

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 3 Hours

Maximum Marks: 70

General Instructions

- (i) This question paper contains **37 questions**. All questions are compulsory.
- (ii) Section A: Questions 1 to 20 are very short answer questions, carrying 1 mark each.
- (iii) Section B: Questions 21 to 27 are short answer questions, carrying 2 marks each.
- (iv) Section C: Questions 28 to 34 are long answer type i questions, carrying 3 marks each.
- (v) Section D: Questions 35 to 37 are long answer type ii questions, carrying 5 marks each.
- (vi) Attempt one alternative where an internal choice is provided. Follow the instructions within each question.
- (vii) Use of calculators is not allowed.

Section A

1. Why are Zn, Cd and Hg non-transition elements?

2. Which transition metal of 3d series does not show variable oxidation states?

3. Why do transition metals and their compounds show catalytic activity?

4. Why are melting points of transition metals high?

5. Why is Cu^{2+} ion coloured while Zn^{2+} ion is colourless in aqueous solution?

6. Write the name of the product when benzene diazonium chloride is treated with KI.

7. Write the IUPAC name of $\text{C}_6\text{H}_5-\text{NH}-\text{C}(=\text{O})-\text{CH}_3$.

8. Name the reducing agent used to obtain Ag from $[\text{Ag}(\text{CN})_2]^-$ complex.

9. Name the vitamin whose deficiency causes convulsions.

10. Pick out the odd one from among the following compounds on the basis of their medicinal properties:

Equanil, Luminal, Bithional, Seconal

11. In fuel cell

(A) chemical energy is converted to electrical energy.

(B) energy of combustion of fuel is converted to chemical energy.

(C) energy of combustion of fuel is converted to electrical energy.

(D) electrical energy is converted to chemical energy.

12. In a Leclanche dry cell, the cathode is

(A) Zn container (B) MnO_2 rod (C) Graphite rod (D) NH_4Cl

13. The rate constant for a first order reaction is equal to the initial rate of reaction when the initial concentration of the reactant is

(A) $1 \times 10^{-2} \text{ M}$ (B) 1 M (C) 10 M (D) 0.1 M

14. On the basis of crystal field theory, electronic configuration of d^4 complex when $\Delta_o > P$ is

(A) $t_{2g}^3 e_g^1$ (B) $t_{2g}^2 e_g^2$ (C) $t_{2g}^0 e_g^4$ (D) $t_{2g}^4 e_g^0$

15. Which of the following is a non-reducing sugar?

(A) Sucrose (B) Maltose (C) Glucose (D) Lactose

16. **Assertion (A):** Non-ideal solutions form azeotropic mixture.

Reason (R): Maximum boiling azeotropes are formed by a solution showing negative deviation.

Select the correct answer from the following codes:

(i) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

(ii) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

(iii) Assertion (A) is correct, but Reason (R) is incorrect statement.

(iv) Assertion (A) is incorrect, but Reason (R) is correct statement.

17. Assertion (A): The complex $[\text{Cr}(\text{H}_2\text{O})_3 \text{Cl}_3]$ does not give precipitate with AgNO_3 solution.

Reason (R): The complex $[\text{Cr}(\text{H}_2\text{O})_3 \text{Cl}_3]$ is non-ionizable.

Select the correct answer from the following codes:

- (i) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).
- (ii) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).
- (iii) Assertion (A) is correct, but Reason (R) is incorrect statement.
- (iv) Assertion (A) is incorrect, but Reason (R) is correct statement.

18. Assertion (A): Conductivity of an electrolyte decreases with decrease in concentration.

Reason (R): Number of ions per unit volume increases on dilution.

Select the correct answer from the following codes:

- (i) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).
- (ii) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).
- (iii) Assertion (A) is correct, but Reason (R) is incorrect statement.
- (iv) Assertion (A) is incorrect, but Reason (R) is correct statement.

19. Assertion (A): Reactivity of ketones is more than aldehydes.

Reason (R): The carbonyl carbon of ketones is less electrophilic as compared to aldehydes.

Select the correct answer from the following codes:

- (i) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).
- (ii) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).
- (iii) Assertion (A) is correct, but Reason (R) is incorrect statement.
- (iv) Assertion (A) is incorrect, but Reason (R) is correct statement.

20. Assertion (A): The $\text{C}-\text{O}-\text{H}$ bond angle in alcohols is slightly less than the tetrahedral angle.

Reason (R): This is due to the repulsive interaction between the two lone electron pairs on oxygen.

Select the correct answer from the following codes:

- (i) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).
- (ii) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).
- (iii) Assertion (A) is correct, but Reason (R) is incorrect statement.
- (iv) Assertion (A) is incorrect, but Reason (R) is correct statement.

Section B

21. Write the role of the following:

- (i) Na_3AlF_6 in the extraction of Aluminium
- (ii) CO in the refining of Ni

OR

Write the chemical equations involved in the leaching of bauxite ore to prepare pure alumina.

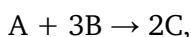
22. Write two differences between physisorption and chemisorption.

OR

Define the following terms with a suitable example of each:

- (i) Associated colloids
- (ii) O/W emulsion

23. In the given reaction



the rate of formation of C is $2.5 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$. Calculate the

- (i) rate of reaction, and
- (ii) rate of disappearance of B.

24. Define the following terms with a suitable example of each:

- (i) Analgesics
- (ii) Cationic detergent

25. (a) How can you show that complexes $[\text{Co}(\text{NH}_3)_5 \text{Cl}] \text{SO}_4$ and $[\text{Co}(\text{NH}_3)_5 \text{SO}_4] \text{Cl}$ are ionization isomers?

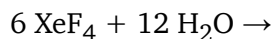
(b) Write the formula of the following complex using IUPAC norms:

Potassium trioxalatochromate (III)

26. (a) How can you explain the absence of an aldehyde group in the pentaacetate of D-glucose?

(b) Name the bases present in RNA. Which one of these is not present in DNA?

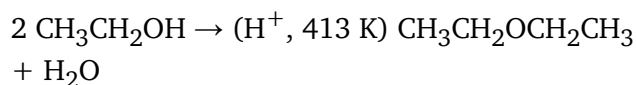
27. Write the products of the following reaction:



Is this reaction a disproportionation reaction? Give reasons in support of your answer.

Section C

28. (a) Write the mechanism of the following reaction:



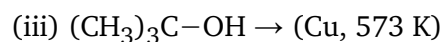
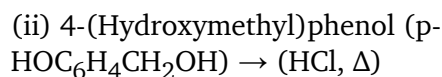
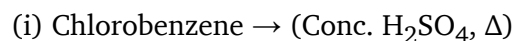
(b) Write the preparation of phenol from cumene.

OR

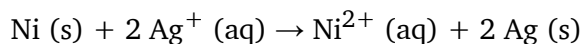
How can you convert the following:

- (i) Sodium phenoxide to o-hydroxybenzoic acid
- (ii) Acetone to propene
- (iii) Phenol to chlorobenzene

29. Write the major product(s) of the following reactions:



30. Calculate the maximum work and $\log K_c$ for the given reaction at 298 K:



Given:

$$E^\circ_{\text{Ni}^{2+}/\text{Ni}} = -0.25 \text{ V}, E^\circ_{\text{Ag}^+/\text{Ag}} = +0.80 \text{ V}$$

$$1 \text{ F} = 96500 \text{ C mol}^{-1}$$

31. A first order reaction is 40% complete in 80 minutes. Calculate the value of rate constant (k). In what time will the reaction be 90% completed?

[Given: $\log 2 = 0.3010$, $\log 3 = 0.4771$, $\log 4 = 0.6021$, $\log 5 = 0.6771$, $\log 6 = 0.7782$]

32. Write the names and structures of the monomers in the following polymers:

- (i) Neoprene
- (ii) Melamine-formaldehyde polymer
- (iii) Teflon

33. Define Lyophobic and Lyophilic sol with a suitable example of each. Why is coagulation of Lyophilic sol difficult as compared to Lyophobic sol?

OR

Define the following terms:

- (i) Shape-selective catalysis
- (ii) Kraft temperature
- (iii) Peptization

34. Write the products formed when $(\text{CH}_3)_3\text{C}-\text{CHO}$ reacts with the following reagents:

- (i) CH_3COCH_3 in the presence of dilute NaOH
- (ii) HCN
- (iii) Conc. NaOH

Section D

35. (a) Give reasons:

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

(ii) $(\text{CH}_3)_2\text{NH}$ is more basic than $(\text{CH}_3)_3\text{N}$ in an aqueous solution.

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

(b) Distinguish between the following:

(i) $\text{CH}_3\text{CH}_2\text{NH}_2$ and $(\text{CH}_3\text{CH}_2)_2\text{NH}$

(ii) Aniline and CH_3NH_2

OR

(a) Write the structures of A and B in the following reactions:

(i) $\text{C}_6\text{H}_5\text{N}_2^+ \text{Cl}^- \rightarrow (\text{CuCN}) \text{A} \rightarrow (\text{H}_2\text{O}/\text{H}^+) \text{B}$

(ii) $\text{CH}_3\text{COOH} \rightarrow (\text{NH}_3) \text{A} \rightarrow (\text{NaOBr}) \text{B}$

(b) Write the chemical reaction of methyl amine with benzoyl chloride and write the IUPAC name of the product obtained.

(c) Arrange the following in the increasing order of their pK_b values:

$\text{C}_6\text{H}_5\text{NH}_2$, NH_3 , $\text{C}_2\text{H}_5\text{NH}_2$, $(\text{C}_2\text{H}_5)_2\text{NH}$

36. (a) A solution contains 5.85 g NaCl (Molar mass = 58.5 g mol^{-1}) per litre of solution. It has an osmotic pressure of 4.75 atm at 27°C . Calculate the degree of dissociation of NaCl in this solution.

(Given: $R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$)

(b) State Henry's law. Why is air diluted with helium in the tanks used by scuba divers?

OR

(a) When 19.5 g of $\text{F}-\text{CH}_2-\text{COOH}$ (Molar mass = 78 g mol^{-1}) is dissolved in 500 g of water, the depression in freezing point is observed to be 1°C . Calculate the degree of dissociation of $\text{F}-\text{CH}_2-\text{COOH}$.

[Given: K_f for water = $1.86 \text{ K kg mol}^{-1}$]

(b) Give reasons:

(i) 0.1 M KCl has higher boiling point than 0.1 M Glucose.

(ii) Meat is preserved for a longer time by salting.

37. (a) Give reasons:

- (i) Helium does not form compounds like Xenon.
- (ii) HClO_4 is a stronger acid than HOCl .
- (iii) Sulphur is a polyatomic solid whereas Oxygen is a diatomic gas.

(b) Write one reaction as an example of each, to show that conc. H_2SO_4 acts as

- (i) an oxidising agent, and
- (ii) a dehydrating agent.

OR

(a) Account for the following:

- (i) Hydration enthalpy of F^- ion is more than Cl^- ion.
 - (ii) SO_2 is a reducing agent, whereas TeO_2 is an oxidising agent in group-16 oxides.
- (b) Write the reaction of F_2 with water. Why does I_2 not react with water?
- (c) Draw the structure of XeF_2 .

- End of Question Paper -