

SYLLABUS
CHEMISTRY (043)
CLASS- XII- (2013-14)

Total Periods : 180

70 marks

Time: 3 Hours

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

The question paper will include value based question(s) to the extent of 3-5 marks.

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, 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 & 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, Raoult'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.

Redox reactions, conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Kohlrausch's Law, electrolysis and law 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 a reaction (Average and instantaneous), factors affecting rate 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

(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 suspension; 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 & uses; compounds of nitrogen, preparation and properties of ammonia and nitric acid, oxides of nitrogen (Structure only); Phosphorus - allotropic forms, compounds 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; 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 and its consequences.

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's theory, VBT, and CFT; structure and stereo isomerism, importance of coordination compounds (in qualitative inclusion, extraction of metals and biological system).

Unit X : Haloalkanes and Haloarenes.

(Periods 12)

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 in monosubstituted compounds only).

Uses 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 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

(Periods 12)

Aldehydes and Ketones: Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, 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 12)

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

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

Vitamins - Classification and functions.

Nucleic Acids: DNA and 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)

Chemicals in medicines - analgesics, tranquilizers antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines.

Chemicals in food - preservations, artificial sweetening agents, elementary idea of antioxidants. **Cleansing agents**- soaps and detergents, cleansing action.

Practicals

Evaluation Scheme for Examination	Marks
Volumetric Analysis	10
Salt Analysis	8
Content Based Experiment	6
Class record, project work and viva	6
Total	30

PRACTICAL SYLLABUS

Micro-chemical methods are available for several of the practical experiments. Wherever possible, such techniques should be used.

A. Surface Chemistry (Periods 5)

- (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 (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 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_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).
- iii) Determination of enthalpy change during interaction (Hydrogen bond formation) between acetone and chloroform.

D. Electrochemistry (Periods 2)

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

E. Chromatography (Periods 2)

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

F. Preparation of Inorganic Compounds (Periods 4)

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

G. Preparation of Organic Compounds (Periods 2)

Preparation of any one of the following compounds

- i) Acetanilide
- ii) Di-benzal acetone
- iii) p-Nitroacetanilide
- iv) Aniline yellow or 2 - Naphthol aniline dye.₃
Al

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.

Cation - Pb^{2+} , Cu^{2+} , As^{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)

PROJECT

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

A few suggested Projects

- Study of the presence of oxalate ions in guava fruit at different stages of ripening.
- Study of quantity of casein present in different samples of milk.
- Preparation of soybean milk and its comparison with the natural milk with respect to curd formation, effect of temperature, etc.
- Study of the effect of potassium bisulphate as food preservative under various conditions (temperature, concentration, time etc.)
- Study of digestion of starch by salivary amylase and effect of pH and temperature on it.
- Comparative study of the rate of fermentation of following materials: wheat flour, gram flour, potato juice, carrot juice etc.
- Extraction of essential oils present in Saunf (aniseed), Ajwain (carum), Illaichi (cardamom).
- 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.

Recommended Textbooks.

1. Chemistry Part -I, Published by NCERT.
2. Chemistry Part -II, Published by NCERT.

SAMPLE QUESTION PAPER

CHEMISTRY (043)

CLASS XII (2013-14)

Design of Question paper

Time: 3 hrs.

Maximum Marks:70

A. Weightage to different forms of questions

S. No.	Type of question	Marks per Question	Total number of Questions	Total marks
1	VSA	1	8	8
2	SA I	2	10	20
3	SA II/Value Based Question	3	9	27
4	LA	5	3	15
Total			30	70

B. Typology of Questions

S. No.	Typology	Weightage in marks	Weightage in percentage
1	Knowledge Based	14	20%
2	Conceptual Understanding	21	30%
3	Inferential Type	14	20%
4	Reasoning Based	11	15%
5	Skill Based	10	15%
	Total	70	100%

C. Scheme of options

There will be no overall choice. However, internal choice in any one question of two marks, any one question of three marks and all the three questions of five marks weightage has been provided.

D. Difficulty level of questions

S. No.	Estimated difficulty level	Percentage of marks
1	Easy	15
2	Average	70
3	Difficult	15

SAMPLE QUESTION PAPER
CHEMISTRY (043)
CLASS-XII – (2013-14)
BLUE PRINT

Time Allowed: 3 Hrs.

Maximum Marks:70

S.No.	UNIT	VSA (1 Mark)	SAI (2 Marks)	SAII(3)/ Value based question (3marks)	LA (5 marks)	TOTAL
1.	Solid State		4(2)			4 (2)
2.	Solutions				5 (1)	5 (1)
3.	Electrochemistry		2(1)	*3(1)		5(2)
4.	Chemical Kinetics	1(1)	4(2)			5(3)
5.	Surface Chemistry	1(1)		3(1)		4(2)
6.	General Principles and Processes of Isolation of Elements			3(1)		3(1)
7.	p-block Elements	1(2)		3(2)		8(4)
8.	d & f- Block Elements				5(1)	5(1)
9.	Co-ordination Compounds	1(1)	2(1)			3(2)
10.	Haloalkanes and Haloarenes		2(2)			4(2)
11.	Alcohols, Phenols & Ethers	1(1)		3(1)		4(2)
12.	Aldehydes, Ketones & Carboxylic Acids	1(1)			5(1)	6(2)
13.	Organic Compounds Containing Nitrogen		4(2)			4(2)
14.	Biomolecules	1(1)		3(1)		4(2)
15.	Polymers			3(1)		3(1)
16.	Chemistry in Everyday Life			3(1)		3(1)
	Total:	8(8)	20(10)	27(9)	15(3)	70(30)

Key: Total marks (no. of questions)

*** Value Based Question**

NOTE :

- Value Based Questions may be asked from any unit / chapter / topic.
- It will carry 3-5 marks.

SAMPLE QUESTION PAPER
CHEMISTRY (043)
CLASS-XII – (2013-14)

Time Allotted: 3 Hrs

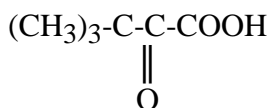
Maximum Marks: 70

General Instructions:

1. All questions are compulsory.
2. Question No. 1-8 are very short answer questions and carry 1 mark each.
3. Question No. 9-18 are short answer questions and carry 2 marks each.
4. Question No. 19-27 are also short answer questions and carry 3 marks each.
5. Question No. 28-30 are long answer questions and carry 5 marks each.
6. Use log tables if necessary, use of calculators is not allowed.

Q.1 Bond enthalpy of fluorine is lower than that of chlorine, why?

Q.2 Give the IUPAC name of the following compound:



Q.3 On increasing temperature, activation energy of a reaction decreases, why?

Q.4 Which of the following is most effective electrolyte in the coagulation of AgI/Ag+sol?
 K_2SO_4 , MgCl_2 , $\text{K}_4[\text{Fe}(\text{CN})_6]$

Q.5 Write the reaction when glucose is heated with excess of HI.

Q.6 Which Xe compound has distorted octahedral shape?

Q.7 What is the denticity of co-ordination compound used for the treatment of lead Poisoning?

Q.8 An alkoxide is a stronger base than hydroxide ion. Justify.

Q.9 (a) State the law which helps to determine the limiting molar conductivity of weak electrolyte.

(b) Calculate limiting molar conductivity of CaSO_4 (limiting molar conductivity of calcium and sulphate ions are 119.0 and 160.0 $\text{S cm}^2 \text{mol}^{-1}$ respectively).

Q.10 Rate constant K for first order reaction has been found to be $2.54 \times 10^{-3} \text{ sec}^{-1}$. Calculate its three-fourth life.

OR

A first order gas reaction $\text{A}_{2(\text{g})}\text{B}_{2(\text{g})} \rightarrow 2\text{A}_{(\text{g})} + 2\text{B}_{(\text{g})}$ at the temperature 400°C has the rate Constant $K = 2.0 \times 10^{-4} \text{ sec}^{-1}$. What percentage of A_2B_2 is decomposed on heating for 900 seconds.

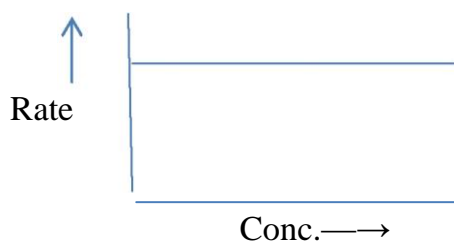
Q.11 Do the following conversions:

- (i) Methyl bromide to acetone.
- (ii) Benzyl chloride to 2-phenyl acetic acid.

Q.12 How will you distinguish between the following pairs of compounds:

- (i) Chloroform and carbon tetra chloride.
- (ii) Benzyl alcohol and chlorobenzene.

Q.13 For a chemical reaction variation in rate with conc. is shown below:



What is the order of the reaction?

What are the units of rate constant K for the reaction?

Q.14 Give the electronic configuration of d-orbitals of $K_3 [Fe(CN_6)]$ and $K_3 [FeF_6]$ and explain why these complexes give different colour with same solution.

(At. No. Of Fe=26u)

Q.15 Give reason for the following:

- (i) O-Toludine is more basic than aniline.
- (ii) Tertiary amines do not undergo acetylation reaction.

Q.16 Write the following name reaction:

- (i) Gabriel phthalimide reaction.
- (ii) Hoffman bromamide reaction.

Q.17 Silver metal crystallises with a face centred cubic lattice. The length of unit cell is found to be 4.077×10^{-8} cm. Calculate atomic radius and density of silver.
(atomic mass of Ag = 108u, $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$)

Q.18 Calculate packing efficiency in ccp structure.

Q.19 Manu and his father went to a shop to purchase a battery for their inverter. Shopkeeper showed them two types of batteries, one with lead plates and the other with cadmium plates. The battery with cadmium plates was more expensive than the lead battery. They decided to purchase lead battery as it was cheaper.

After reading the above passage, answer the following questions:

- a) As a student of chemistry, why would you suggest to Manu and his father to buy the expensive cadmium plate battery. Give two reasons.
- b) Which two values will you be promoting through your suggestions?

Q.20 Give a reason for the following:

- (i) Rough surface of catalyst is more effective than smooth surface.
- (ii) Smoke passed through charged plates before allowing it to come out of chimneys in factories.
- (iii) Ne gets easily absorbed over charcoal than He.

Q.21 (a) Give one example of each of the following:

- (i) Acidic flux (ii) Basic flux
- (b) What happens when:
 - (i) Cu_2O undergoes self reduction in a silica line converter.
 - (ii) Haematite oxidises carbon to carbon monoxide.

OR

- (a) What role does cryolite play in Hall Haraoult process?
- (b) How can alumina be separated from silica in a bauxite ore associated with silica? Give equations also.

Q.22 Write balanced chemical equations for the following reactions.

- (a) Hypophosphorous acid is added to AgNO_3 solution.
- (b) Chlorine gas is passed through hot and concentrated solution of sodium hydroxide.
- (c) XeF_2 undergoes hydrolysis.

- Q.23 (i) Draw the structure of sulphuric acid.
(ii) A sparkless current is passed through oxygen to prepare ozone. why?
(iii) Bleaching action of sulphur is a temporary action .Comment.
- Q.24 (i) Give one structural difference between amylose and amylopectin
(ii) Name the protein and its shape present in oxygen carrier in human body.
(iii) Name two fat storing tissues in human body.
- Q.25 Define the following by giving one example of each:
- (i) Antiseptics
(ii) Antioxidants
(iii) Narcotic analgesics
- Q.26 (a) Write the names of the monomers of polymer used for making unbreakable crockery.
(b) write the reaction of preparation of neoprene.
(c) Arrange the following polymers in decreasing order of intermolecular forces.
- PVC, Nylon 66, Natural rubber.
- Q.27 Write the mechanism for preparation of ethanol from ethene.
- Q.28 (a) What is the freezing point of 0.4 molal solution of acetic acid in benzene in which it dimerises to the extent of 85%. Freezing point of benzene is 278.4K and its molar heat of fusion is $10.042 \text{ kJ mol}^{-1}$.
(b) Explain the following:
- (i) Solution of chloroform and acetone is an example of maximum boiling azeotrope.
(ii) A doctor advised a person suffering from high blood pressure to take less quantity of common salt.

OR

- (a) Calculate the boiling point of a solution containing 0.61g of benzoic acid in 5 g of CS_2 .Assuming 84% dimerisation of acid. The boiling point and K_b of CS_2 are 46.2°C and $2.3 \text{ K Kg mol}^{-1}$ respectively.
(b) State Raoult's law for the solution containing non-volatile solute. Give its mathematical expression also.

Q.29 Account for the following :

- (i) Transition elements show highest oxidation state in their oxides than fluorides.
- (ii) Cu has positive electrode potential in the first transition series.
- (iii) Ionisation enthalpy of lanthanides is higher than actinides.
- (iv) Potassium dichromate is a good oxidising agent in acidic medium.
- (v) Actinides show more number of oxidation states than lanthanides.

OR

(a) Compare non transition and transition elements on the basis of their

- (i) Variability of oxidation states (ii) stability of oxidation states.

(b) Give chemical reactions for the following observations:

- (i) Potassium permanganate is a good oxidising agent in basic medium.
- (ii) Inter convertibility of chromate ion and dichromate ion in aqueous solution depends Upon pH of the solution.
- (iii) Potassium permanganate is thermally unstable at 513K.

Q.30. (a) Give names of the reagents to bring about the following transformations:

- i) Ethanoic acid to ethanol
- ii) Propane-1-ol to propanal
- iii) Pent-3-en-2-ol to pent-3-en-2-one
- iv) Sodium benzoate to benzene

(b) Arrange the following in the uncreasing order of:

- i) Methanal, Propanal, Butanone, Ethanal, Propanone (nucleophilic addition reaction)
- ii) Formaldehyde, Acetone, Acetaldehyde (reactivity towards HCN)
- iii) Acetophenone, p-tolualdehyde, p-nitrobenzaldehyde, Benzaldehyde (nucleophilic addition reaction)

OR

(a) Bring out the following conversions:.

- (i) 4-nitrotoluene to 2-bromobenzoic acid.
- (ii) Ethylcyanide to 1- phenyl propanone.

(c) Give a reason for the following :

- (i) Chloroacetic acid is more acidic than acetic acid.
- (ii) Carboxylic acids have higher boiling point than alcohols.
- (iii) 4-nitrobenzoic acid is more acidic than 4-methoxy benzoic acid.

SAMPLE QUESTION PAPER
CHEMISTRY(043)
MARKING SCHEME

TIME ALLOTTED :3 Hrs

MAXIMUM MARKS;70

1. Relatively large electron-electron repulsion among the lone pairs of F₂ molecule but they are much closer to each other in Cl₂ molecule. 1
2. 3,3-Di methyl-2-oxobutanoic acid. 1
3. Temperature and activation energy are inversely proportional to each other. 1
4. K₄[Fe(CN)₆] 1
5. $\text{CHO}-(\text{CHOH})_4\text{CH}_2\text{OH} + \text{HI (excess)} \xrightarrow{\Delta} \text{n-hexane (C}_6\text{H}_{14}\text{)}$
6. XeF₆ 1
7. Name is Ethylenediamine tetraacetate and denticity is 6. 1
8. Due to the presence of an alkyl group higher electron density is found on alkoxide ion. 1
9. (a) Kohlrausch law of independent migration of ions: The limiting molar conductivity of an electrolyte can be represented as the sum of the individual contribution of the anions and cations of the electrolyte. 1

$$\begin{aligned}
 \text{(b) } \Lambda^0_m(\text{CaSO}_4) &= \lambda^0_{\text{Ca}^{2+}} + \lambda^0_{\text{SO}_4^{2-}} \\
 &= 119.0 \text{ S cm}^2 \text{ mol}^{-1} + 106.0 \text{ S cm}^2 \text{ mol}^{-1} \quad 1/2 \\
 &= 225.0 \text{ S cm}^2 \text{ mol}^{-1} \quad 1/2
 \end{aligned}$$

10.

$$K = \frac{2.303}{t} \log \frac{a}{a-x} \quad 1/2$$

$$t = \frac{2.303}{k} \log \frac{a}{a-x}$$

$$[a = 1, x = 3/4]$$

$$t_{3/4} = \frac{2.303}{2.54 \times 10^3} \log \frac{1}{1-3/4} \quad 1/2$$

$$t_{3/4} = 0.9066 \times 10^3 \times 0.6021$$

1

$$t_{3/4} = 5.46 \times 10^2 \text{ sec}$$

OR

$$K = \frac{2.303}{t} \log \frac{a}{a-x} \quad 1/2$$

$$2.0 \times 10^{-4} (\text{sec}^{-1}) = \frac{2.303}{900} \log \frac{a}{a-x} \quad 1/2$$

$$\log \frac{a}{a-x} = \frac{2.0 \times 10^{-4} \times 900}{2.303} = 0.0781 \quad 1/2$$

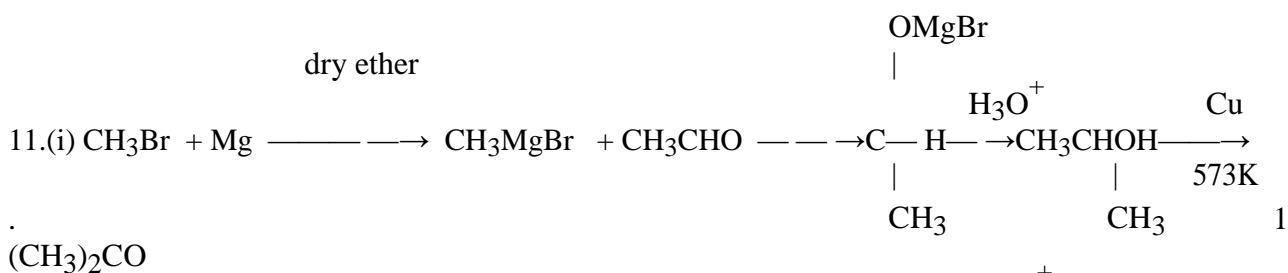
$$\text{taking antilog } \frac{a}{a-x} = \text{antilog}(0.0781) = 1.197$$

$$a = 1.197a - 1.197x$$

$$x = \frac{0.197}{1.197} a = 0.1645a \quad 1/2$$

Where $a = 100$, then $x = 0.1645 \times 100 = 16.45$

i.e 16.45 % of initial concentration has changed into products.



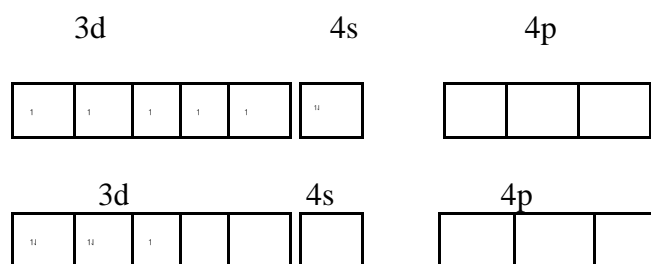
12. (a) On heating chloroform and carbon tetrachloride with aniline and ethanolic potassium hydroxide separately chloroform forms pungent smelling isocyanide but carbon tetra chloride does not form this compound. 1

(b) On adding sodium hydroxide and silver nitrate to both the compounds benzyl chloride forms white precipitate but chlorobenzene does not form white precipitate. 1

13. (i) Order of reaction is zero. 1

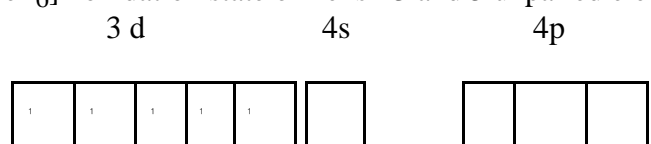
(ii) units of rate constant is $\text{mol L}^{-1} \text{s}^{-1}$ 1

14. Oxidation state of Fe in $K_3[Fe(CN)_6]$ is +3
 Configuration of Fe^{3+} is $[Ar]3d^5$



it has 5 unpaired electrons in 3d orbital which get paired leaving behind one unpaired electron only.

In $K_3[FeF_6]$ oxidation state of Fe is +3 and 5 unpaired electrons are there in 3d orbitals.

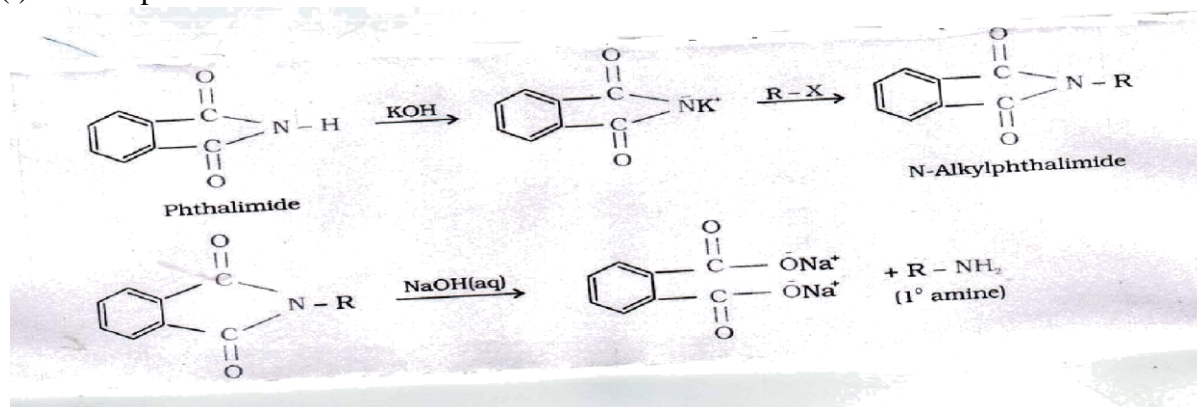


Because of the presence of different no. of unpaired electrons these impart different colour of same solution. 1

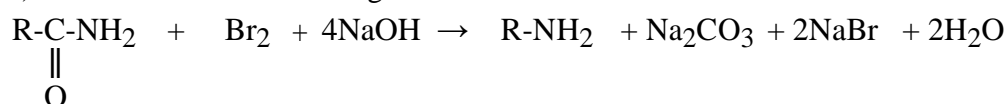
15.(i) Ortho toluidine is more basic than aniline due to the presence of electron releasing methyl group (+I effect) electron density at nitrogen of NH_2 in o-toluidine increases. 1

(ii) Due to the absence of replaceable hydrogen atom at nitrogen. 1

16.(i) Gabriel phthalimide reaction 1



(b) Hoffmann bromamide degradation reaction



1

17. Given $a = 4.077 \times 10^{-8}$ cm, $Z = 4$, $M = 108$ g mol⁻¹, $N_A = 6.022 \times 10^{23}$

$$= \frac{Z \times M}{a^3 \times N_A}$$

1/2

$$= \frac{4 \times 108 \text{ g/mol}}{(4.077 \times 10^{-8})^3 \times 6.022 \times 10^{23}} = 6.22 \text{ g/cm}^3 \quad 1/2$$

$$r = \frac{a}{2\sqrt{2}} = \frac{4.077 \times 10^{-8} \text{ cm}}{2\sqrt{2}} \quad 1/2$$

$$= 1.44 \times 10^{-8} \text{ cm} \quad 1/2$$

18. For ccp structures $a = \frac{4r}{\sqrt{2}} = 2\sqrt{2}r$ or $r = \frac{a}{2\sqrt{2}}$ 1/2

Packing efficiency = $\frac{\text{Volume occupied by four spheres in the unit cell} \times 100}{\text{Total volume of the unit cell}}\%$ 1/2

$$= \frac{4 \times \frac{4}{3} \pi r^3 \times 100}{(2\sqrt{2}r)^3} \%$$

$$= \frac{(\frac{16}{3}) \pi r^3 \times 100}{16\sqrt{2}r^3} \% = 74\% \quad 1/2$$

19. a) -Harmful effects of lead on the human being 2

- as well as on the environment

It is wise to choose sustained long term benefit than short term gain with regard to health/money

Knowledge of chemistry and its relation to environment

b) (i) Environmental protection

(ii) Health concerns 1

20. (i) Rough surface of a catalyst provides more surface area for adsorption. 1

(ii) So that unburnt charged carbon particles get settled between the charged plate leaving behind air free from pollutants. 1

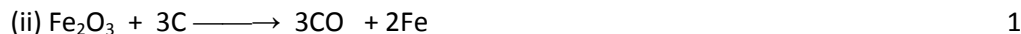
(iii) Ne has higher critical temperature i.e stronger vander waal's forces therefore easily adsorbed. 1

21 (a) Acidic flux is SiO_2 1/2

Basic flux is CaO 1/2

(b)

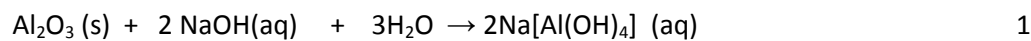
(i) Cu_2O undergoes self reduction to form blister copper as



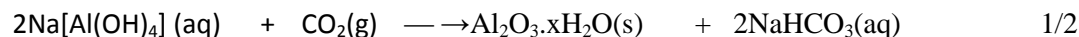
OR

(a) Cryolite reduces melting point of alumina . 1

(b) Concentration of ore is carried out by digesting the powdered ore with a concentrated solution of NaOH at 473-523 K and 35 -36 bar pressure. Al_2O_3 is leached out as sodium meta aluminate and SiO_2 as sodium silicate leaving behind impurities.

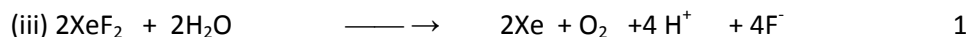
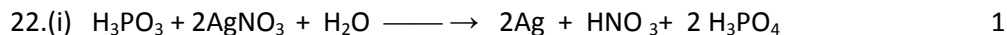
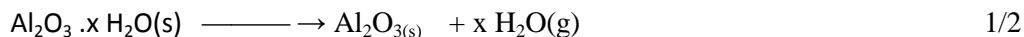


The resulting solution is filtered, cooled and neutralised by passing CO_2 gas through it. Then hydrated Al_2O_3 gets precipitated leaving sodium silicate in the solution.

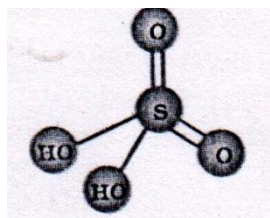


Sodium silicates remain in the solution and hydrated alumina is filtered , washed, dried and heated to get pure alumina (Al_2O_3).

1470K



23(i)



1

(ii) Since the formation of ozone from oxygen is endothermic reaction silent electric discharge prevents its decomposition. 1

(iii) Bleaching by sulphur dioxide is temporary because of its reducing nature. 1

24 (i) Amylose is a long unbranched chain polymer of α -D(+) glucose. 1/2

Amylopectin is a branched chain polymer of α -D glucose. 1/2

(ii) Globular protein and its shape is spherical. $\frac{1}{2} + 1/2$

(iii) Liver and adipose tissue. $\frac{1}{2} + 1/2$

25. (i) Antiseptics are the chemicals applied to the living tissues either to kill or prevent the growth of microorganisms .e.g dettol. $\frac{1}{2} + 1/2$

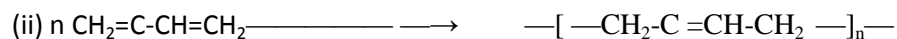
(ii) Antioxidants are the compounds which retard the action of oxygen on food and reduces its rate of decomposition by oxidation.e.g BHA $\frac{1}{2} + 1/2$

(iii) Narcotic analgesics are the chemicals used for the relief of post operative pain.e.g morphine.1

26. (i) Monomers of the polymer are melamine and formaldehyde.

$\frac{1}{2}+1/2$

polymerisation



1

|

Cl

|

Cl

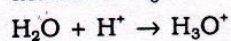
(iii) Nylon66 > Natural rubber > PVC

27.

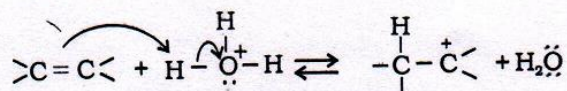
Mechanism

The mechanism of the reaction involves the following three steps:

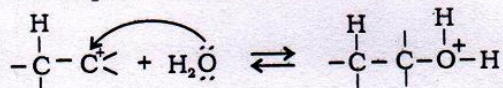
Step 1: Protonation of alkene to form carbocation by electrophilic attack of H_3O^+ .



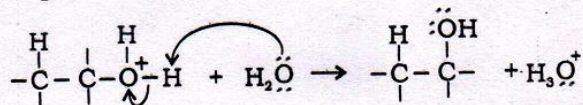
1



Step 2: Nucleophilic attack of water on carbocation.



Step 3: Deprotonation to form an alcohol.



1

28 :: Given, $m = 0.4$, $T_f^0 = 278.4$, $\Delta H_{\text{fus}} = 10.042 \text{ KJ mol}^{-1}$

$$RT_f^2 M \quad 8.34 \times 10^3 \times (278.4)^2 \times 78$$

$$K_f = \text{---} = \text{---} = 5.0 \text{ K Kg mol}^{-1} \quad \frac{1}{2} + \frac{1}{2}$$

$$1000 \times \Delta H_{\text{fus}} \quad 1000 \times 10.042$$



$$\alpha = \frac{i-1}{1/n - 1} = \frac{i-1}{\frac{1}{2} - 1} \quad \frac{1}{2}$$

$$\begin{aligned} &= \frac{i-1}{\frac{1}{2} - 1} = 0.85 \\ &= i-1 = -0.425 \quad \frac{1}{2} \end{aligned}$$

$$i = 0.575$$

$$\Delta T_f = i K_f m = 0.575 \times 5 \times 0.4 = 1.15$$

$$T_f = T_f^0 - \Delta T_f = 278.4 - 1.15 = 277.25 \text{ K} \quad \frac{1}{2} + \frac{1}{2}$$

(b) i) This solution has lesser vapour pressure due to stronger interactions between chloroform and acetone molecules. 1

ii) Because higher quantity of NaCl will increase no. of sodium and chloride ions in the body fluid which can increase the osmotic pressure of body fluid i.e blood pressure of a person. 1

OR



$$\alpha = \frac{i - 1}{1/n - 1} = 0.84 = \frac{i - 1}{\frac{1}{2} - 1} \quad \frac{1}{2} + 1/2$$

$$i = 1 - \frac{0.84}{2} = 1 - 0.42 = 0.58$$

Normal molar mass of benzoic acid = 122g mol⁻¹

$$\Delta T_b = i \cdot K_b \cdot m = 0.58 \times 2.3 \times 0.1 = 0.1334^\circ\text{C} \quad \frac{1}{2} + 1/2$$

$$T_b = T_b^0 + \Delta T_b = 46.2 + 0.1334 = 46.334^\circ\text{C}$$

(b) Raoult's law: The relative lowering of vapour pressure of the solvent over a solution is equal to the mol fraction of non-volatile solute present in the solution. 1+1

$$P_1^0 - P_1$$

Mathematical expression $\chi_B = \frac{P_1^0 - P_1}{P_1^0}$

29.(i) Because oxygen forms multiple bonds with transition metals but fluorine does not form multiple bonds. 1

(ii) Cu has lower hydration enthalpy which is unable to compensate sum of first and second ionisation enthalpy. 1

(iii) 4f electrons of lanthanides is less effectively shielded by nuclear charge than 5f electrons of actinides. 1

(iv) Because dichromate ions get reduced to chromium ions in acidic medium. 1

(v) The actinides show more number of oxidation states than lanthanides because in actinides 5f, 6d and 7s levels have comparable energies. 1

OR

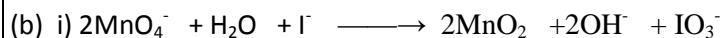
(i) Oxidation states of transition elements differ from each other by unity. In non transition elements

Oxidation states normally differ by a unit of two.

$\frac{1}{2}+1/2$

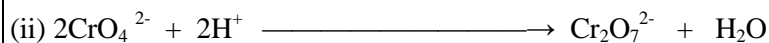
(ii) In transition elements higher oxidation states are favoured by heavier elements whereas in non transition elements lower oxidation state is favoured by transition elements.

$\frac{1}{2}+1/2$



1

Acid (pH less than 7)

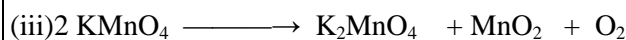


1



Alkali (pH more than 7)

$\Delta 513\text{K}$



1

30. (a) (i) $\text{Li AlH}_4/\text{H}_3\text{O}^+$

$1/2$

(ii) PCC

$1/2$

(iii) PCC

$1/2$

(iv) sodalime

$1/2$

(b) (i) Butanone < Propanone < Propanal < Ethanal < Methanal.

1

(ii) Acetone < Acetaldehyde < Formaldehyde.

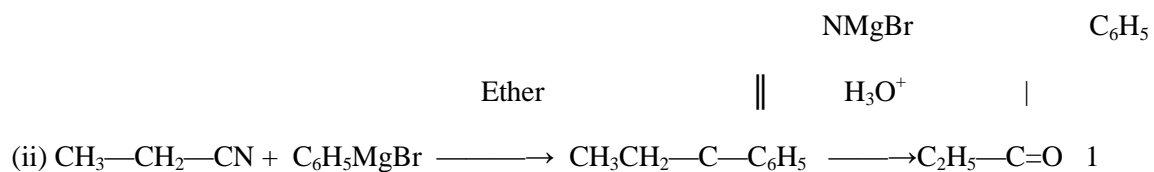
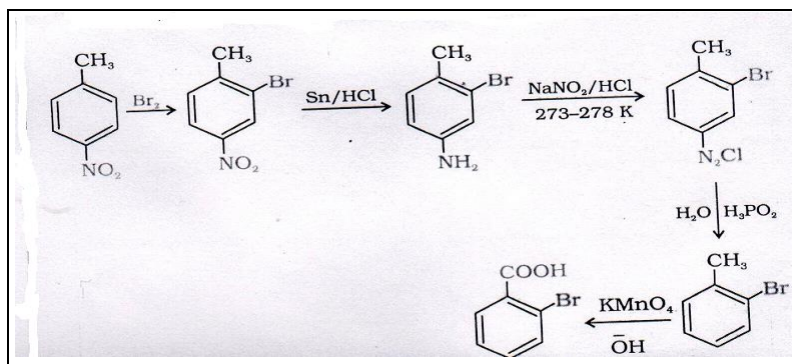
1

(iii) Acetophenone < p-Tolualdehyde < Benzaldehyde < p-Nitro benzaldehyde.

1

OR

(a) (i)



(b) (i) Because chloroacetate ion is more resonance stabilised than acetate ion due to the presence of electron withdrawing chlorine atom (+I effect).

(ii) Due to the presence of extensive intermolecular hydrogen bonding in carboxylic acids than in alcohols molecules.

(iii) Because of $-I$ effect of nitro group stability of benzoate ion increases in 4-nitro benzoic acid.

But methoxy (+I effect) group decreases the stability of benzoate ion.
