<br><br>State the value of Avogadro' s number | |
| Learn the concept of mole concept | 1.8 Mole concept – mole fraction of the | Define mole. Explanation with | Explanation of the mole concept with | Methane has the formula $CH_4$. | |

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| | solvent and solute | examples. Define mole fraction- quantitative calculations | suitable calculations | If a sample contains .30 mole, how many moles of H are present | |
| | 1.8.1 Conversion of grams into moles and moles into grams | Principle of calculations | Quantitative calculations | Calculate the number of moles of 100 g. each of the following substances a) $NH_3$ b) $C_2H_5OH$ | |
| Knowledge about Emperical formula Understands the method of arriving molecular formula from empirical formula. | 1.9 Calculation of empirical formula from quantitative analysis and percentage composition. | Arriving E.F organic empirical from the percentage composition and explain with examples | Method of calculating percentage composition, empirical formula and from analytical data | Calculate the percentage composition of CaO. Calculate empirical formula of a compound in which 2.571 g. of compound contains 1.102g. of carbon and 1.469 g. of oxygen | |
| | 1.9.1 Calculation of molecular formula from emperical formula | Arriving M.F from E.F – explaining with example | Relationship between Empirical formula and molecular formula is impressed in the form of an equation | The molecular formulas of some substances are as follows. Write their empirical formula. a) Acetylene $C_2H_2$ cured in oxyacetylene flame Glucose, $C_6H_{12}O_6$ (the chief sugar in blood) | |
| | 1.10 Laws of chemical combination and Dalton' s atomic theory | | | | |
| | 1.10.1 Laws of multiple proportion and law of reciprocal proportion | | | | |
| | 1.10.2 Postulates of Dalton' s atomic theory and limitations | | | | |
| Learn the Stoichiometric equation | 1.11 Stoichiomaetric equations | Explain the meaning of Stoichiometric equation with examples | Teach the meaning of Stoichiometry | Why chemical equations are to be balanced? | |
| Impresses the law of conservation of mass and reminds conservation of atoms in chemical | 1.11.1 Balancing chemical equation in its molecular form | Method of balancing explained with examples and guide lines are given | Choosing some important reactions and reach them for balancing in | Bright and shiny, aluminum objects are covered with a coating of $Al_2O_3$. | |

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| reaction | | | molecular form | Balance this reaction. | |
| | 1.11.2 Oxidation reduction-Oxidation number | Define Oxidation and reduction in terms of electron concept. Define and explain oxidation number | Quantitative calculations of oxidation number of atoms in several compounds are taught | Define oxidation and reduction in terms of electron concept | |
| | 1.11.3 Balancing Redox equation using oxidation number | Method of balancing redox equations using oxidation number with examples | Choosing important chemical reactions and explanation is given to balance it. | Define Oxidation number and calculate oxidation number of the atoms in the following compounds $Cr_2O_7^{2-}$ $MnO_2$ $MnO_4^-$ | |
| | | | Importance of Stoichiometric calculation is given | Balance the following equation : $MnO_4^- + Fe^{+2}$ ✍ $Mn^{+2} + Fe^{+3}$ | |
| Recognises the importance of calculations of chemical reactions | 1.12 Calculations based on equations | Principles are explained | | | |
| | 1.12.1 Mass/Mass relationship | Teaching of several reactions and then after balancing calculations of mass-mass relationship explained | Specific reactions are taken and after balancing teach mass-mass relationship | Calculate the amount of $Al_2Cl_6$ that is formed from 20.08 g of Al. | |
| Recognises the concentration of reactants in solution | 1.13. Methods of expressing concentration of solution | Concentration is explained | Recalls the calculation of number of moles, of solute and then calculation of molality and molarity and normality | Define :<br>a) Molality<br>b) Morality<br>c) Normality<br>How a solution of sulphuric acid of 0.1M and 0.1 N sulphuric acid is prepared | |
| | 1.14 Calculations on principle of volumetric Analysis | Laws of volumetric analysis is explained | Quantitative methods of calculating normality and the amount of the substances present in solution are explained | 25 ml. of .1N NaOH required 50 ml of HCl. Calculate the amount of HCl present in 500 ml. | |
| Knowledge about equivalent mass of an element and compounds | 1.15 Determination of equivalent mass of an element | Definition with explanation | | Define equivalent mass | |
| | Determination of equivalent mass by oxide, chloride and hydrogen displacement method | Explains different methods of determining equivalent mass of elements | Calculations on oxide, chloride and hydrogen displacement are explained | | |
| | 1.15.2 Calculation of equivalent mass | Explain the methods of calculating equivalent | Calculations of equivalent masses | Calculate the equivalent mass | |

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| | of an element and compounds | mass of acids, gases, oxidising and reducing agents | of acids, gases, oxidising and reducing agents are explained. | of HCl, $SO_4^{2-}$, NaOH, $KMnO_4$ and $K_2Cr_2O_7$ | |
| Recalls the importance of Avogadro's hypothesis | 1.15.3 Determination of molar mass of a volatile solute using Avogadro' s hypothesis. | Principles involving calculation of molar mass of a volatile substance in impressed | Experimental method and calculation based on it is clearly explained | Describe in detail how molar mass of a volatile substance is calculated from Avogadro' s hypothesis. | |

**UNIT II ENVIRONMENTAL CHEMISTRY**

| **Expected specific outcome of Learning** | **Contents in terms of concepts** | **Curriculum transactional strategies** | **Illustrations** | **Evaluation** | **Suggested no. of periods** |
|---|---|---|---|---|---|
| Knowledge about environment | 2.1 Environment | Defines environment and its significance | Diagram showing different layers of atmosphere | | |
| Understands pollution and pollutants | 2.2 Pollution and pollutants | Explains pollution and pollutants with common examples | Illustrate the difference between polluted and pure air, water and land | State international standards for drinking water | |
| Learns about different types of Pollution and Pollutants | 2.3 Types of pollution | Explains different types of pollution<br>-air pollution<br>-water pollution<br>-land pollution | | | |
| | 2.4 Types of pollutants | State different types of pollutants gaseous, liquid and solid pollutants. | | Give examples for different types of pollutants. | |
| Understands the causes for pollution | 2.5 causes for pollution | Explains different ways and means of pollution-effluents like oxides of S, Oxides of N, Oxides of C, burning of fossil fuels, CFCs, discharge of sewage, heavy metals, detergents, fertilizers etc | Diagram to explain different causes of pollution | Mention any two important causes for each type of pollution | |
| Understands the effects of pollution | 2.6 Effects of pollution | Explains how acid rain is formed, Green house effect, and its consequence. Depletion of ozone layer by CFCs, substitution of " O" by " CO" in haemoglobin | | What is the effect of pollution on Tajmahal | |
| Applies different skills to avoid pollution | 2.7 General methods of prevention of environmental pollution | Explains different ways and means of prevention of pollution.<br>1) Forestation encouragement<br>2) Encouraging the use of lean fuel, test certificates for | | What is acid rain? | |

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| | | motor cycles<br>3) Compelling effluent treatment in industries<br>4) Preventing uses of fossil fuels<br>5) Discouraging the use of CFCs<br>6) Installation of catalytic converters to automobiles<br>7) Sewage treatment, waste management<br>8) Avoiding usage of synthetic pesticide usage | | | |

**UNIT III - GENERAL INTRODUCTION TO METALLURGY**

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| Recalls the origin of elements | 3.1 Ores and minerals | Defines ores and minerals and gives different types of ores | Ores of some important elements with composition | Differentiate ores and minerals | |
| Analyses the various sources of minerals | 3.2 Sources from earth, living system and in sea | Mention the elements present in earth's crust living system and sea | List showing various elements present in various sources | | |
| Learns the purification methods of ores | 3.3 Purification of ores- Oxide ores sulphide ores magnetic and non magnetic ores | Mention different types of purification of ores | Diagrammatic representation of magnetic separation and froth floatation methods | How the oxide ores are concentrated? Explain how sulphides and magnetic ores are concentrated. | |
| Learns the metallurgical process | 3.4 Metallurgical process | Gives the flow chart of metallurgical process | | | |
| | 3.4.1 Roasting – oxidation | Explains the method of roasting | Explain the method of roasting and smelting with reference to carbonate and sulphide ore | What are the various chemical changes occur in roasting and in smelting | |
| | 3.4.2 Smelting – Reduction | Explains the method of smelting | | | |
| Learns the changes occurring in Bessemerisation | 3.4.3 Bessemerisation | Explain the method of Bessemerisation | Diagrammatic representation of Bessemer converter and indicate the chemical changes in the manufacture of steel | Explain the principle of Bessemerisation | |
| Importance of purification of metals | 3.4.4 Purification of metals – electrolytic and vapour phase refining | Explain the methods of electrolytic refining and "mond's process". | List of metals which can be purified Cu, Au, Ag, Pb, Zn, Al by electrolytic method. | Explain zone refining and electrolytic refining | |

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| | | | Purification of Ni by "mond's process". | | |
| Learns the occurrence of metals as ores | 3.5 Mineral wealth of India | Mention the names of minerals and their occurrence in India | List showing the occurrence of ores in India and their location | Explain mineral wealth of Tamil Nadu | |

**UNIT IV - ATOMIC STRUCTURE - I**

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| Recalls the historical approach of structure of atom. | 4.1. Brief introduction of history of structure of atom. | Explains elementary ideas of structure of atom by Thomson and Rutherford. | Diagrammatic representation of various atomic models. | | |
| Recognises the merits of Neils Bohr's model. | 4.2. Defects of Rutherford's model and Niels Bohr's model of an atom | Mention various defects of Rutherford's model and give important postulates of Bohr's model of an atom. | Importance of Rutherford's model of an atom and discovery of nucleus. | Explain Rutherford's model and its main defect. Describe in detail about Niels Bohr's model of an atom. | |
| Learns Sommerfeld's extension of atomic structure. | 4.3. Sommerfeld's extension of atomic structure. | Mention the postulates of Sommerfeld. | Diagrammatic representation of Bohr-Sommerfeld. | Give an account of Sommerfield extension of atomic structure. | |
| Analyses the significance of quantum number. | 4.4. Electronic configuration and quantum numbers. | Explains the four different quantum numbers. | Exercises in assigning quantum numbers. | Explain the significance of quantum numbers. | |
| Learns the shapes of orbitals. | 4.5. Orbitals - shapes of s, p, and d orbitals. | Explanation of the shapes of orbitals. | Chart showing the shapes of s, p, and d orbitals. | Define orbital. Explain the shapes of s, p, and d orbitals. | |
| Understands the quantum designation of electron. | 4.6. Quantum designation of electron. | Method of representing quantum designation of an electron - $nP^x$. | Giving various quantum designation of an electron. | For an electron $2p_x^2$ mention the quantum numbers. | |
| Understands Pauli's exclusion principles. | 4.7. Pauli's exclusion principle. | Defines Pauli's exclusion principle. | Importance of Pauli's exclusion principle is explained. | State Pauli's exclusion principle and explain with example. | |
| Understands Hund's rule | 4.8 Hund 's rule of maximum multiplicity | Defines Hund 's rule of maximum multiplicity | Diagrammatic representation of occupation of electron in p and d orbital | State and explain "Hund's rules" | |
| Understands Aufbau principle | 4.9 Aufbau principle | Defines Aufbau principle | Schematic representation of filling of orbitals by electron | What is "Aufbau principle" | |
| Analysis the | 4.10 Stability of | Explains the stability of | Extra ordinary | Explain the | |

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| stability of orbitals | orbitals | orbitals. | stability of half filled and completely filled should be emphasised with example. | nature of stability of orbitals. | |
| | 4.11 Classification of elements based on electronic configuration | Classification of elements as s- block, p-block, d-block, f-block elements. | Common electronic configuration of s,p,d and f block elements | How elements are classified based on electronic configuration. | |

**UNIT V - PERIODIC CLASSIFICATION - I**

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| Recalls the history of periodic classification | 5.1 Brief history of periodic classification. | Brief historical approach -from Doberener's to Mendeleev | Salient features of each classification is explained | State and explain Mendeleev's periodic law. | |
| Understands the IUPAC periodic table and its implications | 5.2 IUPAC periodic table and IUPAC nomenclature of elements with atomic number greater than 100. | Modern periodic law and important features of IUPAC periodic table | Chart of IUPAC periodic table and table showing IUPAC nomenclature of elements with atomic no above 103. | Give the IUPAC name of the elements with atomic number 110,111,112. | |
| Understands special feature modern periodic table in terms of electronic configuration. | 5.3 Electronic configuration and periodic table | Classification of elements based on electronic configuration. | Electronic configuration of s,p,d and f block elements. | Write the electronic configuration of following elements. Rb,Ba,Br,Cr,Ni, Ce, Eu,Gd,U. | |
| Analysis the gradation of properties along a period and down the group. | 5.4 periodicity of properties | Trends of atomic radii, ionic radii, ionisation energy, electron affinity, electro negativity along the periods and down the group. | Graphical representation of gradation of the following properties among elements a) atomic volume b) atomic radii c) I.E d) E.A | Which of the following will have the most electron affinity P, S, Cl, F. Explain your answer. | |
| Analyse the anamolous properties of elements. | 5.5 Anamolous periodic properties of elements. | Anamolous periodic properties in terms of screening constant, stability etc. | Reasons for anamolous periodic properties are explained. | Why B has lower I-E than Be? Compare I-E values of Cu & K. | |

**UNIT VI - Group - I s-Block elements**

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| Recalls isotopes and understands their nature and application. | 6.1 Isotopes of hydrogen - Nature and application. | Mentions different isotopes of hydrogen Distinguishes the same. Their preparation and application of isotopes in different fields. | Diagrams to show structures of isotopes | What are the different isotopes of hydrogen? How deuterium is separated by Hertz diffusion method? How tritium is obtained from Li? | |
| Differentiates ortho and para hydrogen | 6.1.1ortho and para hydrogen. | Definition for ortho and parahydrogen. Separation - conversion -comparison. | Diagram to differentiate ortho and para hydrogen. | Define ortho and para hydrogen? | |
| Gains knowledge about application of heavy water | 6.1.2 Heavy water | Defines heavy water - methods of preparation- properties, comparison and applications. | Table of comparison between ordinary water and heavy water. | Mention important applications of heavy water? | |
| Gains knowledge about hydrogen per oxide. | 6.1.3 Hydrogen per oxide. | Explains preparation, properties and uses of hydrogen peroxide. | | Explain any two oxiding and one reducing property of hydrogen peroxide. | |
| Understands special features of hydrogen as a fuel | 6.1.4. Liquid hydrogen as a fuel. | "Hydrogen economy" is explained - Advantages of hydrogen fuel. | | What is hydrogen economy? What are the advantageous of hydrogen fuel? | |
| Analyses general properties of alkali metals. | 6.2 Alkali Metals | Position in the modern periodic table. Reasoning of name- alkali metals. Mention the element present in that group. | Diagram which shows the position of s-block in modern periodic table - Group - I | | |
| | 6.2.1General Characteristics | Explain electronic configuration, gradation and similarities in properties-density, IE, Atomic volume, melting point metallic character | | Why alkali metals are found to possess high reducing properties? | |
| Recognises the chemical properties | 6.2.2. Chemical properties | Explains general chemical reactions with $O_2$, $H_2O$, $H_2$, $X_2$ ammonia etc. | Give Stoichiometric equation for all the reactions. | Write the chemical reaction of alkali metals with water. | |
| Knowledge about oxides and hydroxides | 6.2.3 Basic nature of oxides and hydroxides | Summary about the formation and basic nature of oxides and hydroxides of alkali metals | Equations to explain formation of oxides and hydroxides | How will you prove the basic nature of oxides of alkali metals? | |
| Learns the extraction of alkali metals | 6.3. Extraction of Lithium and Sodium. | Explains the methods of extraction of lithium and sodium from their chloride. | Diagrams of electrolytic methods | Explain how sodium is extracted from fused NaCl? | |

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| Recognises the properties and understands the uses of alkali metals | 6.3.1. Properties and uses | Explains general physical and chemical properties of Lithium and sodium. Explains anomalous behavior of Lithium. | Uses of Lithium and Sodium are listed. | How lithium differs from other alkali metals? | |

**UNIT VII - Group - II S-Block elements**

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| Understands the general characteristics of II group elements and compares with I group. | 7.1 General Characteristics | Explains general characteristics - Atomic Volume, atomic and Ionic radii, I E, metallic character etc. compares with I group. | | Why first ionization energy of alkaline earth metals higher than that of I group? | |
| Applies knowledge of electrolysis for metal extraction. | 7.2. Magnesium | Mentions ores explains the extraction of magnesium. Explains the properties and uses. | Diagrammatic representation of electrolytic process | What are the naturally occurring compounds of magnesium? | |
| Knowledge about compounds of II group elements | 7.3 Compounds of alkaline earth metals | Explains preparation, properties and uses of CaO, Plaster of paris, $MgSO_4$ | Illustrates the preparation and properties with equation | Mention the uses of Plaster of Paris? | |

**UNIT VIII - p-Block elements**

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| Understands the general characteristics of p-block elements | 8.1 General characteristics of p-block elements | Explain the general electronic configuration, Inert pair effect, nature of halides, nature of hydrides and nature of oxides. | Sketch showing the position of p-block elements in the modern periodic table. | Explain the inert pair effect of p-block elements? | |
| Understands the important ores of Boron and its isolation | 8.2 Group-13. Boron Group.<br><br>8.2.1 Important ores of Boron<br><br>8.2.2. Isolation of Boron- Properties | Explain the isolation of boron from its ores. | Write balanced equation for the preparation of elemental Boron by reduction of $BBr_3$ with dihydrogen. | Describe briefly how elemental boron can be prepared? | |
| Applies knowledge for the preparation and the properties of Boron compounds. | 8.2.3. Compounds of Boron- Borax, Boranes, diboranes, Borazole- preparation, properties. | Borax, Boranes, diboranes, Borazole preparation and properties are explained with balanced equations. | Diagrammatic representation of diborane and Borazole. | Describe what happen when Boric acid is heated? What happens when a borax solution is acidified? | |
| Learns the uses of boron and its Compounds. | 8.2.4 User of Boron and its Compounds. | Borax is used as flux, boric acid as antiseptic, boron fibers are used in making light are explained | List the uses of boron compounds. | What are the uses of boric acid and borax? | |
| Recalls the allotropes of Carbon, structural | 8.3 Carbon group - Group - 14. | Carbon exists in several crystalline and amorphous forms, | Diagrammatic representation of diamond, graphite | Explain the difference in the properties of | |

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| differences of graphite and diamond | 8.3.1 Allotropes of carbon.<br><br>8.3.2 Structural difference of graphite and diamond | including fullerenes can be explained. | and Structure of $C_{60}$ Buckminster fullerene. | diamond and graphite on the basis of their structure. | |
| Acquires knowledge about Physical and Chemical Properties of oxides, Carbides, halides and sulphides of Carbon | 8.3.3 General physical and chemical Properties of oxides, Carbides, halides and Sulphides of Carbon group.<br><br>8.4. Nitrogen - Group - 15. | Brief properties of Compounds of Carbon group are explained. | List the important uses of Carbon group compounds. | Why Silicon Carbide is used as an abrasive? | |
| Learns the fixation of nitrogen. | 8.4.1. Fixation of Nitrogen - natural and Industrial. | A brief idea about Haber's process in the manufacture of $NH_3$ and the biological fixation nitrogen is impressed. | Diagrammatic representation of Nitrogen cycle and natural fixation of Nitrogen. | Write a note on Nitrogen cycle? | |
| Understands the preparation of nitric acid | 8.4.2 $HNO_3$ - Ostwald process. | Explains the preparation of nitric acid by Ostwald process from ammonia explained with equations. | Diagrammatic representation of resonance structure of nitrate. | What is the reaction of nitric acid with Cu, and $I_2$? | |
| Recognises the uses of Nitrogen and its compounds | 8.4.3. Uses of Nitrogen and its compounds | Liquid Nitrogen as a refrigerant, nitric acid used in the pickling of Stainless steel. | | Describe the uses of ammonia and nitric acid. | |
| Recognises the importance of molecular oxygen for all oxygenated animals | 8.5 Oxygen - Group -16.<br><br>8.5.1 Importance of molecular oxygen- cell fuel | Importance of Molecular Oxygen as a cell fuel and the importance of hemoglobin as an oxygen carrier. | Block diagram of oxygen carrying tendency of hemoglobin. | How molecular oxygen is important for all oxygenated animals? | |
| Proposes the difference between nascent oxygen and molecular oxygen. | 8.5.2 Difference between nascent oxygen and molecular oxygen. | Impress the nascent oxygen for oxidation purposes and molecular oxygen for cell fuel. | Represent some oxidation reactions using nascent oxygen. | Give equation for the reaction of acidified $K_2Cr_2O_7$ to give nascent oxygen | |
| Recalls the important of oxides. | 8.5.3 Oxides- classification, Acidic, basic, amphoteric, neutral and peroxide | Properties of oxides can be explained. | Equations explaining various properties of oxides are listed. | What are peroxides? In what way they differ from dioxides? | |
| Realises the importance of ozone. | 8.5.4. Ozone preparation, Property and structure. | Preparations of Ozone through ozoniser and formation of Ozone in the upper atmosphere by nature. | Equations explaining the formation of Ozone. | Explain the importance of Ozone on all living organisms on earth? | |
| Understands the factors affecting Ozone layer. | 8.5.5 Factors affecting Ozone layer. | Action of refrigerants on Ozone layer its effect on environment. | Ozone Structure | How Ozone layer protects the atmosphere? | |

**UNIT IX - Solid State - I**

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| Recognises the classification of Solids. | 9.1 Classification of solids- amorphous, crystalline | Classifies solids as amorphous and crystalline solids. | Giving examples of amorphous solids and crystalline solids. | Distinguish between amorphous and crystalline solids. | |
| Understands the concept of unit cell | 9.2 Unit Cell | Defines a unit cell | Diagrams showing Sodium Chloride and caesium chloride unit cells. | Define a unit cell | |
| Learns to identify the important planes in a cubic system in terms of miller indices. | 9.3 Miller indices | Define Miller indices | Find the miller indices of planes in a cube. | Identify the following planes in a simple cube. (100), (010), (001), (110), (101), (011) and (111) planes. | |
| Recognies different types of cubic Crystal systems | 9.4 Types of lattices belong to cubic system. | Explains the simple cubic, body centered cubic and face centered cubic lattices. | Give example for each type of lattices | What are the lattices belonging to cubic system? | |

**UNIT X - Gaseous State**

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| Recognises the measurable properties of gases. | 10.1 Four important measurable properties of gases. | Explains the properties of gases like pressure, volume, temperature and mass. | Express pressure, Volume, Temperature and mass in different units. | What are measurable properties of gases? | |
| Learns various gas laws and combined gas equation. | 10.2 Gas laws and ideal gas equation. | Defines Boyle's law, Charles laws and derives ideal gas equation. | Represent the gas laws mathematically and show P-V, V-P and T-V curves. | What is molar volume of nitrogen at 500K and 600 atm.according to ideal gas law? | |
| Learns to express universal gas constant "R" in different units | 10.3 Calculation of gas Constant "R" | Calculates the value of universal gas constant and express it in different units. | Give the numerical values of gas constant in different units. | Give the values of gas constant in Calories/K/mole, J/K/mole, ergs/K/ mole, lt atm/K/mole. | |
| Understands Dalton's law of partial pressure. | 10.4 Dalton's law of partial pressure. | Defines Dalton's law of partial pressure and calculates partial pressure. | Express the partial pressure in terms of molefractions | Calculate the partial pressure of a mixture of two moles of Nitrogen and 2 moles of Hydrogen at STP? | |
| Recognises Graham's law of diffusion. | 10.5 Graham's law of diffusion. | Defines Graham's law of diffusion of gases. | Mathematical representation of Graham's law of | Define Graham's law of diffusion. | |

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| | | | diffusion. | | |
| Analyse the causes for deviation of real gases from ideality. | 10.6 Causes for deviation of real gases from ideal behavior. | Explains the deviation due to volume occupied by gas molecules and presence of intermolecular forces. | Diagrams showing volume correction and pressure correction. | Explain the causes for deviation of real gases from ideal behavior. | |
| Recognises the importance of Vanderwaal's equation. | 10.7 Vanderwaal's equation of state. | Explains Vanderwaal's equation. | Give the significance of Vanderwaal's constants. | What are the units of Vanderwaal's constants a and b? | |
| Analyses the critical phenomena | 10.8 Critical Phenomena | Explains critical phenomena and defines critical constants and arrives the relation between critical and vanderwaal's constants. | Andrew's experiment - P-V isotherm of $CO_2$, Thomson's experiment - P-V isotherm of $CO_2$. | Deduce the relationship between critical constants and Vanderwaal's constants? | |
| Recognises the concept of Joule-Thomson effect and inversion temperature<br>Understands the method of liquefaction of gases | 10.9 Joule-Thomson effect and inversion temperature.<br>10.10 Liquefaction of gases.<br>10.10.1 Methods of Liquefaction of gases. | Defines Joule-Thomson effect and inversion temperature.<br>Conditions for Liquefaction of gases.<br>Linde's method, Claude's Method, Adiabatic demagnetisation | Diagrammatic representation of Joule-Thomson effect.<br>Various condition for conversion of gas to liquid.<br>Diagrams explaining the liquefaction of gases. | Define Joule-Thomson effect.<br>What are conditions for the liquefaction of gases?<br>Describe Claude's method of liquefaction of gases with diagram. | |

**UNIT XI - Chemical Bonding**

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| Recalls the basic theories on chemical bonding | 11.1 Elementary theories on chemical bonding | | | | |
| Recognises Kossel-Lewis approach<br>Recalls octet rule | 11.1.1 Kossel-Lewis approach<br>11.1.2 Octet rule | Explain the Kossel-Lewis concept in terms of inert gas electronic configuration.<br>Explains Octet rule - attainment of 8 - electron configuration. | Formation of NaCl and MgO<br>Examples to illustrate octet rule - $CO_2$,$N_2$,$O_2$,$CH_2$=C$H_2$ | Illustrate octet rule by taking $CO_2$ and ethylene molecule as examples. | |
| Acquires knowledge about different types of bonds. | 11.1.3 Types of bonds | Mention different types of bonds | | What are the different types of bonds? | |
| Analyses the formation of ionic bonds. | 11.2 Ionic bond | Explains the formation of ionic bond between electropositive and electronegative | Electron dot representation of formation of NaCl, CaO, $MgF_2$, $AlBr_3$, | Explain the formation of ionic bond for $AlBr_3$ and CaO. | |

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| | | elements | and AlN. | | |
| Recognises the concept of lattice energy and its calculation | 11.2.1 Lattice energy and calculation of lattice energy using Born-Haber cycle | Defines lattice energy. Explains the determination of lattice energy by Born-Haber cycle | Schematic representation of Born-Haber cycle for the solid MX | Calculate the lattice energy for NaCl using Born-Haber cycle. | |
| Analyses the properties of ionic compounds | 11.2.2 Properties of electrovalent compounds | Properties like physical state, solubility, melting point, boiling point and conductivity can be explained. | | Discuss the important properties of electrovalent compound. | |
| Recognises the concept of Co-valent bond based on Lewis Structure | 11.3 Covalent bond<br><br>11.3.1 Lewis structure of Covalent bond.<br><br>11.3.2 Properties of covalent compounds. | <br><br>Electron dot representation with reference to the molecules like $Cl_2$, $O_2$, ethane, ethylene, acetylene, and $PH_3$.<br><br>Explains the properties like melting point, boiling point, solubility and conductivity. | <br><br>Diagrammatic representation of Lewis structure of covalent compounds. | <br><br>Give the electron dot representation for $PH_3$ and ethane.<br><br>Explains the important properties of covalent compounds. | |
| Analyses the Covalent character of ionic bonds | 11.4.1 Fajan's rules | Explains the condition for the covalency of ionic bond. | Covalent character of compounds like $AlCl_3$ | Discuss Fajan's rule. | |
| Analyses the polarity of covalent bonds | 11.4.2 Polarity of Covalent bonds | Explains the polarity of covalent bonds in terms of electronegativity. | Polarity of $H_2O$, HCl, HCN | Give the reason for the polarity of HCl molecule | |
| Recognises VSEPR Model | 11.5 VSEPR Model | Explains the concept of VSEPR model with suitable examples | Shapes of molecules like $BeCl_2$, $BF_3$, $CH_4$, $NH_3$,$H_2O$, $PCl_5$, $SF_6$ | Give the shapes of the following molecule- $CH_4$, $NH_3$,$H_2O$, $PCl_5$ | |
| Understands the covalent bonding through VB theory | 11.6 Covalent bond through valence bond approach | Explains the overlapping of orbital, and the concept of hybridisation. | Different types of overlapping - S-S, P-P and S-P and hybridisation- $SP^3$, $SP^2$ and SP are explained with examples. | What are the important features of VB theory? What is hybridisation?] | |
| Learns the concept of resonance | 11.7 Concept of resonance | Define the concept of resonance and explains the same with examples | Concept of resonance is illustrated with reference to molecules like $CO_2$, $O_3$, $N_2O$, $CO_3^{2-}$ and benzene. | Define resonance. Give the various resonance structure of $CO_2$. | |
| Recalls the concept of coordinate covalent bond | 11.8 coordinate covalent bond | Explains the coordinate covalent bond formation with examples. | Bonding in $NH_4Cl$,$H_3N$:$BF_3$, $Ni(CO)_4$ | Explain the coordinate covalent bond with suitable example. | |

**UNIT XII - COLLIGATIVE PROPERTIES**

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| Recognises the concept of Colligative Properties | 12.1 Concept of Colligative Properties and its scope. | Defines Colligative properties and mention its scope in the determination of molar mass of a non-volatile solute | | What are Colligative properties? Give example. | |
| Understands the lowering of vapour pressure | 12.2 Lowering of vapour pressure. | Explain the lowering of vapour pressure due to the dissolution of a non-volatile solute | Reasoning of lowering of vapour pressure of a dilute solution. | Give reason for lowering of vapour pressure. | |
| Recognises Raoult's law and its use in calculating molar mass<br><br>Recognises the concept of depression of freezing point. | 12.3 Raoult's law- Ostwald - walker method.<br><br>12.4 Depression of freezing point of dilute solution. | Defines Raoult's law and arriving the expression relating molar mass and relative lowering of vapour pressure.<br><br>Explains the depression of freezing point of a solution due to the dissolution of non-volatile solute in a solvent. | Calculate the molar mass of non-volatile solute through Ostwald-Walker method.<br><br>Give equation relating molar mass and depression of freezing point. | Calculate the vapour pressure of the solution. The molefraction of the solute is 0.25. The vapour pressure of the pure solvent is 0.8<br>What is the freezing point of solution containing 3g of a non-volatile solute in 20g of water. Freezing point of pure water is 273K, $K_f$ of water=1.86 K Kg /mol. Molar mass of solute is 300g/mol. | |
| Learns the Beckmann method of determination of molar mass | 12.4.1 Beckmann method | Describes the experimental method of determining molar mass of non-volatile solute using Beckmann method. | Diagram showing Beckmann method using Beckmann thermometer. | Describe Beckmann method. | |
| Recognises the concept of elevation of boiling point | 12.5 Elevation of boiling point of dilute solution. | Explains the elevation of boiling point of a solvent due to the dissolution of non-volatile solute | Give equation relating molar mass and elevation of boiling point | Deduce the relationship between elevation of boiling point of molar mass | |
| Learns the Cotrell's method of determination of molar mass | 12.5.1 Cotrell's method. | Describes the experimental method of determining molar mass of non-volatile solute using Cotrell's method | Diagram showing Cotrell's method | Describe Cotrell's method of determining the boiling point of liquid. | |
| Recalls the concept Osmosis | 12.6. Osmotic pressure<br><br>12.6.1 Laws of Osmotic pressure | Explains the concept of osmosis and defines Osmotic pressure.<br><br>Defines the laws of Osmotic pressures and mathematical expressions of the same. | Diagram showing the process of osmosis.<br><br>Give equation relating molar mass and Osmotic pressure | What is Osmotic pressure?<br><br>Deduce the relationship between Osmotic pressure | |

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| | | | | and concentration. | |
| Learns the Berkley Hartley's method. | 12.6.2. Berkley-Hartley's method. | Describes the Berkley-Hartley's method of determining Osmotic pressure. | Diagram of Berkley- Hartley's apparatus. | Describe Berkley-Hartley's method. | |
| Understands the reason for abnormal Colligative properties. | 12.7 Abnormal colligative properties Van't Hoff factor and degree of dissociation | Explains the reasons for abnormal colligative properties and explain with examples. | Give equations for Van't Hoff factor and degree of dissociation. | Define Van't Hoff factor and relate it with degree of dissociation. | |

**UNIT XIII - Thermodynamics - I**

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| Recognises the scope of thermodynamics | 13.1 Thermodynamics-Scope | Possibility of a process can be predicted. | | | |
| Understands various terminology used in thermodynamics | 13.2 Terminology used in thermodynamics | Defines systems, surroundings, types of systems, Isothermal and adiabatic process intensive and extensive properties, state functions, path functions, spontaneous and non-spontaneous process, exothermic and endothermic process. | Each term is explained with suitable examples. | Define system and surroundings. What are state functions? | |
| Understands the nature of thermodynamic properties. | 13.3 Thermodynamic properties -nature | Dependence on initial and final states of the system can be emphasized. | Dependency on the states of the system can be explained with illustration. | Differentiate path and state functions. | |
| Learns Zeroth laws of Thermodynamics | 13.3.1. Zeroth law of thermodynamics | Defines Zeroth law of thermodynamics. | Temperature is defined | Define Zeroth law of Thermodynamics. | |
| Knowledge about the I law of thermodynamics. | 13.3.2. First law of thermodynamics | Statement and its significance | Importance of law of conservation of energy is emphasised. | State the law of Conservation of energy. | |
| Understands the concept of internal energy. | 13.3.3. Internal energy | Defines internal energy and explain the factors contributing the internal energy | All the components of internal energy can be explained. | What are the factors contributing the internal energy? | |
| Gains Knowledge about the concept of enthalpy | 13.3.4 Enthalpy | Explains the concept of enthalpy. | The dependence of enthalpy on temperature is impressed. | What is enthalpy of a reaction? What is standard enthalpy? | |
| Finds the relation between ?H and ?E | 13.3.5. Relation between ?H and ?E<br><br>13.3.6 Mathematical form of First law | Derives the relationship between ?H and ?E<br><br>Gives the equation ?E = q-w. | Apply the equation relating ?H and ?E to systems involving solids, liquids and gases.<br><br>Qualitative explanation of arriving the equation | Derive the relation between ?H and ?E.<br><br>Write mathematical expression of I | |

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| | | | ?E = q-w. | law of thermodynamics . | |
| Recognises the enthalpy of transition. | 13.3.7. Enthalpy of transition.<br><br>13.3.8. Enthalpy of formation.<br><br>13.3.9 Enthalpy of Combustion.<br><br>13.3.10 Enthalpy of neutralisation. | Defines the enthalpy of fusion, enthalpy of vapourisation and enthalpy of sublimation.<br><br>Defines the enthalpy of formation and standard enthalpy of formation.<br><br>Define enthalpy of combustion.<br><br>Defines enthalpy of neutralisation and explains the constancy of enthalpy of neutrailisation of strong acid by a strong base and variation of enthalphy of neutralisation of weak acid by a strong base and vice versa. | Illustrate with the following transitions.<br>$H_2O_{(s)}$ ? $H_2O_{(l)}$ ? $H_2O_{(g)}$<br>$I_{2(s)}$? $I_{2(g)}$<br><br>Calculation of enthalpy of formation of $CO_2$, $H_2O$ and $CH_4$<br><br>Experimental determination of enthalpy of combustion by bomb calorimeter.<br><br>1) HCl + NaOH ? NaCl + $H_2O$<br><br>2) $CH_3COOH$ + NaOH ? $CH_3COONa$ + $H_2O$<br><br>3) HCl + $NH_4OH$ ?<br><br>$NH_4Cl+H_2O$<br><br>Illustrate with the above neutralisation reaction. | Define the enthalpy of fusion and enthalpy of vapourisation.<br><br>Define standard enthalpy of formation.<br><br>How will you determine enthalpy of combustion?<br><br>Why is enthalpy of neutralisation of weak acid by a strong bases less than 57.32?<br><br>Define enthalpy of neutralisation. | |
| Understands various sources of energy.<br><br>Understands the need for the non-conventional energy resources. | 13.4 Various sources of energy<br><br>13.4.1. Non-conventional energy resources. | Giving various sources of energy like solar energy, thermal energy, atomic energy, electrical energy, hydrolic energy.<br>1. Conversion of solar energy into thermal energy, light energy etc.<br>2. Electrical energy from wind mills and tides | Importance of non-conventional energy resources is impressed. | State various sources of energy.<br><br>How is electrical energy generated from wind mills and tides. | |

**UNIT XIV - CHEMICAL EQUILIBRIUM – I**

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| Understands the scope of chemical equilibrium | 14.1 Scope of Chemical Equilibrium. | To study the extent of completeness of chemical reactions | | | |
| Recall reversible and irreversible nature of reactions and chemical equilibrium in physical and chemical process | 14.2 Reversible and irreversible reactions | Reactions explaining reversible and irreversible reactions | Examples for reversible and irreversible reactions. | What are reversible and irreversible reactions? | |
| | 14.2.1 Nature of chemical equilibrium | Explains the dynamic nature of chemical equilibrium | | Why is chemical equilibrium called as dynamic equilibrium | |
| | 14.2.2 Equilibrium in physical process<br><br>14.2.3 Equilibrium in chemical process | Explains the equilibrium in physical changes<br><br>Explains the equilibrium in chemical changes | Illustrate to the transition of<br>Solid = Solid<br>Solid = Liquid<br>Liquid = Vapour<br><br>Chemical equilibrium in homogeneous and heterogeneous systems can be explained with example. | Explains the equilibrium in physical and chemical process with examples | |
| Understands the law of chemical equilibrium applicable to different types of chemical reactions | 14.3 Law of chemical equilibrium and equilibrium constant | Defines the law of chemical equilibrium and expressions for equilibrium constant and gives the significance of equilibrium constants. | Express equilibrium constant in terms of concentration and partial pressures and derive the relationship between them. | Define law of mass action. Derive the relationship between Kp and Kc. | |
| | 14.3.1 Homogeneous equilibria | Explain equilibria in solution and gas phase. | Write expressions for equilibrium constants for homogenous equilibria | Deduce the equilibrium constant for the formation of hydrogen iodide from hydrogen and Iodine | |
| | 14.3.2 Heterogeneous equilibria | Explains heterogeneous equilibria with examples | Write expression for equilibrium constant for heterogeneous equilibria | What is heterogeneous equilibria? Give examples | |

**UNIT XV - CHEMICAL KINETICS - I**

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| Recognises the scope of studying rate of reactions | 15.1 Scope | To study the mechanism of reactions | Importance of mechanism of chemical reactions | | |
| Analyses the concept of rate and factors affecting it | 15.1.1 Rate of chemical reactions | Defines the rate of chemical reactions and factors affecting the rate of reactions | Mathematical representation of rate with reference to common | Define rate of reactions and give the factors affecting it. | |

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| | | | reactions | | |
| Recognises the concept of rate law | 15.1.2 Rate law and rate determining step | Write the rate laws and explains the specific rate | Examples of certain measurable rate reaction and apply rate law. | Define rate law and rate constant | |
| Learns to calculate reaction rate from rate law | 15.1.3 Calculation of reaction rate from the rate law | Calculates the reaction rate from rate law | Numerical problems | Decomposition of $N_2O_5$ occurs in the following manner. $2N_2O_5 \rightarrow 4NO_2 + O_2$ Write various formulae expressing the rate of reaction | |
| Analyses the difference between order and molecularity | 15.2 Order and molecularity of the reactions | Defines order and molecularity and differentiates them | | Distinguish between order and molecularity? | |
| | 15.3 Calculation of exponents of a rate law | | | | |
| Analyses the chemical reactions on the basis of their order | 15.4 Classification of rates based on order of the reactions | Explains Zero, first, second, third fractional and pseudo first order reactions | Give examples for each type of reactions | How are reactions classified? | |

**UNIT XVI - BASIC CONCEPTS OF ORGANIC CHEMISTRY**

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| Knowledge about catenation | 16.1. Catenation | Define catenation Explains with suitable examples | | How carbon is able to form innumerous number of compounds | |
| Understands classification of organic compounds | 16.2 Classification of organic compounds | Different types of organic compounds like aliphatic , aromatic, mono cyclic, hetero cyclic, alicyclic compounds are explained with suitable examples | Schematic representation of classification of organic compounds | Explain the classification of organic compounds with suitable examples | |
| Recalls different kinds of functional groups | 16.3 Functional groups | Defines functional groups, functional groups of different organic compounds are identified. | Mentioning the functional groups of different compounds - chart | Give the functional groups of the following compounds a) alcohol b) Ketone c) Carboxylic acid d) Aldehyde e) Ester | |
| Knowledge of IUPAC nomenclature and its significance | Nomenclature | Need for IUPAC nomenclature of organic compounds is emphasised Method of writing IUPAC names of different organic compounds are | Tables showing basic pattern of IUPAC – name and common names of different Organic compounds | Write the IUPAC names of the following compounds a)$CH_3OH$ b)$CH_3COCH_3$ c)$CH_3OCH_3$ d)$CH_3COOCH_3$ | |

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| | | explained with suitable examples | | e)HCOOH | |
| Understands the different types of isomerism present in organic compounds | 16.5 Isomerism | Defines isomerism – explains the different types of isomerism – chain, position,- functional isomerism with examples | Diagrammatic representation wherever it is necessary | Identify the types of isomerism found in the following pairs<br>a)1-butanol and 2-methyl-1-propanol<br>b)1,2-dichlorobenzene and 1,4–dichlorobenzene<br>c)propanal and propanone | |
| Understands the different types of Organic reactions | 16.6 Types of organic reactions | Explains the following reactions with examples -substitution, addition, elimination condensation, polymerisation, hydrolysis oxidation and reduction reactions | | Explain the following with an example<br>a) addition reaction<br>b) elimination reaction<br>c) hydrolysis<br>d) condensation reaction<br>e) reduction reaction | |
| Knowledge about different types fission of chemical bond | 16.7<br>Fission of bonds | Explains homolytic and heterolytic fission with example | Homolytic - radicals<br>Hetrolytic -ions | What are the two types of fission? | |
| Knowledge about electrophiles and nucleophiles | 16.7.1<br>Electrophiles and nucleophiles | Defines electrophile and examples are given<br>Define nucleophile and examples are given | Equation which shows the attack of electrophile and nucleophile | Give 2 example each for nucleophile and electrophile | |
| Understands the formation of carbonium ion and carbanion | 16.7.2<br>Carbonium ion<br>Carbanion | The formation of carbonium and carbanion are explained along with their hybridisation and structure | Sketch shows the structure of carbanion and carbonium ion | | |
| Understands free radical mechanism | 16.8<br>Free radicals | Formation of free radicals in homolytic fission – explanation-chain reaction of chlorination of methane | Chart showing initiation, propagationand termination steps | Explain the chlorination of methane with free radical mechanism | |
| Knowledge about different types of inductive effect | Electron displacement in covalent bond | Explains inductive and mesomeric effects of different group involved in covalent bond | Figure explanation shows +I and –I effects of different groups | Indicate why halo and OH groups are o-, p-directing whereas “ $NO_2$” group is meta directing.<br>Explain with reference to electron displacement. | |

## UNIT XVII - PURIFICATION OF ORGANIC COMPOUDS

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| Learns the characteristics of organic compounds | 17.1 Characteristics of organic compounds | States the physical properties of organic compounds<br>-Soluble in organic solvents<br>-insoluble in polar solvents<br>-volatile in nature<br>-low m.pt and b.pt<br><br>Need for purification | Difference between organic and inorganic compounds in physical properties is illustrated | Explain the physical properties of organic compounds? | |
| Knowledge of crystallisation | 17.2 Crystallisation | Defines Crystallisation<br>Different steps involved in Crystallisation-different organic solvents | Performs experiments to demonstrate the technique | What are the steps involved in crystallisation? | |
| | 17.2.1 Fractional Crystallisation | Explains the separation of substances with different solubilities in the same solvent | | Predict a method to separate a mixture in solutions containing two solids with different solubilities. | |
| Knowledge of sublimation | 17.3 Sublimation | Defines sublimation –<br>- Sublimating substances<br>- Method of purifying substances using sublimation | Schematic diagram | How are iodine and naphthalene purified? | |
| | 17.4 Distillation | Defines distillation | Pictorial representation | | |
| Understands fractional distillation | 17.4.1 Fractional distillation | Explains the method of purifying liquids with different boiling point with suitable examples | Diagrammatic representation | How is the mixture of alcohol and water purified? | |
| Learns steam distillation | 17.4.2 Steam distillation | Principle & procedure | Diagrams showing experimental set up | How is aniline purified? | |
| Learns the principle of these techniques and their applications to purify simple organic compounds | 17.5 Chromatography | Defines chromatography principle-different types of chromatography. Adsorption – column, thin layer-partition. | Diagrammatic representation of column, thin layer – chromatogram, and developed chromatogram | Explain the principle of paper chromatography ? | |

## UNIT XVIII - DETECTION AND ESTIMATION OF ELEMENTS

| **Expected specific outcome of Learning** | **Contents in terms of concepts** | **Curriculum transactional strategies** | **Illustrations** | **Evaluation** | **Suggested no. of periods** |
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| Learns the principle of detection and estimation of elements in | 18.1 Detection of carbon and hydrogen | The method of detection of carbon and hydrogen in organic compound. The reactions involved | Diagrammatic representation of detection of carbon and Hydrogen. | How are carbon and hydrogen detected in an organic compound? | |

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| organic compounds | | in detection | | | |
| | 18.2 Detection of Nitrogen | Lassaigne' s Test Preparation of sodium fusion extract- experimental reactions- Detection of both sulphur and nitrogen | Identifies N, S, halogens in simple organic compounds by qualitative tests. | Give the formula of Prussian blue in Lassaigne' s Test? | |
| | 18.3 Detection of halogens | Lassaigne' s Test and the reactions involved | | What is the colour of silver iodide. | |
| | 18.4 Detection of sulphur | Sodium fusion extract. Experiments – reactions involved | Equations for the reactions are illustrated | How is sulphur detected? | |
| | 18.5 Estimation of carbon and hydrogen | Principle-Apparatus-procedure-calculations for percentage of carbon and hydrogen problems based on the percentage of carbon and hydrogen | Diagrams showing experimental set up of this technique. | Numerical problems are asked. | |
| | 18.6 Estimation of Nitrogen | Kjeldahl's method principle – procedure calculations-problems based on percentage of nitrogen in organic compounds | Schematic representation of Kjeldahl' s method. | How is nitrogen estimated by Kjeldahl' s method | |
| | 18.7 Estimation of sulphur | Carius method calculations, problems based on estimation of sulphur | Pictorial representation | How is sulphur estimated | |
| | 18.8 Estimation of halogens | Carius method – Principle- procedure-Calculation-problems based on the estimation of halogens | Schematic diagram to explain the process | Numerical problem based on this method | |

**UNIT XIX - HYDROCARBONS**

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| Learns the classification of hydrocarbons | 19.1 Classification of Hydrocarbons | Classification into aliphatic and aromatic, alicyclic. | Chart showing the classification of hydrcarbons | | |
| Learns the IUPAC rules of nomenclature of alkanes. | 19.2 IUPAC nomenclature | IUPAC nomenclature of aliphatic saturated hydrocarbons | Mention the names of IUPAC nomenclature of hydrocarbons | Write structures of the following compounds based on IUPAC rules<br>i) 2,2,3 trimethyl butane<br>ii) 3-ethyl-2-methyl pentane | |
| | 19.3 Sources of alkanes | Gives important sources of alkanes | | | |
| Recognises the methods of preparations of alkanes | 19.4 General methods of preparation of alkanes | Explains various methods of preparation of alkanes<br>1) Reduction of unsat. Hydrocarbons<br>2)Reduction of alkyl halides<br>3)Decarboxylation of | Represent the methods of preparation with suitable chemical equations | Write any five methods of preparation of alkanes. | |

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| | | fatty acids<br>4)Kolbe's electrolytic method<br>5)Wurtz reaction | | | |
| Understands the physical properties of alkanes | 19.5.Physical properties | Mention the physical properties - m.p and b.p and their variation with molar masses solubility | | Why branched alkanes possess lower melting and boiling point than corresponding straight chain alkanes? | |
| Analyses the chemical properties of alkanes | 19.5.1 Chemical properties | Explains the chemical properties like combustion, substitution polymerisation | Give the chemical equations of the reactions | Explain substitution reaction of alkanes | |
| Understands different conformations of alkanes | 19.6 conformations of alkanes | Explain the concept of conformation with reference to ethane, propane, n-butane and cyclohexane | Give different conformations of ethane, propane, n-butane and cyclohexane | Draw different conformations of n-butane and cyclohexane | |
| Gains knowledge about alkenes and their IUPAC nomenclature | 19.7 Alkenes | Sources | | | |
| | 19.8 IUPAC nomenclature of alkenes | Gives the IUPAC rules of nomenclature of alkenes | List of alkenes with IUPAC names. | Give the IUPAC names of the following<br>a) $CH_3$-$CH_2$-CH-CH=$CH_2$<br>$CH_3$<br>b) $CH_3$-CH=CH-$CH_2$<br>Cl | |
| Understands general mehtods of preparation of alkenes<br><br>Learns Physical and chemical properties of alkenes | 19.9<br>General methods of preparation<br><br>19.9.1 )Physical Properties | Explains the following genereal methods of preparation<br>i)dehydration of alcohols<br>ii)dehydro halogenation of alkyl halides<br>iii)hydrogenation of alkynes<br>Mentions important physical properties | Represent the reactions with suitable chemical equations | How will you obtain propene from<br>i)n-propyl alcohol<br>ii)n-propyl bromide ? | |
| | 19.9.2) Chemical Properties | Explains the following characteristic reactions of alkenes<br>i)addition reactions<br>ii)polymerisation reaction | Represent the reactions with suitable chemical equations<br>Explain 1,2- and 1,4- addition to butadienes | Explain Markovnikov's rule and peroxide effect with examples. | |

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| | 19.9.3) Uses | Mentions important uses of alkenes | | Mention the uses of ethene | |
| Recalls the preliminary ideas about alkynes | 19.10 Alkynes | Fundamental ideas like C ? C bond, $C_nH_{2n-2}$ etc. | | | |
| | 19.11 IUPAC Nomenclature of alkynes | Mentions the rules of IUPAC nomenclature of alkynes | List of alkynes with IUPAC names | Give the structures of the following compounds<br>i)Propyne<br>ii)2-butyne<br>iii)4-methyl-2-pentyne | |
| Understands preparation and properties of alkynes | 19.12 General methods of preparation | Gives the general methods of preparation | Represent with suitable chemical reactions | | |
| | 19.13. Physical Properties | Mentions important physical properties | | | |
| | 19.13.1 Chemical properties | Explains the following reactions with examples<br>i)addition reactions<br>ii)reactions of acidic hydrogen<br>iii)Polymerisation | Represent the reactions with suitable chemical equations | Discuss the reactions of acidic hydrogen in acetylene | |
| | 19.13.2 Uses | Mentions important uses of alkynes | | What are the uses of acetylene? | |

**UNIT XX - AROMATIC HYDROCARBONS**

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| Introduces Aromatic hydrocarbons | 20 Aromatic Hydrocarbons | Benzene, Tolune, Napthalene and Anthracene | Give the Structures of the compounds. | Give the structures of naphthalene and toluene | |
| Knows the naming of aromatic hydrocarbons | 20.1 IUPAC nomenclature of aromatic hydrocarbons | IUPAC Naming of mono, di & tri substituted benzene derivatives | | | |
| Understands the concept of resonance in benzene | 20.1.1 Structure of Benzene | Resonance Structure-(Modern concept), Delocalisation, Huckel's (4n+2) rule. | Explains various concepts of structure of benzene and its aromaticity | Discuss the structure of Benzene | |
| Recognises the orientation effect of substituents on the benzene ring | 20.1.2 Orientation of substituents on the benzene ring | Explains the nature of orientation of functional groups on the benzene rings. | Explanation the electronic effects of different functional groups on the orientation of substituents | Give examples of ortho-para directing and meta directing groups | |
| Learns different methods of preparation of benzene | 20.2.1 Commercial preparation of benzene | Benzene from coal tar Describes the method. | | Describe the preparation of benzene from coal tar. | |

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| | 20.2. General methods of preparation of Benzene and its homologues. | Gives different methods of preparation of benzene | Represent the reactions with chemical equations | How will you prepare Benzene from the following.<br>i)aromatic acids<br>ii)alkyl benzene | |
| Recognises the physical and chemical properties of benzene | 20.3. Physical properties | Mentions physical properties | | | |
| | 20.3.1 Chemical properties | Explains electrophilic substitution reactions on benzene ring | Explanation mechanism of electrophilic substitution reaction with suitable chemical equations | Write notes on the following<br>i)Halogenation<br>ii)Nitration<br>iii)Friedel-Craft's alkylation<br>iv)Sulphonation | |
| | 20.3.2 Uses | Mention the uses of benzene | | | |
| Recognises the carcinogenic and toxic nature of polynuclear hydrocarbons | 20.4 Carcinogenic and toxic nature | Mentions carcinogenic and toxic polynuclear hydrocarbons | List the polynuclear hydrocarbons which are toxic | Give some examples of carcinogenic and toxic polynuclear hydrocarbons | |

**UNIT XXI - ORGANIC HALOGEN COMPOUNDS**

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| Understands the classification of organic halogen compounds | 21.1 Classification of organic halogen compounds | Classifies into<br>i) alkyl halides<br>ii) aryl halides<br>iii) aralkyl halides<br>iv) classify into $1^0$,$2^0$ and $3^0$ alkyl halides | | Give examples of each type of organic halides | |
| Learns the IUPAC nomenclature of alkyl halides | 21.2 IUPAC nomenclature of alkyl halides. | Gives IUPAC names of common alkyl halides. | | Give IUPAC names<br>a) Methyl bromide<br>b) Sec. butyl iodide. | |
| Understands preparation and properties of alkyl halides | 21.3 General methods of preparation. | Mentions important general methods of preparation. | Explains with suitable chemical equations | How will you prepare ethyl bromide from<br>1) ethanol<br>2) ethane | |
| | 21.4 Properties | Order of reactivity of different halides is mentioned.<br>Explain the substitution, elimination and reduction reactions. | Represents the reactions with chemical equations | How will you prepare the following from alkyl halides?<br>1) alkenes<br>2) alcohols<br>3) ethylbenzene | |

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| Understands the mechanism of nucleophilic substitution reaction and elimination reaction. | 21.5 Nucleophilic substitution reactions | SN2 reactions- Primary halides undergo SN2 reactions.<br>SN1 reactions – tertiary halides undergo SN1 reactions | Mechanistic paths are represented. Mentions the dependency of rate on concentration order of the reactions. | Discuss SN2 and SN1 reactions. | |
| | 21.6 Elimination reactions. | Mechanisms of E2 and E1 eliminations are explained with suitable examples. | | Write notes on elimination reactions of alkyl halides. | |
| | 21.7 uses | Mentions important uses of alkyl halides | | What are the uses of alkyl halides? | |
| | 21.8 Aryl halide | Types of aryl halides | | | |
| Gains the knowledge of preparation of aryl halides | 21.9 General methods of preparation. | Preparation by direct halogenation and decomposition of diazonium salts are explained. | Represent the reactions with chemical equations. | Give two methods of preparation of chlorobenzene. | |
| Analyses the properties of arylhalides | 21.10 Properties | Reactions due to aromatic ring and the halogen atom | Represent the reactions with chemical equations. | How will you convert chlorobenzene into<br>1) ethylbenzene<br>2) o- and p-dichlorobenzene | |
| | 21.11 Uses | Mentions the uses of aryl halides. | | | |
| Gains knowledge about aralkyl halides | 21.12 Aralkyl halides | Benzyl chloride – preparaion | Gives the chemical reactions. | How will you prepare benzyl chloride from toluene and benzyl alcohol? | |
| | 21.12.1 Comparsion arylhaldies and aralkyl halides. | Comparsion of nuclear and side chain derivatives of halides | Table showing the difference between aryl halide and aralkyl halide | | |
| | 21.13 Grignard reagents. | General formula and nomenclature | | Mention the formula and structure of methyl magnesium iodide and phenyl magnesium iodide. | |
| | 21.13.1 Preparation | Preparations of methyl magnesium iodide | Describe the method of preparation. | How will you prepare methyl magnesium iodide. | |
| Analyses the synthetic uses of Grignard reagent. | 21.13.2 Synthetic uses. | Mentions various synthetic uses of methyl magnesium iodide. | Gives the chemical equations. | How will you prepare the followings from methyl | |

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| | | | | magnesium bromide.<br>1) isopropyl alcohol<br>2) acetaldehyde<br>3) ethylacetal. | |

CHEMISTRY PRACTICALS FOR STD XI

I. Knowledge of using Burette, Pipette and use of logarithms is to be demonstrated.

II. Preparation of Compounds.
1. Copper Sulphate Crystals from amorphous copper sulphate solutions
2. Preparation of Mohr's Salt
3. Preparation of Aspirin
4. Preparatrion of Iodoform
5. Prepartion of tetrammine copper(II) sulphate

III. Identification of one cation and one anion from the following. (Insoluble salt should not be given)

Cation:- $Pb^{++}$, $Cu^{++}$, $Al^{++}$, $Mn^{2+}$, $Zn^{++}$, $Ca^{++}$, $Ba^{++}$, $Mg^{++}$, $NH_4^+$

Anions:- Borate, Sulphide, Sulphate, Carbonate, Nitrate, Chloride, Bromide.

IV. Determination of Melting point of a low melting solid.

V. Acidimetry Vs Alkalimetry
1. Preparation of Standard solution of Oxalic and Sodium Carbonate solution.
2. Titration HCl Vs NaOH
3. Titration HCl Vs $Na_2CO_3$
4. Titration Oxalic acid Vs NaOH

**Mode of Examination**

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| 1. | Preparation of Compound | (05) |
| 2. | Volumetric analysis | (10) |
| 3. | Qualitative analysis | (15) |
| 4. | Internal assessments | (20) |
| | Total | 50 |