

## 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. Predict the stereochemistry of the product formed if an optically active alkyl halide undergoes substitution reaction by  $S_N1$  mechanism.

2. What is plane polarised light?

3. Write the structures of the products formed when ethoxybenzene is treated with HI.

4. Predict the major product formed when 2-Bromopentane reacts with alcoholic KOH.

5. Give one use of  $CHI_3$ .

6. Identify which liquid will have lower vapour pressure at  $90^\circ\text{C}$  if the boiling points of two liquids A and B are  $140^\circ\text{C}$  and  $180^\circ\text{C}$  respectively.

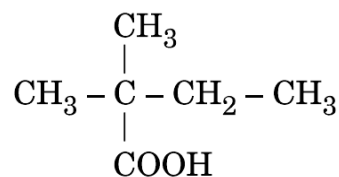
7. Which structural unit present in a detergent makes it non-biodegradable?

8. Give the structure of the monomer of Teflon.

9. Out of zinc and tin, whose coating is better to protect iron objects?

10. Will the rate constant of the reaction depend upon T if the  $E_a$  (activation energy) of the reaction is zero?

11. What is the correct IUPAC name of the given compound?



- (A) 2,2-Dimethylbutanoic acid
- (B) 2-Carboxyl-2-methylbutane
- (C) 2-Ethyl-2-methylpropanoic acid
- (D) 3-Methylbutane carboxylic acid

12. Hardening of leather in tanning industry is based on

- (A) Electrophoresis
- (B) Electro-osmosis
- (C) Mutual coagulation
- (D) Tyndall effect

13. Out of the following, the strongest base in aqueous solution is

- (A) Methylamine
- (B) Dimethylamine
- (C) Trimethylamine
- (D) Aniline

14. Iodoform test is given by

- (A) Pentan-2-one
- (B) Ethanoic acid
- (C) Pentan-3-one
- (D) Methoxymethane

**15.** Out of the following transition elements, the maximum number of oxidation states are shown by

- (A) Sc ( $Z = 21$ )
- (B) Cr ( $Z = 24$ )
- (C) Mn ( $Z = 25$ )
- (D) Fe ( $Z = 26$ )

**16. Assertion (A):** The molecularity of the reaction  $\text{H}_2 + \text{Br}_2 \rightarrow 2\text{HBr}$  appears to be 2.

**Reason (R):** Two molecules of the reactants are involved in the given elementary reaction.

- (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):** Linkage isomerism arises in coordination compounds because of ambidentate ligand.

**Reason (R):** Ambidentate ligand like  $\text{NO}_2^-$  has two different donor atoms i.e., N and O.

- (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):** Au and Ag are extracted by leaching their ores with a dil. solution of NaCN.

**Reason (R):** Impurities associated with these ores dissolve in NaCN.

- (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):** F-F bond in  $\text{F}_2$  molecule is weak.

**Reason (R):** F atom is small in size.

- (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):** Sucrose is a non-reducing sugar.

**Reason (R):** Reducing groups of glucose and fructose are involved in glycosidic bond formation.

- (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.
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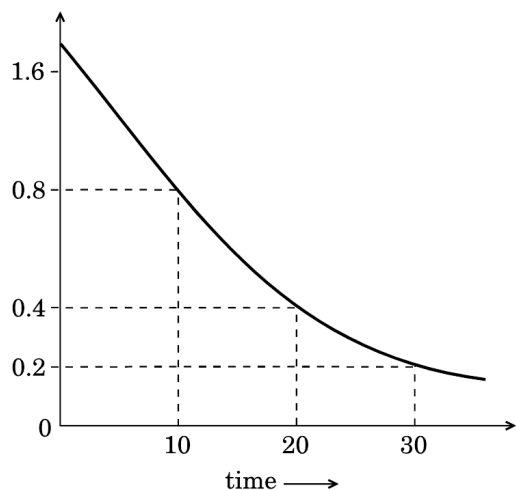
## Section B

21. For a 5% solution of urea (Molar mass = 60 g/mol), calculate the osmotic pressure at 300 K. [R = 0.0821 L atm K<sup>-1</sup> mol<sup>-1</sup>]

OR

Visha took two aqueous solutions – one containing 7.5 g of urea (Molar mass = 60 g/mol) and the other containing 42.75 g of substance Z in 100 g of water, respectively. It was observed that both the solutions froze at the same temperature. Calculate the molar mass of Z.

22. Analyse the given graph, drawn between concentration of reactant vs. time.



- (a) Predict the order of reaction.  
(b) Theoretically, can the concentration of the reactant reduce to zero after infinite time? Explain.

23. Define the following terms:

- (a) Tranquilizers  
(b) Antiseptic

OR

Explain the cleansing action of soaps.

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

- (a) Buna-N  
(b) Nylon 6

25. Draw the shape of the following molecules:

- (a) H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>  
(b) XeF<sub>4</sub>

26. Give the formulae of the following compounds:

- (a) Pentaamminecarbonatocobalt (III) chloride  
(b) Potassium tetracyanonickelate (II)

27. What happens when

- (a) Acetone is treated with Zn(Hg) / Conc. HCl, and  
(b) Ethanal is treated with methylmagnesium bromide and then hydrolysed?

## Section C

28. Account for the following:

- (a) Sulphurous acid is a reducing agent.
- (b) Fluorine forms only one oxoacid.
- (c) Boiling point of noble gases increases from He to Rn.

OR

Complete the following chemical reactions:

- (a)  $\text{MnO}_2 + 4 \text{HCl} \rightarrow$
- (b)  $\text{XeF}_6 + \text{KF} \rightarrow$
- (c)  $\text{I}^- (\text{aq}) + \text{H}^+ (\text{aq}) + \text{O}_2 (\text{g}) \rightarrow$

29. Calculate the mass of ascorbic acid (Molar mass =  $176 \text{ g mol}^{-1}$ ) to be dissolved in 75 g of acetic acid, to lower its freezing point by  $1.5^\circ\text{C}$ . ( $K_f = 3.9 \text{ K kg mol}^{-1}$ )

30. How will the rate of the reaction be affected when

- (a) Surface area of the reactant is reduced,
- (b) Catalyst is added in a reversible reaction, and
- (c) Temperature of the reaction is increased?

31. Give the structures of A and B in the following sequence of reactions:

- (a)  $\text{CH}_3\text{COOH} \xrightarrow{\text{NH}_3} \text{A} \xrightarrow{\text{NaOBr}} \text{B}$
- (b)  $\text{C}_6\text{H}_5\text{NO}_2 \xrightarrow{\text{Fe/HCl}} \text{A} \xrightarrow{\text{NaNO}_2 + \text{HCl}, 0^\circ-5^\circ\text{C}} \text{B}$
- (c)  $\text{C}_6\text{H}_5\text{N}_2\text{Cl} \xrightarrow{\text{CuCN}} \text{A} \xrightarrow{\text{H}_2\text{O}/\text{H}^+} \text{B}$

OR

(a) How will you distinguish between the following pairs of compounds:

- (i) Aniline and Ethanamine
- (ii) Aniline and N-methylaniline

(b) Arrange the following compounds in decreasing order of their boiling points:

Butanol, Butanamine, Butane

32. Give the plausible explanation for the following:

- (a) Glucose doesn't give 2,4-DNP test.
- (b) The two strands in DNA are not identical but are complementary.
- (c) Starch and cellulose both contain glucose unit as monomer, yet they are structurally different.

33. Explain the role of the following:

- (a) NaCN in froth floatation process.
- (b)  $\text{I}_2$  in the metallurgy of Zr.
- (c) Limestone in the metallurgy of Fe.

34. Distinguish between physisorption and chemisorption on the basis of

- (a) Force of attraction,
- (b) Temperature, and
- (c) Enthalpy of adsorption.

## Section D

35. (a) Account for the following:

- (i) Copper (I) compounds are white whereas Copper (II) compounds are coloured.
  - (ii) Chromates change their colour when kept in an acidic solution.
  - (iii) Zn, Cd, Hg are considered as d-block elements but not as transition elements.
- (b) Calculate the spin-only moment of  $\text{Co}^{2+}$  ( $Z = 27$ ) by writing the electronic configuration of Co and  $\text{Co}^{2+}$ .

OR

- (a) Give three points of difference between lanthanoids and actinoids.
- (b) Give reason and select one atom/ion which will exhibit asked property:
  - (i)  $\text{Sc}^{3+}$  or  $\text{Cr}^{3+}$  (Exhibit diamagnetic behaviour)
  - (ii) Cr or Cu (High melting and boiling point)

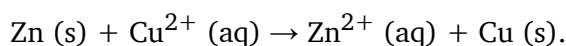
36. (a) Out of t-butyl alcohol and n-butanol, which one will undergo acid catalyzed dehydration faster and why?

- (b) Carry out the following conversions:
- (i) Phenol to Salicylaldehyde
  - (ii) t-butylchloride to t-butyl ethyl ether
  - (iii) Propene to Propanol

OR

- (a) Give the mechanism for the formation of ethanol from ethene.
- (b) Predict the reagent for carrying out the following conversions:
  - (i) Phenol to benzoquinone
  - (ii) Anisole to p-bromoanisole
  - (iii) Phenol to 2,4,6-tribromophenol

37. (a) Calculate  $\Delta G^\circ$  for the reaction



Given:  $E^\circ$  for  $\text{Zn}^{2+}/\text{Zn} = -0.76 \text{ V}$  and  $E^\circ$  for  $\text{Cu}^{2+}/\text{Cu} = +0.34 \text{ V}$

$$R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$$

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

(b) Give two advantages of fuel cells.

OR

(a) Out of the following pairs, predict with reason which pair will allow greater conduction of electricity:

- (i) Silver wire at  $30^\circ\text{C}$  or silver wire at  $60^\circ\text{C}$ .
  - (ii)  $0.1 \text{ M CH}_3\text{COOH}$  solution or  $1 \text{ M CH}_3\text{COOH}$  solution.
  - (iii)  $\text{KCl}$  solution at  $20^\circ\text{C}$  or  $\text{KCl}$  solution at  $50^\circ\text{C}$ .
- (b) Give two points of differences between electrochemical and electrolytic cells.

- End of Question Paper -