

**CLASS-XII  
CHEMISTRY**

**Time: 3 Hrs**

**Theory: 70 Marks  
Practical: 25 Marks  
INA : 5 Marks  
Total: 100 Marks**

**STRUCTURE OF QUESTION PAPER (THEORY)**

1. There will be one theory paper comprising of 18 questions. All questions are compulsory.
2. Question no. 1 will have 20 sub parts and each part will carry 1 mark. All questions are compulsory. This question will be of multiple choice, numerical, one word answers, true false and comprehensive.
3. Question no. 2 to 8 will be of two marks each. There will be internal choice in two questions. All questions are compulsory.
4. Question no.9 to 15 will be of three marks each. There will be internal choice in two questions. All questions are compulsory
5. Question no.16 to 18 will be of five marks each. There will be internal choice in them.
6. Distribution of marks over different dimensions of the paper will be as follows.

<b>LEARNING OUTCOMES</b>	<b>PERCENTAGE OF MARKS</b>
KNOWLEDGE	36%
UNDERSTANDING	44%
APPLICATION	20%
Total	100%

7. Use of un-programmable calculator is allowed. The log tables can be used.
8. Total weightage of numerical will around 20%

**UNITWISE DISTRIBUTION OF MARKS**

<b>SR.NO</b>	<b>UNIT</b>	<b>TOTAL MARK</b>
1	Solid State	06
2	Solutions	07
3	Electro-chemistry	06
4	Chemical-kinetics	05
5	Surface chemistry	05
6	p-block elements	08
7	d & f-block elements	08
8	Coordination number	03
9	Haloalkanes & Haloarenes	06
10	Alcohol, Phenols & Ether	05
11	Aldehyde, Ketons & Carboxylic acids	05
12	Organic compounds containing Nitrogen compounds	03
13	Biomolecules	03
	<b>TOTAL QUESTIONS &amp; TOTAL MARKS</b>	<b>T.Q=18 T.M=70</b>

**Total Question in paper =18**

**SCHEMATIC DISTRIBUTION OF MARKS**

<b>Sr. No</b>	<b>UNIT</b>	<b>1 MARK</b>	<b>2 MARK</b>	<b>3 MARK</b>	<b>5 MARK</b>	<b>TOTAL MARK</b>
1	Solid State	1 (O.W.)	1 T	1 N	-	06
2	Solutions	1 N(M.C.Q.)	-	1N+1(T)	-	07
3	Electro-chemistry	-	-	1N+1(T)	-	06
4	Chemical-kinetics	1N (M.C.Q.)	2N (1 (internal choice question))	-	-	05
5	Surface chemistry	5 (comprehension)	-	-	-	05
6	p-block elements	1(O.W)	1	-	1 (internal choice question)	08
7	d & f-block elements	1 (O.W.)	1	-	1 (internal choice question)	08
8	Coordination number	1(M.C.Q.)	1 (internal choice question)	-	-	03
9	Haloalkanes & Haloarenes	1 (T/F)	-	-	1 (internal choice question)	06
10	Alcohol, Phenols & Ether	2 (M.C.Q., T/F)	-	1 (internal choice question)	-	05
11	Aldehyde, Ketons & Carboxylic acids	2 (O.W, T/F)	-	1 (internal choice question)	-	05
12	Organic compounds containing Nitrogen compounds	3 (T/F, O.W., M.C.Q)	-	-	-	03
13	Biomolecules	1 (T/F)	1	-	-	03
	TOTAL QUESTIONS & TOTAL MARKS	20 sub parts T.M=20	T.Q=7 TM=14	T.Q=7 T.M=21	T.Q=3 T.M=15	T.Q=18 T.M=70

**Note: In above SCHEMATIC DISTRIBUTION OF MARKS**  
**T=Theory, N=Numerical, M.C.Q. = Multiple choice questions,**  
**O.W= One word, T/F= True and False**

**Total Question in paper =18 questions**

**Note: In above SCHEMATIC DISTRIBUTION OF MARKS**  
**T=Theory, N=Numerical, M.C.Q. = Multiple choice questions,**  
**O.W= One word, T/F= True and False**

**Total Question in paper =18 questions**

## **INSTRUCTIONS FOR PAPER SETTER**

### **Note:**

1. There will be one theory paper comprising of 18 questions. All questions are compulsory.
2. Question no. 1 will have 20 sub parts and each part will carry 1 mark. All questions are compulsory. This question will be of multiple choice, numerical, one word answers, true false and comprehensive.
3. Question no. 2 to 8 will be of two marks each. There will be internal choice in two questions. All questions are compulsory.
4. Question no.9 to 15 will be of three marks each. There will be internal choice in two questions. All questions are compulsory
5. Question no.16 to 18 will be of five marks each. There will be internal choice in them.
6. Questions paper should cover all the syllabus.
7. No question or topic should be repeated in the question paper.
8. 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.
9. All sets must be of equal standard and difficulty level questions.
10. 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.
12. Language used should be clearly understood & specific.
13. Time and length limit of paper should be kept in mind while setting the paper.

## **SYALLBUS (THEORY)**

### **Unit I: Solid State**

Classification of solids based on different binding forces: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea). Unit cell in two dimensional and three dimensional lattices, calculation of density of unit cell, packing in solids, packing efficiency, voids, number of atoms per unit cell in a cubic unit cell, point defects, electrical and magnetic properties.

Band theory of metals, conductors, semiconductors and insulators and  $n$  and  $p$  type semiconductors.

### **Unit II: Solutions**

Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, colligative properties - relative lowering of vapour pressure, Raoult's Law, elevation of B.P., depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass. Vant Hoff factor.

### **Unit III: Electrochemistry**

Redox reactions; conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Kohlrausch's Law, electrolysis and laws of electrolysis (elementary idea) dry cell-electrolytic

cells and Galvanic cells; lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, fuel cells; corrosion. Relation between Gibbs Energy change and EMF of cell.

#### **Unit IV: Chemical Kinetics**

Rate of a reaction (average and instantaneous), factors affecting rates of reaction; concentration, temperature, catalyst; order and molecularity of a reaction: rate law and specific rate constant, integrated rate equations and half life (only for zero and first order reactions); concept of collision theory (elementary idea, no mathematical treatment). Activation Energy, Arrhenius equation.

#### **Unit V: Surface Chemistry**

Absorption physisorption and chemisorption; factors affecting adsorption of gases on solids; catalysis; homogenous and heterogeneous, activity and selectivity; enzyme catalysis; colloidal state: distinction between true solutions, colloids and suspensions; lyophilic, lyophobic, multimolecular and macromolecular/colloids; properties of colloids; Tyndall effect, Brownian movement, electrophoresis, coagulation; emulsion-types of emulsions.

#### **Unit VI: General Principles and Processes of Isolation of Elements**

Principles and methods of extraction – concentration, oxidation, reduction electrolytic method and refining; occurrence and principles of extraction of aluminum, copper, zinc and Iron.

#### **Unit VII: p-Block Element**

**Group 16 elements:** General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; dioxygen; preparation, properties and uses; classification of oxides; Ozone. Sulphur - allotropic forms; compounds of sulphur preparation, properties and uses of sulphur dioxide, sulphuric acid, industrial process of manufacture, properties and uses, oxoacids of sulphur (structures only).

**Group 17 elements:** (General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; compounds of halogens; preparation, properties and uses of chlorine and hydrochloric acid, interhalogen compounds, oxoacids of halogens (structures only).

**Group 18 elements:** General introduction, electronic configuration. Occurrence, trends in physical and chemical properties, uses.

#### **Unit-VIII:d and f Block Elements**

General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals-metallic character, ionization, enthalpy, oxidation states, ionic radii, colour, catalytic properties, magnetic properties, interstitial compounds, alloy formation. Preparation and properties of  $K_2Cr_2O_7$ , and  $KMnO_4$ .

**Lanthanoids** - electronic configuration, oxidation states, chemical reactivity and lanthanoid contraction and consequences.

**Actenoids** - Electronic configuration, oxidation states.

**Unit-IX: Coordination Compounds**

Coordination compounds - introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds, bonding; Werner's theory VBT, CFT, Isomerism (structure and stereo) importance of coordination compounds (in qualitative analysis, extraction of metals and biological systems).

**Unit-X: Haloalkanes and Haloarenes.**

**Haloalkanes:** Nomenclature, nature of C-X bond, physical and chemical properties, mechanism of substitution reactions, optical rotation.

**Haloarenes:** Nature of C-X bond, substitution reactions (directive influence of halogen for monosubstituted compounds only)

Uses and environmental effects of - dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT.

**Unit -XI: Alcohols, Phenols and Ethers**

**Alcohols:** Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only); identification of primary, secondary and tertiary alcohols; mechanism of dehydration, uses, with special reference to - methanol and ethanol.

**Phenols:** Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols.

**Ethers:** Nomenclature, methods of preparation, physical and chemical properties, uses.

**Unit-XII: Aldehydes, Ketones and Carboxylic Acids**

**Aldehydes and Ketones:** Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, and mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes; uses.

**Carboxylic Acids:** Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.

**Unit-XIII: Organic compounds containing Nitrogen**

**Amines:** Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines.

**Cyanides and Isocyanides** - will be mentioned at relevant places in context.

**Diazonium Salts:** Preparation, chemical reactions and importance in synthetic organic chemistry.

**Unit-IV: Biomolecules**

**Carbohydrates** - Classification (aldoses and ketoses), monosaccharides (glucose and fructose), oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen); importance

**Proteins** - Elementary idea of amino acids, peptide bond, polypeptides proteins, primary structure, secondary structure, tertiary structure and quaternary structure (qualitative idea only), denaturation of proteins; enzymes.

**Vitamins:** Classification and functions.

**Harmones:** Elementary idea (excluding structure)

**Nucleic Acids:** DNA & RNA .

#### **Unit-XV: Polymers**

Classification - natural and synthetic, methods of polymerization (addition and condensation), copolymerization. Some important polymers; natural and synthetic like polythene, nylon, polyesters, bakelite, rubber. Biodegradable and Non- Biodegradable Polymers.

#### **Unit-XVI: Chemistry in everyday life :**

1. **Chemicals in medicines** analgesic, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines.
2. **Chemicals in food-** preservatives, artificial sweetening agents. Elementary idea of antioxidants.
3. **Cleansing agents-** soaps and detergents, cleansing action.

#### **STRUCTURE OF QUESTION PAPER (PRACTICAL)**

**Marks: 25**

<b>Evaluation Scheme for Examination</b>	<b>Marks</b>
Volumetric Analysis	07
Salt Analysis	07
Content Based Experiment	05
Project Work	03
Class record and viva	03
Total	25

#### **PRACTICAL SYLLABUS**

##### **A. Surface Chemistry**

- a. Preparation of one lyophilic and one lyophobic sol. Lyophilic sol - starch, egg albumin and gum. Lyophobic sol - aluminum hydroxide, ferric hydroxide, arsenious sulphide.
- b. Study of the role of emulsifying in stabilizing the emulsions of different oils.

##### **B. Chemical Kinetics**

- a. Effect of concentration and temperature on the rate of reaction between sodium thiosulphate and hydrochloric acid.
- b. Study of reaction rates of any one of the following:-

- i. Reaction of iodide ion with hydrogen peroxide at room temperature using different concentration of iodide ions.
  - ii. Reaction between potassium iodate,  $\text{KIO}_3$ , and sodium sulphite: ( $\text{Na}_2\text{SO}_3$ ) using starch solution as indicator (clock reaction).
- C. **Thermochemistry:** Any one of the following experiments
  - a. Enthalpy of dissolution of copper sulphate or potassium nitrate.
  - b. Enthalpy of neutralization of strong acid (HCl) and strong base (NaOH)
  - c. Determination of enthalpy change during interaction (Hydrogen bond formation) between acetone and chloroform.
- D. **Electrochemistry:** Variation of cell potential in  $\text{Zn}/\text{Zn}^{2+}|\text{Cu}^{2+}/\text{Cu}$  with change in concentration of electrolytes ( $\text{CuSO}_4$  or  $\text{ZnSO}_4$  at room temperature).
- E. **Chromatography**
  - a. Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of  $R_f$  values.
  - b. Separation of constituents present in an inorganic mixture containing two cations only (constituents having wide difference in  $R_f$  values to be provided).
- F. **Determination of concentration/molarity of  $\text{KMnO}_4$ , solution by titrating it against a standard Solution of:**
  - a. Oxalic acid.
  - b. Ferrous ammonium sulphate.  
(Students will be required to prepare standard solutions by weighing themselves).
- G. **Preparation of Inorganic Compounds**
  - a. Preparation of double salt of ferrous ammonium sulphate or potash alum.
  - b. Preparation of potassium ferric oxalate.
- H. **Preparation of Organic Compounds:** Preparation of any two of the following compounds
  - a. Acetanilide
  - b. Di-benzal acetone
  - c. p-Nitroacetanilide,
  - d. Aniline yellow or 2-Naphthol aniline dye.
  - e. Iodoform
- I. **Test for the functional groups present in organic compounds:** Unsaturation, alcoholic, phenolic, aldehydic, ketonic, carboxylic and amino (primary) groups.

**J. Study of carbohydrates, fats and proteins in pure form and detection of their presence in given food stuffs.**

**K. Qualitative analysis:** Determination of one cation and one anion in a given salt.

**Cations-**  $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{As}^{3+}$ ,  $\text{Al}^{3+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Zn}^{2+}$ ,  
 $\text{Co}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{NH}_4^+$

**Anions-** \

(Note: Insoluble salts excluded)

### **PROJECT**

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

#### **A few suggested Projects**

1. Study of presence of oxalate ions in guava fruit at different stages of ripening.
2. Study of quantity of casein present in different samples of milk.
3. Preparation of soyabean milk and its comparison with the natural milk with respect to curd formation, effect of temperature etc.
4. Study of the effect of potassium bisulphate as food preservative under various conditions (temperature, concentration, time etc.)
5. Study of digestion of starch by salivary amylase and effect of PH and temperature on it.
6. Comparative study of the rate of fermentation of following material wheat flour, gram flour, Potato juice, carrot juice etc.
7. Extraction of essential oils present in saunf (aniseed), Ajwain (carum) illaichi (cardamom).
8. Study of common food adulterants in fat, oil, butter, sugar, turmeric powder, chilli powder and pepper.

**Note:** Any investigatory project, which involves about 10 periods of work, can be chosen with the approval of the teacher.



## CLASS XII (Portion to be reduced)

S No	Unit	Portion to be Reduced
1	Solid State	Electrical and magnetic properties. Band theory of metals, conductors, semiconductors and insulators and n and p type semi conductors.
2	Solutions	Abnormal molecular mass, Van't Hoff factor
3	Electrochemistry	Lead accumulator, fuel cells, corrosion, law of electrolysis (elementary idea), dry cell- electrolytic cells and Galvanic cells,
4	Chemical Kinetics	Concept of collision theory (elementary idea, no mathematical treatment), activation energy, Arrhenius equation.
5	Surface Chemistry	emulsion - types of emulsions, catalysis: homogenous and heterogeneous, activity and selectivity of solid catalysts; enzyme catalysis,
6	General Principles and Processes of Isolation of Elements	Entire unit
7	p-Block Elements	Preparation and properties of Phosphine, Sulphuric Acid: industrial process of manufacture, Oxides of Nitrogen (Structure only); Phosphorus - allotropic forms, compounds of Phosphorus: Preparation and properties of Halides and Oxo acids (elementary idea only).
8	d and f Block Elements	Chemical reactivity of lanthanoids, Actinoids -Electronic configuration, oxidation states and comparison with lanthanoids. Preparation and properties of $\text{KMnO}_4$ and $\text{K}_2\text{Cr}_2\text{O}_7$
9	Coordination Compounds	Structure and stereoisomerism, importance of coordination compounds (in qualitative analysis, extraction of metals and biological system).
10	Haloalkanes and Haloarenes	Uses and environmental effects of -dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT.
11	Alcohols, Phenols and Ethers	uses with special reference to methanol and ethanol.
12	Aldehydes, Ketones and Carboxylic Acid	---
13	Amines	Diazonium salts: Preparation, chemical reactions and importance in synthetic organic chemistry.

14	Biomolecules	Oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen), importance of carbohydrates. Vitamins- classification and functions. Enzymes. Hormones - Elementary idea excluding structure.
15	Polymers	entire chapter
16	Chemistry in Everydaylife	entire chapter

### Practical

Following portions should be considered deleted.

#### A. Surface Chemistry

- a. Preparation of one lyophilic and one lyophobic sol  
Lyophilic sol - starch, egg albumin and gum  
Lyophobic sol - aluminium hydroxide, ferric hydroxide, arsenous sulphide.
- b. Dialysis of sol-prepared in (a) above.
- c. Study of the role of emulsifying agents in stabilizing the emulsion of different oils.

#### B. Chemical Kinetics

- a. Effect of concentration and temperature on the rate of reaction between Sodium Thiosulphate and Hydrochloric acid.
- b. Study of reaction rates of any one of the following:
  - i) Reaction of Iodide ion with Hydrogen Peroxide at room temperature using different concentration of Iodide ions.
  - ii) Reaction between Potassium Iodate, (KIO<sub>3</sub>) and Sodium Sulphite: (Na<sub>2</sub>SO<sub>3</sub>) using starch solution as indicator (clock reaction).

#### C. Thermo chemistry Any one of the following experiments

- i) Enthalpy of dissolution of Copper Sulphate or Potassium Nitrate.
- ii) Enthalpy of neutralization of strong acid (HCl) and strong base (NaOH).
- iii) Determination of enthalpy change during interaction (Hydrogen bond formation) between Acetone and Chloroform.

#### D. Electrochemistry Variation of cell potential in Zn/Zn<sup>2+</sup> || Cu<sup>2+</sup>/Cu with change in concentration of electrolytes (CuSO<sub>4</sub> or ZnSO<sub>4</sub>) at room temperature.

#### H. Preparation of Organic Compounds Preparation of any one of the following compounds

- i) Acetanilide
- ii) Di-benzal Acetone
- iii) p-Nitroacetanilide

Aniline yellow or 2 - Naphthol Anilinedye