

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 hcp while atoms of element B occupy two-third of the octahedral voids. What is the formula of the solid?

2. 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:

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

3. Oxidation of $\text{CH}_3 - \text{CHO}$ is easier than $\text{CH}_3 - \text{COCH}_3$. Why?

4. Write the IUPAC name of the following compound:

$\text{CH}_3 - \text{N}(\text{CH}_3) - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$

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

OR

Give an example of heterogeneous catalysis.

Section B

6. What happens when

(a) XeF_2 is hydrolysed?

(b) SO_2 is passed into aqueous solution of Fe^{3+} salt?

7. Complete and balance the following equations:

(a) $\text{MnO}_4^- + \text{I}^- + \text{H}^+ \rightarrow$

(b) $\text{Na}_2\text{Cr}_2\text{O}_7 + \text{KCl} \rightarrow$

8. 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.

Cathode: $\text{Na}^+(\text{aq}) + \text{e}^- \rightarrow \text{Na}(\text{s}); E^\circ = -2.71 \text{ V}$

$\text{H}^+(\text{aq}) + \text{e}^- \rightarrow \frac{1}{2} \text{H}_2(\text{g}); E^\circ = 0.00 \text{ V}$

Anode: $\text{Cl}^-(\text{aq}) \rightarrow \frac{1}{2} \text{Cl}_2(\text{g}) + \text{e}^-; E^\circ = +1.36 \text{ V}$

$2\text{H}_2\text{O}(\text{aq}) \rightarrow \text{O}_2(\text{g}) + 4\text{H}^+ + 4\text{e}^-; E^\circ = +1.23 \text{ V}$

9. 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.

10. 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.

11. 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

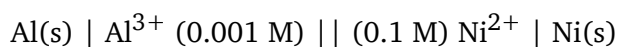
12. Define the following terms:

(a) Polysaccharides

(b) Nucleotides

Section C

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



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

14. (a) What type of stoichiometric defect is shown by NaCl and why?

(b) Calculate the efficiency of packing in case of a metal crystal for face centred cubic unit cell.

15. Write three differences between physisorption and chemisorption.

16. 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}

17. 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 Mn_2O_7 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?

18. 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 Liquation

(c) Leaching and Roasting

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



[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. 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

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

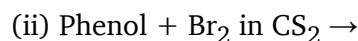
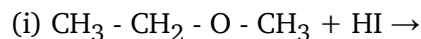
(a) Phenol and 1-propanol

(b) Ethanol and dimethyl ether

(c) 1-propanol and 2-Methyl-2-propanol

OR

Write the products of the following reactions:



23. Differentiate between the following:

(a) Antiseptics and Disinfectants

(b) Antacids and Antihistamines

(c) Soaps and Detergents

24. 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?

Section D

25. (a) Give IUPAC name of $\text{CH}_3 - \text{CH} = \text{CH} - \text{CHO}$.
(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 $(\text{CH}_3)_3\text{C}-\text{CHO}$ reacts with the following:
(i) Zinc amalgam and dilute hydrochloric acid
(ii) Concentrated sodium hydroxide solution
(iii) Semicarbazide and a weak acid

26. (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°C assuming it to be completely dissociated. (Atomic masses $\text{K} = 39 \text{ u}$, $\text{S} = 32 \text{ u}$, $\text{O} = 16 \text{ u}$)

OR

- (a) Write two characteristics of non-ideal solution.
(b) 2 g of benzoic acid ($\text{C}_6\text{H}_5\text{COOH}$) 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?

27. 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?

- End of Question Paper -