

Chapter-5 Coordination compounds

- 1 The name of complex $[\text{Fe}(\text{CN})_6]^{3-}$ is
(a) Tricyanido ferrate (III) ion
(b) Hexacyanido ferrate (III) ion
(c) Hexacyanido iron (III)
(d) Hexacyanido ferrate (II) ion
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- 2 The shapes of $[\text{Cu}(\text{NH}_3)_4]^{2+}$ and $[\text{Pt}(\text{NH}_3)_2 \text{Cl}_2]$ are
(a) square planar, tetrahedral
(b) tetrahedral, square planar
(c) square planar, square planar
(d) tetrahedral, tetrahedral
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- 3 The geometries of ammonia complexes with Ni^{2+} , Pt^{2+} and Zn^{2+} respectively are
(a) octahedral, square planar, tetrahedral
(b) square planar, octahedral, tetrahedral
(c) tetrahedral, square planar, octahedral
(d) octahedral, tetrahedral, square planar
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- 4 According to crystal field theory the M–L bond in complex is
(a) Purely ionic (b) Purely covalent
(c) Purely coordinate (d) partially covalent
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- 5 Which of the following species is not expected to be a ligand? [NCERT Exemplar Problem]
(a) NO (b) NH_4^+
(c) $\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2$ (d) CO
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6 What kind of isomerism exists between $[\text{Cr}(\text{H}_2\text{O})_6] \text{Cl}_3$ (violet) and $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$ (greyish-green)? [NCERT Exemplar Problem]

- (a) linkage isomerism
- (b) solvate isomerism
- (c) ionisation isomerism
- (d) coordination isomerism

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7 IUPAC name of $[\text{Pt}(\text{NH}_3)_2 \text{Cl}(\text{NO}_2)]$ is: [NCERT Exemplar Problem]

- (a) Platinum diaminechloronitrite
- (b) Chloronitrito-N-ammineplatinum (II)
- (c) Diamminechloridonitrito-N-platinum (II)
- (d) Diamminechloronitrito-N-platinate (II)

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8 Identify the correct statements for the behaviour of ethane-1, 2-diamine as a ligand. [NCERT Exemplar Problem]

- (a) It is a neutral ligand.
- (b) It is a didentate ligand.
- (c) It is a chelating ligand.
- (d) It is a unidentate ligand.

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9 Which of the following complexes show linkage isomerism?

- (a) $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]^{2+}$
- (b) $[\text{Co}(\text{H}_2\text{O})_5\text{CO}]^{3+}$
- (c) $[\text{Cr}(\text{NH}_3)_5\text{SCN}]^{2+}$
- (d) $[\text{Fe}(\text{en})_2\text{Cl}_2]^+$

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10 Match the complex species given in Column I with the possible isomerism given in Column II and assign the correct code:

Column I (Complex species)	Column II (Isomerism)
(A) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$	(1) optical
(B) $\text{cis-}[\text{Co}(\text{en})_2\text{Cl}_2]^+$	(2) ionisation

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(C) $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$ (3) coordination

(D) $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$ (4) geometrical

(5) linkage

Code: (i) A (1) B (2) C (4) D (5)

(ii) A (4) B (3) C (2) D (1)

(iii) A (4) B (1) C (5) D (3)

(iv) A (4) B (1) C (2) D (3)

11 Match the compounds given in Column I with the oxidation state of cobalt present in it (given in Column II) and assign the correct code.

Column I (Compound)	Column II (Oxidation state of Co)
(A) $[\text{Co}(\text{NCS})(\text{NH}_3)_5](\text{SO}_3)$	(1) + 4
(B) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{SO}_4$	(2) 0
(C) $\text{Na}_4[\text{Co}(\text{S}_2\text{O}_3)_3]$	(3) + 1
(D) $[\text{Co}_2(\text{CO})_8]$	(4) + 2
	(5) + 3

Code: (i) A (1) B (2) C (4) D (5)

(ii) A (4) B (3) C (2) D (1)

(iii) A (5) B (1) C (4) D (2)

(iv) A (4) B (1) C (2) D (2)

12 Amongst the following, the most stable complex is

(a) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$

(b) $[\text{Fe}(\text{NH}_3)_6]^{3-}$

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

(d) $[\text{FeCl}_6]^{3-}$

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13 (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).

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14 (i) Write down the IUPAC name of the complex: $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$

(ii) Write the formula for the following complex: Potassium tetrachloridonickelate (II)

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15 (i) Write down the IUPAC name of the following complex: $[\text{Cr}(\text{en})_3]\text{Cl}_3$

(ii) Write the formula for the following complex:

Potassium trioxalato chromate(III)

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16 Write the IUPAC name of the complex $[\text{Cr}(\text{NH}_3)_4\text{Cl}_2]^+$. What type of isomerism does it exhibit?

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17 Write the state of hybridization, shape and IUPAC name of the complex $[\text{Ni}(\text{CN})_4]^{2-}$. (Atomic no. of Ni = 28)

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18 Write the state of hybridization, shape and IUPAC name of the complex $[\text{Co}(\text{NH}_3)_6]^{3+}$. (Atomic no. of Co = 27)

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- 19 (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 number of Co = 27) 3
- 20 What do you understand by stepwise stability constant and overall stability constant of a coordination compound? How are these two constants related? 3
- 21 Give the formula of each of the following coordination entities:
 (i) Co^{3+} ion is bound to one Cl^- , one NH_3 molecule 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 behaviour of each of the above coordination entities.
 (At. nos. Co = 27, Ni = 28) 3
- 22 For the complex $[\text{Fe}(\text{en})_2\text{Cl}_2]\text{Cl}$, identify the following:
 (i) Oxidation number of iron.
 (ii) Hybrid orbitals and shape of the complex.
 (iii) Magnetic behaviour of the complex.
 (iv) Number of its geometrical isomers.
 (v) Whether there may be optical isomer also.
 (vi) Name of the complex. 3
- 23 Compare the following complexes with respect to their shape, magnetic behaviour and the hybrid orbitals involved:
 (i) $[\text{CoF}_4]^{2-}$
 (ii) $[\text{Cr}(\text{H}_2\text{O})_2(\text{C}_2\text{O}_4)_2]^-$
 (iii) $[\text{Ni}(\text{CO})_4]$
 (At. no.: Co = 27, Cr = 24, Ni = 28) 3

- 24 (i) Draw the geometrical isomers of complex $[\text{Pt}(\text{en})_2\text{Cl}_2]^{2+}$. Which of them is optically inactive?
(ii) On the basis of crystal field theory, write the electronic configuration for d^4 ion, if $\Delta_0 > P$.
(iii) Write the hybridization type and magnetic behaviour of the complex $[\text{Ni}(\text{CN})_4]^{2-}$. (Atomic number of Ni = 28)
- 25 (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 $[\text{Co}(\text{en})_3]^{3+}$? (en = ethane-1, 2-diamine)
(iii) Why is $[\text{NiCl}_4]^{2-}$ paramagnetic but $[\text{Ni}(\text{CO})_4]$ is diamagnetic? (At nos.: Cr = 24, Co = 27, Ni = 28)