

CHEMISTRY
THEORY
COURSE STRUCTURE
CLASS XI

*One Paper**Time : 3 Hours**Marks : 70*

Units	Title	No. of Period	Marks
I.	Some basic concepts of Chemistry	14	18
II.	Structure of atom	14	
III.	Classification of elements and periodicity in properties	6	
IV.	Chemical bonding and molecular structure	14	
V.	States of matter : Gases and Liquids	12	16
VI.	Thermodynamics	14	
VII.	Equilibrium	16	18
VIII.	Redox reactions	8	
IX.	Hydrogen	8	
X.	s-Block elements	12	
XI.	Some p-block elements :	12	18
XII.	Organic Chemistry : Some basic Principles and Techniques	12	
XIII.	Hydrocarbons	12	
XIV.	Environmental chemistry	6	
Total		160	70

Note: A minimum of 3 marks must be allotted to each unit.

Unit I : Some basic Concepts of Chemistry**(14 Periods)**

Importance of Chemistry, Nature of Matter, properties of matter and their measurement, uncertainty in measurement, laws of Chemical combination, Dalton's Atomic Theory, Atomic and Molecular Masses, Mole concept and Molar Masses, percentage composition, Stoichiometry and Stoichiometric calculations.

Unit II : Structure of Atom (14 Periods)

Discovery of electron, proton and neutron; atomic number, isotopes and isobars. Thompson'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 exclusion principles 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. (6 periods)

Why do we need to classify elements? Genesis of periodic classification, Modern Periodic Law and the present form of the periodic Table, nomenclature of elements with Atomic Number > 100, Electronic configurations of elements and the periodic table, Electronic configuration and types of elements, s-, p-d-f- Blocks, Periodic Trends in Properties of Elements – atomic radii, ionic radii, electron gain enthalpy, electronegativity, periodic trends in chemical properties.

Unit IV : Chemical Bonding and Molecular Structure. (14 periods)

Kossel – Lewis Approach to Chemical Bonding, Ionic or Electrovalent Bond, Bond parameters, The Valence shell Electron Pair Repulsion (VSEPR) Theory, Valence Bond Theory, Hybridisation, Molecular Orbital Theory, Bonding in some Homonuclear Diatomic molecules, hydrogen Bonding.

Unit IV : States of matter (12 periods)

Intermolecular Forces, Thermal Energy, intermolecular Forces vs Thermal Interaction, The Gaseous State, The Gas Laws, Ideal Gas Equation, Kinetic Energy and Molecular Speeds, Kinetic Molecular Theory of Gas, Behaviour of Real Gases : Deviation from Ideal Gas Behaviour, Liquefaction of Gases, Liquid State.

Unit VI : Thermodynamics (14 periods)

Thermodynamic Terms, Applications, Measurement of ΔU and H , Calorimetry, Enthalpy change, $\Delta_r H$ of a Reaction-Reaction Enthalpy, Enthalpies for different types of reactions, Spontaneity, Gibbs energy change and equilibrium.

Unit –VII : Equilibrium**(16 periods)**

Equilibrium in physical processes, equilibrium in chemical processes – Dynamic Equilibrium, Law of Chemical Equilibrium and Equilibrium constant, Homogenous Equilibria, Heterogeneous Equilibria, Application of Equilibrium constants, Relationship between Equilibrium constant K, Reaction Quotient Q and Gibbs Energy G, Factors Affecting Equilibria Ionic Equilibrium in solution, Acids, Bases and salts, Ionization of Acids and Bases, buffer solutions, solubility Equilibria of sparingly soluble salts.

Unit – VIII : Redox Reactions**(8 periods)**

Classical idea of Redox reactions – Oxidation and Reduction Reactions, Redox Reactions in terms of Electron Transfer Reactions, Oxidation Number, Redox Reactions and Electrode Processes.

Unit – IX : Hydrogen**(8 periods)**

Position of Hydrogen in the periodic table, Dihydrogen, H_2 , Preparation and types of hydride, properties of Dihydrogen,; Hydrides, water, Hydrogen Peroxide (H_2O_2), Heavy water, D_2O ; Dihydrogen as a fuel.

Unit – X : The s- Block Elements**(12 periods)**

Group 1 elements : Alkali Metals, General Characteristics of the compounds of the Alkali Metals, Anomalous properties of Lithium, some important compounds of sodium, Biological Importance of sodium and potassium, Group 2 elements : Alkaline Earth Metals, General characteristics of compounds of the Alkaline Earth Metals, Anomalous Behaviors of Beryllium, Some important compounds of calcium, biological importance of Magnesium and calcium.

Unit –XI : The p-Block Elements**(12 periods)**

Group 13 Elements : The boron family, Important Trends and Anomalous properties of Boron, Some Important compound of Boron, Uses of Boron and Aluminum and their compounds, Group 14 Elements : The Carbon family, Important Trends and Anomalous behavior of carbon, Allotropes of carbon, some important compounds of carbon and silicon.

Unit – XII : Organic Chemistry – some basic principles and Techniques. (12 periods)

General Introduction, Tetra valence of carbon : shapes of organic compounds, structural representations of organic compounds, classification of organic compounds, Nomenclature of organic compounds, Isomerism, Fundamental concepts in organic Reaction Mechanism, Methods of compounds, Methods of purification of organic compounds, Qualitative Analysis of organic compounds, Quantitative Analysis.

Unit –XIII : Hydrocarbons**(12 periods)**

Classification, Alkanes- Nomenclature, isomerism, conformations (ethane only), Preparations, Physical properties, chemical reactions including free radical mechanism of halogenations, 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, halogenations, Friedel Craft's alkylation and acylation; directive influence of functional group in mono-substituted benzene; carcinogenicity and toxicity.

Unit – XIV : Environmental Chemistry**(6 periods)**

Environmental pollution – Air, water and soil pollutions, chemical reactions in atmosphere, smogs, major atmospheric pollutants; acid rain, ozone and its reactions, effects of depletion of ozone layer, greenhouse effect and global warming – pollution due to industrial wastes; green chemistry as an alternative tool for reducing pollution, strategy for control of environmental pollution.

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CHEMISTRY**PRACTICALS****CLASS - XI**

Evaluation Scheme for Examination		Marks
A.	Volumetric Analysis	10
B.	Salt Analysis	8
C.	Content Based Experiment	6
D.	Class Record and Viva	6
Total		30

A. Quantitative estimation (Periods 18)

- 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.

B. Qualitative analysis (Periods 18)

Determination of one anion and one cation in a given salt

Cations : Pb^{2+} , Cu^{2+} , As^{3+} , 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-} , $\text{C}_2\text{O}_4^{2-}$,
 CH_3COO^-

(Note : Insoluble salts excluded)

C. Content based experiment**(i) Basic Laboratory Techniques : (Periods 3)**

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

(ii) Characterization and Purification of Chemical Substances : (Periods 7)

1. Determination of melting point of an organic compound
2. Determination of boiling point of organic compound
3. Crystallization involving impure sample of any one of the following :
Alum, Copper sulphate, Benzoic acid

(iii) Experiments related to pH change (Periods 7)

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

(iv) Chemical equilibrium (Periods 5)

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

(v) Detection of nitrogen, sulphur, chlorine (Periods 12)**D. Class record and viva voce.**

PRESCRIBED TEXTBOOKS :

1. Chemistry Part I & II (Textbook for class XI)
Published by : The Council of Higher Secondary Education, Manipur with copy right from the NCERT, New Delhi.

REFERENCE BOOK :

1. A Textbook of Chemistry Book-I
by : R.L. Madan
Published by: Macmillan Publishers India Pvt. Ltd.
2. Conceptual Chemistry for Class XI
By : S.K. Jain
Published by : S. Chand & Company Ltd., New Delhi.
3. Dinesh Companion Chemistry for Class XI
By : S.K. Malhotra
Published by : S. Dinesh & Co., Jalandhar City
4. Practical Chemistry for Class XI
By : R.P. Manchanda.
Published by : Saraswati House Pvt. Ltd., New Delhi.
5. A Textbook of Practical Chemistry for Class XI
By : Dr. N. Nila Singh and Dr. K. Nabachandra Singh
Published by : Writer's Book Store, Paona Bazar, Imphal
6. Comprehensive Practical Chemistry for Class XI
By : Dr. N.K. Varma, B.K. Vermani and Dr. Neera Verma
Published by : Laxmi Publications (P) Ltd., New Delhi.
7. Dinesh Manual Practical in Chemistry for Class XI
By : V.K. Sharma
Published by : S. Dinesh & Co., Jalandhar City
8. Pradeep's New Course Chemistry for Class XI
By : S.C. Kheterpal, S.N. Dhawan & P.N. Kapil
Published by : Pradeep Publications, Jalandhar.