

## General Instructions

- (i) This question paper contains 26 questions. All questions are compulsory.
- (ii) It comprises 6 single-correct multiple-choice questions.
- (iii) Attempt every question; detailed solutions are provided in the companion solutions booklet.

1. Read the following assertion and reason and choose the correct alternative.

**Assertion:** Elevation in boiling point for two isotonic solutions is same.

**Reason:** Boiling point depends upon the concentration of the solute.

- (A) Both assertion and reason are true and the reason is the correct explanation of assertion
- (B) Both assertion and reason are true but the reason is not the correct explanation of assertion
- (C) Assertion is correct but reason is wrong
- (D) Assertion is wrong but reason is correct

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2. Which of the following ions has highest magnetic moment?

- (A)  $Cr^{2+}$
- (B)  $Co^{2+}$
- (C)  $Fe^{2+}$
- (D)  $V^{2+}$

3. Which of the following complexes exhibit linkage isomerism?

- (A)  $[Cr(NH_3)_4Cl_2]$
  - (B)  $[Co(NH_3)_5(NO_2)]Cl_2$
  - (C)  $[Co(NH_3)_5(SO_4)]Br$
  - (D)  $[Pt(NH_3)_2Br_2]$
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4. Benzyl alcohol is obtained from benzaldehyde by the following reaction.

- (A) Aldol condensation
  - (B) Perkin reaction
  - (C) Cross aldol condensation
  - (D) Cannizzaro reaction
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5. Which of the following is the most basic compound?

- (A) Aniline
  - (B) p-Nitro aniline
  - (C) Benzyl amine
  - (D) Acetanilide
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6. The chemical name of vitamin  $B_1$  is

- (A) Riboflavin
  - (B) Thiamine
  - (C) Ascorbic acid
  - (D) Pyridoxine
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7. Explain reverse osmosis and write any one example of artificial semipermeable membrane. (1 + 1 = 2)

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8. Mention the different steps for the preparation of potassium permanganate from pyrolusite ore and draw the structure of permanganate ion. (1 + 1 = 2)

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9. Write the IUPAC names of the following coordination compounds.

(i)  $[Cr(NH_3)_2Cl_2(en)]Cl$

(ii)  $[Pt(NH_3)_4Cl_2][PtCl_4]$  (1 + 1 = 2)

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10. Alkyl chloride reacts with aqueous KOH to form alcohol while in the presence of alcoholic KOH, alkene is obtained as major product. Explain. (2)

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11. Define molal elevation constant. (2)

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12. Ortho nitrophenol is more acidic than phenol. Explain. Draw the resonance structures of their corresponding phenoxide ion. (2)

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13. How will you differentiate the following?

(i) Acetaldehyde and acetone

(ii) Acetaldehyde and formaldehyde

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14. Differentiate between fibrous and globular proteins.

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15. An aqueous solution of glucose is 10% (w/w). What would be the molality and mole fraction of each component in the solution? (Molar mass of glucose =  $180 \text{ g mol}^{-1}$ )

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16. Define molar conductivity of a solution of an electrolyte and explain Kohlrausch law.

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17. Describe the effect of concentration and temperature on the rate of chemical reaction. Rate constant  $K = 5.5 \times 10^{-14} \text{ s}^{-1}$  for a first order reaction. Calculate the half life time of this reaction.

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18. (i) Explain with reason that transition metals generally form coloured compounds.  
(ii) Write a short note on the lanthanoid contraction.

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19. Write the Nernst equation of the following cell at 298 K and calculate its electromotive force.



$$\text{Given: } E_{\text{Mg}^{2+}/\text{Mg}}^{\circ} = -2.37 \text{ V} \text{ and } E_{\text{Cu}^{2+}/\text{Cu}}^{\circ} = 0.34 \text{ V. (4)}$$

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20. What is the order of reaction? Derive the integrated rate equation for a first order reaction and obtain an expression for the half life period of this reaction. (1+2+1=4)

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**21.** Discuss the chelate effect with an example. Explain the nature of bonding in  $[\text{Fe}(\text{CN})_6]^{4-}$  on the basis of valence bond theory. (2+2=4)

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**22.** (i) Write a short note on the cyclic structure of glucose.  
(ii) What is the difference between a nucleoside and a nucleotide?  
(2+2=4)

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**23.** Write short notes on the following: (i) Freons (ii) Sandmeyer reaction  
(iii) Friedel Craft acylation of haloarene. (2+1+1=5)

**OR**

What happens when (write chemical equation only): (i) Propene reacts with HI (ii) Ethyl bromide reacts with magnesium in the presence of dry ether (iii) Chlorobenzene is heated with sodium in dry ether (iv) The mixture of chlorobenzene and methyl chloride is heated with sodium in the presence of dry ether (v) Isopropyl alcohol reacts with conc. HCl and  $\text{ZnCl}_2$ . (1+1+1+1+1=5)

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**24.** (i) Write notes on Williamson's synthesis. (ii) Write the chemical equation for the preparation of phenol from cumene. (iii) How will you convert phenol to salicylaldehyde? (2+1+1=5)

**OR**

What happens when (write chemical equations only): (i) Phenol reacts with dil.  $\text{HNO}_3$  (ii) Ethyl methyl ether is heated with conc. HI (iii) Phenol is heated with conc.  $\text{HNO}_3$  in the presence of conc.  $\text{H}_2\text{SO}_4$  (iv) Ethyl alcohol reacts with thionyl chloride in the presence of pyridine (v) Phenol reacts with bromine water. (1+1+1+1+1=5)

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**25.** Write short notes on the following. (i) Cross aldol condensation (ii) Stephen reaction (iii) Etard reaction. (2 + 1 + 1 = 5)

**OR**

How will you obtain (write chemical equations only): (i) Ethanoic anhydride from Ethanoic acid (ii) Benzoic acid from Ethyl benzoate (iii) Benzamide from benzoic acid. (2 + 1 + 1 = 5)

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**26.** (i) Explain Hinsberg test for the distinction between primary, secondary and tertiary amines. (ii) Write a short note on Carbylamine reaction. (2 + 2 = 5)

**OR**

What happens when (write chemical equations only): (i) Aqueous solution of benzene diazonium chloride is heated (ii) Acetamide is reacted with aqueous KOH in the presence of bromine (iii) Aniline reacts with sodium nitrite and dil. HCl at 0°C (iv) Aniline reacts with acetic anhydride in the presence of pyridine (v) Aniline reacts with Bromine water.

(1 + 1 + 1 + 1 + 1 = 5)