

**Terms used in coordination chemistry, Oxidation state (number),  
Coordination number, Denticity.**

**[MHT-CET 2017]**

33. The correct charge on and coordination number of 'Fe' in  $K_3[Fe(CN)_6]$  is  
 a) + 2, 4                      b) + 3, 6                      c) + 2, 6                      d) + 3, 3

**[MHT-CET 2018]**

34. What is the oxidation number of gold in the complex  $[AuCl_4]^-$  ?  
 a) + 4                      b) + 3                      c) + 2                      d) + 1

**[MHT-CET 2019]**

35. What is the denticity of ethylene diamine tetra - acetate ion ?  
 a) 4                      b) 2                      c) 1                      d) 6
36. The coordination number of  $Pt^{2+}$  ion in  $[Pt Cl_2(NH_3)_2]$  complex is  
 a) 4                      b) 8                      c) 2                      d) 6

**[MHT-CET 2020]**

37. Which among the following coordination compounds does not have coordination number equal to number of ligands ?  
 a)  $[Co(NH_3)_6]^{3+}$                       b)  $[Cu(NH_3)_4]^{2+}$                       c)  $[Co(en)_3]^{3+}$                       d)  $[Pt(NH_3)_6]^{4+}$
38. Which statement from the following is true for a complex hexamminecobalt (III) chloride?  
 a) It is an anionic complex  
 b) In this coordination number of cobalt is +3  
 c) In this oxidation state of cobalt is +3  
 d) It is heteroleptic complex
39. Identify the oxidation state of Cr in  $K_3[Cr(C_2O_4)_3]$   
 a) + 5                      b) + 2                      c) + 6                      d) + 3
40. What is the oxidation number of Fe in  $K_3[Fe(CN)_6]$  ?  
 a) - 6                      b) + 6                      c) + 3                      d) - 3
41. What is the oxidation number of Ru in  $[Ru(NH_3)_5 H_2O] Cl_2$  ?  
 a) + 2                      b) + 5                      c) + 1                      d) + 6
42. What are the oxidation state and coordination number of platinum respectively in  $[Pt(NH_3)_6]^{4+}$  ?  
 a) + 6 and 6                      b) + 4 and 4                      c) + 6 and 4                      d) + 4 and 6
43. What is oxidation state of iron in potassium hexacyanoferrate (II) ?  
 a) + 3                      b) + 2                      c) + 6                      d) + 4
44. What is the coordination number of Pt in  $[PtCl_2(NH_3)_2]$  and  $[Pt(NH_3)_6]^+$  respectively?  
 a) 2 and 4                      b) 2 and 2                      c) 4 and 6                      d) 4 and 4
45. Which among the following compounds is cationic complex ?  
 a) Sodium hexanitrocobaltate (III)                      b) Lithium hydridoaluminate (III)  
 c) Sodium tetrachlorozincate (II)                      d) Diammine silver (I) nitrate.

## Co-ordination compounds

66. What is the oxidation number of central metal atom in  $[\text{Cr}(\text{NH}_3)_6](\text{NO}_3)_3$  ?  
 a) + 2                      b) + 6                      c) + 4                      d) + 3
67. What is oxidation state of iron in potassium ferrate ?  
 a) + 2                      b) + 4                      c) + 3                      d) + 6

## [MHT-CET 2021]

68. Which among the following is a homoleptic complex ?  
 a)  $[\text{Pt Br}_2 (\text{NH}_3)_4] \text{Br}_2$                       b)  $[\text{Co}(\text{NO}_2)_3(\text{NH}_3)_3]$   
 c)  $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)_3]$                       d)  $[\text{Fe}(\text{H}_2\text{O})_5 \text{CN}(\text{S})]^{2+}$
69. Identify homoleptic complex from following.  
 a)  $[\text{Co}(\text{NH}_3)_6]^{3+}$                       b)  $[\text{Co}(\text{NH}_3)_5\text{Cl}] \text{SO}_4$   
 c)  $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$                       d)  $[\text{Co}(\text{H}_2\text{O})(\text{NH}_3)_5] \text{I}_3$
70. Which among following statements is true about  $\text{Na}_4[\text{Fe}(\text{CN})_6]$  ?  
 a) The complex ion carries - 4 charge.  
 b) It is a neutral complex.  
 c) The oxidation state of Fe in this complex is + 6  
 d) The C. N. of Fe in this complex is 10

## [MHT-CET 2022]

71. How many unpaired electrons are present in cobalt ion in +3 oxidation state prior to hybridization in  $[\text{CoF}_6]^{3-}$  complex ion ?  
 a) 3                      b) 4                      c) zero                      d) 2
72. What is the oxidation state of cobalt in complex  $[\text{Co}(\text{NH}_3)_6]^{3+}$  ?  
 a) 2 +                      b) 3 +                      c) 4 +                      d) 6 +
73. Identify the correct decreasing stability order of complexes formed by metal ions with same ligand.  
 a)  $\text{Co}^{2+} > \text{Ni}^{2+} > \text{Fe}^{2+} > \text{Cu}^{2+}$                       b)  $\text{Cu}^{2+} > \text{Ni}^{2+} > \text{Co}^{2+} > \text{Fe}^{2+}$   
 c)  $\text{Cu}^{2+} > \text{Co}^{2+} > \text{Fe}^{2+} > \text{Ni}^{2+}$                       d)  $\text{Fe}^{2+} > \text{Co}^{2+} > \text{Ni}^{2+} > \text{Cu}^{2+}$
74. Identify the co-ordination number of cobalt ion in hexaammine cobalt (III) iodide complex.  
 a) 4                      b) 6                      c) 8                      d) 5
75. Identify cationic complex from following.  
 a) Tetracyanonickelate (II) ion  
 b) Triamminetrinitrocobalt (III)  
 c) Pentaamminechlorocobalt (II) sulphate  
 d) Trioxalatocobaltate (III) ion.

## Effective atomic number (EAN) rule

## [MHT-CET 2017]

76. Which of the following coordinate complexes is an exception to EAN rule ?  
 (Given : At. No. Pt = 78, Fe = 26, Z = 30, Cu = 29)  
 a)  $[\text{Pt}(\text{NH}_3)_6]^{4+}$                       b)  $[\text{Fe}(\text{CN})_6]^{4+}$                       c)  $[\text{Zn}(\text{NH}_3)_4]^{2+}$                       d)  $[\text{Cu}(\text{NH}_3)_4]^{2+}$



The effective atomic number of iron ( $z = 26$ ) in  $[\text{Fe}(\text{CN})_6]^{-3}$  is

- a) 35                      b) 34                      c) 33                      d) 36  
 The effective atomic number of Co ( $z = 27$ ) in  $[\text{Co}(\text{NH}_3)_6]^{3+}$  is  
 a) 27                      b) 34                      c) 35                      d) 36

## [MHT-CET 2020]

What is the effective atomic number of Fe in  $[\text{Fe}(\text{CN})_6]^{4-}$ ? (At. no. of Fe = 26)

- a) 26                      b) 34                      c) 36                      d) 35

Which from the following complexes, the central metal ion does NOT obey EAN rule?  
 (Atomic no : Pt = 78, Cu = 29, Zn = 30, Fe = 26)

- a)  $[\text{Pt}(\text{NH}_3)_6]^{4+}$                       b)  $[\text{Zn}(\text{NH}_3)_4]^{2+}$                       c)  $[\text{Cu}(\text{NH}_3)_4]^{2+}$                       d)  $[\text{Fe}(\text{CN})_6]^{4-}$

What is the effective atomic number of Zn in  $[\text{Zn}(\text{NH}_3)_4]\text{SO}_4$ ?

- a) 27                      b) 36                      c) 30                      d) 28

What is EAN of cobalt in  $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$  (At no. of Co = 27)?

- a) 36                      b) 28                      c) 27                      d) 30

What is the effective atomic number of Cu in  $[\text{Cu}(\text{NH}_3)_4]^{2+}$ ? (At. no. of Cu = 29)

- a) 35                      b) 36                      c) 29                      d) 34

## [MHT-CET 2021]

What is the effective atomic number of Fe in  $[\text{Fe}(\text{CN})_6]^{4-}$ ?

(Atomic number of Fe = 26)

- a) 36                      b) 26                      c) 30                      d) 32

What is effective atomic number of cobalt in  $[\text{Co}(\text{NH}_3)_6]^{3+}$  Pt Co ( $z = 27$ )?

- a) 30                      b) 33                      c) 27                      d) 36

What is effective atomic number of Pt in  $[\text{Pt}(\text{NH}_3)_4]^{2+}$ ?

(Given : atomic number of Pt = 78)

- a) 76                      b) 84                      c) 72                      d) 86

What is the oxidation state of cobalt in coordination complex if its EAN is 36 and the value of C.N. is 6 (Given : atomic no. of Co = 27)

- a) +4                      b) +2                      c) +1                      d) +3

What is the value of coordination number in Fe in its complex if effective atomic number is 35 and the oxidation state is +3? ( $z = 26$ )

- a) 4                      b) 2                      c) 8                      d) 6

If four different coordinate compounds A, B, C and D have EAN 18, 36, 54 and 35 respectively, identify the compound that does not obey EAN rule.

- a) A                      b) D                      c) C                      d) B

## [MHT-CET 2022]

What is the value of number of electrons donated by ligand molecules in a complex  $[\text{Fe}(\text{CN})_6]^{3-}$  if EAN is 35 and Fe ( $z = 26$ )?

- a) 4                      b) 26                      c) 6                      d) 12

What is the EAN of central metal ion in  $[\text{Cr}(\text{CO})_6]$  if Cr ( $z = 24$ )?

- a) 36                      b) 35                      c) 18                      d) 54

[MHT-CET 2015]

92.  $[\text{Cr}(\text{NH}_3)_6][\text{Cr}(\text{SCN})_6]$  and  $[\text{Cr}(\text{NH}_3)_2(\text{SCN})_4][\text{Cr}(\text{NH}_3)_4(\text{SCN})_2]$  are the examples of what type of isomerism?

- a) Ionization isomerism  
c) Coordination isomerism

- b) Linkage isomerism  
d) Solvate isomerism

[MHT-CET 2019]

93. Which among the following is used in the treatment of cancer?

- a) Trans -  $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$   
c) Trans -  $[\text{Pt}(\text{en})_2\text{Cl}_2]$

- b) Cis -  $[\text{PtCl}_2(\text{NH}_3)_2]$   
d) Cis -  $[\text{Pt}(\text{en})_2\text{Cl}_2]$

94. The complex ions  $[\text{Co}(\text{H}_2\text{O})_5(\text{ONO})]^{2+}$  and  $[\text{Co}(\text{H}_2\text{O})_5\text{NO}_2]^{2+}$  are

- a) linkage isomers  
c) coordination isomers

- b) geometrical isomers  
d) ionization isomers.

[MHT-CET 2020]

95. What type of isomerism is present between (i)  $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$  and (ii)  $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$ ?

- a) Coordination      b) Linkage      c) Ionization      d) Hydrates

96. Which among the following pairs of compounds is an example of linkage isomerism?

- a)  $[\text{Co}(\text{NH}_3)_5\text{NO}_2]\text{SO}_4$  and  $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{NO}_2$   
b)  $[\text{Co}(\text{NH}_3)_5\text{NO}_2]\text{Cl}_2$  and  $[\text{Co}(\text{NH}_3)_5\text{ONO}]\text{Cl}_2$   
c)  $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$  and  $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$   
d)  $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Br}$  and  $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$

[MHT-CET 2022]

97. Identify the type of isomerism exhibited by complex compounds,  $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$  and  $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$ .

- a) Ionization isomerism  
c) Solvate isomerism

- b) Coordination isomerism  
d) Linkage isomerism

98. What type of isomerism is exhibited by  $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$  and  $[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$ ?

- a) Linkage isomerism  
c) Coordination isomerism

- b) Ionization isomerism  
d) Solvate isomerism

99. Which among the following complexes exhibits the geometrical as well as optical isomerism?

- a)  $[\text{Pt}(\text{NH}_3)(\text{H}_2\text{O})\text{Cl}_2]$   
c)  $[\text{Co}(\text{en})_3]^{3+}$

- b)  $[\text{PtCl}_2(\text{en})_2]^{2+}$   
d)  $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$

100. Identify a pair of compounds that represents linkage isomers.

- a)  $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]^{2+}$  and  $[\text{Co}(\text{NH}_3)_5(\text{ONO})]^{2+}$   
b)  $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$  and  $[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$   
c)  $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Br}$  and  $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$   
d)  $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$  and  $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$



101. Which among the following is NOT a type of constitutional isomer ?
- Coordination isomers
  - Ionization isomers
  - Geometric isomers
  - Solvate isomers

### IUPAC Nomenclature of Coordination Compounds

[MHT-CET 2015]

102. The correct IUPAC name of  $[\text{Co}(\text{NH}_3)_3(\text{NO}_2)_3]$
- Triamminetrinitro - N - cobalt (III)
  - Triamminetrinitro - N - cobalt (II)
  - Triamminecobalt (III) nitrite
  - Triamminetrinitro - N - cobaltate (III)

[MHT-CET 2019]

103. IUPAC name of the complex  $\text{Ba}[\text{CuCl}_4]$  is
- Bariumtetrachlorocuprate (II)
  - Tetrachlorobariumcuprate (III)
  - Tetrachlorobariumcopper (II)
  - Bariumtetrachlorocuprate (III)
104. The IUPAC name of coordinate complex  $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$  is
- diamminedichloroplatinum (II)
  - dichlorodiammineplatinum (IV)
  - diamminedichloroplatinum (IV)
  - dichlorodiammineplatinum (II)

[MHT-CET 2020]

105. Which among the following is a correct formula of pentammineaquacobalt (III) iodide?
- $[\text{Co}(\text{H}_2\text{O})(\text{NH}_3)_3]\text{I}$
  - $[\text{Co}(\text{NH}_3)_5\text{I}]\text{H}_2\text{O}$
  - $[\text{Co}(\text{NH}_3)_5(\text{H}_2\text{O})]\text{I}_3$
  - $[\text{Co}(\text{H}_2\text{O})(\text{NH}_3)_5\text{I}]$
106. Identify the formula of potassiumtrioxlatoaluminate (III)
- $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)_3]$
  - $[\text{K}_3\text{Al}(\text{C}_2\text{O}_4)_3]$
  - $\text{K}_4[\text{Al}(\text{C}_2\text{O}_4)_3]$
  - $\text{Al}_3[\text{K}_3(\text{C}_2\text{O}_4)_3]$
107. What is IUPAC name of  $[\text{CoCl}_2(\text{en})_2]^+$  ?
- Bis (ethylenediammine) dichlorocobalt (III) ion
  - Ethylene diamine cobalt (I) dichloride
  - Ethylene diamine cobalt chloride
  - Dichloro ethylene diammine cobalt (I)
108. Which among the following is a correct formula of Bariumtetrachlorocuprate (II) ?
- $\text{Ba}[\text{CuCl}_4]$
  - $\text{Cu}[\text{BaCl}_4]$
  - $\text{Ba}[\text{CuCl}_2]\text{Cl}_2$
  - $\text{Cu}[\text{BaCl}_2]\text{Cl}_2$
109. What is the systematic name of  $[\text{Cr}(\text{en})_3]\text{Cl}_3$  ?
- Ethylenediamminetrichlorochromate
  - Tri(ethylenediamine)chromium(II)chloride
  - Tris(ethylenediammine)chromium(III)chloride
  - Ethylenediamminechromium(II)chloride

110. What is systematic name of  $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$ ?

- a) Tetraammoniumcobaltchloride
- b) Tetramminedichlorocobalt (III) chloride
- c) Tetramminecobalt (II) chloride
- d) Dichlorotetraamminecobalt (III) chloride

[MHT-CET 2021]

111. What is the IUPAC name of  $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)_3]$ ?

- a) Potassium aluminium oxalate
- b) Potassium trioxalato aluminate (II)
- c) Potassium trioxalatoaluminate (III)
- d) Aluminium potassium oxalate

112. Which of the following is the formula of the coordination compound, sodium hexafluoroaluminate (III)?

- a)  $\text{Na}[(\text{AlF}_3)_2]$
- b)  $[\text{NaF}_2\text{AlF}_3]\text{F}$
- c)  $\text{Na}_3[\text{AlF}_6]$
- d)  $\text{Na}[\text{AlF}_6]$

113. Identify the formula of a coordinate complex pentaamminecarbonatocobalt (III) chloride.

- a)  $[\text{Co}_3(\text{NH}_3)_5(\text{COO})\text{Cl}_3]$
- b)  $[\text{Co}(\text{NH}_3)_5\text{CO}_2]\text{Cl}_3$
- c)  $[\text{Co}(\text{NH}_3)_5\text{CO}_3]\text{Cl}$
- d)  $[\text{Co}(\text{en})_5\text{CO}_2]\text{Cl}_3$

114. What is the IUPAC name of  $\text{Na}_3[\text{Co}(\text{NO}_2)_6]$ ?

- a) Sodiumhexanitrocobaltate (III)
- b) Sodiumnitrocobalt
- c) Hexanitrosodiumcobaltate
- d) Hexanitrocobalt (III) sodium

115. What is IUPAC name of  $[\text{Co}(\text{H}_2\text{O})(\text{NH}_3)_5]\text{I}_3$ ?

- a) Pentaammineaquacobalt (III) iodide
- b) Pentaammineaquacobalt iodide
- c) Monoaquapentaammine triiodo cobaltate
- d) Pentaammineaquaquatriiodo cobaltate

116. Identify IUPAC name of  $[\text{Co}(\text{NH}_3)_3(\text{NO}_3)_3]$  from following.

- a) Triamminetrinitrocobalt (III)
- b) Trinitrotriammine cobalt
- c) Triaminotrinitrocobalt (VI)
- d) Triamminetrinitrocobaltate

117. What is IUPAC name of  $[\text{Fe}(\text{H}_2\text{O})_5(\text{NCS})]^{2+}$ ?

- a) Isothiocyanopentaquaferate (II)
- b) Pentaquaiothiocyanatoiron (III) ion
- c) Pentaquoioisocyanate iron (II) ion
- d) Pentaquaiothiocyanoferrate ion.

[MHT-CET 2022]

118. Identify the formula of Bis (ethylenediamine) dithiocyanatoplatinum (IV).

- a)  $[\text{Pt}(\text{en})_2(\text{SCN})_2]^{2+}$
- b)  $[\text{Pt}(\text{en})(\text{SCN})_2]^+$
- c)  $[\text{Pt}[(\text{en})_2\text{S}_2\text{CN}]^{4+}$
- d)  $[\text{Pt}[(\text{en})_2\text{S}_2\text{CN}]^{4-}$

119. Identify the formula of potassium trioxalatoaluminate (III)

- a)  $\text{K}[\text{Al}_3(\text{C}_2\text{O}_4)_3]$
- b)  $\text{Al}[\text{K}_3(\text{C}_2\text{O}_4)_3]$
- c)  $\text{K}[\text{Al}(\text{C}_2\text{O}_4)_3]$
- d)  $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)_3]$



148. Which among the following statements about  $[\text{Ni}(\text{CN})_4]^{2-}$  is NOT true ?
- In these electrons are paired prior to hybridization.
  - Oxidation state of Ni is +6
  - Ni undergoes  $\text{dsp}^2$  hybridization
  - It is a square planar complex

[MHT-CET 2022]

149. Which among the following complexes does not exhibit different geometrical isomers? (M = metal ion and A, B, C = ligands)

- $[\text{MA}_6]$
- $[\text{MA}_4\text{BC}]$
- $[\text{MA}_4\text{B}_2]$
- $[\text{M}(\text{AA})_2\text{B}_2]$

150. Identify correct pair of properties of  $[\text{Co}(\text{NH}_3)_6]^{3+}$  complex ion.

- High spin, paramagnetic
- Low spin, paramagnetic
- High spin, diamagnetic
- Low spin, diamagnetic

151. What is the number of unpaired electrons of nickel observed in  $[\text{Ni}(\text{CN})_4]^{2-}$  ?

- 6
- 2
- 4
- zero

152. How many hybrid orbitals of cobalt ion are involved in formation of hexaammine cobalt (III) chloride complex ?

- 6
- 3
- 2
- 4

153. Identify the number of unpaired electrons present and the geometry respectively of a complex  $[\text{CoF}_6]^{3-}$ . (Atomic number of Co = 27)

- 0, Octahedral
- 2, Trigonal pyramidal
- 0, Trigonal bipyramidal
- 4, Octahedral

154. What type of geometry and magnetic nature is present in a complex  $[\text{NiCl}_4]^{2-}$  ?

- square planar, paramagnetic
- square planar, diamagnetic
- tetrahedral, diamagnetic
- tetrahedral, paramagnetic

155. Which among following pairs of structure and magnetic property is correct for tetracyanonickalate (II) ion ?

- Tetrahedral, diamagnetic
- square planar, diamagnetic
- Tetrahedral, paramagnetic
- square planar, paramagnetic

156. Identify the type of hybridization involved in hexaamminecobalt (III) complex ion.

- $\text{d}^2\text{sp}^3$
- $\text{sp}^3\text{d}^2$
- $\text{sp}^3$
- $\text{dsp}^3$

157. What is the number of unpaired electrons in  $[\text{Co}(\text{NH}_3)_6]^{3+}$  complex ?

- six
- four
- zero
- two

158. Which from following statements is NOT correct about  $[\text{CoF}_6]^{3-}$  complex ?

- It is an octahedral complex
- It is low spin complex
- There are four unpaired electrons in this complex
- It is paramagnetic

159. Which of the following statements is true about complex ions  $[\text{NiCl}_4]^{2-}$  and  $[\text{Ni}(\text{CN})_4]^{2-}$  ?

- In both of these 3d electrons get paired prior to hybridization
- Both complexes are square planar
- In both complex ions Ni undergoes  $\text{sp}^3$  hybridization
- $[\text{Ni}(\text{Cl})_4]^{2-}$  is paramagnetic but  $[\text{Ni}(\text{CN})_4]^{2-}$  is diamagnetic