

CBSE 12th Chemistry

Chapter- 9 (Coordination Compounds)

Unsolved Important Questions

SECTION A

(Each question in this section carry 1 mark)

- Q.1.** What is the coordination number of each type of ions in a rock-salt type crystal structure?
- Q.2.** Give an example of linkage isomerism?
- Q.3.** Which of the following is more stable complex and why?
 $[Co(NH_3)_6]^{3+}$ and $[Co(en)_3]^{3+}$

SECTION B

(Each question in this section carry 2 marks)

- Q.4.** For the complex $[Fe(en)_2Cl_2]Cl$, (en=ethylene diamine), identify
- (i) The oxidation number of iron,
 - (ii) The hybrid orbits and the shape of the complex,
 - (iii) The magnetic behavior of the complex.
 - (iv) The number of geometrical isomers,
 - (v) Whether there is an optical isomer also, and
 - (vi) name of the complex. (At. No. of Fe = 26)
- Q.5.** Name the following coordination compounds according to IUPAC system of nomenclature:
- (i) $[Co(NH_3)_4(H_2O)Cl]Cl_2$
 - (ii) $[CrCl_2(en)_2]Cl$, (en = ethane – 1, 2 – diamine)
- Q.6.** Write the IUPAC name of the complex $[Cr(NH_3)_4Cl_2]^+$. What type of isomerism does it exhibit?

- Q.7. (i) Write down the IUPAC name of the following complex:
 $[\text{Cr}(\text{NH}_3)_2\text{Cl}_2(\text{en})]\text{Cl}$ (en = ethylenediamine)
- (ii) Write the formula for the following complex:
Pentaamminenitrito-o-Cobalt(III).
- Q.8. When a co-ordination compound $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ is mixed with AgNO_3 , 2 moles of AgCl are precipitated per mole of the compound. Write.
- (i) Structural formula of the complex.
- (ii) IUPAC name of the complex.
- Q.9. (i) Write down the IUPAC name of the following complex:
 $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$
- (ii) Write the formula for the following complex: Potassium tetrachloridonickelate(II).
- Q.10. Using IUPAC norms write the formulae for the following:
- (a) Sodium dicyanidoaurate (I)
- (b) Tetraamminechloridonitrito-N-platinum(IV) sulphate

SECTION C

(Each question in this section carry 3 marks)

- Q.11. (a) What is a ligand? Give an example of a bidentate ligand.
- (b) Explain as to how the two complexes of nickel, $[\text{Ni}(\text{CN})_4]^{2-}$ and $\text{Ni}(\text{CO})_4$ have different structures but do not differ in their magnetic behavior. (Ni = 28)
- Q.12. Give the formula of each of the following coordination entities:
- (i) CO^3 ion is bound to one Cl^- , one NH_3 molecules and two bidentate ethylene diamine (en) molecules.
- (ii) Ni^{2+} ion is bound to two water molecules and two oxalate ions. Write the name and magnetic behavior of each of the above coordination entities.
(At. Nos. Co=27, Ni =28)
- Q.13. Write the IUPAC names of the following coordination compounds:
- (i) $[\text{Cr}(\text{NH}_3)_3\text{Cl}_3]$
- (ii) $\text{K}_3[\text{Fe}(\text{CN})_6]$
- (iii) $[\text{CoBr}_2(\text{en})_2]^+$, (en = ethylenediamine)

Q.14. (i) Draw the geometrical isomers of complex $[Pt(NH_3)_2Cl_2]$.
(ii). On the basis of crystal field theory, write the electronic configuration for d^4 ion if $\Delta_o < P$.

(iii). Write the hybridization and magnetic behavior of the complex $[Ni(CO)_4]$. (At. no. of Ni = 28).

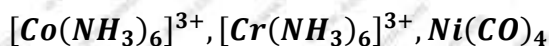
Q.15. (i) What type of isomerism is shown by the complex $[Co(NH_3)_6][Cr(CN)_6]$?
(ii) Why a solution of $[Ni(H_2O)_6]^{2+}$ is green while a solution of $[Ni(CN)_4]^{2-}$ is colourless? (At. no. of Ni = 28).
(iii) Write the IUPAC name of the following complex: $[Co(NH_3)_5(CO_3)]Cl$.

Q.16. (a) What is the basis of formation of the spectrochemical series?
(b) Draw the structures of geometrical isomers of the following coordination complexes:
 $[Co(NH_3)_3Cl_3]$ and $[CoCl_2(en)_2]^+$
(en = ethylenediamine and atomic number of Co is 27).

Q.17. Giving a suitable example for each, explain the following:

- (i) Crystal field splitting
- (ii) Linkage isomerism
- (iii) Ambidentate ligand

Q.18. Compare the following complexes with respect to structural shapes of units magnetic behavior and hybrid orbitals involved in units:



At. Nos: Co = 27, Cr = 24, Ni = 28

Q.19. Explain the following terms giving a suitable example in each case:

- (i) Ambident ligand
- (ii) Denticity of a ligand
- (iii) Crystal field splitting in an octahedral field.

Q.20. Name the following coordination entities and draw the structures of their stereoisomers:

(i) $[\text{Co}(\text{en})_2\text{Cl}_2]^+$ (en = ethan – 1, 2 – diamine)

(ii) $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$

(iii) $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$

(Atomic numbers Cr=24, Co=27)

Q.21. For the complex $[\text{NiCl}_4]^{2-}$, write .

(i) the IUPAC name.

(ii) the hybridization type.

(iii) the shape of the complex. (Atomic no. of Ni = 28)

Q.22. What is meant by crystal field splitting energy? On the basis of crystal field theory, write the electronic configuration of d^4 terms of t_{2g} and e_g in an octahedral field when

(i) $\Delta_0 > P$

(ii) $\Delta_0 < P$

Q.23. (i) Write the IUPAC name of the complex $[\text{Cr}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$.

(ii) What type of isomerism is exhibited by the complex $[\text{Co}(\text{en})_3]^{3+}$?

(iii) Why is $[\text{NiCl}_4]^{2-}$ paramagnetic $[\text{Ni}(\text{CO})_4]$ is a diamagnetic?

(At. Nos. : Cr = 24, Co = 27, Ni = 28)

Q.24. (i) What type of isomerism is shown by the complex $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$?

(ii) On the basis of crystal field theory, write the electronic configuration for d^4 ion if $\Delta_0 < P$.

(iii) Write the hybridization and shape of $[\text{CoF}_6]^{3-}$. (Atomic no. of Co = 27)

Q.25. (a) For the complex $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$, write the hybridization, magnetic character and spin of the complex. (At. Number: Fe = 26)

(b) Draw one of the geometrical isomers of the complex $[\text{Pt}(\text{en})_2\text{Cl}_2]^{2+}$ which is optically inactive.

Q.26. (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?

SECTION D

(Each question in this section carry 5 marks)

Q.27. (a) What is meant by undictated, bidentate and ambidentate ligands? Give two examples for each.

(b) Calculate the overall complex dissociation equilibrium constant for the $\text{Cu}(\text{NH}_3)_4^{2+}$ ion, given that β_4 for this complex is 2.1×10^{13} .

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