TRIPURA BOARD OF SECONDARY EDUCATION

SYLLABUS

(effective from 2015)

SUBJECT : CHEMISTRY

(Class – XII)

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CHEMISTRY

COURSE STRUCTURE

CLASS XII (Theory)

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

Unit	Title	Marks
I.	Solid State	4
II.	Solutions	5
III.	Electrochemistry	5
IV.	Chemical Kinetics	5
V.	Surface Chemistry	4
VI.	General Principles & Processes of Isolation of Elements	3
VII.	p-Block Elements	8
VIII.	d-and f-Block Elements	5
IX.	Co-ordination compounds	3
X.	Haloalkanes and Haloarenes	4
XI.	Alcohols, Phenols and Ethers	4
XII.	Aldehydes, Ketons and Carboxylic acids	6
XIII.	Organic Compounds containing Nitrogen	4
XIV.	Biomolecules	4
XV.	Polymers	3
XVI	Chemistry in Everyday life	3
	Total	**70**

Unit I : Solid State (Periods 12)

Classification of solids based on different bindings forces : molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea), unit cell in two dimensional and three dimensional lattices, packing efficiency, calculation of density of unit cell, packing in solids, 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 & p type semiconductors.

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, Rault's law, elevation of boiling point, depression of freezing point, osmotic pressure determination of molecular masses using colligative properties, abnormal molecular mass, van't Hoff factor and calculations involving it.

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, Relation between Gibbs energy change and emf of a cell, fuel cells : corrosion.

Unit IV : Chemical Kinetics (Periods 12)

Rate of 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, Arrhenious equation.

Unit V : Surface Chemistry (Periods 8)

Adsorption – Physisorption and chemisorption; factors affecting adsorption of gases on solids; catalysis : homogeneous 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, Elementary idea of nanomaterials.

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) : Phosphorus-allotropic forms, compound of phosphorus : 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, classification of oxides, Ozone. Sulphur-allotropic forms; compound of sulphur : preparation, properties and uses of sulphur dioxide; sulphuric acid : industrial process of manufacture, properties and uses, other oxides and oxoacids of sulphur (structures only).

Group 17 elements : General introduction, electronic configuration, oxidation states, occurrence, trend in physical and chemical properties; compounds and 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 $K_2Cr_2O_7$ & $KMnO_4$.

Lanthanoids : Electronic configuration, oxidation states, chemical reactivity and lanthanoid contraction and its consequence.

Actinoids : Electronic configuration, oxidation states and comparison with lanthanoids.

Unit IX : Coordination compounds (Periods 12)

Coordination compounds - Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds, Bonding (Werner' theory. VBT and CFT) : structural and stereo isomerism, importance of coordination compounds (in qualitative inclusion of analysis, extraction of metals and biological systems).

Unit X : Haloalkanes and Haloarenes (Periods 12)

Haloalkness : Nomenclature, nature of C-X bond, physical and chemical properties, mechanism of substitution reactions. Stability of carbocations, R-S and D-L configurations.

Haloareness : Nature of C-X bond, substitution reactions (directive influence of halogen for monosubstituted compounds only, stability of carbocations R-S and D-L configurations)

Use and environmental effects of – dichloromethane, 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 of methanol and ethanol.

Phenols : Nomenclature, methods of preparation, physical and chemical properties, Acidic nature of Phenols, Elctrophillic substitution reaction, uses of Phenols.

Ether : Nomenclature, methods of preparation, physical and chemical properties, uses

Unit XII : Aldehydes, Ketons 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)

Nitro Compounds : General methods of preparation and chemical reactions.

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 12)

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

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 protiens; enzymes. Lipids and hormones, their classification and functions.

Vitamins : Classification and function

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, Biodegradable and non-biodegradable polymers.

Unit XVI : Chemistry in Everyday life (Periods 8)

1. Chemicals in medicines : analgesics, 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 detegents, cleansing action.

PRACTICAL

Time : 3 Hours **Marks : 30**

Evaluation scheme of Examination	**Marks**
Volumetric Analysis (Redox)	10
Salt Analysis(Single salt)	8
Content Based Experiment(Any one : (i) Organic functional group, (ii) Preparation of lyophillic sol or lyophobic sol, (iii) Preparation of double salt)	6
Class record and viva	3+3=6
	Total 30

Practical Syllabus **(Periods 6)**

A. Surface Chemistry.

a) Preparation of one lyophilic and one lyophobic sol.

Lyophilic sol - starch, egg albumin and gum

Lyophobic sol - aluminium hydroxide, ferrie hydroxide.

B. Chemical Kinetics **(Periods 4)**

a) Effect of concentration and temperature on the rate of reaction between sodium thiosulphate and hydrochloric acid.

b) Study of reaction rates of the following :

i) Reaction between potassium iodate, KIO_3 and sodium sulphite : (Na_2SO_3) using starch solution as indicator (clock reaction).

C. Thermochemistry **(Periods 4)**

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)

D. Electrochemisty (Periods 2)

Variation of cell potential in Zn / Zn^{2+}||Cu^{2+}/Cu with change in concentration of electrolytes ($CuSO_4$ Or $ZnsSO_4$) at room temperature.

E. Chromatography (Periods 2)

i) Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of Rf values.

F. Preparation of Inorganic Compounds (Periods 4)

i) Preparation of double salt of ferrous ammonium sulphate or potash alum.

G. Preparation of Organic Compounds (Periods 4)

Preparation of any two of the following compounds

i) Acetanilide

ii) Aniline yellow or 2 - Napthol aniline dye.

iii) Iodoform

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

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

I. Characteristic tests of Carbohydrates, fats and proteins in pure samples and their detection 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+}, Al^{+3}, Fe^{3+}, Ni^{2+}, Zn^{2+}, CO^{2+}, Ca^{2+}, Ba^{2+}, Mg^{2+}, NH_4^{+}

Anions : CO_3^{2-}, S^{2-}, SO_4^{2-}, NO_3^{-}, Cl^{-}, Br^{-}, I^{-}, CH_3CCO^{-}

(Note : Insoluble salts excluded)

UNITWISE QUESTION TYPES WITH MARKS DISTRIBUTION

Unit	Title	MCQ/ Objective 1 Mark	SA-I 2 Marks	SA-II 3 marks	LA 5 marks	Total
I	Solid State	1	-	1	-	4
II	Solutions	1	2	-	-	5
III	Electrochemistry	-	-	-	1	5
IV	Chemical Kinetics	-	1	1	-	5
V	Surface Chemistry	1	-	1	-	4
VI	General Principles & Processes of Isolation of Elements	1	1	-	-	3
VII	p-Block Elements	1	1	-	1	8
VIII	d and f Block Elements	-	1	1	-	5
IX	Coordination compounds	-	-	1	-	3
X	Haloalkanes and Haloarenes	1	-	1	-	4
XI	Alcohols, Phenols and Ethers	1	-	1	-	4
XII	Aldehydes, Ketons and Carboxylic Acids	1	-	-	1	6
XIII	Organic compounds containing Nitrogen	-	2	-	-	4
XIV	Biomolecules	-	2	-	-	4
XV	Polymers	-	-	1	-	3
XVI	Chemistry in Everyday life	-	-	1	-	3
	Total no. of questions	4+4=8	10	9	3	
	Total	8	20	27	15	70

N.B. 1. Internal choice : There is no overall choice in the paper. However there is an internal choice in one question of 2 marks weightage, one question of 3 marks weightage and all the three questions of 5 marks weightage. But not more than one internal choice should be from the same unit.

2. In SA-II & LA-types, total allotted marks in each may be subdivided if, necessary.

3. Questions should be set covering each unit.