

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. Out of Chlorobenzene and Cyclohexyl chloride, which one is more reactive towards nucleophilic substitution reaction and why?

2. Arrange the following in decreasing order of solubility in water:

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

3. What type of colloid is formed when a solid is dispersed in a gas? Give an example.

4. Out of KCl and AgCl, which one shows Schottky defect and why?

OR

Why does ZnO appear yellow on heating?

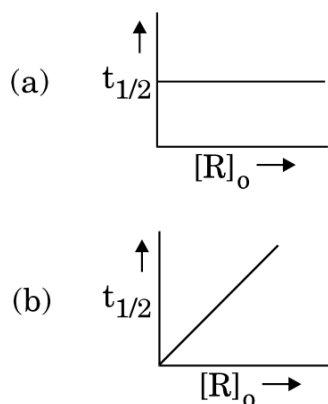
5. What is the difference between amylose and amylopectin?

OR

Write the products obtained after hydrolysis of lactose.

Section B

6. Define order of reaction. Predict the order of reaction in the given graphs:



where $[R]_0$ is the initial concentration of reactant and $t_{1/2}$ is half-life.

7. Give reasons:

- An increase in temperature is observed on mixing chloroform and acetone.
- Aquatic animals are more comfortable in cold water than in warm water.

8. When FeCr_2O_4 is fused with Na_2CO_3 in the presence of air it gives a yellow solution of compound (A). Compound (A) on acidification gives compound (B). Compound (B) on reaction with KCl forms an orange coloured compound (C). An acidified solution of compound (C) oxidises Na_2SO_3 to (D). Identify (A), (B), (C) and (D).

9. Write balanced chemical equations for the following processes:

- Cl_2 is passed through slaked lime.
- SO_2 gas is passed through an aqueous solution of Fe(III) salt.

OR

- Write two poisonous gases prepared from chlorine gas.
- Why does Cu^{2+} solution give blue colour on reaction with ammonia?

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

- Polydentate ligand
- Homoleptic complex

OR

Using IUPAC norms, write the formulae for the following complexes:

- Potassium tri(oxalato)chromate(III)
- Hexaaquamanganese(II) sulphate

11. (a) Although both $[\text{NiCl}_4]^{2-}$ and $[\text{Ni}(\text{CO})_4]$ have sp^3 hybridisation yet $[\text{NiCl}_4]^{2-}$ is paramagnetic and $[\text{Ni}(\text{CO})_4]$ is diamagnetic. Give reason. (Atomic no. of $\text{Ni} = 28$)

(b) Write the electronic configuration of d^4 on the basis of crystal field theory when

- $\Delta_o < P$ and
- $\Delta_o > P$

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

- $\text{CH}_3\text{CH}_2\text{OH} \xrightarrow{\text{PCC}} \text{A} \xrightarrow{\text{CH}_3\text{OH}/\text{dry HCl(g)}} \text{B}$
- $\text{CH}_3\text{COCH}_3 \xrightarrow{\text{NaCN}} \text{A} \xrightarrow{\text{H}_3\text{O}^+} \text{B}$

Section C

13. The following data were obtained for the reaction:



Experi- ment	[A]/ M	[B]/ M	Initial rate of formation of C /M min ⁻¹
1	0.2	0.3	4.2×10^{-2}
2	0.1	0.1	6.0×10^{-3}
3	0.4	0.3	1.68×10^{-1}
4	0.1	0.4	2.40×10^{-2}

(a) Find the order of reaction with respect to A and B.

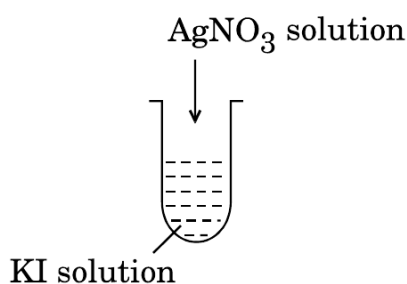
(b) Write the rate law and overall order of reaction.

(c) Calculate the rate constant (k).

14. (a) Write the dispersed phase and dispersion medium of butter.

(b) Why does physisorption decrease with increase in temperature?

(c) A colloidal sol is prepared by the method given in the figure. What is the charge on AgI colloidal particles formed in the test tube? How is this sol represented?



15. A solution containing 1.9 g per 100 mL of KCl ($M = 74.5 \text{ g mol}^{-1}$) is isotonic with a solution containing 3 g per 100 mL of urea ($M = 60 \text{ g mol}^{-1}$). Calculate the degree of dissociation of KCl solution. Assume that both the solutions have same temperature.

16. An element X with an atomic mass of 81 u has density 10.2 g cm^{-3} . If the volume of unit cell is $2.7 \times 10^{-23} \text{ cm}^3$, identify the type of cubic unit cell. (Given: $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$)

17. Write the principle of the following:

- Hydraulic washing
- Chromatography
- Froth-floatation process

18. Give reasons for the following:

- Transition metals have high enthalpies of atomization.
- Manganese has lower melting point even though it has a higher number of unpaired electrons for bonding.
- Ce^{4+} is a strong oxidising agent.

19. Write the structures of monomers used for getting the following polymers:

- Novolac
- Neoprene
- Buna-S

OR

(a) Write one example each of

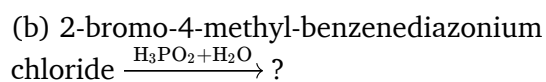
- Cross-linked polymer
- Natural polymer

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

Terylene, Buna-N, Polystyrene

(c) Define biodegradable polymers with an example.

20. Complete the following reactions:



OR

How do you convert the following:

(a) N-phenylethanamide to p-bromoaniline

(b) Benzene diazonium chloride to nitrobenzene

(c) Benzoic acid to aniline

21. (a) Pick out the odd one from the following on the basis of their medicinal properties:

Equanil, Seconal, Bithional, Luminal

(b) What type of detergents are used in dishwashing liquids?

(c) Why is the use of aspartame limited to cold foods?

OR

Define the following terms with a suitable example of each:

(a) Antibiotics

(b) Antiseptics

(c) Anionic detergents

22. Among all the isomers of molecular formula $\text{C}_4\text{H}_9\text{Br}$, identify

(a) the one isomer which is optically active.

(b) the one isomer which is highly reactive towards $\text{S}_{\text{N}}2$.

(c) the two isomers which give same product on dehydrohalogenation with alcoholic KOH.

23. (a) Write the product when D-glucose reacts with $\text{Br}_2(\text{aq})$.

(b) What type of bonding provides stability to α -helix structure of protein?

(c) Name the vitamin whose deficiency causes pernicious anaemia.

OR

Define the following terms:

(a) Invert sugar

(b) Native protein

(c) Nucleotide

24. (a) Give reasons:

(i) Benzoic acid is a stronger acid than acetic acid.

(ii) Methanal is more reactive towards nucleophilic addition reaction than ethanal.

(b) Give a simple chemical test to distinguish between propanal and propanone.

Section D

25. (a) Account for the following:

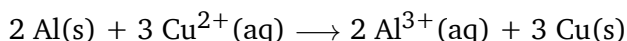
- (i) Tendency to show -3 oxidation state decreases from N to Bi in group 15.
 - (ii) Acidic character increases from H_2O to H_2Te .
 - (iii) F_2 is more reactive than ClF_3 , whereas ClF_3 is more reactive than Cl_2 .
- (b) Draw the structure of (i) XeF_2 , (ii) $\text{H}_4\text{P}_2\text{O}_7$.

OR

- (a) Give one example to show the anomalous reaction of fluorine.
- (b) What is the structural difference between white phosphorus and red phosphorus?
- (c) What happens when XeF_6 reacts with NaF ?
- (d) Why is H_2S a better reducing agent than H_2O ?
- (e) Arrange the following acids in the increasing order of their acidic character: HF , HCl , HBr and HI

26. (a) The conductivity of 0.001 mol L^{-1} acetic acid is $4.95 \times 10^{-5} \text{ S cm}^{-1}$. Calculate the dissociation constant if Λ_m° for acetic acid is $390.5 \text{ S cm}^2 \text{ mol}^{-1}$.

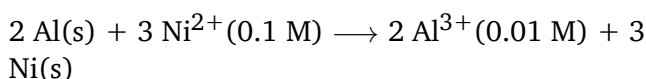
(b) Write Nernst equation for the reaction at 25°C :



(c) What are secondary batteries? Give an example.

OR

(a) Represent the cell in which the following reaction takes place:



Calculate its emf if $E_{\text{cell}}^\circ = 1.41 \text{ V}$.

(b) How does molar conductivity vary with increase in concentration for strong electrolyte and weak electrolyte? How can you obtain limiting molar conductivity (Λ_m°) for weak electrolyte?

27. (a) Give equations of the following reactions:

- (i) Phenol is treated with conc. HNO_3 .
 - (ii) Propene is treated with B_2H_6 followed by $\text{H}_2\text{O}_2/\text{OH}^-$.
 - (iii) Sodium t-butoxide is treated with CH_3Cl .
- (b) How will you distinguish between butan-1-ol and butan-2-ol?
- (c) Arrange the following in increasing order of acidity:
Phenol, ethanol, water

OR

- (a) How can you obtain Phenol from (i) Cumene, (ii) Benzene sulphonic acid, (iii) Benzene diazonium chloride?
- (b) Write the structure of the major product obtained from dinitration of 3-methylphenol.
- (c) Write the reaction involved in Kolbe's reaction.

- End of Question Paper -