

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

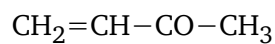
1. Write IUPAC name of the complex $K_3[Cr(C_2O_4)_3]$.

OR

Using IUPAC norms write the formula of Hexaamminecobalt(III) sulphate.

2. Why is $CH_2=CH-CH_2-Cl$ more easily hydrolysed than $CH_3-CH_2-CH_2-Cl$?

3. Write the IUPAC name of the following compound:



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

OR

What is the difference between Nucleotide and Nucleoside?

5. Arrange the following in increasing order of their boiling point:



Section B

6. What happens when AgCl is doped with CdCl₂? What is the name of this defect?

OR

What type of defect is shown by NaCl in

- (a) stoichiometric defects, and
- (b) non-stoichiometric defects?

7. 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.

8. Complete and balance the following equations:

- (a) $S + H_2SO_4 \text{ (conc.)} \rightarrow$
- (b) $NH_3 + H_2O \rightarrow$

OR

Write balanced chemical equations involved in the following reactions:

- (a) Chlorine gas reacts with cold and dilute NaOH.
- (b) Calcium phosphide is dissolved in water.

9. Draw structures of the following:

- (a) XeF₄
- (b) $S_2O_3^{2-}$

10. (a) Write the reaction that occurs at anode on electrolysis of concentrated H₂SO₄ using platinum electrodes.

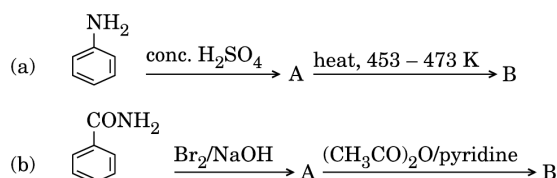
(b) What is the effect of temperature on ionic conductance?

11. (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) CH₃COOH dissolved in water
- (ii) CH₃COOH dissolved in benzene

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



Section C

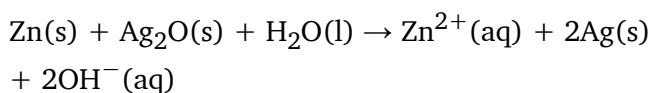
13. Define the following with a suitable example, of each:

- (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?

14. (a) Following reaction takes place in the cell:



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, (Λ_m°) for strong electrolyte and weak electrolyte?

15. 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?

16. A solution 0.1 M of Na_2SO_4 is dissolved to the extent of 95% . What would be its osmotic pressure at 27°C ? ($R = 0.0821 \text{ L atm K}^{-1} \text{ mol}^{-1}$)

17. (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 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?

18. Give reasons for the following:

- (a) O–O single bond is weaker than S–S single bond.
- (b) Tendency to show -3 oxidation state decreases from Nitrogen (N) to Bismuth (Bi).
- (c) Cl_2 acts as a bleaching agent.

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

- (a) Buna-S
- (b) Glyptal
- (c) Nylon-6

OR

(a) Arrange the following polymers in increasing order of their intermolecular forces:

Polyvinylchloride, Neoprene, Terylene

(b) Write one example each of

(i) Natural polymer

(ii) Thermosetting polymer

(c) What is the significance of numbers 6,6 in the polymer Nylon-6,6?

20. (a) Which one of the following is a disinfectant?

0.2% solution of phenol or 1% solution of phenol

(b) What is the difference between agonists and antagonists?

(c) Write one example each of

(i) Artificial sweetener

(ii) Antacids

OR

Define the following terms with a suitable example of each:

(a) Antiseptics

(b) Bactericidal antibiotics

(c) Cationic detergents

21. What happens when

(a) Salicylic acid is treated with $(\text{CH}_3\text{CO})_2\text{O}/\text{H}^+$?

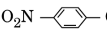
(b) Phenol is oxidised with $\text{Na}_2\text{Cr}_2\text{O}_7/\text{H}^+$?

(c) Anisole is treated with $\text{CH}_3\text{Cl}/\text{anhydrous AlCl}_3$?

Write chemical equation in support of your answer.

22. Answer the following:

(a) Out of  and , which one is more reactive towards $\text{S}_{\text{N}}2$ reaction and why?

(b) Out of  and , which one is more reactive towards nucleophilic substitution reaction and why?

(c) Out of  and , which one is optically active and why?

23. (a) Give one chemical test as an evidence to show that $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{SO}_4$ and $[\text{Co}(\text{NH}_3)_5(\text{SO}_4)]\text{Cl}$ are ionisation isomers.

(b) $[\text{NiCl}_4]^{2-}$ is paramagnetic while $[\text{Ni}(\text{CO})_4]$ 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. Differentiate between the following:

(a) Fibrous protein and Globular protein

(b) Essential amino acids and Non-essential amino acids

(c) Amylose and Amylopectin

25. (a) Account for the following:

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

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

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

(b) Write the chemical equations for the preparation of KMnO_4 from MnO_2 . Why does purple colour of acidified permanganate solution decolourise when it oxidises Fe^{2+} to 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 Fe(II) salt by acidified dichromate solution.

26. (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.

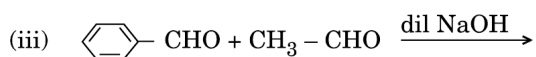
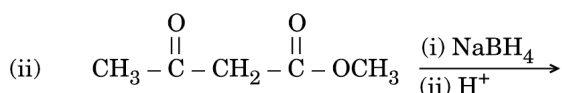
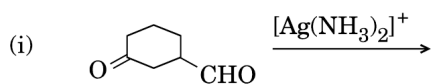
OR

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

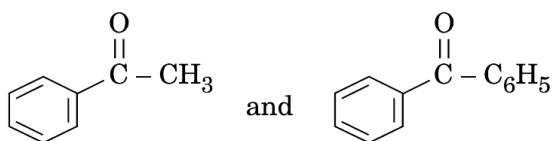
(b) Write a condition under which a bimolecular reaction is kinetically first order. Give an example of such a reaction.

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

27. (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 CH_3OH in presence of dry HCl

(ii) Dilute NaOH

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

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

(i) $\text{F}-\text{CH}_2\text{COOH}$, $\text{O}_2\text{N}-\text{CH}_2\text{COOH}$, CH_3COOH , HCOOH — acid character

(ii) Acetone, Acetaldehyde, Benzaldehyde, Acetophenone — reactivity towards addition of HCN

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