2023

Time - 3 hours

Full Marks - 60

*Answer **all groups** as per instructions.*
Figures in the right hand margin indicate marks.

GROUP - A

1. Answer all questions and fill in the blanks as required. [1 × 8

(a) Find out co-ordination number of central metal ion in $[Co(en)_2Cl_2]Cl$.

(b) What is the IUPAC name of $[Pt(Py)_4][PtCl_4]$?

(c) Write two important ores of Mn.

(d) Give example of linkage isomers.

(e) What are the geometrical isomers of the complex having formula $[M(aa)_2b_2]$aa : bidentate and b : unidentate ligand.

(f) Write one function of Haemoglobin.

(g) $(MnO_4)^{-1} + 8H^+ +$ _____ $= Mn^{+2} + 4H_2O$. (Fill up the gap.)

(h) Lanthanum ion does not exist in +4 oxidation state.
(State True / False)

GROUP - B

2. Answer any eight of the following within two or three sentences each. [1½ × 8

(a) Find out secondary valency of Cr in $K[Cr(NH_3)_2(C_2O_4)_2]$.

(b) Give one example of Chelating agent.

(c) Define Crystal field stabilisation energy.

(d) Between $[NiCl_4]^{-2}$ and $[Ni(CN)_4]^{-2}$, which one is paramagnetic.

(e) Indicate the hybridisation of metal ion and geometry of $[Co(NH_3)_6]^{+2}$ ion.

(f) Why is human blood red in colour ?

(g) Explain : 1 M $KMnO_4$ = 5 N $KMnO_4$ solution in acidic medium.

(h) Write down toxic effect of Mercury.

(i) Write down uses of Na/K pump.

(j) Between $[Co(NH_3)_6]Cl_3$ and $[Co(NH_3)_3Cl_3]$, which one shows conductivity ?

GROUP - C

3. Answer any eight of the following within 75 words each. [2 × 8

(a) Discuss the geometry of $[Ni(CN)_4]^{2-}$ ion.

(b) $CoCl_3 5NH_3$ when dissolved in water, two chloride ions are precipitated. Its molar conductivity corresponds to 3. What is the formula of co-ordination compound ? Write its IUPAC name.

(c) Calculate crystal field stabilisation energy for d^5 high spin octahedral.

(d) Anhydrous Copper Sulphate is colourless but hydrated Copper Sulphate is blue in colour. Explain.

(e) Discuss Labile and Inert Complex.

(f) Write down differences of primary and secondary valency.

(g) What happens when Sodium oxalate is added to warm solution of acidified potassium permanganate solution ? Write the balanced ionic equation.

(h) Why is Fe(III) more stable than Co(III) ?

(i) What are the various oxidation states of Vanadium ?

(j) Why does Zinc show only 2(+) oxidation state ?

GROUP - D

4. Answer any four questions within 500 words each.

(a) Write down the basic postulates of valence bond theory. Discuss Inner orbital complex with one example. [6

(b) [illegible] [5]

(c) [illegible] [5]

(d) [illegible] [5]

(e) [illegible] [5]

(f) [illegible] [5]

(g) [illegible] [5]

No. of Printed Pages : 5

Sem-IV-Chem-CC-IX(R&B)

2023

Time - 3 hours

Full Marks - 60

*Answer **all groups** as per instructions.*

Figures in the right hand margin indicate marks.

GROUP - A

1. Answer all questions and fill in the blanks as required. [1 × 8

(a) Primary amine on reaction with nitrous acid forms _____.

(b) Aniline on heating with fuming H_2SO_4 gives _____.

(c) What is a coupling reaction ?

(d) $C_6H_5\overset{\oplus}{N}_2Cl^{\ominus} \xrightarrow[\Delta]{HF\,/\,BF_3} C_6H_5F + N_2 + HCl$

This reaction is known as _____.

(e) How many monosubstituted isomers are possible in Naphthalene ?

(f) Write the structure of Alizarine.

(g) Paal-Knorr synthesis is used for the preparation of _____.

(h) _____ terpenoid is extracted from rose.

P.T.O.

GROUP - B

2. Answer <u>any eight</u> of the following within two or three sentences each. [1½ × 8

(a) What is Carbylamine reaction ?

(b) Arrange the following in the increasing order of their basicity.

p-Toluidine, N, N-Dimethyl-p-toluidine, Aniline, p-Nitro Aniline

(c) How can you prepare butter yellow dye from BDC ?

(d) Why excess of HCl is used during diazotisation of Aniline with $NaNO_2$ and HCl at $0\text{-}5^0$ C ?

(e) What happens when α-aminonaphthyl amine is oxidised with alkaline $KMnO_4$ solution ?

(f) Why naphthalene is more reactive than benzene ?

(g) Explain why pyrrole is acidic like phenol ?

(h) Write the structural formula of Imidazole.

(i) How can you detect an alkaloid if it contains a phenolic –OH group ?

(j) What is isoprene rule ?

GROUP - C

3. Answer any eight of the following within 75 words each. [2 × 8

(a) Aniline is a weaker base than cyclohexyl amine. Explain.

(b) Explain Hoffmann's exhaustive methylation of amine.

(c) How can you prepare benzoic acid from B.D.C. ?

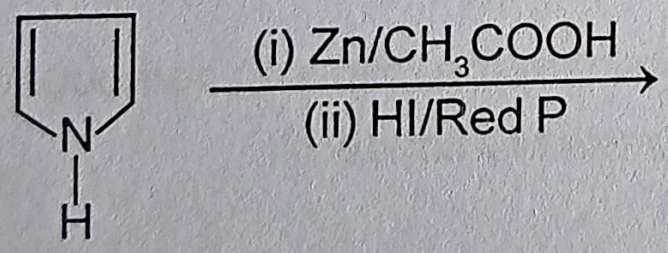
(d) Why pH is maintained between 5-7 during the preparation of dye from benzene diazonium chloride with aniline ?

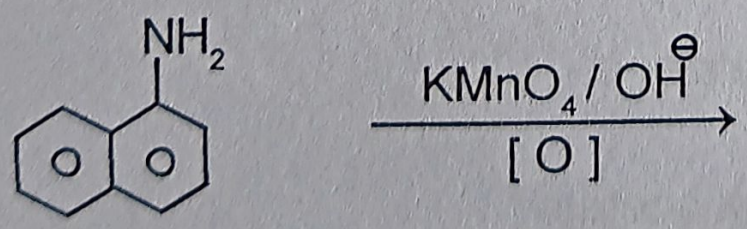
(e) How can you synthesize α-Naphthoic acid from α-chloro-naphthalene ?

(f) Describe the formylation of anthracene.

(g) Explain why pyridine is a stronger base than aniline ?

(h) Complete the following reactions :

(i) 

(ii) 

(i) How can you prove the presence of pyridine moeity in Nicotine ?

(j) Write the structural formula of two geometrical isomers of citral and give their names.

GROUP - D

4. Answer any four questions within 500 words each.

(a) How can you distinguish between 1^0, 2^0 and 3^0 amines with Hinsberg reagent ? [6

(b) How can you prepare ethylamine using : [2 × 3

(i) Curtius degradation method

(ii) Gabriel phthalimide synthesis

(iii) Mannich reaction [6

(c) How can you prepare the following compounds starting from Benzene Diazonium Chloride ? [2 × 3

(i) Iodobenzene

(ii) Nitrobenzene

(iii) Phenyl acetate

(d) Elucidate the structure of Napthalene. [6

(e) Elucidate the structure of Citral. [6

(f) Bring out the following conversions : [2 × 3

(i) Phenol to Aminocyclohexane

(ii) Naphthalene to Phthalic acid

(iii) Pyridine to 4, 4′-Dipyridyl

(g) Write short notes on (within 250 words each). [3 × 2

(i) Reductive oxidation

(ii) Medicinal importance of Morphine

2023

Time - 3 hours

Full Marks - 60

*Answer **all groups** as per instructions.*
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GROUP - A

1. Fill in the blanks. (all) [1 × 8

(a) The relation between specific conductance (K) and equivalent conductance (λ) of an electrolyte is _____.

(b) Transport number of CH_3COO^- ions is _____ than that of $C_6H_5COO^-$ ions.

(c) Which among the following is the strongest reducing agent $Zn(s)$, $Cr(s)$, $H_2(g)$ and $Fe^{2+}(aq)$?

(d) According to Debye Huckel theory, the speed of an ion is an electric field is _____.

(e) The mass of substance deposited by passage of 1 coulomb of charge is called _____.

(f) In a Galvanic cell, the anode is made up of _____ metal.

(g) A measure of the electric intensity due to presence of ions in the solutions is called _____.

(h) Potentiometric titrations are used for _____ type of solutions.

GROUP - B

2. Answer any eight of the following within two or three sentences each. [1½ × 8

(a) Define molar conductance.

(b) What are the factors determining conductance of an electrolyte ?

(c) What is the advantage of transport number ?

(d) What is the principle of conductometric titrations ?

(e) What is the effect of dilution on equivalent conductance ?

(f) In the electrochemical cell, $M/M^+ \| X^-/X$, $E^0_{m^+/m} = 0.44\ V$ and $E^0_{X/X^-} = -0.33\ V$. Calculate the E^0_{Cell}.

(g) Explain why KNO_3 is used to make salt bridge ?

(h) How dipole moments value can be used to predict shapes of molecules ?

(i) What is Lorenz-Laurentz equation ?

(j) State Liquid Junction potential.

GROUP - C

3. Answer any eight of the following within 75 words each. [2 × 8

(a) The increase in magnitude of equivalent conductance on dilution is more for weak electrolytes than for strong electrolytes. Explain.

(b) What is Debye Huckel theory for strong electrolytes ?

(c) Show that the transport numbers of cation and anion is unity.

(d) Derive a relation between ionic conductance and transport number.

(e) Define ionic mobility and ionic conductance. How are they related ?

(f) Differentiate between cell potential and potential difference ?

(g) What is a reversible electrode ? Give an example.

(h) Derive a relationship between free energy and electrical energy.

(i) What is Clausius-Mosotti equation used for ?

(j) Give a method of measuring dipolemoment.

GROUP - D

4. Answer any four questions.

(a) State Kohlrausch law. Calculate the equivalent conductance at infinite dilution of CH_3COOH from the following data : [2 + 4

$\Lambda_{0\ HCl} = 426.2\ ohm^{-1}.cm^2.\ g.eq^{-1}$,

$\Lambda_{0\ CH_3\ COONa} = 91\ ohm^{-1}.cm^2.\ g.eq^{-1}$,

$\Lambda_{0\ NaCl} = 126.5\ ohm^{-1}.cm^2.g.eq^{-1}$

(b) Derive Debye Huckel Onsager equation for strong electrolytes. [6

(c) Write notes on : [3 × 2

(i) Debye-Falkenhagen effect

(ii) Walden's rule

(d) Describe moving boundary method for determination of transport number. What is the effect of concentration on transport number ? [4 + 2

(e) What is Nernst equation ? Derive Nernst equation for the following reaction : $Mn^+(aq) + ne^- \rightarrow M(s)$ [2 + 4

(f) (i) How can you determine equilibrium constant from EMF ? [3

(ii) Briefly describe concentration Cell. [3

(g) (i) Write a note on single electrode potential. [3

(ii) Draw the cell diagram that undergoes the following redox reaction : $Ce^{4+}(aq) + Fe^{2+}(aq) \rightarrow Ce^{3+}(aq) + Fe^{3+}(aq)$. [3

(h) (i) How can you determine ionic product of water from conductance measurement ? [3

(ii) Write a brief note on molecular polarizabilities. [3

2023

Time - 3 hours

Full Marks - 60

*Answer **all groups** as per instructions.*
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GROUP - A

1. Fill in the blanks. (all) [1 × 8

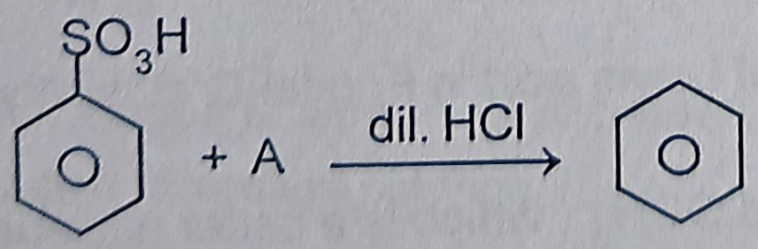
(a) At standard state, the values of pressure and temperature is _____.

(b) The relation between K_P and K_C of the equation $2\,NH_3(g) \rightleftharpoons N_2(g) + 3H_2(g)$ is _____.

(c) Ionic product of water is _____ to temperature.

(d) For precipitation to take place, solubility product must be _____ than ionic product.

(e) In the reaction :



. Identify A.

(f) The electrophile used in nitration of benzene is _____.

P.T.O.

(g) What is the product formed when benzene diazonium chloride is treated with cuprous chloride ?

(h) t-butyl alcohol can be prepared by reacting methyl magnesium bromide with _____.

GROUP - B

2. Answer any eight of the following within two or three sentences each. [1½ × 8

(a) Define standard enthalpy of formation.

(b) State bond dissociation energy.

(c) What is Le-Chatelier's principle ?

(d) Name two factors affecting degree of ionisation.

(e) Blue litmus paper turns red in copper sulphate solution. Explain.

(f) Why dil. HCl is added first followed by passing H_2S gas for detection of Gr II radicals in qualitative analysis ?

(g) What is the role of Lewis acid in Friedel-Craft's alkylation ?

(h) Between OH^- and OCH_3^- , which is a better nucleophile and why ?

(i) Like alkyl halide, why aryl halide does not undergo nucleophilic substitution reaction easily ?

(j) How can you convert phenol to salicylic acid ?

GROUP - C

3. Answer any eight of the following within 75 words each. [2 × 8

(a) Calculate ΔH^0 for the reaction :

$$CH_4\,(g) + 4F_2\,(g) \rightarrow CF_4\,(g) + 4HF\,(g)$$

Given that the enthalpies of formation of CH_4, CF_4 and HF are –75 kJ, –680 kJ and –269 kJ respectively.

(b) Calculate ΔH of the reaction :

$$CH_2Cl_2\,(g) \rightarrow C\,(g) + 2H\,(g) + 2Cl\,(g).$$

Bond energies of C–H bond and C–Cl bond are 99.28 kCal mol^{-1} and 77.99 kCal $mole^{-1}$ respectively.

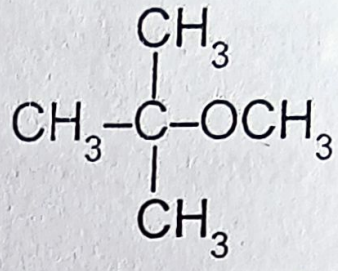
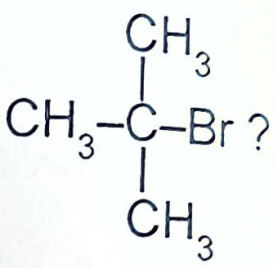
(c) What is the effect of temperature and pressure on the following equilibrium :

$$N_2\,(g) \rightarrow 3H_2\,(g) \rightleftharpoons 2NH_3\,(g),\ \Delta H = -22.9\ kCal.$$

(d) What happens when HCl is passed through concentrated solution of sodium chloride ?

(e) Calculate the pH of 0.0001 M NaOH.

(f) Convert : Phenol to O-Cresol

(g) How can you prepare  from  ?

Propose a mechanism for the reaction.

(h) What happens when ethylalcohol is treated with conc. HCl in presence of anhydrous $ZnCl_2$?

(i) Starting from aniline, how can you prepare phenol ?

(j) Explain why aldehydes and ketones react with derivatives of ammonia in presence of dil. HCl.

GROUP - D

4. Answer any four questions.

(a) Write short notes on : [3 × 2

(i) Kirchoff's equation

(ii) Thérmochemistry

(b) Derive a relationship between K_P and K_C for the following reaction :

$$aA_{(g)} + bB_{(g)} \rightleftharpoons cC_{(g)} + dD_{(g)}$$ [6

(c) Define solubility of a solute in a given solvent. Calculate the solubility of $HgSO_4$. (K_{sp} for $HgSO_4$ is 6.4×10^{-5}) [2 + 4

(d) (i) Write a note on electrophilic substitution reaction of benzene. [3

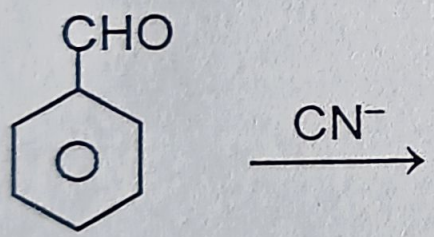
(ii) State Williamson's synthesis. Give its mechanism. [3

(e) Write short notes on : [3 × 2

(i) Pinacol-Pinacolone rearrangement

(ii) Oxidation of diols

(f) Complete the reaction giving a suitable mechanism :



What happens when the product obtained is oxidised with conc. HNO_3 ? [2+2+2

(g) (i) What happens when chlorobenzene reacts with ammonia in presence of potassium amide. [2

(ii) By the help of a chemical reaction, distinguish between propan-1-ol and propan-2-ol. [2

(iii) Give the reaction of acetaldehyde and propionaldehyde with dil NaOH. [2