UP Board Class 12 Chemistry 2026 Set 347 EA Question Paper

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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. What will be the Nernst equation of the cell for the following reaction?

$2Cr(s) + 3Cd^{2+}(aq) \rightarrow 2Cr^{3+}(aq) + 3Cd(s)$

(A) $E_{cell} = E^{\circ}_{cell} - \frac{RT}{6F} \ln \frac{[Cd^{2+}]^3}{[Cr^{3+}]^2}$

(B) $E_{cell} = E^{\circ}_{cell} - \frac{RT}{6F} \ln \frac{[Cr^{3+}]^2}{[Cd^{2+}]^3}$

(C) $E_{cell} = E^{\circ}_{cell} + \frac{RT}{6F} \ln \frac{[Cr^{3+}]^2}{[Cd^{2+}]^3}$

(D) $E_{cell} = E^{\circ}_{cell} + \frac{RT}{2F} \ln \frac{[Cd^{2+}]^3}{[Cr^{3+}]^2}$

2. If the rate law for a reaction is $\text{rate} = K[A]^2[B]^0$, then what will be the order of the reaction?

(A) Zero order

(B) First order

(C) Second order

(D) Third order

3. For which of the following ions is the magnetic moment (μ) the highest?

(A) Zn^{2+}

(B) Fe^{2+}

(C) Co^{2+}

(D) Ni^{2+}

4. The increasing order of reactivity of the following compounds in S_N1 reaction is:

A. $(CH_3)_3CBr$

B. $CH_3CH_2CH_2CH_2Br$

C. $(CH_3)_2CHCH_2Br$

D. $CH_3CH(Br)CH_2CH_3$

(A) A < B < C < D

(B) B < C < D < A

(C) D < C < B < A

(D) B < D < A < C

5. Which of the following is most acidic?

(I) 4-methoxybenzoic acid ($-COOH$ with para $-OCH_3$)

(II) benzoic acid

(III) 4-nitrobenzoic acid ($-COOH$ with para $-NO_2$)

(A) (I)

(B) (II)

(C) (III)

(D) None of these

6. Which of the following is temperature independent?

(A) Molality

(B) Molarity

(C) Normality

(D) None of these

7. Explain whether the half-life of a first order reaction depends or not on the initial concentration of the reactants.

8. Define electrode potential and emf of a cell.

9. $[NiCl_4]^{2-}$ is paramagnetic, while $[Ni(CO)_4]$ is diamagnetic although both are tetrahedral. Why?

10. Give the IUPAC names of the following organic compounds:

i) $CH_3 - CH_2 - CO - CH_2 - CH(CH_3) - CH_3$

ii) $C_6H_5 - CH = CH - CHO$

11. What is the van't Hoff factor? Write the equation for colligative properties including the van't Hoff factor.

12. Why do the transition metals and many of their compounds act as catalysts? Explain.

13. Write the mechanism of the bimolecular nucleophilic substitution reaction (S_N2) of an alkyl halide.

14. What is a peptide bond? Explain with an example.

15. i) Write the electronic configuration of an element with atomic number 24.

ii) Find the number of unpaired electrons in the Co^{2+} ion.

iii) Why is the range of oxidation states in the actinoid series greater than in the lanthanoid series?

16. What happens when aniline reacts with the following?

i) Bromine water

ii) $(CH_3CO)_2O$ / Pyridine

iii) HNO_2 + HCl (0°-5°C)

17. Write the structure of (A), (B) and (C) in the following reaction: phenol (C_6H_5OH) with concentrated HNO_3 gives (C); phenol with dilute HNO_3 gives (A) + (B).

18. Write the structure of (A), (B) and (C) in the following reaction:

$$C_6H_5NO_2 \xrightarrow{Fe/HCl} (A) \xrightarrow{NaNO_2+HCl,\ 273\ K} (B) \xrightarrow{H_2O/H^+,\ \Delta} (C)$$

19. Write the reagent for each of the following reactions:

i) R–OH + …… → R–Cl

ii) R–OH + …… → R–Br

iii) $CH_2=CH_2$ + …… → $BrCH_2$–CH_2Br

iv) C_6H_5–$CH=CH_2$ + …… → C_6H_5–CH_2–CH_2Br

20. What are fuel cells? Draw a labelled diagram of the hydrogen–oxygen fuel cell and give the reactions that occur in the cell.

21. Explain molecularity and order of a reaction with the help of an example.

22. Write a method of preparation of diethyl ether and write the mechanism of the reaction of diethyl ether with HI.

23. Complete the following reactions:

i) $C_6H_5COCl \xrightarrow{H_2/Pd\text{-}BaSO_4} ?$

ii) $CH_3\text{-}CO\text{-}CH_2\text{-}CO\text{-}OC_2H_5 \xrightarrow{(i)\ NaBH_4\ (ii)\ H^+} ?$

iii) anisole $(C_6H_5OCH_3) + CH_3COCl \xrightarrow{anhydrous\ AlCl_3} ?$

iv) acetophenone $(C_6H_5COCH_3) + NaOH + I_2 \rightarrow .....$

v) $CH_3CHO + Zn\text{-}Hg + HCl \rightarrow .....$

OR

Write short notes on the following:

i) Tollen's test

ii) Fehling test

iii) Haloform reaction of methyl ketone

iv) Reaction of phenyl methyl ketone with 2,4-dinitrophenyl hydrazine (2,4-DNP)

v) Wolff-Kishner reaction.

24. Discuss the nature of bonding in $[CoF_6]^{3-}$ and $[Ni(CN)_4]^{2-}$ on the basis of valence bond theory (VBT) and find the value of magnetic moment in both.

OR

Explain the stereoisomerism in coordination compounds with suitable examples.

25. i) Write the chemical names of water soluble vitamins and the diseases caused by their deficiency.

ii) Explain the cyclic structure of glucose. [2+3]

OR

i) Explain the primary, secondary, tertiary and quaternary structures of protein.

ii) Write a note on denaturation of protein. [4+1]

26. Explain mole fraction. Calculate the mole fraction of ethylene glycol if 20% of the mass of ethylene glycol is present in the solution. [1+4]

OR

i) Calculate the molarity of the solution in which 5 g NaOH is dissolved in 450 mL of solution.

ii) Calculate the molality of the solution in which 2.5 g acetic acid is dissolved in 75 g benzene. [2½+2½]