

CLASS - XI
35. CHEMISTRY

Time: 3 Hrs

Theory: 70 Marks
Practical: 20 Marks
C.C.E.: 10 Marks
Total: 100 Marks

STRUCTURE OF QUESTION PAPER (THEORY)

- 1 There will be one theory paper comprising of 26 questions. All questions are compulsory.
- 2 Question no. 1 to 8 will be of one mark each. All questions are compulsory.
- 3 Question no. 9 to 16 will be of two marks each. All questions are compulsory.
- 4 Question no.17 to 23 will be of four marks each. There will be internal choice in two questions.
- 5 Question no.24 to 26 will be of six marks each. There will be internal choice in them.
- 6 Distribution of marks over different dimensions of the paper will be as follows.

LEARNING OUTCOMES	PERCENTAGE OF MARKS
KNOWLEDGE	36%
UNDERSTANDING	44%
APPLICATION	20%
Total	100%

- 7 There will be question of the objective type such as Yes/No, tick/cross, fill in the blanks, multiple choice, true/false and definition etc.
- 8 Use of un-programmable calculator is allowed. The log tables can be used.
- 9 Total weightage of numerical will be 20%

UNITWISE DISTRIBUTION OF MARKS

SR.NO	UNIT	TOTAL MARK
1	Some Basic Concept of Chemistry	05
2	Structure of Atom	06
3	Classification of Elements and Periodicity in Properties	05
4	Chemical Bonding and Molecular Structure	06
5	Hydrogen	05
6	S-Block Elements (Alkali and Alkaline Earth Metals)	05
7	Organic Chemistry- Some Basic Principles and Techniques	05
8	Status of Matter: Gases and Liquids	05
9	Thermodynamics	05
10	Equilibrium	06
11	Redox Reaction	04
12	Some p-Block Elements, General introduction to p-Block Elements	05
13	Hydrocarbons	06
14	Environmental Chemistry	02
	TOTAL QUESTIONS &TOTAL MARKS	T.Q=26 T.M=70

Total Question in paper =26 including 5 choice questions

SCHEMATIC DISTRIBUTION OF MARKS

Sr. No	UNIT	1 MARK	2 MARK	4 MARK	6 MARK	TOTAL MARK
1	Some Basic Concept of Chemistry	1	-	1	-	05
2	Structure of Atom	-	-	-	1	06
3	Classification of Elements and Periodicity in Properties	1	2	-	-	05
4	Chemical Bonding and Molecular Structure	-	-	-	1	06
5	Hydrogen	1	-	1	-	05
6	S-Block Elements (Alkali and Alkaline Earth Metals)	1	-	1	-	05
7	Organic Chemistry- Some Basic Principles and Techniques	1	-	1	-	05
8	Status of Matter: Gases and Liquids	1	-	1	-	05
9	Thermodynamics	1	-	1	-	05
10	Equilibrium	-	1	1	-	06
11	Redox Reaction	-	2	-	-	04
12	Some p-Block Elements, General introduction to p-Block Elements	1	2	-	-	05
13	Hydrocarbons				1	06
14	Environmental Chemistry	-	1	-	-	02
	TOTAL QUESTIONS & TOTAL MARKS	T.Q=8 T.M=8	T.Q=8 TM=16	T.Q=7 T.M=2 8	T.Q=3 T.M=1 8	T.Q=26 T.M=7 0

Total Question in paper =26 including 5 choice questions

INSTRUCTIONS FOR PAPER SETTER

Note:

- There will be one theory paper consisting of total 26 questions.
- Question no.1 to 8 will be of 1 mark each. There will be 4 questions of the objective type such as yes/no, multiple choice questions, fill in the blanks.
- Question no.9 to 16 will be of 2 marks each. There will be 3 numerical questions of 2 marks each.
- Question no. 17 to 23 will be of 4 marks each. There will be two four marks questions of internal choice. These questions should not be lengthy.
- Question No.24 to 26 will be 6 marks and their will be 100% internal choice in them. These questions must have two parts: part (a) will be of one mark and part (b) will be of 5 marks. Part (a) may cover any topic from same unit as of long 5 marks question of part (b).
- Questions paper should cover all the syllabus.
- No question or topic should be repeated in the question paper.
- Questions in the paper can be asked only from mentioned PSEB syllabus. Questions from any topic which is not mentioned in the syllabus will be considered as out of syllabus question.
- All 3 sets must be of equal standard and difficulty level questions.
- At the end of each question, paper setter must write detailed distribution of marks of each sub-question.

11. Vague, many possible answer questions, confusing answer question etc type of question will not be asked in the paper. One mark questions, answer should be of one word or one line only.
12. Language used should be clearly understood & specific.
13. Time and length limit of paper should be kept in mind.
14. Time and length limit of paper should be kept in mind while setting the paper.
15. Questions paper should be made to according to knowledge, understanding and applications part marks distribution.

SYLLABUS (THEORY)

Unit-I Some Basic Concepts of Chemistry

General introduction: Importance and scope of chemistry. Historical approach to particulate nature of matter, laws of chemical combination. Dalton's atomic theory: concept of elements, atoms and molecules. Atomic and molecular masses. Mole concept and molar mass: percentage composition, empirical and molecular formula; chemical reactions, stoichiometry and calculations based on stoichiometry.

Unit-II Structure of Atom

Discovery of electron, proton and neutron; atomic number, isotopes and isobars. Thomson's model and its limitations, Rutherford's model and its limitations. 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 principle and Hund's rule, electronic configuration of atoms, stability of half filled and completely filled orbitals.

Unit-III Classification of Elements and Periodicity in Properties

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

Unit-IV Chemical Bonding and Molecular Structure

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

Unit-V States of Matter: Gases and Liquids

Three states of matter. Intermolecular interactions, types of bonding, melting and boiling points. Role of gas laws in elucidating the concept of the molecule, Boyle's law. Charles' law, Gay Lussac's law, Avogadro's law. Ideal behaviour, empirical derivation of gas equation, Avogadro's number. Ideal gas equation. Derivation from ideal behaviour, liquifaction of gases, critical temperature, kinetic energy and molecular speeds (elementary idea) derivation from ideal behaviour, liquification of gasses, critical temperature

Liquid State - Vapour pressure, viscosity and surface tension (qualitative idea only, no mathematical derivations).

Unit-VI Thermodynamics

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

First law of thermodynamics - internal energy and enthalpy heat capacity and specific heat measurement of ΔU and ΔH , Hess's law of constant heat summation, enthalpy of: bond dissociation, combustion, formation, atomization, sublimation. Phase transition, ionization, solution and dilution.

Introduction of entropy as a state function, Gibbs energy change for spontaneous and non-spontaneous processes, criteria for equilibrium.

Second law of thermodynamics, third law of thermodynamics (Brief introduction).

Unit-VII 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 polybasic acids, acid strength, concept of pH, Henderson Equation. Hydrolysis of salts (elementary idea). Buffer solutions, solubility product, common ion effect (with illustrative examples).

Unit-VIII 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, application of redox reaction.

Unit-IX Hydrogen

Position of hydrogen in periodic table, occurrence, isotopes, preparation, properties and uses of hydrogen; hydrides - ionic, covalent and interstitial; physical and chemical properties of water, heavy water; hydrogen peroxide-preparation, reactions, structure and use; hydrogen as a fuel.

Unit-X S Block Elements (Alkali and Alkaline earth metals)

Group 1 and Group 2 elements

General introduction, electronic configuration, occurrence, anomalous properties of the first element of each group, diagonal relationship, trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii), trends in chemical reactivity with oxygen, water, hydrogen and halogens; uses.

Preparation and properties of some important compounds :

Sodium carbonate, sodium chloride sodium hydroxide and sodium hydrogen carbonate, biological importance of sodium and potassium.

CaO, CaCO_3 and industrial use of lime and limestone, biological importance of Mg and Ca.

Unit-XI Some p-Block Elements, General introduction to p-Block Elements

Group 13 elements: General introduction, electronic configurations, occurrence. Variation of properties, oxidation states, trends in chemical reactivity, anomalous properties of first element of the group; Boron-physical and chemical properties, some important compounds: borax, boric acid, boron hydrides. Aluminium: reactions with acids and alkalies and uses.

Group 14 elements : General introduction, electronic configurations, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behaviour of first element, Carbon - catenation, allotropic forms, physical and chemical properties; uses of some important compounds: oxides.

Important compounds of silicon and a few uses: silicon tetrachloride silicones, silicates and Zeolites, their uses.

Unit-XII Organic Chemistry Some Basic Principles and Techniques

General introduction, methods of purification, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds. Electronic displacements in a covalent bond:- inductive effect, electromeric effect, resonance and hyper conjugation.

Homolytic and heterolytic fission of a covalent bond: free radicals, carbocations, carboanion; electrophiles and nucleophiles, types of organic reactions

Unit-XIII Hydrocarbons

Classification of hydrocarbons

Aliphatic Hydrocarbon

Alkanes Nomenclature isomerism, conformations (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 - hydrogen, halogens, hydrogen halides and water.

Aromatic hydrocarbons: Introduction, IUPAC nomenclature: Benzene; resonance aromaticity: chemical properties: mechanism of electrophilic substitution. - nitration sulphonation, halogenation, Friedel Craft's alkylation and acylation: directive influence of functional group in mono-substituted benzene; carcinogenicity and toxicity.

Unit-XIV Environmental Chemistry

Environmental pollution - air, water and soil pollution, chemical reactions in atmosphere, smog, 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.

STRUCTURE OF QUESTION PAPER (PRACTICAL)

Time: 3.00 hrs.

Marks: 20

1.	Volumetric Analysis	06
2.	Salt Analysis	05
3.	Content based experiment	05
4.	Class record and Viva	<u>04</u>
	Total Marks	20

PRACTICAL SYLLABUS

Micro Chemical Methods are available for several of the practical experiments where ever possible such techniques should be used.

A. Basic Laboratory Techniques

- Cutting glass tube and glass rod
- Bending a glass tube
- Drawing out a glass jet
- Boring a cork

B. Experiments related to pH change

- Anyone of the following experiments:
 - Determination of pH of some solutions obtained from fruit juices, solution of known and varied concentrations of acids, bases and salts using pH paper or universal indicator.

- Comparing the pH of solutions of strong and weak acid of same concentration.
- Study the pH change in the titration of a strong base using Universal indicator.

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

C. Qualitative Analysis

Determination of one anion and one cation in a given salt

Cations- Pb^{2+} , Cu^{+2} , As^{3+} , Al^{3+} , Fe^{3+} , Mn^{2+} , 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)

D. Detection of nitrogen, sulphur, chlorine in organic compounds.

PROJECTS

- Investigation of 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 period of work can be chosen with the approval of the teacher.

A. Characterization and purification of chemical substances

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

B. Chemical Equilibrium

One of the following experiments:

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

C. 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.

PROJECT

Scientific Investigations involving A few suggested Projects

- Checking the bacterial contamination in drinking water by testing sulphide ion. Study of the methods of p.
- Testing the hardness, presence of iron fluoride, chloride etc. depending upon the regional variation in drinking water and the study of causes of presence of these ions above permissible limit (if any).
- Study the method of purification of water.

