

## Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 3 Hours

Maximum Marks: 70

### General Instructions

- (i) All questions are compulsory.
- (ii) Questions 1 to 5 are very short answer questions and carry 1 mark each.
- (iii) Questions 6 to 10 are short answer questions and carry 2 marks each.
- (iv) Questions 11 to 22 are short answer questions and carry 3 marks each.
- (v) Question 23 is a value based question and carries 4 marks.
- (vi) Questions 24 to 26 are long answer questions and carry 5 marks each.
- (vii) Use log tables, if necessary. Use of calculators is not allowed.

## Questions

1. What is the effect of catalyst on:

- (i) Gibbs energy ( $\Delta G$ ) and
- (ii) activation energy of a reaction?

2. Write one similarity between Physisorption and Chemisorption.

3. Write the formula of an oxo-anion of Manganese (Mn) in which it shows the oxidation state equal to its group number.

4. Write the structure of 3-Bromo-2-methylprop-1-ene.

5. Write IUPAC name of the following compound:



6. Write the reactions involved in the following reactions:

- (i) Clemmensen reduction
- (ii) Cannizzaro reaction

7. Draw the structures of the following:

- (i)  $\text{H}_4\text{P}_2\text{O}_7$
- (ii)  $\text{XeOF}_4$

8. Define the following terms:

- (i) Abnormal molar mass
- (ii) van't Hoff factor (i)

9. Calculate the degree of dissociation ( $\alpha$ ) of acetic acid if its molar conductivity ( $\Lambda_m$ ) is  $39.05 \text{ S cm}^2 \text{ mol}^{-1}$ .

Given:  $\Lambda^\circ(\text{H}^+) = 349.6 \text{ S cm}^2 \text{ mol}^{-1}$  and  $\Lambda^\circ(\text{CH}_3\text{COO}^-) = 40.9 \text{ S cm}^2 \text{ mol}^{-1}$ .

10. Complete the following chemical equations:

- (i)  $\text{F}_2 + 2\text{Cl}^- \longrightarrow$
- (ii)  $2\text{XeF}_2 + 2\text{H}_2\text{O} \longrightarrow$

OR

What happens when

- (i) HCl is added to  $\text{MnO}_2$ ?
- (ii)  $\text{PCl}_5$  is heated?

Write the equations involved.

11. Give reasons:

- (i) Acetylation of aniline reduces its activation effect.
- (ii)  $\text{CH}_3\text{NH}_2$  is more basic than  $\text{C}_6\text{H}_5\text{NH}_2$ .
- (iii) Although  $-\text{NH}_2$  is o/p directing group, yet aniline on nitration gives a significant amount of m-nitroaniline.

12. Give reasons:

- (i) Thermal stability decreases from  $\text{H}_2\text{O}$  to  $\text{H}_2\text{Te}$ .
- (ii) Fluoride ion has higher hydration enthalpy than chloride ion.
- (iii) Nitrogen does not form pentahalide.

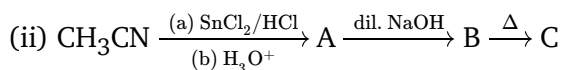
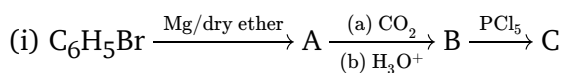
13. Define the following:

- (i) Anionic detergents
- (ii) Limited spectrum antibiotics
- (iii) Tranquilizers

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

- (i) Nylon-6
- (ii) Melamine - formaldehyde polymer
- (iii) Teflon

15. Write structures of compounds A, B and C in each of the following reactions:



OR

Do the following conversions in not more than two steps:

- (i) Benzoic acid to benzaldehyde
- (ii) Ethyl benzene to Benzoic acid
- (iii) Propanone to Propene

16. (a) Write the principle of method used for the refining of germanium.

(b) Out of PbS and PbCO<sub>3</sub> (ores of lead), which one is concentrated by froth floatation process preferably?

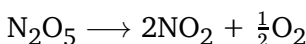
(c) What is the significance of leaching in the extraction of aluminium?

17. Following compounds are given to you:

2-Bromopentane, 2-Bromo-2-methylbutane, 1-Bromopentane

- (i) Write the compound which is most reactive towards S<sub>N</sub>2 reaction.
- (ii) Write the compound which is optically active.
- (iii) Write the compound which is most reactive towards β-elimination reaction.

18. Following data are obtained for the reaction:



t/s: 0, 300, 600

[N<sub>2</sub>O<sub>5</sub>]/mol L<sup>-1</sup>:  $1.6 \times 10^{-2}$ ,  $0.8 \times 10^{-2}$ ,  $0.4 \times 10^{-2}$

- (a) Show that it follows first order reaction.
- (b) Calculate the half-life.

(Given log 2 = 0.3010, log 4 = 0.6021)

19. Write one difference between each of the following:

- (i) Multimolecular colloid and Macromolecular colloid
- (ii) Sol and Gel
- (iii) O/W emulsion and W/O emulsion

20. (i) What type of isomerism is shown by the complex [Co(en)<sub>2</sub>Cl<sub>2</sub>]Cl?

(ii) Write the hybridisation and magnetic character of [Co(C<sub>2</sub>O<sub>4</sub>)<sub>3</sub>]<sup>3-</sup>. (At. no. of Co = 27)

(iii) Write the IUPAC name of the following complex: [Cr(NH<sub>3</sub>)<sub>4</sub>Cl<sub>2</sub>]<sup>+</sup>.

**21.** (a) Calculate the mass of Ag deposited at cathode when a current of 2 amperes was passed through a solution of  $\text{AgNO}_3$  for 15 minutes.

(Given: Molar mass of Ag =  $108 \text{ g mol}^{-1}$ ,  $1F = 96500 \text{ C mol}^{-1}$ )

(b) Define fuel cell.

**22.** A 10% solution (by mass) of sucrose in water has freezing point of 269.15 K. Calculate the freezing point of 10% glucose in water, if freezing point of pure water is 273.15 K.

Given: (Molar mass of sucrose =  $342 \text{ g mol}^{-1}$ )

(Molar mass of glucose =  $180 \text{ g mol}^{-1}$ )

**23.** After watching a programme on TV about the presence of carcinogens (cancer causing agents) Potassium bromate and Potassium iodate in bread and other bakery products, Ritu a class XII student decided to aware others about the adverse effects of these carcinogens in foods. She consulted the school principal and requested him to instruct canteen contractor to stop selling sandwiches, pizza, burgers and other bakery products to the students. Principal took an immediate action and instructed the canteen contractor to replace the bakery products with some proteins and vitamins rich food like fruits, salads, sprouts etc. The decision was welcomed by the parents and students.

After reading the above passage, answer the following questions:

- (i) What are the values (at least two) displayed by Ritu?
- (ii) Which polysaccharide component of carbohydrates is commonly present in bread?
- (iii) Write the two types of secondary structure of proteins.
- (iv) Give two examples of water soluble vitamins.

**24.** (a) An element has atomic mass  $93 \text{ g mol}^{-1}$  and density  $11.5 \text{ g cm}^{-3}$ . If the edge length of its unit cell is 300 pm, identify the type of unit cell.

(b) Write any two differences between amorphous solids and crystalline solids.

OR

(a) Calculate the number of unit cells in 8.1 g of aluminium if it crystallizes in a f.c.c. structure.

(Atomic mass of Al =  $27 \text{ g mol}^{-1}$ )

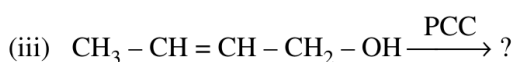
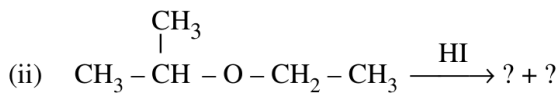
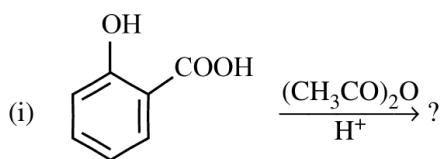
(b) Give reasons:

(i) In stoichiometric defects, NaCl exhibits Schottky defect and not Frenkel defect.

(ii) Silicon on doping with Phosphorus forms n-type semiconductor.

(iii) Ferrimagnetic substances show better magnetism than antiferromagnetic substances.

25. (a) Write the product(s) in the following reactions:



(b) Give simple chemical tests to distinguish between the following pairs of compounds:

(i) Ethanol and Phenol

(ii) Propanol and 2-methylpropan-2-ol

OR

(a) Write the formula of reagents used in the following reactions:

(i) Bromination of phenol to 2,4,6-tribromophenol

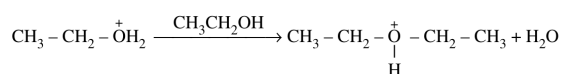
(ii) Hydroboration of propene and then oxidation to propanol.

(b) Arrange the following compound groups in the increasing order of their property indicated:

(i) p-nitrophenol, ethanol, phenol (acidic character)

(ii) Propanol, Propane, Propanal (boiling point)

(c) Write the mechanism (using curved arrow notation) of the following reaction:



26. (a) Account for the following:

(i) Transition metals form large number of complex compounds.

(ii) The lowest oxide of transition metal is basic whereas the highest oxide is amphoteric or acidic.

(iii)  $E^\circ$  value for the  $\text{Mn}^{3+}/\text{Mn}^{2+}$  couple is highly positive (+1.57 V) as compared to  $\text{Cr}^{3+}/\text{Cr}^{2+}$ .

(b) Write one similarity and one difference between the chemistry of lanthanoid and actinoid elements.

OR

(a) (i) How is the variability in oxidation states of transition metals different from that of the p-block elements?

(ii) Out of  $\text{Cu}^+$  and  $\text{Cu}^{2+}$ , which ion is unstable in aqueous solution and why?

(iii) Orange colour of  $\text{Cr}_2\text{O}_7^{2-}$  ion changes to yellow when treated with an alkali. Why?

(b) Chemistry of actinoids is complicated as compared to lanthanoids. Give two reasons.

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