

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 2 Hours

Maximum Marks: 35

General Instructions

- (i) This question paper contains **12 questions**. All questions are compulsory.
- (ii) Section A: Questions 1 to 3 are very short answer questions, carrying 2 marks each.
- (iii) Section B: Questions 4 to 11 are short answer questions, carrying 3 marks each.
- (iv) Section C: Questions 12 are case-based questions, carrying 5 marks each.
- (v) Attempt one alternative where an internal choice is provided. Follow the instructions within each question.
- (vi) Use of calculators is not allowed.

Section A

1. Arrange the following in the increasing order of their property indicated:

- (a) Ethanal, Propanone, Propanal, Butanone (reactivity towards nucleophilic addition)
 - (b) 4-Nitrobenzoic acid, benzoic acid, 3,4-Dinitrobenzoic acid, 4-Methoxybenzoic acid (Acid strength)
-

2. Explain the following reactions:

- (a) Clemmensen reduction
 - (b) Stephen reaction
-

3. Answer the following questions (Do any two):

- (a) Identify the order of reaction from the following unit for its rate constant: $\text{L mol}^{-1} \text{s}^{-1}$
 - (b) The conversion of molecules A to B follow second order kinetics. If concentration of A is increased to three times, how will it affect the rate of formation of B?
 - (c) Write the expression of integrated rate equation for zero order reaction.
-

Section B

4. (a) (i) Define coagulation.
(ii) State Hardy-Schulze rule.
(iii) What is Electrophoresis?

OR

(b) Write three differences between Physisorption and Chemisorption.

5. (a) (i) Write the IUPAC name of the following complex: $[\text{Pt}(\text{NH}_3)_6]\text{Cl}_4$
(ii) On the basis of crystal field theory, write the electronic configuration of d^5 ion, if $\Delta_o < P$.
(iii) What are Heteroleptic complexes?

OR

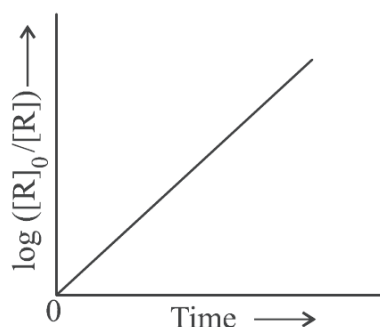
(b) (i) Using IUPAC norms write the formulas for the following:

- (i.i) Pentaamminenitrito-N-Cobalt (III)
(i.ii) Tetrahydroxidozincate (II)
(ii) What is crystal field splitting energy?

6. (a) Write any two consequences of Lanthanoid Contraction.

(b) Name the element of 3d series which exhibits the largest number of oxidation states. Give reason.

7. Observe the graph shown in figure and answer the following questions:

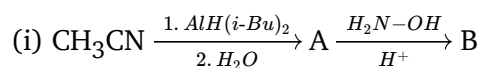


- (a) What is the order of the reaction?
(b) What is the slope of the curve?
(c) Write the relationship between k and $t_{1/2}$ (half life period).

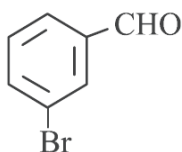
8. Give reasons for the following statements:

- (a) Scandium ($Z = 21$) is a transition element but Zn ($Z = 30$) is not.
(b) $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ is coloured while $[\text{Sc}(\text{H}_2\text{O})_6]^{3+}$ is colourless.
(c) Physical and chemical properties of the 4d and 5d series of the transition elements are quite similar than expected.

9. (a) Complete the following:



(ii) Write IUPAC name of the following compound:



(iii) Write chemical test to distinguish between the following compounds: Phenol and Benzoic acid

OR

(b) Convert the following:

(i) Benzoic acid to Benzaldehyde

(ii) Propan-1-ol to 2-Bromopropanoic acid

(iii) Acetaldehyde to But-2-enal

10. A primary amine 'A' $\text{C}_2\text{H}_7\text{N}$ reacts with alkyl halide ($\text{C}_2\text{H}_5\text{I}$) to give secondary amine 'B'. 'B' reacts with $\text{C}_6\text{H}_5\text{SO}_2\text{Cl}$ to give a solid 'C' which is insoluble in alkali. Identify 'A', 'B', 'C' and write all the chemical reactions involved.

11. (a) Account for the following:

(i) pK_b of aniline is more than that of methylamine.

(ii) Aniline does not undergo Friedel-Crafts reaction.

(iii) Primary amines have higher boiling points than tertiary amines.

OR

(b) (i) Arrange the following compounds in the increasing order of their basic strength in aqueous solution: CH_3NH_2 , $(\text{CH}_3)_3\text{N}$, $(\text{CH}_3)_2\text{NH}$

(ii) What is Hinsberg's reagent?

(iii) What is the role of pyridine in the acylation reaction of amines?

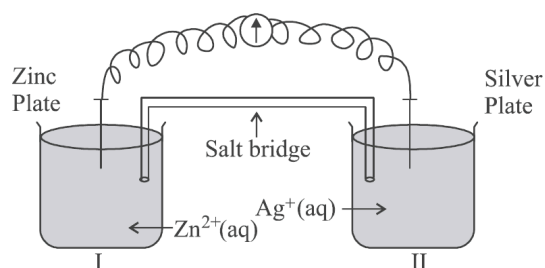
Section C

12. Read the passage given below and answer the questions that follow:

Oxidation-reduction reactions are commonly known as redox reactions. They involve transfer of electrons from one species to another. In a spontaneous reaction, energy is released which can be used to do useful work. The reaction is split into two half reactions. Two different containers are used and a wire is used to drive the electrons from one side to the other and a Voltaic/Galvanic cell is created. It is an electrochemical cell that uses spontaneous redox reactions to generate electricity. A salt bridge also connects to the half cells. The reading of the voltmeter gives the cell voltage or cell potential or electromotive force. If E_{cell}° is positive the reaction is spontaneous and if it is negative the reaction is non-spontaneous and is referred to as electrolytic cell. Electrolysis refers to the decomposition of a substance by an electric current. One mole of electric charge when passed through a cell will discharge half a mole of a divalent metal ion such as Cu^{2+} . This was first formulated by Faraday in the form of laws of electrolysis.

12. (continued)

The conductance of material is the property of materials due to which a material allows the flow of ions through itself and thus conducts electricity. Conductivity is represented by k and it depends upon nature and concentration of electrolyte, temperature etc. A more common term molar conductivity of a solution at a given concentration is conductance of the volume of solution containing one mole of electrolyte kept between two electrodes with the unit area of cross-section and distance of unit length. Limiting molar conductivity of weak electrolytes cannot be obtained graphically.



- (a) Is silver plate the anode or cathode?
- (b) What will happen if the salt bridge is removed?
- (c) When does electrochemical cell behaves like an electrolytic cell?
- (d) (i) What will happen to the concentration of Zn^{2+} and Ag^{+} when $E_{cell} = 0$?

12. (continued)

- (ii) Why does conductivity of a solution decreases with dilution?

OR

- (d) The molar conductivity of a 1.5 M solution of an electrolyte is found to be $138.9 \text{ S cm}^2 \text{ mol}^{-1}$. Calculate the conductivity of this solution.

- End of Question Paper -