

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. Name the cell which was used in the Apollo Space Programme.

7. How many coulombs are required for the oxidation of 1 mol of H_2O to O_2 ?

8. Write the slope value obtained in the plot of $\ln[R]$ vs. time for a first order reaction.

9. Name the disaccharide which on hydrolysis gives two molecules of glucose.

10. Name the class of the synthetic detergent which is used in toothpaste.

11. Which of the following is refined by the zone refining process?

(A) Cu (B) Zn (C) Ge (D) Sn

12. Racemisation occurs in

(A) $\text{S}_{\text{N}}2$ reaction (B) $\text{S}_{\text{N}}1$ reaction (C) Neither $\text{S}_{\text{N}}2$ nor $\text{S}_{\text{N}}1$ reactions (D) $\text{S}_{\text{N}}2$ reaction as well as $\text{S}_{\text{N}}1$ reaction

13. $\text{C}_6\text{H}_5-\text{CH}_2-\text{NH}_2$ on heating with CHCl_3 and alcoholic KOH gives foul smell of

(A) $\text{C}_6\text{H}_5-\text{CH}_2\text{OH}$ (B) $\text{C}_6\text{H}_5-\text{CH}_2\text{NC}$ (C) $\text{C}_6\text{H}_5-\text{CH}_2\text{CN}$ (D) $\text{C}_6\text{H}_5-\text{CH}_2\text{Cl}$

14. One mole of $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ compound reacts with excess AgNO_3 solution to yield two moles of AgCl (s). The structural formula of the compound is

(A) $[\text{Cr}(\text{H}_2\text{O})_5 \text{Cl}] \text{Cl}_2 \cdot \text{H}_2\text{O}$ (B) $[\text{Cr}(\text{H}_2\text{O})_3 \text{Cl}_3] \cdot 3\text{H}_2\text{O}$ (C) $[\text{Cr}(\text{H}_2\text{O})_4 \text{Cl}_2] \text{Cl} \cdot 2\text{H}_2\text{O}$ (D) $[\text{Cr}(\text{H}_2\text{O})_6] \text{Cl}_3$

15. Peptide linkage is present in

(A) Carbohydrates (B) Vitamins (C) Proteins (D) Rubber

16. **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.

17. Assertion (A): The C–O–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.

18. Assertion (A): $[\text{Pt}(\text{en})_2 \text{Cl}_2]^{2+}$ complex is less stable than $[\text{Pt}(\text{NH}_3)_4 \text{Cl}_2]^{2+}$ complex.

Reason (R): $[\text{Pt}(\text{en})_2 \text{Cl}_2]^{2+}$ complex shows chelate effect.

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): Osmotic pressure is a colligative property.

Reason (R): Osmotic pressure is directly proportional to molarity.

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): Reactivity of ketones is more than aldehydes.

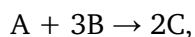
Reason (R): The carbonyl carbon of ketones is less electrophilic as compared to aldehydes.

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.

Section B

21. 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.

22. 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.

23. 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

24. (a) Write the IUPAC name and hybridisation of the complex $[\text{CoF}_6]^{3-}$. (Given: Atomic number of Co = 27)

(b) What type of isomerism is shown by the complex $[\text{Co}(\text{en})_2 \text{Cl}_2]^+$? Name the structure of an isomer of this complex which is optically active.

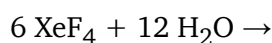
25. Give reasons:

- (i) Shaving soaps contain glycerol.
- (ii) Antacids should not be used for longer time.

26. Define the following terms:

- (i) Oligosaccharides
- (ii) Invert sugar

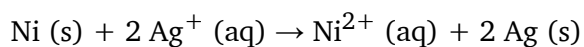
27. Write the products of the following reaction:



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

Section C

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



Given:

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

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

29. 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?

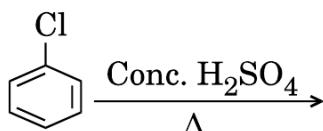
[Given: $\log 2 = 0.3010$, $\log 3 = 0.4771$, $\log 4 = 0.6021$, $\log 5 = 0.6771$, $\log 6 = 0.7782$]

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

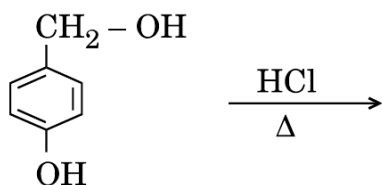
- (i) Buna-S
- (ii) Nylon-6,6
- (iii) Bakelite

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

(i)

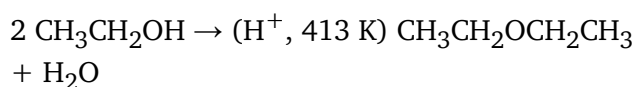


(ii)



(iii) $(\text{CH}_3)_3\text{C}-\text{OH} \rightarrow (\text{Cu}, 573 \text{ K})$

32. (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

33. 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

34. 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

Section D

35. (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 .

36. (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

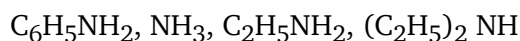
OR

(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:



37. (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.