

## GENERAL INSTRUCTIONS:

Read the following instructions carefully.

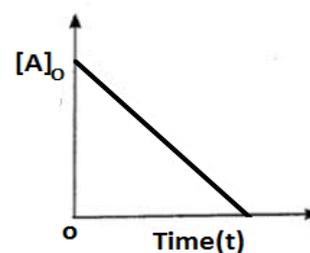
1. There are 12 questions in this question paper with internal choice.
2. SECTION A - Q. No. 1 to 3 are very short answer questions carrying 2 marks each.
3. SECTION B - Q. No. 4 to 11 are short answer questions carrying 3 marks each.
4. SECTION C- Q. No. 12 is case based question carrying 5 marks.
5. All questions are compulsory.
6. Use of log tables and calculators is not allowed

## SECTION A

- 1 a) Define limiting Molar conductivity 2  
 b) Why on dilution the  $\Lambda_m$  of  $\text{CH}_3\text{COOH}$  increases drastically, while that of  $\text{CH}_3\text{COONa}$  increases gradually? 2
- 2 Explain why sodium hydrogensulphite is used for the separation and purification of aldehydes with suitable example? 2
- 3 Arrange the following compounds as directed:- 2  
 a)  $(\text{CH}_3)_2\text{NH}$ ,  $\text{CH}_3\text{NH}_2$ ,  $\text{C}_6\text{H}_5\text{NH}_2$  (increasing order of solubility in water)  
 b)  $(\text{CH}_3)_3\text{N}$ ,  $(\text{CH}_3)_2\text{NH}$ ,  $\text{CH}_3\text{NH}_2$  (decreasing order of basicity strength in water)

## SECTION B

- 4 For a chemical reaction variation in concentration  $[A]$  vs. time (s) plot is given below: 3  
 i. Predict the order of the given reaction.  
 ii. What does the slope of the line indicates?  
 iii. What is the unit of rate constant  $k$ ?

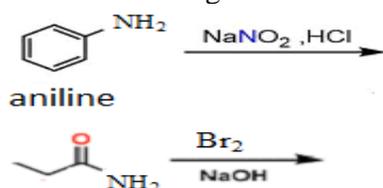


OR

- a) The rate of reaction decreases with the progress of reaction. Why? 1+2  
 b) A first order reaction takes 30 minutes for 50% completion. Calculate the time required for 90% completion of this reaction. ( $\log 2 = 0.3010$ )
- 5 a) What is the role of platinum wire in hydrogen electrode? 1+2  
 b) Calculate the emf of the following cell at 298K, if  $E^\circ_{\text{Sn}^{2+}/\text{Sn}} = 0.14\text{V}$  ( $\log 5 = 0.6989$ )  
 $\text{Sn}/\text{Sn}^{2+}(0.050\text{M}) \parallel \text{H}^+(0.020\text{M})/\text{H}_2(\text{g})(1\text{ Bar})/\text{Pt}(s)$
- 6 a) What is Hinsberg's reagent? 3  
 b) How it is used to distinguish between primary, secondary and tertiary amines? Explain using suitable chemical reactions.

OR

- a) How acetylation of aniline with acetic anhydride decreases the activating effect of  $-\text{NH}_2$  group?  
 b) Complete the following



- 7 Give reason for the following 3  
 a) Chromium is typically hard metal but mercury is liquid.  
 b) Atomic radii of 4d and 5d series elements are nearly same.  
 c)  $\text{Cu}^+$  is unstable in aqueous solution.

OR

- a) Calculate the spin only magnetic moment of  $\text{Co}^{2+}$ .  
 b) Mention the type of compounds formed when small atoms like H, C and N get trapped inside the crystal lattice of transition metals. Also give physical and chemical characteristics of these compounds.

- 8 Carry out the following conversion: 3
- Benzoic acid to m-nitrobenzyl alcohol
  - Methyl cyanide to ethanol
  - Propanone to propene

OR

An organic compound A having molecular formula  $C_4H_8O$  gives orange red precipitate with 2,4-DNP reagent. It does not reduce Tollen's reagent but gives yellow precipitate of iodoform on heating with NaOH and  $I_2$ . Compound A on reduction with  $NaBH_4$  gives compound B, which undergoes dehydration reaction on heating with conc.  $H_2SO_4$  to form compound C. Compound C on ozonolysis gives two molecules of ethanol.

Identify A and B. Write their structures and reaction of A with NaOH/ $I_2$

- 9 Write the chemical equation to illustrate the following name reactions 3
- Cannizzaro Reaction
  - Etard reaction
  - Gattermann-Koch reaction

OR

- Give simple tests to distinguish between the following pair of organic compounds: Butanal and Butan-2-one
- Identify the products in the following reactions:

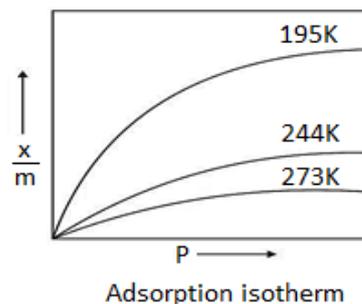


- 10 a) Which of the following complex is more stable and why? 3  
 $[Co(NH_3)_6]^{3+}$  and  $Co(en)_3^{3+}$   
 b) Although both  $[NiCl_4]^{2-}$  and  $[Ni(CO)_4]$  have  $sp^3$  hybridization yet  $[NiCl_4]^{2-}$  is paramagnetic and  $[Ni(CO)_4]$  is diamagnetic. Give reason  
 c) A coordination compound with molecular formula  $CrCl_3 \cdot 4H_2O$  precipitated one mole of AgCl with  $AgNO_3$  solution. Its molar conductivity is found to be equivalent to two ions. Write the structural formula of the compound.

- 11 a) Write the formulas for the following coordination compound: 3  
 Amminebromidochloridonitrito-N-platinate(II)  
 b) Write the IUPAC name of the coordination compound:  
 $K_3[Al(C_2O_4)_3]$   
 c) With the help of labeled diagram show the Crystal field splitting in tetrahedral coordination entities

#### SECTION C

- 12 The Freundlich equation or Freundlich adsorption isotherm, an adsorption isotherm, is an empirical relationship between the quantity of a gas adsorbed into a solid surface and the gas pressure. The same relationship is also applicable for the concentration of a solute adsorbed onto the surface of a solid and the concentration of the solute in the liquid phase. In 1909, Herbert Freundlich gave an expression representing the isothermal variation of adsorption of a quantity of gas adsorbed by unit mass of solid adsorbent with gas pressure. This equation is known as Freundlich adsorption isotherm or Freundlich adsorption equation. As this relationship is entirely empirical, in the case where adsorption behavior can be properly fit by isotherms with a theoretical basis, it is usually appropriate to use such isotherms instead (see for example the Langmuir and BET adsorption theories). The Freundlich equation is also derived (non-empirically) by attributing the change in the equilibrium constant of the binding process to the heterogeneity of the surface and the variation in the heat of adsorption. 5



- Why is adsorption always exothermic?
- Discuss the effect of temperature on the adsorption of the gases on solids.
- Write the log equation of Freundlich adsorption isotherm and plot the graph between  $\log p$  and  $\log x/m$ .
- Write the information conveyed by intercept and slope of the graph.
- What modification is made during adsorption from a solution by a solid adsorbent?