

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 formula of a compound in which the element P forms ccp lattice and atoms of Q occupy $2/3^{\text{rd}}$ of tetrahedral voids?

2. Arrange the following hydrides of Group-16 elements in the increasing order of their thermal stability:

H_2O , H_2S , H_2Se , H_2Te

3. What is the role of desorption in the process of catalysis?

4. Write the IUPAC name of the following compound:

$\text{C}_6\text{H}_5 - \text{CH}_2 - \text{CH}_2 - \text{OH}$

5. Among the isomers of pentane (C_5H_{12}), write the one which on photochemical chlorination yields a single monochloride.

6. Do the following conversions in not more than two steps:

(a) Propene to Acetone

(b) Propanoic acid to 2-hydroxypropanoic acid

OR

Write the reaction involved in the following:

(a) Etard reaction

(b) Wolff-Kishner reduction

7. What are colligative properties? Write the colligative property which is used to find the molecular mass of macromolecules.

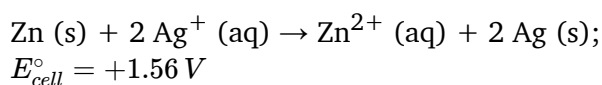
8. (a) Write the IUPAC name of the isomer of the following complex:

$[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$

(b) Write the formula for the following:

Tetraammineaquachloridocobalt(III) nitrate

9. In a galvanic cell, the following cell reaction occurs:



(a) Is the direction of flow of electrons from zinc to silver or silver to zinc?

(b) How will concentration of Zn^{2+} ions and Ag^+ ions be affected when the cell functions?

10. In the following ions:

Mn^{3+} , V^{3+} , Cr^{3+} , Ti^{4+}

(Atomic no.: Mn = 25, V = 23, Cr = 24, Ti = 22)

(a) Which ion is most stable in an aqueous solution?

(b) Which ion is the strongest oxidizing agent?

(c) Which ion is colourless?

(d) Which ion has the highest number of unpaired electrons?

11. The electrical resistance of a column of 0.05 M KOH solution of diameter 1 cm and length 45.5 cm is $4.55 \times 10^3 \Omega$. Calculate its molar conductivity.

12. Define the following terms with an example in each:

(a) Lyophobic colloids

(b) Homogeneous catalysis

(c) O/W emulsion

OR

Write three differences between Physisorption and Chemisorption.

13. A solution of glucose (Molar mass = 180 g mol^{-1}) in water has a boiling point of 100.20°C . Calculate the freezing point of the same solution. Molal constants for water K_f and K_b are $1.86 \text{ K kg mol}^{-1}$ and $0.512 \text{ K kg mol}^{-1}$ respectively.

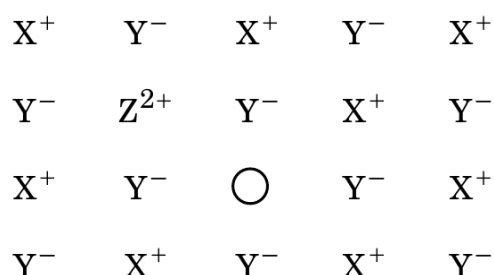
14. (a) Write the principle of vapour phase refining.

(b) What is the role of depressant in froth floatation process?

(c) Write the name of reducing agent to obtain iron from Fe_2O_3 at high temperature.

15. (a) What is the radius of sodium atom if it crystallises in bcc structure with the cell edge of 400 pm ?

(b) Examine the given defective crystal:



(i) Write the term used for this type of defect.

(ii) What is the result when XY crystal is doped with divalent (Z^{2+}) impurity?

16. Give reasons:

(a) Propanone is less reactive than ethanal towards nucleophilic addition reactions.

(b) $\text{O}_2\text{N} - \text{CH}_2 - \text{COOH}$ has lower pK_a value than CH_3COOH .

(c) $(\text{CH}_3)_2\text{CH} - \text{CHO}$ undergoes aldol condensation whereas $(\text{CH}_3)_3\text{C} - \text{CHO}$ does not.

17. Write the names and structures of the monomers of the following polymers:

(a) Terylene

(b) Teflon

(c) Nylon-6,6

18. (a) Define crystal field splitting energy. On the basis of crystal field theory, write the electronic configuration for d^4 ion if $\Delta_o < P$.

(b) $[\text{Ni}(\text{CN})_4]^{2-}$ is colourless whereas

$[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ is green. Why? (At. no. of Ni = 28)

19. What happens when

(a) $(\text{CH}_3)_3\text{C} - \text{OH}$ is treated with Cu at 573 K ,

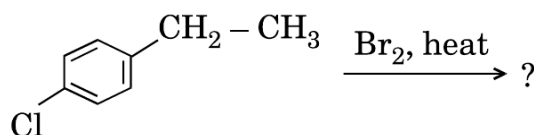
(b) Anisole is treated with CH_3Cl /anhydrous AlCl_3 ,

(c) Phenol is treated with Zn dust?

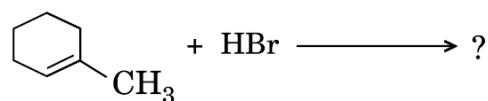
Write chemical equations in support of your answer.

20. Draw the structures of the major monohalo product for each of the following reactions:

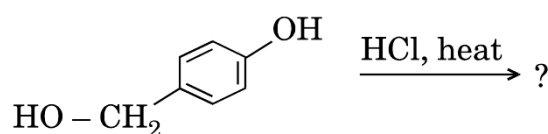
(a)



(b)



(c)



21. Account for the following:

- (a) CuCl_2 is more stable than Cu_2Cl_2 .
- (b) Atomic radii of 4d and 5d series elements are nearly same.
- (c) Hydrochloric acid is not used in permanganate titrations.

22. Define the following terms:

- (a) Tranquilizer
- (b) Anionic detergent
- (c) Disinfectant

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, Veena, a class XII student, decided to make others aware about the adverse effects of these carcinogens in foods. She consulted the school principal and requested him to instruct the canteen contractor to stop selling sandwiches, pizzas, burgers and other bakery products to the students. The 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.

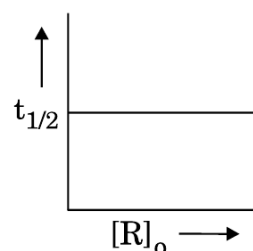
After reading the above passage, answer the following questions:

- (a) What are the values (at least two) displayed by Veena?
- (b) Which polysaccharide component of carbohydrates is commonly present in bread?
- (c) Write the two types of secondary structures of proteins.
- (d) Give two examples of water soluble vitamins.

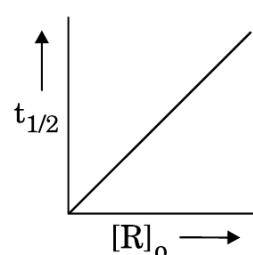
24. (a) A first order reaction is 75% completed in 40 minutes. Calculate its $t_{1/2}$.

(b) Predict the order of the reaction in the given plots:

(i)



(ii)

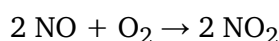


where $[\text{R}]_0$ is the initial concentration of reactant.

(Given: $\log 2 = 0.3010$, $\log 4 = 0.6021$)

OR

The following data were obtained for the reaction:



Experiment	$[\text{NO}]$ / M	$[\text{O}_2]$ / M	Initial rate of formation of NO_2 / M min^{-1}
1	0.3	0.2	7.2×10^{-2}
2	0.1	0.1	6.0×10^{-3}
3	0.3	0.4	2.88×10^{-1}
4	0.4	0.1	2.40×10^{-2}

(a) Find the order of reaction with respect to NO and O_2 .

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

(c) Calculate the rate constant (k).

25. (a) Account for the following:

(i) BiH_3 is the strongest reducing agent in Group 15 elements hydrides.

(ii) Cl_2 acts as a bleaching agent.

(iii) Noble gases have very low boiling points.

(b) Draw the structures of the following:

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

(ii) XeOF_4

OR

(a) Although nitrogen and chlorine have nearly same electronegativity yet nitrogen forms hydrogen bonding while chlorine does not. Why?

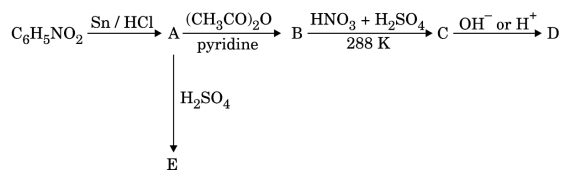
(b) What happens when F_2 reacts with water?

(c) Write the name of the gas evolved when XeF_2 is dissolved in water.

(d) Write the formula of a noble gas species which is isostructural with IBr_2^- .

(e) Complete the equation: $[\text{Fe}(\text{H}_2\text{O})_6]^{2+} + \text{NO} \rightarrow ?$

26. Write the structures of A, B, C, D and E in the following reactions:



OR

(a) Write the structures of the main products when benzene diazonium chloride reacts with the following reagents:

(i) CuCN

(ii) $\text{CH}_3\text{CH}_2\text{OH}$

(iii) Cu/HCl

(b) Arrange the following in the increasing order of their basic strength:

CH_3NH_2 , $(\text{CH}_3)_2\text{NH}$, $\text{C}_6\text{H}_5\text{NH}_2$, $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$

(c) Write one chemical test to distinguish between Aniline and Ethyl amine.

- End of Question Paper -