

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 2 Hours

Maximum Marks: 35

General Instructions

- (i) This question paper contains **12 questions**. All questions are compulsory.
- (ii) Section A: Questions 1 to 3 are very short answer questions, carrying 2 marks each.
- (iii) Section B: Questions 4 to 11 are short answer questions, carrying 3 marks each.
- (iv) Section C: Questions 12 are case-based questions, carrying 5 marks each.
- (v) Attempt one alternative where an internal choice is provided. Follow the instructions within each question.
- (vi) Use of calculators is not allowed.

Section A

1. Predict the reagent for carrying out the following transformations: (Any two)

- (i) Benzoyl chloride to Benzaldehyde
 - (ii) Ethanal to 3-hydroxy butanal
 - (iii) Ethanoic acid to 2-chloroethanoic acid
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2. (i) Why on dilution the Λ_m of CH_3COOH increases very fast, while that of CH_3COONa increases gradually?

(ii) What happens if external potential applied becomes greater than E°_{cell} of electrochemical cell?

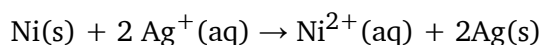
3. An Organic compound (A) with molecular formula $\text{C}_3\text{H}_7\text{NO}$ on heating with Br_2 and KOH forms a compound (B). Compound (B) on heating with CHCl_3 and alcoholic KOH produces a foul smelling compound (C) and on reacting with $\text{C}_6\text{H}_5\text{SO}_2\text{Cl}$ forms a compound (D) which is soluble in alkali. Write the structures of (A), (B), (C) and (D).

Section B

4. Account for the following:

- (i) Cu^{2+} salts are coloured while Zn^{2+} salts are white.
- (ii) E° value for the $\text{Mn}^{3+}/\text{Mn}^{2+}$ couple is much more positive than that for $\text{Cr}^{3+}/\text{Cr}^{2+}$.
- (iii) Transition metals form alloys.

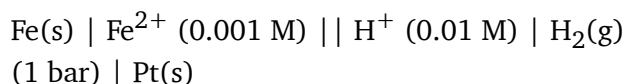
5. (a) Calculate $\Delta_r G^\circ$ and $\log K_c$ for the following cell:



Given that $E^\circ_{\text{cell}} = 1.05 \text{ V}$, $1\text{F} = 96,500 \text{ C mol}^{-1}$.

OR

(b) Calculate the e.m.f. of the following cell at 298 K:



Given that $E^\circ_{\text{cell}} = +0.44 \text{ V}$

$[\log 2 = 0.3010, \log 3 = 0.4771, \log 10 = 1]$

6. (a) Using valence bond theory, predict the hybridization and magnetic character of following: $[\text{CoF}_6]^{3-}$ [Atomic number of Co = 27]

(b) Write IUPAC name of the following complex: $[\text{CoBr}_2(\text{en})_2]^+$

(c) How many ions are produced from the complex $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ in solution?

7. (a) Differentiate between the following:

- (i) Adsorption and Absorption
- (ii) Lyophobic Sol and Lyophilic Sol
- (iii) Multimolecular Colloid and Macromolecular colloid.

OR

(b) (I) Define the following terms:

- (i) Zeta Potential
- (ii) Coagulation

(II) Why a negatively charged sol is obtained when AgNO_3 solution is added to KI solution?

8. Define transition metals. Why Zn, Cd and Hg are not called transition metals? How is the variability in oxidation states of transition metals different from that of p-block elements?

9. (a) What happens when

(i) Propanone is treated with CH_3MgBr and then hydrolysed?

(ii) Ethanal is treated with excess ethanol and acid?

(iii) Methanal undergoes Cannizzaro reaction?

OR

(b) Write the main product in the following reactions:

(i) $2\text{CH}_3\text{COCl} + (\text{CH}_3)_2\text{Cd} \rightarrow$

(ii) $\text{CH}_3\text{CH}_2\text{CHO} \xrightarrow{\text{Zn(Hg)/Conc. HCl}}$

(iii) $\text{C}_6\text{H}_5\text{COONa} + \text{NaOH} \xrightarrow{\Delta, \text{CaO}}$

10. Give reasons:

(i) Ammonolysis of alkyl halides is not a good method to prepare pure primary amines.

(ii) Aniline does not give Friedel-Crafts reaction.

(iii) Although $-\text{NH}_2$ group is o/p directing in electrophilic substitution reactions, yet aniline on nitration gives good yield of m-nitroaniline.

11. (a) (i) Which acid of the following pair would you expect to be stronger?

$\text{F-CH}_2\text{-COOH}$ or $\text{CH}_3\text{-COOH}$

(ii) Arrange the following compounds in increasing order of their boiling points:

$\text{CH}_3\text{CH}_2\text{OH}$, $\text{CH}_3\text{-CHO}$, $\text{CH}_3\text{-COOH}$

(iii) Give simple chemical test to distinguish between Benzaldehyde and Acetophenone.

OR

(b) (i) Which will undergo faster nucleophilic addition reaction? Acetaldehyde or Propanone

(ii) What is the composition of Fehling's reagent?

(iii) Draw structure of the semicarbazone of Ethanal.

12. Read the following passage and answer the questions that follow:

The rate of reaction is concerned with decrease in concentration of reactants or increase in the concentration of products per unit time. It can be expressed as instantaneous rate at a particular instant of time and average rate over a large interval of time. A number of factors such as temperature, concentration of reactants, catalyst affect the rate of reaction. Mathematical representation of rate of a reaction is given by rate law:

$$\text{Rate} = k[A]^x [B]^y$$

x and y indicate how sensitive the rate is to the change in concentration of A and B. Sum of x + y gives the overall order of a reaction. When a sequence of elementary reactions gives us the products, the reactions are called complex reactions. Molecularity and order of an elementary reaction are same. Zero order reactions are relatively uncommon but they occur under special conditions. All natural and artificial radioactive decay of unstable nuclei take place by first order kinetics.

(a) What is the effect of temperature on the rate constant of a reaction?

(b) For a reaction $A + B \rightarrow \text{Product}$, the rate law is given by, $\text{Rate} = k[A]^2 [B]^{1/2}$. What is the order of the reaction?

(c) How order and molecularity are different for complex reactions?

(d) A first order reaction has a rate constant $2 \times 10^{-3} \text{ s}^{-1}$. How long will 6 g of this reactant take to reduce to 2 g?

OR

The half life for radioactive decay of ^{14}C is 6930 years. An archaeological artifact containing wood had only 75% of the ^{14}C found in a living tree. Find the age of the sample.

[$\log 4 = 0.6021$, $\log 3 = 0.4771$, $\log 2 = 0.3010$, $\log 10 = 1$]

- End of Question Paper -