

Question Bank
B.Sc (H) Chemistry Semester 6
Inorganic Chemistry IV

Q1. How is the unequal concentration of Na^+ and K^+ ions in extra cellular and intracellular fluid controlled in the human body? Give a diagrammatic representation of the process and explain the mechanism involved in it.

Q2. Haemoglobin acts as an oxygen carrier from lungs to muscles but as a carbon dioxide carrier from the tissues to the lungs. Explain this cycle?

Q3. Explain the changes observed in the IR stretching frequency of the C –O bond in (i) terminal and bridging carbonyl group, (ii) in carbonyl compounds of the same metal when some CO molecules are replaced by poor π acceptor groups?

Q4. The cyclopentadienyl rings in ferrocene have aromatic character but cyclopentadiene itself has no such character. Explain.

Q5. A mixture of salts, when heated with ethanol and conc. H_2SO_4 gave a gas A which burnt with a green-edged flame when ignited. The mixture also gave a red gas B when heated with potassium dichromate and conc. H_2SO_4 . The pungent gas evolved on heating the mixture with sodium hydroxide solution gave a brown precipitate C with potassium tetraiodomercurate (II). The residue left on boiling the mixture with dilute HCl is soluble in hot water and the hot solution gives a white precipitate D with dilute sulphuric acid and a yellow precipitate E with potassium chromate solution. Identify (with formula) A, B, C, D and E and name the ions present.

Q6. Give the complete cycle describing each step to outline the working of the Ziegler-Natta catalyst for the isotactic polymerization of ethene.

Q7. Q7. What do you understand by essential and non-essential metal ions in the biosystem? Give an example of each type.

Q8. What is the major difference in the nature of the channels selective for sodium and potassium and what are the evidences for this?

Q9. What are metalloenzymes? Describe the active site of the enzyme CA and CPA and briefly describe the biological role of the enzyme.

Q10. A beneficial metal may become toxic if present in excess. Discuss briefly taking iron and copper as an example.

Q11. How will you choose a drug to remove excess of a metal ion in the body? Give an example of such a drug.

Q12. Mention the features that a chelating agent should possess to be used as a drug?

- Q13. Why are the following metals toxic: Hg, Pb, Cd? What are the antidotes used for these?
- Q14. What is meant by the terms LD_{50} , ID_{90} and TI in connection to anti-tumour drugs? Which will have higher TI – cis-platin or trans – platin?
- Q15. What are the special properties possessed by cisplatin that make it an effective antitumor drug?
- Q16. Describe the Perutz mechanism of oxygenation of haemoglobin. What is the trigger for this mechanism?
- Q17. Where and in what form iron is stored in human body? How is it transferred from storage sites to the sites for incorporation in haemoglobin?
- Q18. How are organometallic compounds classified on the basis of bonding? Give an example of each type.
- Q19. What is meant by π acidity? Is CO a stronger π acid ligand than NO^+ or not? Justify your choice.
- Q20. How does the total valence electron count of the central metal atom in carbonyls and their derivatives reflect their stability? Predict which of the following will be stable:
a. $V(CO)_5NO$ (b) $Cr(C_6H_6)(CO)_3$ (c) $V(CO)_6$ (d) $Co(CO)_4$
- Q21. Two different structures of $Co_2(CO)_8$ are consistent with 18 electron rule. How will you predict the structure on the basis of IR studies?
- Q22. Using VBT derive the structures of ; $Cr(CO)_6$, $Fe(CO)_5$, $Ni(CO)_4$, $Mn_2(CO)_{10}$.
- Q23. Draw the structure of the anion of Zeise's salt and briefly discuss the nature of bonding. Give 2 evidences to indicate that back bonding occurs in this compound?
- Q24. Draw the structure of methyl lithium. In which category of organometallic compounds will you place it? What are the coordination numbers of Li and C in the tetramer?
- Q25. Give two methods of synthesis of ferrocene and discuss its structures in solid and gaseous states.
- Q26. Give confirmatory tests for borate and oxalate ions in a salt mixture. Why are they called interfering ions?
- Q27. Explain the concept of solubility product as applicable to precipitation of Group II and Group IV cations in qualitative analysis?
- Q28. An unknown salt A, when heated with NaOH solution, produced a pungent smelling gas B. B turned red litmus blue and gave dense white fumes of C when a glass rod dipped in HCl was

held at the mouth of the test tube. A, on heating with concentrated sulphuric acid, gave a mixture of two odourless gases D and E. D burnt with a blue flame while E turned lime water milky. An aqueous solution of A gave a white precipitate with calcium chloride solution, the acid extract of which discharged the colour of acidified potassium permanganate solution. Identify A, B, C, D and E giving the reactions involved.

Q29. What do you understand by common ion effect? Explain giving two examples.

Q30. The hydrochloric acid solution of a salt of metal M gives white turbidity when diluted with water. A compound of M is used in the confirmatory test of a Group IV metal ion. Identify M and explain the reactions mentioned with equations.

Q31. Why is phosphate ion an interfering anion? Explain giving reactions. Give a scheme for the removal of phosphate ions.

Q32. What is a catalyst? Explain its role with the help of suitable examples.

Q33. Differentiate between homogeneous and heterogeneous catalysis ?

Q34. What are the characteristics of a good catalyst? How can a catalyst be deactivated?

Q.35 Differentiate between physical and chemical adsorption (or physisorption and chemisorption) with reference to heterogeneous catalysis.

Q36. Give the complete cycle describing each step in the working of the Wilkinson's catalyst for hydrogenation of alkenes.

Q37. Give a possible mechanism of conversion of synthesis gas to synthetic gasoline by Fischer-Tropsch method.