



CET25C5 COORDINATION COMPOUNDS

Class 12 - Chemistry

Time Allowed: 1 hour and 30 minutes

Maximum Marks: 75

1. Which of the following is paramagnetic? [1]
a) $K_3[Fe(CN)_6]$ b) $K_4[Fe(CN)_6]$
c) $Ni(CO)_4$ d) $[Co(NH_3)_6]Cl_3$
2. The octahedral complex, trioxalatochromate(III) will show [1]
a) Structural isomerism b) Optical isomerism
c) Linkage isomerism d) Geometrical isomerism
3. Which of the following exists as white salt in anhydrous state? [1]
a) Copper oxide b) Both $CuSO_4$ and CuF_2
c) CuF_2 d) $CuSO_4$
4. The crystal field splitting depends upon [1]
a) Distance of ligand from metal ion b) Charge on the metal ion
c) Both the field produced by the ligand and the charge on the metal ion. d) Field produced by the ligand
5. The oxidation state of Ni in $[Ni(CO)_4]$ is [1]
a) 4 b) 3
c) 0 d) 2
6. Which of the following is true about crystal field theory? [1]
a) It is based on the concept of hybridisation of orbitals. b) It explains why anionic ligands are at the low end of the electrochemical series.
c) It is an electrostatic model. d) It considers the covalent character of bonding between the ligand and the central metal.
7. The compounds $[Co(SO_4)(NH_3)_5]Br$ and $[Co(SO_4)(NH_3)_5]Cl$ represent: [1]
a) Isonisation isomerism b) No isomerism
c) Linkage isomerism d) Coordination isomerism
8. Which of the following species is expected to be colourless? [1]
a) $[Ti(H_2O)_6]^{3+}$ b) $[Fe(CN)_6]^{4-}$

- c) $[\text{Cr}(\text{NH}_3)_6]^{3+}$ d) $[\text{Ti}(\text{NO}_3)_4]$
9. The formula of the complex Iron (III) hexacyanidoferrate (II) is: [1]
a) $\text{Fe}_2[\text{Fe}(\text{CN})_6]_3$ b) $\text{Fe}[\text{Fe}(\text{CN})_6]$
c) $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$ d) $\text{Fe}_3[\text{Fe}(\text{CN})_6]_2$
10. In the complex $\text{Fe}(\text{CO})_x$, the value of x is [1]
a) 5 b) 2
c) 3 d) 4
11. What is used as the complexing agent in volumetric analysis of ions like Mg^{2+} and Ca^{2+} ? [1]
a) DMG b) EDTA
c) All of these d) KSCN
12. What is the secondary valency of Cobalt in $[\text{Co}(\text{en})_2\text{Cl}_2]^+$? [1]
a) 8 b) 6
c) 4 d) 2
13. Which of the following species is not expected to be a ligand? [1]
a) NH_4^+ b) $\text{NH}_2\text{CH}_2\text{NH}_2$
c) CO d) NO
14. According to Werner's theory, the secondary valences of the central atom correspond to its: [1]
a) Charge b) Oxidation number
c) Effective atomic number d) Coordination number
15. Which isomerism is exhibited by the compound $[\text{Co}(\text{NH}_3)_3(\text{H}_2\text{O})_3]\text{Cl}_3$? [1]
a) Geometrical isomerism b) Coordination isomerism
c) Linkage isomerism d) Hydrate isomerism
16. In the complex ion, $[\text{Fe}(\text{C}_2\text{O}_4)^{3-}]$, the coordination number of Fe is [1]
a) 6 b) 4
c) 5 d) 3
17. The coordination number of Co in the complex $[\text{Co}(\text{en})_3]^{3+}$ is: [1]
a) 6 b) 5
c) 4 d) 3
18. Which of the following ligands is an ambidentate ligand? [1]
a) NO_2 b) NH_3
c) CO d) H_2O
19. 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)? [1]

- a) Solvate isomerism
b) Ionisation isomerism
c) Linkage isomerism
d) Coordination isomerism
20. What type of isomerism is shown by the following pair of complex compounds? [1]
[Co(NH₃)₆] [Cr(CN)₆] and [Cr(NH₃)₆] [Co(CN)₆]
- a) Ionization isomerism
b) Hydrate isomerism
c) Linkage isomerism
d) Coordination isomerism
21. Which among the following will not show geometrical isomerism? [1]
a) [Co(en)₃]³⁺
b) [Cr(NH₃)₄Cl₂]Cl
c) [Co(en)₂Cl₂]Cl
d) [Cr(en)₂Cl₂]Cl
22. The correct IUPAC name of [Pt(NH₃)₂ Cl₂] is [1]
a) Diamminedichloridoplatinum (II)
b) Diamminedichlorideplatinum (0)
c) Diamminedichlorideplatinum (IV)
d) Dimminedichlorideplatinum (IV)
23. The CFSE for octahedral [CaCl₆]⁴⁻ is 18,000 cm⁻¹. The CFSE for tetrahedral [COCl₄]²⁻ will be: [1]
a) 16,000 cm⁻¹
b) 8,000 cm⁻¹
c) 20,000 cm⁻¹
d) 18,000 cm⁻¹
24. Which of the following species is **not** expected to be a ligand? [1]
a) H₂O
b) CO
c) NH₄⁺
d) NH₃
25. Which of the following complexes is a chelate complex? [1]
a) [Co(NH₃)₆]³⁺
b) [Co(en)₃]³⁺
c) [Co(NH₃)₄Cl₂]⁺
d) [CoF₆]³⁻
26. Which of the following is the most stable complex ? [1]
a) [Fe(CO)₅]
b) [Fe(H₂O)₆]³⁺
c) [Fe(C₂O₄)₃]³⁻
d) [Fe(CN)₆]³⁻
27. Which of the following coordination compounds exhibits linkage isomerism? [1]
a) [Co(en)₃]Cl₃
b) [Co(NH₃)₅NO₂](NO₃)₂
c) [Co(NH₃)₃Cl₃]
d) [Co(NH₃)₅(CO₃)]Cl
28. Which type of isomerism is shown by the complexes [Co(NH₃)₅Br]SO₄ and [Co(NH₃)₅SO₄]Br? [1]
a) Solvate
b) Linkage
c) Optical
d) Ionisation
29. According to Werner's theory , the primary valences of the central atom [1]
a) Are equal to its coordination number
b) Are satisfied by negative ions

- c) Decide the geometry of the complex
d) Are satisfied by negative ions or neutral molecules
30. The oxidation number of Co in $[\text{Co}(\text{en})_3]_2(\text{SO}_4)_3$ is: [1]
a) +4
b) +2
c) +3
d) +6
31. The formula of Zeise's salt is [1]
a) $\text{K}^+[\text{PtCl}_3(\text{C}_2\text{H}_4)]^-$
b) $[\text{PtCl}_3.\text{C}_2\text{H}_6]^- \text{K}^+$
c) $[\text{PtCl}_2.(\text{C}_2\text{H}_2)]^- \text{K}^+$
d) $[\text{PtCl}_3.\text{C}_6\text{H}_6]^- \text{K}^+$
32. How many ions are produced from the complex $\text{Co}(\text{NH}_3)_6\text{Cl}_2$ in solution? [1]
a) 2
b) 6
c) 4
d) 3
33. Which of the following is a homoleptic complex? [1]
a) $[\text{Cr}(\text{NH}_3)_3\text{Cl}_3]$
b) $[\text{CoCl}_2(\text{en})_2]^+$
c) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$
d) $[\text{Cu}(\text{NH}_3)_4]^{+2}$
34. Which of the following ligands form a **chelate** complex with metal ion? [1]
a) CN^-
b) $\text{C}_2\text{O}_4^{2-}$
c) H_2O
d) Cl^-
35. The correct name of the compound $[\text{Cu}(\text{NH}_3)_4](\text{NO}_3)_2$ is: [1]
a) Cuprammonium nitrate
b) Tetraamminecopper(I) nitrate
c) Tetraamminecopper(II) nitrate
d) Tetraamminecopper(II)dinitrate
36. cis- and trans- isomers are possible in [1]
a) $[\text{Co}(\text{NH}_3)_6]^{3+}$
b) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$
c) $[\text{Cu}(\text{CN})_4]^{3-}$
d) $[\text{PtCl}_6]^{2-}$
37. The IUPAC name of $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2.6\text{H}_2\text{O}$ is: [1]
a) Ammonium ferrous sulphate hexahydrate
b) Diammonium ferrous disulphate water - 6
c) Ferrous ammonium sulphate water - 6
d) Diammonium ferrous sulphate
38. Which is used in cancer therapy? [1]
a) Zeise's salt
b) Cis – Platin
c) EDTA
d) Cyanocobalamin
39. Which of the following compound would exhibit coordination isomerism? [1]
a) $[\text{Cr}(\text{H}_2\text{O})]\text{Cl}_3$
b) $[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$
c) $[\text{Cr}(\text{en})_2]\text{NO}_2$
d) $[\text{Ni}(\text{NH}_3)_6][\text{BF}_4]_2$

40. The IUPAC name of $\text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ is: [1]
- a) Aluminium potassium sulphate – 12 – water b) Aluminium potassium sulphate dodecahydrate
- c) Aluminium (III) potassium sulphate hydrate – 12 d) Potassium aluminate(III) sulphate hydrate
41. How many ions are produced from the complex $[\text{Co}(\text{NH}_3)_6] \text{Cl}_2$ in solution? [1]
- a) 2 b) 3
- c) 4 d) 6
42. In the formation of complex entity, the central atom/ion acts as: [1]
- a) Lewis acid b) Lewis base
- c) Bronsted acid d) Bronsted base
43. Lithium tetrahydridoaluminate is represented as: [1]
- a) $\text{Al}_2[\text{LiH}_4]_3$ b) $\text{Li}[\text{AlH}_4]_2$
- c) $\text{Al}[\text{LiH}_4]$ d) Lithium tetrahydridoaluminate is represented as: $\text{Li}[\text{AlH}_4]$
44. Total number of unpaired electrons present in Cr^{3+} (Atomic number = 24) is [1]
- a) 3 b) 5
- c) 2 d) 7
45. The crystal field splitting energy in tetrahedral crystal field (Δ_t) is equal to: [1]
- a) $\frac{4}{3} \Delta_0$ b) $\frac{4}{9} \Delta_0$
- c) $\frac{9}{4} \Delta_0$ d) $2\Delta_0$
46. In the complex $\text{PtCl}_4 \cdot 3\text{NH}_3$, the number of ionisable chlorines is [1]
- a) 3 b) 1
- c) 0 d) 2
47. Indicate the complex ion which shows geometrical isomerism. [1]
- a) $[\text{Co}(\text{CN})_5(\text{NC})]^{3-}$ b) $[\text{Pt}(\text{NH}_3)_6]^{3+}$
- c) $[\text{Cr}(\text{H}_2\text{O})_4 \text{Cl}_2]^+$ d) $[\text{Pt}(\text{NH}_3)_3\text{Cl}]$
48. Which type of isomerism is exhibited by the given complex? [1]
 $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$
- a) Coordination isomerism b) Geometrical isomerism
- c) Ionisation isomerism d) Optical isomerism
49. The correct IUPAC name of $\text{Mn}_3(\text{CO})_{12}$ is: [1]
- a) Manganicdodecacarbonyl(0) b) Dodecacarbonylmaganic(II)
- c) Dodecacarbonylmanganate(0) d) Dodecacarbonyltrimangnese(0)

50. Which of the following compounds formed by Cu^{2+} ions is most stable? [1]
- a) $\text{Cu}^{2+} + 4\text{CN}^- \rightleftharpoons [\text{Cu}(\text{CN})_4]^{2-}$; $\text{Log } K = 27.3$ b) $\text{Cu}^{2+} + 4\text{H}_2\text{O} \rightleftharpoons [\text{Cu}(\text{H}_2\text{O})_4]^{2+}$; $\text{Log } K = 8.9$
- c) $\text{Cu}^{2+} + 4\text{NH}_3 \rightleftharpoons [\text{Cu}(\text{NH}_3)_4]^{2+}$; $\text{Log } K = 11.6$ d) $\text{Cu}^{2+} + 2 \text{ en} \rightleftharpoons [\text{Cu}(\text{en})_2]^{2+}$; $\text{Log } K = 15.4$
51. K_3CoF_6 is a high spin complex. What is the hybrid state of Co atom in this complex? [1]
- a) d^2sp^3 b) dsp^2
- c) sp^3d d) sp^3d^2
52. $[\text{Co}(\text{NH}_3)_5\text{NO}_3]\text{SO}_4$ and $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{NO}_3$ exhibit: [1]
- a) ionization isomerism b) coordination isomerism
- c) optical isomerism d) linkage isomerism
53. EDTA is a [1]
- a) hexadentate ligand b) ambidentate ligand
- c) monodentate ligand d) bidentate ligand
54. The anti pernicious anaemia factor which is a coordination compound of Cobalt is: [1]
- a) Cyanocobalamine b) Haemoglobin
- c) Desferrioxime B d) Carbonic anhydrase
55. Which of the following complex ions/molecules of nickel is paramagnetic? [1]
- a) $[\text{Ni}(\text{CO})_4]$ b) $[\text{Ni}(\text{CN})_4]^{2-}$
- c) $[\text{Ni}(\text{NH}_3)_4]^{2+}$ d) $\text{Ni}(\text{dimethylglyoxime})_2$
56. Which of these will dissociate completely into simple ions when dissolved in water? [1]
- a) $\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ b) $\text{K}_4[\text{Fe}(\text{CN})_6]$
- c) $\text{K}_3[\text{Fe}(\text{CN})_6]$ d) $[\text{Co}(\text{CN})_6]^{3-}$
57. Which of the following is a negatively charged ligand? [1]
- a) Cyclopentadienyl b) Thiocarbonyl
- c) Nitrosyl d) Carbonyl
58. How many ions are produced from the complex $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ in solution? [1]
- a) 5 b) 2
- c) 3 d) 4
59. In the complex $[\text{Ni}(\text{H}_2\text{O})_2(\text{NH}_3)_4]^{2+}$, the number of unpaired electron is [1]
- a) 0 b) 2
- c) 3 d) 1

60. In a coordination entity of the type $[\text{PtCl}_2(\text{en})_2]^{2+}$ which isomer will show optical isomerism? [1]

 - mer-isomer
 - fac-isomer
 - cis-isomer
 - trans-isomer

61. The hardness of water is estimated by [1]

 - Titration with EDTA
 - Gravimetric method
 - Distillation method
 - Conductivity method

62. The correct IUPAC name of $[\text{Fe}(\text{C}_5\text{H}_5)_2]$ is: [1]

 - Bicyclopentadienyliron(II)
 - Dicyclopentadienylferrate(II)
 - Cyclopentadienyliron(II)
 - Bis(cyclopentadienyl)iron(II)

63. Tetraamminecopper(II) ion is a square planar complex with one unpaired electron. According to valence bond theory, the hybrid state of copper should be: [1]

 - dsp^2
 - sp^3d^2
 - d^2sp^3
 - sp^3

64. Due to the presence of ambidentate ligands coordination compounds show isomerism. Palladium complexes of the type $[\text{Pd}(\text{C}_6\text{H}_5)_2(\text{SCN})_2]$ and $[\text{Pd}(\text{C}_6\text{H}_5)_2(\text{NCS})_2]$ are: [1]

 - Ionisation isomers
 - Coordination isomers
 - Geometrical isomers
 - Linkage isomers

65. What type of isomerism is shown by the pair $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$ and $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$? [1]

 - Solvate isomerism
 - Ionisation isomerism
 - Linkage isomerism
 - Coordination isomerism

66. Which of the following complexes can form d and l isomers? [1]

 - Trans - $[\text{Co}(\text{en})_2\text{Cl}_2]^+$
 - $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$
 - Cis - $[\text{Co}(\text{en})_2\text{Cl}_2]^+$
 - $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$

67. When 1 mol $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ is treated with an excess of AgNO_3 , 3 mol of AgCl are obtained. The formula of the complex is: [1]

 - $[\text{CrCl}_2(\text{H}_2\text{O})_4]\text{Cl} \cdot 2\text{H}_2\text{O}$
 - $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$
 - $[\text{CrCl}_3(\text{H}_2\text{O})_3] \cdot 3\text{H}_2\text{O}$
 - $[\text{CrCl}(\text{H}_2\text{O})_5]\text{Cl}_2 \cdot \text{H}_2\text{O}$

68. Which type of isomerism is shown by the given complex? [1]

$[\text{Co}(\text{en})_3]^{3+}$

 - Ionisation isomerism
 - Optical isomerism
 - Coordination isomerism
 - Linkage isomerism

69. Which of the following is a polydentate ligand? [1]

 - $\text{C}_2\text{O}_4^{2-}$
 - EDTA^{4-}

- c) NH_3 d) $\text{H}_2\text{N} - \text{CH}_2 - \text{CH}_2 - \text{NH}_2$
70. The metal-carbon bond in metal carbonyls possess: [1]
a) σ character b) π character
c) single bond d) both σ and π character
71. A chelating agent has two or more than two donor atoms to bind to a single metal ion. Which of the following is not a chelating agent? [1]
a) Oxalato b) Ethane-1,2-diamine
c) Glycinate d) Thiosulphate
72. Ferric chloride combines with potassium ferrocyanide solution to give [1]
a) $\text{K}_4[\text{Fe}(\text{CN})_6]$ b) $\text{K}_3[\text{Fe}(\text{CNS})_6]$
c) $\text{KFe}[\text{Fe}(\text{CN})_6]$ d) $\text{K}_3[\text{Fe}(\text{CN})_6]$
73. The pair $[\text{Co}(\text{NH}_3)_4\text{Cl}_2] \text{Br}_2$ and $[\text{Co}(\text{NH}_3)_4\text{Br}_2] \text{Cl}_2$ will show: [1]
a) Ionization isomerism b) Hydrate isomerism
c) Coordinate isomerism d) Linkage isomerism
74. Which among the following has trigonal bipyramidal geometry? [1]
a) Pentacarbonyliron (0) b) Potassium tetracyanonickelate(II)
c) Tetracarbonylnickel(0) d) Hexaamminecobalt(II) nitrate
75. Which of the following ions has the electronic configuration $3d^6$? (Atomic number : Mn = 25, Co = 27, Ni = 28) [1]
a) Ni^{3+} b) Mn^{2+}
c) Co^{3+} d) Mn^{3+}