

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 3 Hours

Maximum Marks: 70

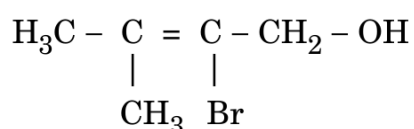
General Instructions

- (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. Write the formula of the compound of phosphorus which is obtained when conc. HNO_3 oxidises P_4 .

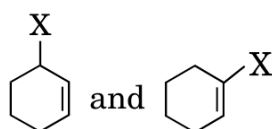
2. Write the IUPAC name of the following compound:



3. What is the effect of adding a catalyst on

- (a) Activation energy (E_a), and
- (b) Gibbs energy (ΔG) of a reaction?

4. Out of the two compounds shown below, which is an example of an allylic halide?

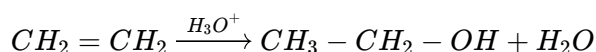


5. What type of colloid is formed when a liquid is dispersed in a solid? Give an example.

6. (a) Arrange the following compounds in the increasing order of their acid strength:

p-cresol, p-nitrophenol, phenol

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



OR

Write the structures of the products when Butan-2-ol reacts with the following:

- (a) CrO_3
- (b) SOCl_2

7. Calculate the number of unit cells in 8.1 g of aluminium if it crystallizes in a face-centred cubic (f.c.c.) structure. (Atomic mass of Al = 27 g mol⁻¹)

8. Draw the structures of the following:

- (a) H_2SO_4
- (b) HClO_3

9. Write the name of the cell which is generally used in hearing aids. Write the reactions taking place at the anode and the cathode of this cell.

10. Using IUPAC norms write the formulae for the following:

- (a) Sodium dicyanidoaurate(I)
- (b) Tetraamminechloridonitrito-N-platinum(IV) sulphate

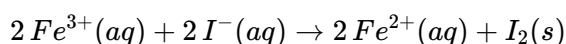
11. (a) Based on the nature of intermolecular forces, classify the following solids:

Silicon carbide, Argon

(b) ZnO turns yellow on heating. Why?

(c) What is meant by groups 12-16 compounds? Give an example.

12. (a) A cell in which the following reaction occurs:



has $E_{\text{cell}}^{\circ} = 0.236 \text{ V}$ at 298 K. Calculate the standard Gibbs energy of the cell reaction.

(Given: 1 F = 96,500 C mol⁻¹)

(b) How many electrons flow through a metallic wire if a current of 0.5 A is passed for 2 hours?

(Given: 1 F = 96,500 C mol⁻¹)

13. (a) What type of isomerism is shown by the complex $[\text{Co}(\text{NH}_3)_5(\text{SCN})]^{2+}$?
- (b) Why is $[\text{NiCl}_4]^{2-}$ paramagnetic while $[\text{Ni}(\text{CN})_4]^{2-}$ is diamagnetic? (Atomic number of Ni = 28)
- (c) Why are low spin tetrahedral complexes rarely observed?

14. Write one difference in each of the following:

- (a) Multimolecular colloid and Associated colloid
- (b) Coagulation and Peptization
- (c) Homogeneous catalysis and Heterogeneous catalysis

OR

- (a) Write the dispersed phase and dispersion medium of milk.
- (b) Write one similarity between physisorption and chemisorption.
- (c) Write the chemical method by which $\text{Fe}(\text{OH})_3$ sol is prepared from FeCl_3 .

15. A first order reaction takes 20 minutes for 25% decomposition. Calculate the time when 75% of the reaction will be completed.

(Given: $\log 2 = 0.3010$, $\log 3 = 0.4771$, $\log 4 = 0.6021$)

16. The following compounds are given to you:

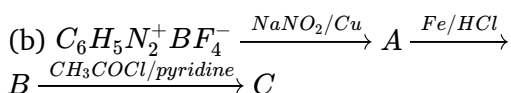
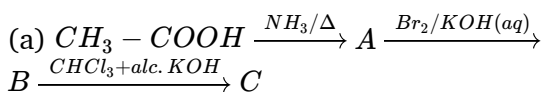
2-Bromopentane, 2-Bromo-2-methylbutane, 1-Bromopentane

- (a) Write the compound which is most reactive towards $\text{S}_{\text{N}}2$ reaction.
- (b) Write the compound which is optically active.
- (c) Write the compound which is most reactive towards β -elimination reaction.

17. Write the principle of the following:

- (a) Zone refining
- (b) Froth floatation process
- (c) Chromatography

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



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

- (a) Nylon-6,6
- (b) Melamine-formaldehyde polymer
- (c) Buna-S

20. Define the following:

- (a) Anionic detergents
- (b) Limited spectrum antibiotics
- (c) Antiseptics

21. Give reasons for the following:

- (a) Red phosphorus is less reactive than white phosphorus.
- (b) Electron gain enthalpies of halogens are largely negative.
- (c) N_2O_5 is more acidic than N_2O_3 .

22. Give reasons for the following:

- (a) Acetylation of aniline reduces its activation effect.
- (b) CH_3NH_2 is more basic than $\text{C}_6\text{H}_5\text{NH}_2$.
- (c) Although $-\text{NH}_2$ is o/p directing group, yet aniline on nitration gives a significant amount of m-nitroaniline.

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, Rupali 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 protein and vitamin rich food like fruits, salads, sprouts, etc. The decision was welcomed by the parents and the students.

After reading the above passage, answer the following questions:

- (a) What are the values (at least two) displayed by Rupali?
- (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) Account for the following:

- (i) Transition metals show variable oxidation states.
- (ii) Zn, Cd and Hg are soft metals.
- (iii) E° 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) Following are the transition metal ions of 3d series:



(Atomic numbers: Ti = 22, V = 23, Mn = 25, Cr = 24)

Answer the following:

- (i) Which ion is most stable in an aqueous solution and why?
- (ii) Which ion is a strong oxidising agent and why?
- (iii) Which ion is colourless and why?
- (b) Complete the following equations:
 - (i) $2\text{MnO}_4^- + 16\text{H}^+ + 5\text{S}^{2-} \rightarrow$
 - (ii) $\text{KMnO}_4 \xrightarrow{\text{heat}}$

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

Given:

(Molar mass of sucrose = 342 g mol^{-1})

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

(b) Define the following terms:

(i) Molality (m)

(ii) Abnormal molar mass

OR

(a) 30 g of urea ($M = 60 \text{ g mol}^{-1}$) is dissolved in 846 g of water. Calculate the vapour pressure of water for this solution if vapour pressure of pure water at 298 K is 23.8 mm Hg.

(b) Write two differences between ideal solutions and non-ideal solutions.

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

(i) Cyclohexanone + HCN $\rightarrow$?

(ii) Sodium benzoate + NaOH $\xrightarrow{\text{CaO}}$?

(iii) $\text{CH}_3\text{-CH=CH-CN} \xrightarrow[\text{(b) } \text{H}_2\text{O}]{\text{(a) DIBAL-H}}$?

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

(i) Butanal and Butan-2-one

(ii) Benzoic acid and Phenol

OR

(a) Write the reactions involved in the following:

(i) Etard reaction

(ii) Stephen reduction

(b) How will you convert the following in not more than two steps:

(i) Benzoic acid to Benzaldehyde

(ii) Acetophenone to Benzoic acid

(iii) Ethanoic acid to 2-Hydroxyethanoic acid

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