

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. A cube solid is made up of two elements A and B. Element A forms ccp while atoms of element B occupy one-third of the tetrahedral voids. What is the formula of the solid?

2. How will you prepare arsenic sulphide sol in the lab?

OR

Give an example of heterogeneous catalysis.

3. CH_3CHO is more reactive than CH_3COCH_3 towards reaction with HCN . Why?

4. What are the products of exhaustive ammonolysis of an alkyl halide?

5. What type of isomerism is shown by complex $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{SO}_4$?

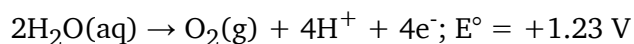
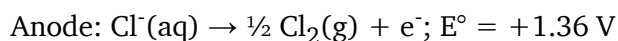
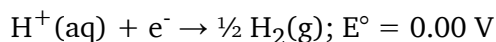
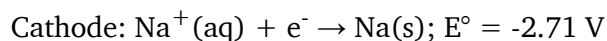
OR

Arrange the following in increasing order of crystal field splitting energy:

$[\text{Cr}(\text{CN})_6]^{3-}$, $[\text{Cr}(\text{NH}_3)_6]^{3+}$, $[\text{CrCl}_6]^{3-}$

Section B

6. Following reactions may occur at cathode and anode during electrolysis of aqueous sodium chloride. What products will be held at anode and cathode? Use given E° values to justify your answer.



7. Show that for a first order reaction, time required for completion of 99% of reaction is twice the time required for completion of 90% of reaction.

8. Arrange the hydrides of group 16 in order of increasing boiling points, giving reason. Name the hydride which is most stable thermodynamically.

9. How is KMnO_4 prepared from pyrolusite? Give steps involved with equations.

10. An aromatic compound 'A' on treatment with CHCl_3 and KOH gives two compounds, both of which give same product 'B' when distilled with Zinc dust. Oxidation of 'B' gives 'C' with molecular formula $\text{C}_7\text{H}_6\text{O}_2$. Sodium salt of 'C' on heating with soda lime gives 'D' which may also be obtained by distilling 'A' with Zinc dust. Identify 'A', 'B', 'C' and 'D'.

OR

How do you convert the following:

(a) Phenol to Toluene

(b) Ethanol to Ethanal

11. What happens when D-glucose is treated with the following? Give equations to support your answer.

(a) HI

(b) HNO_3

OR

Give any two points of difference between globular and fibrous proteins.

12. Write two differences between DNA and RNA.

Section C

13. (a) Following is the alignment of magnetic moments of a substance when placed in a magnetic field. Identify the type of magnetism exhibited by the substance.



(b) Analysis shows that nickel oxide has formula $\text{Ni}_{0.98}\text{O}_{1.00}$. What fractions of nickel exist as Ni^{2+} and Ni^{3+} ions?

14. Calculate the emf of the following cell at 25°C :

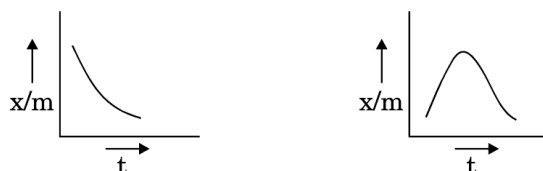
$\text{Al(s)} \mid \text{Al}^{3+} (0.001 \text{ M}) \parallel (0.1 \text{ M}) \text{Ni}^{2+} \mid \text{Ni(s)}$
 Given: $E^\circ_{(\text{Ni}^{2+}/\text{Ni})} = -0.25 \text{ V}$; $E^\circ_{(\text{Al}^{3+}/\text{Al})} = -1.66 \text{ V}$
 $[\log 2 = 0.3010, \log 3 = 0.4771]$

15. The reaction between A and B is first order with respect to A and zero order with respect to B. For this reaction, fill in the blanks in the following table.

Experiment	[A] mol/L	[B] mol/L	Initial Rate Mol/L/min
I	0.1	0.1	2.0×10^{-2}
II	—	0.2	4.0×10^{-2}
III	0.4	0.4	—
IV	—	0.2	2.0×10^{-2}

16. (a) A colloidal solution of AgI is prepared by adding AgNO_3 solution drop-by-drop to excess of KI solution. What will be the charge on the sol so formed? What is the cause of the charge?

(b) Which of the following adsorption isobars represents physisorption? Justify the answer. (x/m - Extent of adsorption; t - temperature)



(c) Two gases A and B have critical temperatures 430 K and 190 K respectively. Which gas will be readily adsorbed and why?

17. State the principle involved in the following metallurgical processes:

- (a) Froth Floatation
- (b) Zone Refining
- (c) Vapour Phase Refining

OR

Give one point of difference between the following:

- (a) Cast Iron and Pig Iron
- (b) Hydraulic Washing and Liquefaction
- (c) Leaching and Roasting

18. Give reasons for the following:

- (a) The only oxidation state shown by Scandium is +3.
- (b) $[\text{Ti}(\text{H}_2\text{O})_6]^{4+}$ is colourless.
- (c) MnO is basic while MnO_2 is acidic.

OR

Answer the following:

- (a) What is the general electronic configuration of lanthanoids?
- (b) What are the common oxidation states of Cerium (At. no. 58)?
- (c) Why do actinoids show a wide range of oxidation states?

19. Using valence bond theory, predict the hybridization and magnetic character of the following:

- (a) $[\text{Co}(\text{NH}_3)_6]^{3+}$
- (b) $[\text{Ni}(\text{CO})_4]$

[At. no.: Co = 27, Ni = 28]

20. (a) Define the following terms:

- (i) Enantiomers
- (ii) Racemic mixture
- (b) Why is chlorobenzene resistant to nucleophilic substitution reaction?

21. Give one chemical test to distinguish between the following:

- (a) Phenol and 1-propanol
- (b) Ethanol and dimethyl ether
- (c) 1-propanol and 2-Methyl-2-propanol

OR

Write the products of the following reactions:

- (i) $\text{CH}_3 - \text{CH}_2 - \text{O} - \text{CH}_3 + \text{HI} \rightarrow$
- (ii) Phenol + Br_2 in $\text{CS}_2 \rightarrow$
- (iii) Anisole + CH_3COCl in presence of anhydrous $\text{AlCl}_3 \rightarrow$

22. Account for the following, supporting your answer with diagrams or equations wherever possible:

- (a) Diazonium salts of aromatic amines are more stable than those of aliphatic amines.
- (b) Methylamine in water reacts with ferric chloride to precipitate hydrated ferric oxide.

OR

Arrange the following in decreasing order of pK_b , giving reason:

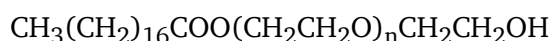
- (a) Aniline, p-nitroaniline and p-toluidine
- (b) $\text{C}_2\text{H}_5\text{NH}_2$, $(\text{C}_2\text{H}_5)_2\text{NH}$, $(\text{C}_2\text{H}_5)_3\text{N}$ in gaseous state

23. Answer the following with reason:

- (a) Is $(\text{NH}-\text{CHR}-\text{CO})_n$, a homopolymer or copolymer?
- (b) Is PVC a condensation or addition polymer?
- (c) Is Bakelite a thermoplastic or a thermosetting plastic?

24. Answer the following:

- (a) What is tincture of iodine? What is its use?
- (b) What are the main constituents of dettol?
- (c) Label the hydrophilic and hydrophobic parts of the given compound:



Section D

25. (a) Draw the graph between vapour pressure and temperature and explain the elevation in boiling point of a solvent in solution.

(b) Determine the osmotic pressure of a solution prepared by dissolving 25 mg of K_2SO_4 in 2 litres of water at $25^\circ C$ assuming it to be completely dissociated. (Atomic masses $K = 39$ u, $S = 32$ u, $O = 16$ u)

OR

(a) Write two characteristics of non-ideal solution.

(b) 2 g of benzoic acid (C_6H_5COOH) dissolved in 25 g of benzene shows a depression in freezing point equal to 1.62 K. Molal depression constant for benzene is $4.9 \text{ K kg mol}^{-1}$. What is the percentage association of acid if it forms dimer in solution?

26. Give reasons for the following:

(a) NO_2 dimerises readily.

(b) Chlorine acts as a bleaching agent.

(c) In spite of small size, electron gain enthalpy of oxygen is less negative as compared to sulphur.

(d) Unlike chlorine, fluorine forms only one oxoacid, HOF.

(e) Noble gases have very low boiling points.

OR

(a) Draw structure and name the shape of the following:

(i) SF_4

(ii) ICl_3

(b) What happens when (Support your answer with equation):

(i) Chlorine gas is passed through hot and concentrated sodium hydroxide solution?

(ii) Xenon hexafluoride is subjected to complete hydrolysis?

(iii) Concentrated sulphuric acid is poured over cane sugar?

27. (a) Give IUPAC name of $CH_3 - CH = CH - CHO$.

(b) How can you distinguish between ethanol and ethanal?

(c) How will you convert the following:

(i) Toluene to benzoic acid

(ii) Ethanol to propan-2-ol

(iii) Propanal to 2-hydroxypropanoic acid

OR

(a) Give IUPAC name of Salicylic acid.

(b) Chloroacetic acid is more acidic than acetic acid. Why?

(c) Write the products formed when $(CH_3)_3C-CHO$ reacts with the following:

(i) Zinc amalgam and dilute hydrochloric acid

(ii) Concentrated sodium hydroxide solution

(iii) Semicarbazide and a weak acid

- End of Question Paper -