

CHEMISTRY SYLLABUS (10+2)

Theory Paper	Time : 3 Hours	Max. Marks: 70
Practical Paper	Time : 3 Hours	Max. Marks 30
		Total Marks : 100

THEORY

STRUCTURE OF QUESTION PAPER

1. There will be one Theory Paper comprising of 30 questions. All questions will be compulsory.
2. Q Nos. 1-10 will be of 1 marks, Q.Nos. 11-18 will be of 2 marks each Q. No. 19-26 will be of 3-marks each, Q-Nos. 27 to 30 will be of 5 marks each.
3. In questions No. 27-30 there will be 100% choice.
4. Distribution of approximate percentage over different dimension in the question paper will be as follows:
 - i) Knowledge 30%
 - ii) Understanding 40%
 - iii) Application 30%
5. Numerical problem will be set in any type of question, however the total weightage to numerical problem will be around 20%.
6. There will be no question of the type. "Write short note on", and objective type questions such as "Yes/No", tick (✓) cross (x) fill in blanks, multiple choice," true/false etc.
7. Use of log tables/unprogrammable calculator is allowed.
8. A candidate will be provided with one answer book of 32 pages only. No extra continuous sheet will be provided.

Unit wise distribution of marks is as follows:

CLASS XII (THEORY)

One Paper

Time : 3 Hours

70 marks

Unit No.	Title	Marks
Unit I	Solid State	4
Unit II	Solutions	5
Unit III	Electrochemistry	5
Unit IV	Chemical kinetics	5
Unit V	Surface Chemistry	4
Unit VI	General principles and processes of Isolation of Elements	3
Unit VII	p-Block Elements	8
Unit VIII	d-and f-Block Elements	5
Unit IX	Coordination Compounds	3
Unit X	Haloalkanes and Haloarenes	4
Unit XI	Alcohols, Phenols and Ethers	4
Unit XII	Aldehydes, Ketones and Carboxylic acids	6
Unit XIII	Organic Compounds containing Nitrogen	4
Unit XIV	Biomolecules	4
Unit XV	Polymers	3
Unit XVI	Chemistry in Everyday life	3
Total :		70

Unit I: Solid State

(Periods 12)

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, voids, number of atoms per unit cell in a cubic unit cell, points defects, electrical and magnetic properties.

Unit II: Solutions

(Periods 12)

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, elevation of B.P., depression of freezing point, osmotic pressure, determination of molecular

masses using colligative properties, abnormal molecular mass.

Unit III: Electrochemistry

(Periods 14)

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.

Unit IV: Chemical Kinetic

(Periods 12)

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)

Unit V: Surface Chemistry

(Periods 8)

Adsorption - 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

(Periods 8)

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

Unit VII: p-Block Elements

(Periods 14)

Group 15 elements: General introduction, electronic configuration, occurrence, oxidation states, trends in physical and chemical properties; nitrogen - preparation, properties and uses; compounds of nitrogen: preparation and properties of ammonia and nitric acid, oxides of nitrogen (structure only); Phosphorous-allotropic forms; compounds of phosphorous: preparation and properties of phosphine, halides (PCl_3 , PCl_5) and oxoacids (elementary idea only).

Group 16 elements: General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; dioxygen; preparation, properties and uses; simple 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 **(Periods 14)**

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 property, 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.

Actionoids - Electronic configuration, oxidation states.

Unit IX: Coordination Compounds **(Periods 12)**

Coordination compounds - introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds bonding; isomerism, importance of coordination compounds (in qualitative analysis, extraction of metals and biological systems).

Unit X: Haloalkanes and Haloarenes. **(Periods 12)**

Haloalkanes:

Nomenclature, nature of C-X bond, physical and chemical properties, mechanism of substitution reactions.

Haloarenes:

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

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

Unit XI: Alcohols, Phenols and Ethers **(Periods 12)**

Alcohols: Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only); identification of primary, secondary and tertiary alcohols; mechanism of dehydration, uses, some important compounds - 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 **(Periods 12)**

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 **(Periods 10)**

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 XIV: Biomolecules **(Periods 8)**

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

Proteins - Elementary idea of α -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.

Nucleic Acids: DNA & RNA.

Unit XV: Polymers **(Periods 8)**

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

Unit XVI: Chemistry in everyday life : **(Period 8)**

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

CLASS XII (PRACTICALS)
STRUCTURE OF QUESTIONS PAPER

One Practical Paper **Time : 3 Hours** **30 marks**

Experiments

Volumetric Analysis	10 Marks
Mixture Analysis	8 Marks
Content Based Experiment	4 Marks
Project	4 Marks
Class record & Viva	4 Marks

NOTE :-

Brief write up carrying 2 marks (If in the Question paper) question on preparation of crystals (Time for write up 5 minutes).

Stepwise distribution of marks of questions on salt analysis.

(i)	Physical nature	1/2
(ii)	Dry heating test	1/2
(iii)	Flame test	1/2
(iv)	Charcoal cavity test	1/2
(v)	dil H ₂ SO ₄	1
(vi)	conc. H ₂ SO ₄ test	1/2

(If anion is detected under dil H₂SO₄ test full credit of 1½ marks is to be given there and then)

Confirmatory test (any two) 1½ marks each 3.

(vii)	Preparation of original solution	1/2
(viii)	Correct group detection	1
(ix)	Systematic detection of ion	1
(x)	Any two confirmatory tests of cation	2

(1 marks each)

Step wise distribution of marks of questions on volumetric analysis.

Details of written part

Correct indicator	½
Correct end point	½
Balanced equation	2
Solution in burette	1
General calculations	1
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	5
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Practical Part

Initial reading	1
Final reading	1
Correct use of pipette	½
Correct end point	½
Three concordant readings	½
Correct titre value	1½
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	5
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Full credit of $\pm 2\%$ variation and deduct ½ mark for additional 0.1 ml variation.

PRACTICALS

Evaluation Scheme for Examination	Marks
Volumetric Analysis	10
Salt Analysis	8
Content Based Experiment	4
Class record and viva	4
Investigatory Project	4
Total	30

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, 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:
- Reaction of iodide ion with hydrogen peroxide at room temperature using different concentration of iodide ions.
 - Reaction between potassium iodate, KIO_3 and sodium sulphite : (Na_2SO_3) using starch solution as indicator (clock reaction).

C. Thermochemistry

(Periods 6)

Any one of the following experiments

- Enthalpy of dissolution of copper sulphate or potassium nitrate.
- Enthalpy of neutralization of strong acid (HCl) and strong base (NaOH)
- Determination of enthalpy change during interaction (Hydrogen bond formation) between acetone and chloroform.

D. Electrochemistry

(Periods 2)

Variation of cell potential in $\text{Zn}/\text{Zn}^{2+}||\text{Cu}^{2+}/\text{Cu}$ with change in concentration of electrolytes (CuSO_4 or ZnSO_4) at room temperature.

E. Chromatography

(Periods 2)

- Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of R_f values.
- Separation of constituents present in an inorganic mixture containing two cations only (constituents having wide difference in R_f values to be provided).

F. Preparation of Inorganic Compounds

(Periods 4)

- Preparation of double salt of ferrous ammonium sulphate or potash alum.
- Preparation of potassium ferric oxalate.

G. Preparation of Organic Compounds

(Periods 4)

Preparation of any two of the following compounds

- i) Acetanilide
- ii) Di-benzal acetone
- iii) p-Nitroacetanilide.
- iv) Aniline yellow or 2-Naphthol aniline dye.
- v) Iodoform.

H. Test for the functional groups present in organic compounds: (Periods 6)

Unsaturation, alcoholic, phenolic, aldehydic, ketonic, carboxylic and amino (primary) groups.

I. Study of carbohydrates, fats and proteins in pure form and detection of their presence in given food stuffs. (Periods 4)

J. Determination of concentration/molarity of KMnO_4 solution by titrating it against a standard solution of : (Periods 8)

- (i) Oxalic acid.
- (ii) Ferrous ammonium sulphate.

(Students will be required to prepare standard solutions by weighing themselves).

K. Qualitative analysis (Periods 14)

- Determination of one cation and one anion in a given salt.

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

Few Suggested Projects

- ✦ Study of diffusion of a solid into a liquid.

- ✦ Determination of the minimum quantity of manganese dioxide required as a catalyst for the preparation of oxygen gas.
- ✦ Determination of rate of flow of solution and liquids horizontally.
- ✦ Investigation of the 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 and reasons for the variation in their tests.
- ✦ Determination of rate of evaporation of different liquids.
- ✦ Study of effect of metal coupling on the corrosion of iron.
- ✦ Study of the effect of acids and bases on the tensile strength of fibres.
- ✦ Analysis of fruit and vegetable prices for the content (acids and mineral present in them).
- ✦ Preparation of rayon threads from various cellulose sources.
- ✦ Study of dyeing fabrics under various conditions.
- ✦ Determination of the dosage of bleaching powder required for disinfections of differentof water (taken from different sources).
- ✦ Study of presence of oxalate ions in guava fruit at different stages of ripening.
- ✦ Study of the setting of mixtures of cement with lime, sand of different qualities, rice husk, etc (with respect to time, volume and strength).
- ✦ Study of the presence of insecticide/pesticide (nitrogen containing) in vegetables and fruits.
- ✦ Study of the dialysis of different sewage water sample and identification of different ions in resulting solutions.
- ✦ Study on quantity of casein present in different samples of milk.
- ✦ Preparation of soyabean milk and its comparison with the natural milk with respect to curd formation, effect of temperature, taste etc.
- ✦ Study of the effect of
- ✦ Study of digestion of starch by salivary amylase and effect of pH and temperature on it.
- ✦ Comparative study of the rate of formation on following materials wheat, flour, gram flour, potato juice, carrot juice and orjuice.
- ✦ Extraction of essential oils present in
- ✦ Study of foods.....

Note : Any other investigatory project can be performed in which involves about 5 periods of work with the approval of the teacher.