

## Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 3 Hours

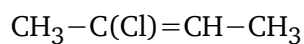
Maximum Marks: 70

### General Instructions

- (i) This question paper contains **27 questions**. All questions are compulsory.
- (ii) Section A: Questions 1 to 5 are very short answer questions, carrying 1 mark each.
- (iii) Section B: Questions 6 to 12 are short answer questions, carrying 2 marks each.
- (iv) Section C: Questions 13 to 24 are short answer questions, carrying 3 marks each.
- (v) Section D: Questions 25 to 27 are long answer 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. Write the IUPAC name of the following compound:



2. Why is chloroform kept in dark coloured bottles?

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3. Write IUPAC name of the complex  $[\text{Co}(\text{en})_2\text{Cl}_2]^+$ .

OR

Using IUPAC norms, write the formula of Sodium tetrachloridonickelate(II).

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4. What is the difference between a glycosidic linkage and a peptide linkage?

OR

What is the difference between Nucleotide and Nucleoside?

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5. Arrange the following in increasing order of their acidic character:

Ethanol, Phenol, Water

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## Section B

6. (a) Out of 0.1 molal aqueous solution of glucose and 0.1 molal aqueous solution of KCl, which one will have higher boiling point and why?

(b) Predict whether van't Hoff factor, (i) is less than one or greater than one in the following:

(i)  $\text{CH}_3\text{COOH}$  dissolved in water

(ii)  $\text{CH}_3\text{COOH}$  dissolved in benzene

7. What happens when  $\text{AgCl}$  is doped with  $\text{CdCl}_2$ ? What is the name of this defect?

OR

What type of defect is shown by  $\text{NaCl}$  in

(a) stoichiometric defects, and

(b) non-stoichiometric defects?

8. Complete and balance the following equations:

(a)  $\text{NH}_3$  (excess) +  $\text{Cl}_2 \rightarrow$

(b)  $\text{XeF}_6 + 2\text{H}_2\text{O} \rightarrow$

OR

Write balanced chemical equations involved in the following reactions:

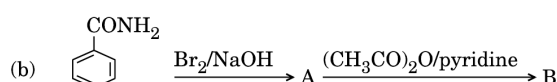
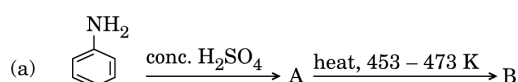
(a)  $\text{XeF}_4$  reacts with  $\text{SbF}_5$ .

(b)  $\text{Au}$  is heated with  $\text{PCl}_5$ .

9. Write any two oxoacids of sulphur and draw their structures.

10. Write the name of two fuels other than hydrogen used in fuel cell. Write two advantages of fuel cell over an ordinary cell.

11. Write structures of compounds A and B in each of the following reactions:



12. Account for the following:

(a) Gabriel phthalimide synthesis is not preferred for preparing aromatic primary amines.

(b) On reaction with benzene sulphonyl chloride, primary amine yields product soluble in alkali whereas secondary amine yields product insoluble in alkali.

## Section C

13. (a) Following reaction takes place in the cell:  
$$\text{Zn(s)} + \text{Ag}_2\text{O(s)} + \text{H}_2\text{O(l)} \rightarrow \text{Zn}^{2+}(\text{aq}) + 2\text{Ag(s)} + 2\text{OH}^-(\text{aq})$$

Calculate  $\Delta_r G^\circ$  of the reaction.

[Given:  $E^\circ_{(\text{Zn}^{2+}/\text{Zn})} = -0.76 \text{ V}$ ,  $E^\circ_{(\text{Ag}^+/\text{Ag})} = 0.80 \text{ V}$ ,  $1 \text{ F} = 96,500 \text{ C mol}^{-1}$ ]

(b) How can you determine limiting molar conductivity, ( $\Lambda_m^\circ$ ) for strong electrolyte and weak electrolyte?

14. Define the following with a suitable example, of each:

- (a) Coagulation
- (b) Multimolecular colloid
- (c) Gel

OR

- (a) Out of starch and ferric hydroxide sol, which one can easily be coagulated and why?
- (b) What is observed when an emulsion is centrifuged?
- (c) What is the role of promoters and poisons in catalysis?

15. (a) An element crystallises in bcc lattice with a cell edge of  $3 \times 10^{-8} \text{ cm}$ . The density of the element is  $6.89 \text{ g cm}^{-3}$ . Calculate the molar mass of the element. ( $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$ )

- (b) What type of semiconductor is obtained when
  - (i) Ge is doped with In?
  - (ii) Si is doped with P?

16. A solution 0.1 M of  $\text{Na}_2\text{SO}_4$  is dissolved to the extent of 95%. What would be its osmotic pressure at  $27^\circ\text{C}$ ? ( $R = 0.0821 \text{ L atm K}^{-1} \text{ mol}^{-1}$ )

17. Write down the reactions taking place in blast furnace related to the metallurgy of iron in the temperature range  $500 \text{ K} - 800 \text{ K}$ . What is the role of limestone in the metallurgy of iron?

OR

What happens when

- (a) Silver is leached with NaCN in the presence of air?
- (b) Copper matte is charged into silica lined converter and hot air blast is blown?
- (c) NaCN is added in an ore containing PbS and ZnS during concentration by froth floatation method?

18. Give reasons for the following:

- (a) Acidic character decreases from  $\text{As}_2\text{O}_3$  to  $\text{Bi}_2\text{O}_3$ .
- (b) All the P–Cl bonds in  $\text{PCl}_5$  are not equivalent.
- (c) HF is a weaker acid than HCl in an aqueous solution.

19. Write the structures of monomers used to obtain the following polymers:

- (a) Natural rubber
- (b) PVC
- (c) Nylon-6,6

OR

Write the mechanism of free radical polymerisation of ethene.

20. (a) Why are metal hydroxides better alternatives than sodium hydrogen carbonate in antacids?

(b) Why is aspirin used in the prevention of heart-attacks?

(c) Why antihistamines do not affect the secretion of acid in stomach?

OR

Define the following terms with a suitable example of each:

- (a) Tranquilizers
- (b) Antibiotics
- (c) Non-ionic detergents

21. Answer the following:

- (a) Out of c1ccccc1Cl and c1ccccc1CCl, which one is more reactive towards  $S_N2$  reaction and why?
- (b) Out of c1ccccc1Cl and O=[N+]([O-])c1ccc(Cl)cc1, which one is more reactive towards nucleophilic substitution reaction and why?
- (c) Out of CC(C)CCO and CC(C)(O)CC, which one is optically active and why?

22. What happens when

(a) Sodium phenoxide is treated with CH3Cl?

(b) CH2=CH-CH2-OH is oxidised by PCC?

(c) Phenol is treated with CH3COCl/anhydrous AlCl3?

Write chemical equations in support of your answer.

23. (a) Give one chemical test as an evidence to show that [Co(NH3)5Cl]SO4 and [Co(NH3)5(SO4)]Cl are ionisation isomers.

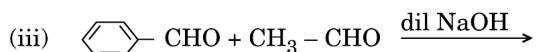
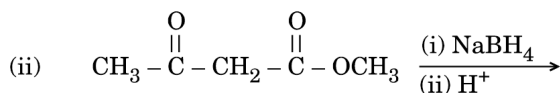
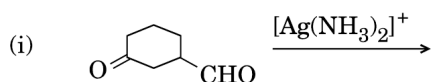
(b) [NiCl4]^{2-} is paramagnetic while [Ni(CO)4] is diamagnetic though both are tetrahedral. Why? (Atomic no. of Ni = 28)

(c) Write the electronic configuration of Fe(III) on the basis of crystal field theory when it forms an octahedral complex in the presence of (i) strong field ligand, and (ii) weak field ligand. (Atomic no. of Fe = 26)

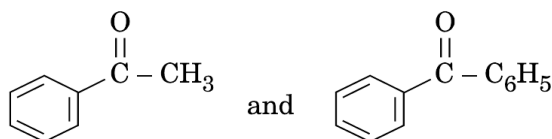
24. Define the following terms with a suitable example of each:

- (a) Tertiary structure of protein
- (b) Essential amino acids
- (c) Disaccharides

25. (a) Predict the main product of the following reactions:



(b) Give a simple chemical test to distinguish between



(c) Why is alpha (α) hydrogen of carbonyl compounds acidic in nature?

OR

(a) Write the main product formed when propanal reacts with the following reagents:

(i) 2 moles of  $\text{CH}_3\text{OH}$  in presence of dry  $\text{HCl}$

(ii) Dilute  $\text{NaOH}$

(iii)  $\text{H}_2\text{N}-\text{NH}_2$  followed by heating with  $\text{KOH}$  in ethylene glycol

(b) Arrange the following compounds in increasing order of their property as indicated:

(i)  $\text{F}-\text{CH}_2\text{COOH}$ ,  $\text{O}_2\text{N}-\text{CH}_2\text{COOH}$ ,  $\text{CH}_3\text{COOH}$ ,  $\text{HCOOH}$  — acid character

(ii) Acetone, Acetaldehyde, Benzaldehyde, Acetophenone — reactivity towards addition of  $\text{HCN}$

26. (a) Account for the following:

(i) Manganese shows maximum number of oxidation states in 3d series.

(ii)  $E^\circ$  value for  $\text{Mn}^{3+}/\text{Mn}^{2+}$  couple is much more positive than that for  $\text{Cr}^{3+}/\text{Cr}^{2+}$ .

(iii)  $\text{Ti}^{4+}$  is colourless whereas  $\text{V}^{4+}$  is coloured in an aqueous solution.

(b) Write the chemical equations for the preparation of  $\text{KMnO}_4$  from  $\text{MnO}_2$ . Why does purple colour of acidified permanganate solution decolourise when it oxidises  $\text{Fe}^{2+}$  to  $\text{Fe}^{3+}$ ?

OR

(a) Write one difference between transition elements and p-block elements with reference to variability of oxidation states.

(b) Why do transition metals exhibit higher enthalpies of atomization?

(c) Name an element of lanthanoid series which is well known to show +4 oxidation state. Is it a strong oxidising agent or reducing agent?

(d) What is lanthanoid contraction? Write its one consequence.

(e) Write the ionic equation showing the oxidation of  $\text{Fe(II)}$  salt by acidified dichromate solution.

27. (a) Define order of reaction. How does order of a reaction differ from molecularity for a complex reaction?

(b) A first order reaction is 50% complete in 25 minutes. Calculate the time for 80% completion of the reaction.

OR

(a) The decomposition of a hydrocarbon has value of rate constant as  $2.5 \times 10^4 \text{ s}^{-1}$  at  $27^\circ\text{C}$ . At what temperature would rate constant be  $7.5 \times 10^4 \text{ s}^{-1}$  if energy of activation is  $19.147 \times 10^3 \text{ J mol}^{-1}$ ?

(b) Write a condition under which a bimolecular reaction is kinetically first order. Give an example of such a reaction.

(Given:  $\log 2 = 0.3010$ ,  $\log 3 = 0.4771$ ,  $\log 5 = 0.6990$ )

- End of Question Paper -