

EXERCISE - I (Conceptual Questions)

Build Up Your Understanding

TERMINOLOGY OF COORDINATION COMPOUND

- In the complex ion $[\text{Fe}(\text{EDTA})]^-$ the coordination number and oxidation state of central metal ion is :-
 (1) C.N. = 6 O.N. = +3
 (2) C.N. = 1 O.N. = -1
 (3) C.N. = 4 O.N. = +2
 (4) C.N. = 3 O.N. = +3

CC0001

- The coordination number and oxidation number of the central metal ion in the complex $[\text{Pt}(\text{en})_2]^{+2}$ is :-
 (1) C.N. = 2, O.N. = +2 (2) C.N. = 6, O.N. = +4
 (3) C.N. = 4, O.N. = +4 (4) C.N. = 4, O.N. = +2

CC0002

- Select bidentate or didentate ligand from the following.
 (1) CO (2) SCN^-
 (3) CH_3COO^- (4) $\text{C}_2\text{O}_4^{2-}$

CC0003

- The oxidation and coordination number of Pt in $[\text{Pt}(\text{C}_2\text{H}_4)\text{Cl}_3]^-$ is respectively :-
 (1) + 1, 3 (2) + 2, 4
 (3) + 3, 6 (4) + 2, 5

CC0004

- The CN and ON of X in the complex compound $[\text{X}(\text{SO}_4)(\text{NH}_3)_5]$ will be respectively :-
 (1) 10 and +3 (2) 1 and +6
 (3) 6 and +4 (4) 6 and +2

CC0005

- What is the oxidation number of Fe in $[\text{Fe}(\text{H}_2\text{O})_5(\text{NO})]^{2+}$ ion?
 (1) +2 (2) +3 (3) +1 (4) 0

CC0006

- Which one is a heteroleptic complex ?
 (1) Ferrocene (2) Chromocene
 (3) Prussian blue (4) Zeise's salt

CC0007

- Select the set representing correct statements only.

(I) A coordination entity constitutes a central metal atom or ion bonded to a fixed number of ions or molecules.

(II) Ligand having two different or similar donor atoms in the complex is called bidentate ligand.

(III) All bidentate ligands are chelating ligands.

(IV) Ni^{+2} , Co^{+3} and Fe^{+3} are acting as Lewis acids in $[\text{NiCl}_2(\text{H}_2\text{O})_4]$, $[\text{CoCl}(\text{NH}_3)_5]^{+2}$ and $[\text{Fe}(\text{CN})_6]^{-3}$.

- (1) I, II, III and IV (2) II and III
 (3) I, III and IV (4) I, II and IV

CC0008

- Oxidation number of Cobalt in $\text{K}[\text{Co}(\text{CO})_4]$ is :-
 (1) +1 (2) -1 (3) 0 (4) +2

CC0009

- Which of the following species is not expected to be ligand :-

- (1) NO (2) NH_4^+
 (3) $\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2$ (4) CO

CC0010

- Identify the statement which is not correct :-

(1) Coordination compounds are mainly known for transition metals.

(2) Coordination number and oxidation state of central metal atom in a complex is same.

(3) Ligand donates at least one electron pair to CMA

(4) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ is a heteroleptic complex.

CC0011

- Which of the following ligands will not show chelation?

- (1) EDTA
 (2) DMG
 (3) Ethane-1, 2 diamine
 (4) SCN^-

CC0012

IUPAC - NOMENCLATURE

13. $K_3[Fe(CN)_6]$ is :-
 (a) Potassium hexacyano ferrate (II)
 (b) Potassium hexacyano ferrate (III)
 (c) Potassium ferri-cyanide
 (d) Hexacyano ferrate (III) potassium
 Correct answer is :-
 (1) Only (a) and (b) (2) Only (b) and (c)
 (3) Only (a) and (c) (4) Only (b) and (d)
CC0013
14. Give the IUPAC name of the complex compound $[Co(NH_3)_4(H_2O)Br](NO_3)_2$.
 (1) Bromoaquatetraamine Cobalt (III) nitrate
 (2) Bromoaquatetraaminocobalt (III) nitrate
 (3) Bromoaquatetraammine cobaltate (III) nitrate
 (4) Tetraammineaquabromido cobalt (III) nitrate
CC0014
15. Which of the following complex is anion :-
 (1) Fluoro pentaammine cobalt(III)
 (2) Trioxalato ferrate(III)
 (3) Penta Carbonyl iron(0)
 (4) Dichloro diammine platinum(II)
CC0015
16. The chloro-bis (ethylenediamine) nitro cobalt (III) ion is :-
 (1) $[Co(NO_2)_2(en)_2Cl_2]$
 (2) $[CoCl(NO_2)_2(en)_2]^+$
 (3) $[CoCl(en)_2NO_2]^+$
 (4) $[Co(en)Cl_2(NO_2)_2]^-$
CC0016
17. Which of the following complexes is not a chelate
 (1) Bis (dimethylglyoximate) nickel(II)
 (2) Potassium ethylenediaminetetra thiocyanatochromate(III)
 (3) Tetrammine dichlorocobalt(III) nitrate
 (4) Trans-diglycinatoplatinum(II)
CC0017

18. The correct IUPAC name of the complex $[Fe(\eta^5-C_5H_5)_2]$ is
 (1) Cyclopentadienyl iron (II)
 (2) Bis (cyclopentadienyl) iron (II)
 (3) Dicyclopentadienyl ferrate (II)
 (4) Ferrocene
CC0018
19. The correct name of $[Pt(NH_3)_4Cl_2]$ $[PtCl_4]$ is :-
 (1) Tetraammine dichloro platinum (IV) tetrachloro platinate (II)
 (2) Dichloro tetra ammine platinum (IV) tetrachloro platinate (II)
 (3) Tetrachloro platinum (II) tetraammine platinate(IV)
 (4) Tetrachloro platinum (II) dichloro tetraammine platinate (IV)
CC0019
20. The IUPAC name of $K_2[Cr(CN)_2O_2(O)_2(NH_3)]$ is:-
 (1) Potassiumamminedicyano dioxoperoxochromate(VI)
 (2) Potassium-ammine-cyano-peroxodioxo chromium (VI)
 (3) Potassiumamminecyanoperoxodioxo chromium (VI)
 (4) Potassiumamminecyanoperoxodioxo chromate (IV)
CC0020
21. The IUPAC name for $[Co(NH_3)_6][Cr(CN)_6]$ is :-
 (1) Hexaammine cobalt (III) hexacyanochromate (III)
 (2) Hexacyanochromium cobalt hexaammine (VI)
 (3) Hexaammine cobalt (III) hexacyanochromium (VI)
 (4) Hexacyanochromium (III) hexaammine cobalt (III)
CC0021
22. The IUPAC name for $[Co(NCS)(NH_3)_5]Cl_2$ is :-
 (1) Pentaammine (thiocyanato-N) cobalt (III) chloride
 (2) Pentaammine (thiocyanato-S) cobalt (III) chloride
 (3) Pentaammine (isothiocyanato-N,S)cobalt (III) chloride
 (4) Pentaammine (mercapto-N) cobalt (III) chloride
CC0022

23. Which rule is incorrect regarding IUPAC nomenclature of complex ions ?
- (1) Cation is named first and then anion is named
 - (2) In the coordination sphere, the ligands are named alphabetically.
 - (3) Positively charged ligands have suffix-ate.
 - (4) More than one same type of ligands are indicated by di, tri, tetra etc.

CC0023

WERNER'S THEORY & EAN

24. Which of the following has least conductivity in aqueous solution.
- (1) $\text{CoCl}_3 \cdot 4\text{NH}_3$
 - (2) $\text{CoCl}_3 \cdot 3\text{NH}_3$
 - (3) $\text{CoCl}_3 \cdot 5\text{NH}_3$
 - (4) $\text{CoCl}_3 \cdot 6\text{NH}_3$

CC0024

25. If EAN of a central metal ion X^{+2} in a complex is 34. and atomic number of X is 28. The number of monodentate ligands present in complex are:-
- (1) 3
 - (2) 4
 - (3) 6
 - (4) 2

CC0025

26. The EAN of cobalt in the complex ion $[\text{Co}(\text{en})_2\text{Cl}_2]^+$ is :-
- (1) 27
 - (2) 36
 - (3) 33
 - (4) 35

CC0026

27. The effective atomic number of Cr (atomic no. 24) in $[\text{Cr}(\text{NH}_3)_6]\text{Cl}_3$ is
- (1) 35
 - (2) 27
 - (3) 33
 - (4) 36

CC0027

28. Which gives only 25% mole of AgCl, when reacts with AgNO_3 :-
- (1) $\text{PtCl}_2 \cdot 4\text{NH}_3$
 - (2) $\text{PtCl}_4 \cdot 5\text{NH}_3$
 - (3) $\text{PtCl}_4 \cdot 4\text{NH}_3$
 - (4) $\text{PtCl}_4 \cdot 3\text{NH}_3$

CC0028

29. In the metal carbonyls of general formula $\text{M}(\text{CO})_x$ (Which follows EAN rule) if M is Ni, Fe and Cr the value of x will be respectively:-
- (1) 6, 5, 6
 - (2) 4, 5, 6
 - (3) 4, 4, 5
 - (4) 4, 6, 6

CC0029

30. A compound has the empirical formula $\text{CoCl}_3 \cdot 5\text{NH}_3$. When an aqueous solution of this compound is mixed with excess silver nitrate, 2 mol of AgCl precipitate per mol of compound. On reaction with excess HCl, no NH_4^+ is detected. Hence it is
- (1) $[\text{Co}(\text{NH}_3)_5\text{Cl}_2]\text{Cl}$
 - (2) $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$
 - (3) $[\text{Co}(\text{NH}_3)_5\text{Cl}_3]$
 - (4) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl} \cdot \text{NH}_3$

CC0030

31. Which is incorrect regarding Werner theory :-
- (1) Co-ordination compounds metals show two types of valancy.
 - (2) Primary valency is satisfied by negative ions.
 - (3) Secondary valency is satisfied by only neutral molecules.
 - (4) Secondary valency is responsible for geometry of complex.

CC0031

32. Number of electrolytes in the complex $\text{CoCl}_3 \cdot 5\text{NH}_3$
- (1) 3
 - (2) 2
 - (3) 4
 - (4) 5

CC0032

VALENCE BOND THEORY

33. Which of the following compound is paramagnetic
- (1) Tetracyanonickelate (II) ion
 - (2) Tetraamminezinc (II) ion
 - (3) Hexaamine chromium (III) ion
 - (4) Diammine silver (I) ion

CC0033

34. The shape of the complex $[\text{Ag}(\text{NH}_3)_2]^+$ is :
- (1) Octahedral
 - (2) Square planar
 - (3) Tetrahedral
 - (4) Linear

CC0034

35. Hexafluoroferrate(III) ion is an outer orbital complex. The number of unpaired electrons are
- (1) 1
 - (2) 5
 - (3) 4
 - (4) 3

CC0035

36. The shape of $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$ is :
 (1) Square planar (2) Pyramidal
 (3) Octahedral (4) Tetrahedral
CC0036
37. Among the following ions, which one has the highest paramagnetism ?
 (1) $[\text{FeF}_6]^{3-}$ (2) $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$
 (3) $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ (4) $[\text{Zn}(\text{H}_2\text{O})_6]^{2+}$
CC0037
38. In the complex ion ML_6^{n+} , M^{n+} has five d-electrons and L is weak ligand then the magnetic properties of the complex ion correspond to how many unpaired electrons
 (1) 0 (2) 5
 (3) 2 (4) 3
CC0038
39. A magnetic moment of 1.73 BM will be shown by one among of the following compounds .
 (1) $[\text{Cu}(\text{NH}_3)_4]^{2+}$ (2) $[\text{Ni}(\text{CN})_4]^{2-}$
 (3) TiCl_4 (4) $[\text{CoCl}_6]^{3-}$
CC0039
40. The magnetic property and the shape of $[\text{Cr}(\text{NH}_3)_6]^{3+}$ complex ions are :
 (1) Paramagnetic, Octahedral
 (2) Diamagnetic, square planar
 (3) Paramagnetic, tetrahedral
 (4) None of the above
CC0040
41. Among the following ions which one is high spin complex.
 (1) $[\text{Cr}(\text{NH}_3)_6]^{2+}$ (2) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$
 (3) $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ (4) $[\text{Zn}(\text{H}_2\text{O})_6]^{2+}$
CC0041
42. Which of the following complexes is an inner orbital complex ?
 (1) $[\text{CoF}_6]^{3-}$ (2) $[\text{FeF}_6]^{3-}$
 (3) $[\text{Cr}(\text{NH}_3)_6]^{3+}$ (4) $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$
CC0042
43. What is Incorrect for $\text{K}_4[\text{Fe}(\text{CN})_6]$
 (1) O.N of Iron is +2
 (2) It exhibit diamagnetic character
 (3) It exhibit paramagnetic character
 (4) It involves d^2sp^3 hybridisation
CC0043
44. In which of the following molecules, central atom used orbitals of different principle quantum number in the hybridisation :-
 (1) $[\text{Fe}(\text{CO})_5]$ (2) $[\text{Zn}(\text{NH}_3)_6]^{+2}$
 (3) $[\text{Ni}(\text{CO})_4]$ (4) $[\text{Ni}(\text{NH}_3)_6]^{+2}$
CC0044
45. What are the geometric shape and the oxidation number of the copper atom, respectively, for the complex ion, $[\text{Cu}(\text{NH}_3)_4(\text{OH}_2)_2]^{2+}$?
 (1) Tetrahedral; + 2 (2) Square planar; -2
 (3) Linear; + 3 (4) Octahedral; + 2
CC0045
46. For $[\text{FeF}_6]^{3-}$ and $[\text{Fe}(\text{CN})_6]^{3-}$ magnetic moment of the fluoride complex is expected to be :-
 (1) The same as the magnetic moment of the cyanide complex
 (2) Larger than the magnetic moment of the cyanide complex because there are more unpaired electrons in the fluoride complex
 (3) Smaller than the magnetic moment of the cyanide complex because there are more unpaired electrons in the fluoride complex
 (4) Larger than the magnetic moment of the cyanide complex because there are fewer unpaired electrons in the fluoride complex
CC0046
47. Which of the following contains one unpaired electron in the 4p orbitals :-
 (1) $[\text{Cu}(\text{NH}_3)_2]^+$ (2) $[\text{Cu}(\text{NH}_3)_4]^{2+}$
 (3) $[\text{Cu}(\text{CN})_4]^{3-}$ (4) $[\text{Ni}(\text{CN})_4]^{2-}$
CC0047
48. How many unpaired electrons are present in the Brown Ring complex $[\text{Fe}(\text{H}_2\text{O})_5(\text{NO})]\text{SO}_4$
 (1) 4 (2) 3 (3) 0 (4) 5
CC0048
49. Which of the following statements about $[\text{Cr}(\text{CO})_6]$ is correct ?
 (1) It is paramagnetic and inner orbital complex
 (2) It is diamagnetic and inner orbital complex
 (3) It is diamagnetic and outer orbital complex
 (4) It is paramagnetic and outer orbital complex
CC0049

50. Which is true for complex $[\text{Ni}(\text{en})_2]^{2+}$?
 (1) paramagnetism, dsp^2 , square planar, C.N. of Ni = 2
 (2) diamagnetism, dsp^2 , square planar, C.N. of Ni = 4
 (3) diamagnetism, sp^3 , tetrahedral, C.N. of Ni = 4
 (4) paramagnetism, sp^3 , tetrahedral, C.N. of Ni = 4

CC0050

51. Arrange the following in order of decreasing number of unpaired electrons :

- I : $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ II : $[\text{Fe}(\text{CN})_6]^{3-}$
 III : $[\text{Fe}(\text{CN})_6]^{4-}$ IV : $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$
 (1) IV, I, II, III (2) I, II, III, IV
 (3) III, II, I, IV (4) II, III, I, IV

CC0051

52. Spin magnetic moment of $[\text{MnBr}_4]^{2-}$ is 5.9 BM its geometry would be :-

- (1) Square planar (2) Tetrahedral
 (3) Square pyramidal (4) Octahedral

CC0052

53. The hybridisation in $[\text{Co}(\text{C}_2\text{O}_4)_3]^{-3}$

- (1) sp^3d^2 (2) sp^3d^3
 (3) dsp^3 (4) d^2sp^3

CC0053

54. Which complex is diamagnetic ?

- (1) $[\text{MnO}_4]^-$ (2) $[\text{Co}(\text{NH}_3)_6]^{+2}$
 (3) $[\text{Fe}(\text{CN})_6]^{-3}$ (4) $[\text{Cr}(\text{H}_2\text{O})_6]^{+3}$

CC0054

CFT, COLOUR OF THE COMPLEX AND STABILITY

55. Which one of these ions absorbs energy from visible spectrum :-

- (1) $[\text{Cu}(\text{NH}_3)_4]^+$
 (2) $[\text{Cu}(\text{NH}_3)_4]^{+2}$
 (3) $[\text{Zn}(\text{H}_2\text{O})_6]^{+2}$
 (4) $[\text{CdCl}_4]^{-2}$

CC0055

56. In the complex $[\text{Ni}(\text{H}_2\text{O})_2(\text{NH}_3)_4]^{+2}$ the magnetic moment (μ) of Ni is :-

- (1) Zero (2) 2.83 BM
 (3) 1.73 BM (4) 3.87 BM

CC0056

57. Which of the following system has maximum number of unpaired electrons :-

- (1) d^5 (Octahedral, low spin)
 (2) d^8 (Tetrahedral)
 (3) d^6 (Octahedral, low spin)
 (4) d^3 (Octahedral)

CC0057

58. In an octahedral crystal field, the t_{2g} orbitals are

- (1) Raised in energy by $0.4 \Delta_0$
 (2) Lowered in energy by $0.4 \Delta_0$
 (3) Raised in energy by $0.6 \Delta_0$
 (4) Lowered in energy by $0.6 \Delta_0$

CC0058

59. If $\Delta_0 < P$, the correct electronic configuration for d^4 system will be :-

- (1) $\text{t}_{2g}^4 \text{e}_g^0$ (2) $\text{t}_{2g}^3 \text{e}_g^1$
 (3) $\text{t}_{2g}^0 \text{e}_g^4$ (4) $\text{t}_{2g}^2 \text{e}_g^2$

CC0059

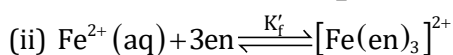
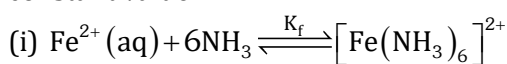
60. Match List-I (Complex ions) with List-II (Number of Unpaired Electrons) and select the correct answer using the codes given below the lists :-

List-I (Complex ions)	List-II (Number of Unpaired Electrons)
A. $[\text{CrF}_6]^{4-}$	i. One
B. $[\text{MnF}_6]^{4-}$	ii. Two
C. $[\text{Cr}(\text{CN})_6]^{4-}$	iii. Three
D. $[\text{Mn}(\text{CN})_6]^{4-}$	iv. Four
	v. Five

Code :	A	B	C	D
(1)	iv	i	ii	v
(2)	ii	v	iii	i
(3)	iv	v	ii	i
(4)	ii	i	iii	v

CC0060

61. Consider the following complex formation reactions and comment on their formation constant value



- (1) $K_f > K'_f$
 (2) $K_f < K'_f$
 (3) $K_f = K'_f$
 (4) Can not be compared

CC0061

62. Select most stable complex :-

- (1) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$ (2) $[\text{Co}(\text{NH}_3)_2(\text{en})_2]^{+3}$
 (3) $[\text{Co}(\text{en})_3]^{+3}$ (4) $[\text{Co}(\text{NH}_3)_4(\text{en})]^{+3}$

CC0062

63. Red color of gem stone ruby is due to impurities of :-

- (1) Al_2O_3 (2) Cr^{+3}
 (3) Al^{+3} ions (4) All of these

CC0063

ISOMERISM

64. A square planar complex is cis platin $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ shows :

- (1) Geometrical isomerism
 (2) Optical isomerism
 (3) Linkage isomerism
 (4) Ionisation isomerism

CC0064

65. The two compounds pentaamminesulphato cobalt (III) bromide and pentaamminebromo cobalt (III) sulphate represent :

- (1) Linkage isomerism
 (2) Ionisation isomerism
 (3) Co-ordination isomerism
 (4) Hydrate isomerism

CC0065

66. Which of the following complex can not exhibit geometrical isomerism :-

- (1) $[\text{Pt}(\text{NH}_3)_2\text{Cl NO}_2]$
 (2) $[\text{Pt}(\text{gly})_2]$
 (3) $[\text{Cu}(\text{en})_2]^{+2}$
 (4) $[\text{Pt}(\text{H}_2\text{O})(\text{NH}_3)\text{BrCl}]$

CC0066

67. Which one of the following compounds will exhibit linkage isomerism :-

- (1) $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$
 (2) $[\text{Co}(\text{NH}_3)_3\text{NO}_2]\text{Cl}_2$
 (3) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$
 (4) $[\text{Co}(\text{en})_2\text{Cl}_2]\text{Cl}$

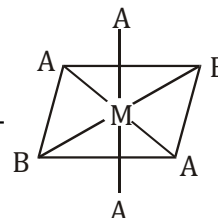
CC0067

68. The compound $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$ and $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]\text{Cl} \cdot 2\text{H}_2\text{O}$ represent

- (1) Linkage isomerism
 (2) Hydrate isomerism
 (3) Ligand isomerism
 (4) Ionisation isomerism

CC0068

69. Compound -



can be marked as -

- (1) Cis form (2) Leavo form
 (3) Dextro form (4) Trans form

CC0069

70. A Planar Complex $[\text{Mabcd}]$ gives :-

- (1) Two Optical isomer
 (2) Two geometrical isomer
 (3) Three optical isomer
 (4) Three geometrical isomers

CC0070

71. No. of geometrical isomers expected for octahedral complex $[\text{Mabcdef}]$ is :-

- (1) Zero (2) 30 (3) 15 (4) 9

CC0071

72. Which of the following complex produce ppt with AgNO_3 and exist in two geometrical isomeric form

- (1) $\text{PtCl}_2 \cdot 4\text{NH}_3$ (2) $\text{PtCl}_2 \cdot 3\text{NH}_3$
 (3) $\text{PtCl}_4 \cdot 4\text{NH}_3$ (4) $\text{PtCl}_4 \cdot 2\text{NH}_3$

CC0072

73. $\text{Cis}[\text{Pt}(\text{en})_2\text{Br}_2]\text{Cl}_2 \cdot 2\text{H}_2\text{O}$ and $\text{trans}[\text{Pt}(\text{en})_2\text{Br}_2]\text{Cl}_2 \cdot 2\text{H}_2\text{O}$ are :-

- (1) Ionisation isomer
 (2) Geometrical isomer
 (3) Hydrate isomer
 (4) Optical isomers

CC0073

74. Which of the following octahedral complex have maximum stereoisomers :-

- (1) $[\text{Fe}(\text{CN})_6]^{-4}$ (2) $[\text{Co}(\text{en})(\text{CN})_4]^{-1}$
 (3) $[\text{Co}(\text{en})_2(\text{Cl})_2]^+$ (4) $[\text{Co}(\text{en})_3]^{+3}$

CC0074

75. Which of the following complex does not show geometrical isomerism ?

- (1) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$
- (2) $[\text{Co}(\text{NH}_3)_3(\text{NO}_2)_3]$
- (3) $[\text{Cr}(\text{en})_3]^{3+}$
- (4) $[\text{Pt}(\text{gly})_2]$

CC0075

76. Which of the following complex compounds does not exhibit geometrical isomerism ?

- (1) $[\text{PtCl}_2(\text{NH}_3)_2]$
- (2) $[\text{PdCl}_2\text{BrI}]$
- (3) $[\text{Pt}(\text{NH}_3)(\text{py})(\text{Cl})(\text{Br})]$
- (4) $[\text{Pt}(\text{NH}_3)_3(\text{Br})]$

CC0076

77. The pair of molecules that exhibit geometrical isomerism are

- (1) $[\text{Cr}(\text{NH}_3)_4\text{Cl}_2]^+$ and $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$
- (2) $[\text{Cr}(\text{NH}_3)_5\text{Cl}]^{2+}$ and $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$
- (3) $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{Co}(\text{NH}_3)_6]^{3+}$
- (4) All of the above show geometric isomerism

CC0077

78. Complex $[\text{Co}(\text{NH}_3)_3(\text{NO}_2)_3]$ show which isomerism:-

- (1) Ionisation and linkage
- (2) Linkage and geometrical
- (3) Geometrical and ligand
- (4) Coordination and linkage

CC0078

79. Which of the following represents incorrect match?

- (1) $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)](\text{NO}_3)_2$: Linkage isomerism
- (2) $[\text{Pt}(\text{NH}_3)(\text{H}_2\text{O})\text{Cl}_2]$: Geometrical isomerism
- (3) $\text{K}[\text{Cr}(\text{H}_2\text{O})_2(\text{C}_2\text{O}_4)_2]$: Geometrical and optical
- (4) $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2\text{H}_2\text{O}$: Hydrate and linkage isomerism

CC0079

80. $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ show 3 different coloured compounds due to :-

- (1) Ionisation isomerism
- (2) Coordination isomerism
- (3) Optical isomerism
- (4) Hydrate isomerism

CC0080

ORGANOMETALLIC COMPOUNDS

81. Which of the following is π -acid ligand

- (1) NH_3
- (2) CO
- (3) glycinate
- (4) ethylene diamine

CC0081

82. Which of the following statement is/are wrong:-

- (a) Al_4C_3 is an organometallic compound
- (b) Metal carbonyls are organometallic compounds
- (c) TEL is π bonded organometallic compound
- (d) Frankland reagent is σ -bonded organometallic compound

The answer is:-

- (1) c & d
- (2) a & c
- (3) a & b
- (4) b & d

CC0082

83. Compounds which contain direct metal carbon bonds are called :

- (1) Organic compound
- (2) Complex compound
- (3) Metal carbides
- (4) OMC compounds.

CC0083

84. Which one of the following is a π bonded OMC?

- (1) Wilkinson's catalyst
- (2) Tetraethyl lead
- (3) Zeise's salt
- (4) Grignard's reagent

CC0084

85. Which of the following statement is true

- (1) FeCO_3 and Fe_3C are organometallic compounds.
- (2) In Ferrocene ligand is cyclopentadienyl.
- (3) $\text{Pb}(\text{C}_2\text{H}_5)_4$ is π -bonded OMC
- (4) In Zeise's salt central metal is sp^3 hybridised.

CC0085

86. Which of the following is not an organometallic compound :-

- (1) $(\text{C}_2\text{H}_5)_2\text{Zn}$
- (2) $\text{CH}_3\text{B}(\text{OCH}_3)_2$
- (3) $\text{B}(\text{OCH}_3)_3$
- (4) $\text{Ni}(\text{CO})_4$

CC0086

Coordination Compounds

87. Number of metal-metal bonds in $[\text{Co}_2(\text{CO})_8]$ will be :-
 (1) 0 (2) 3 (3) 2 (4) 1

CC0087

APPLICATION OF COORDINATION CHEMISTRY

88. In a ferric salt on adding $\text{K}_4[\text{Fe}(\text{CN})_6]$ a prussian blue is obtained which is :-
 (1) $\text{K}_3[\text{Fe}(\text{CN})_6]$ (2) $\text{Fe}_3[\text{Fe}(\text{CN})_6]_4$
 (3) $\text{FeSO}_4[\text{Fe}(\text{CN})_6]$ (4) $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$

CC0088

89. Hypo is used in photography because it is :-
 (1) A reducing agent
 (2) An oxidising agent
 (3) A Complexing agent
 (4) Photo sensitive Compound

CC0089

90. The solubility of AgBr in hypo solution is due to the formation of :-
 (1) Ag_2SO_3 (2) $\text{Ag}_2\text{S}_2\text{O}_3$
 (3) $[\text{Ag}(\text{S}_2\text{O}_3)]^-$ (4) $[\text{Ag}(\text{S}_2\text{O}_3)_2]^{3-}$

CC0090

91. Which of the following is related to Nessler's reagent?
 (1) $\text{PtCl}_4 + \text{KCl} \rightarrow$ (2) $\text{AgCl} + \text{NH}_3 \rightarrow$
 (3) $\text{AgBr} + \text{Na}_2\text{S}_2\text{O}_3 \rightarrow$ (4) $\text{HgI}_2 + \text{KI} \rightarrow$

CC0091

92. $\text{K}_4[\text{Fe}(\text{CN})_6]$ reacts with FeCl_3 to form :-

- (1) $\text{K}_3[\text{Fe}(\text{CN})_6]$ (2) $\text{K}_4[\text{Fe}(\text{CN})_3\text{Cl}_3]$
 (3) $\text{K}_3[\text{Fe}(\text{CN})_5\text{Cl}]$ (4) $\text{KFe}[\text{Fe}(\text{CN})_6]$

CC0092

93. A reagent used for identifying nickel ion is :-

- (1) Potassium ferrocyanide
 (2) Phenolphthalein
 (3) Dimethyl glyoxime
 (4) EDTA

CC0093

94. Which one of the following statement is false for nickel-dimethylglyoximate complex ?

- (1) The stability of complex is only due to the presence of intra-molecular hydrogen bonding
 (2) The complex is stable, only because dimethyl glyoxime ligand is a stronger ligand
 (3) The complex is stable as it has five membered chelate rings as well as intra molecular hydrogen bonding
 (4) Both (1) and (2)

CC0094

EXERCISE-I (Conceptual Questions)

ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	1	4	4	2	4	3	4	1	2	2	2	4	2	4	2
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	3	3	2	1	1	1	1	3	2	2	2	3	4	2	2
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	3	1	3	4	2	1	1	2	1	1	2	3	3	1	4
Question	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	2	2	2	2	2	1	2	4	1	2	2	4	2	2	3
Question	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Answer	2	3	2	1	2	3	2	2	4	4	3	3	2	3	3
Question	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Answer	4	1	2	4	4	2	2	4	3	2	3	4	4	3	4
Question	91	92	93	94											
Answer	4	4	3	4											

EXERCISE - II (Previous Year Questions)

AIPMT/NEET

AIPMT 2014

1. Which of the following complexes is used to be as an anticancer agent?
 (1) mer-[Co(NH₃)₃Cl₃] (2) cis-[PtCl₂(NH₃)₂]
 (3) cis-K₂[PtCl₂Br₂] (4) Na₂CoCl₄

CCO117

AIPMT 2015

2. Cobalt (III) chloride forms several octahedral complexes with ammonia. Which of the following will not give test of chloride ions with silver nitrate at 25°C?
 (1) CoCl₃·4NH₃ (2) CoCl₃·5NH₃
 (3) CoCl₃·6NH₃ (4) CoCl₃·3NH₃

CCO118

3. Which of these statements about [Co(CN)₆]³⁻ is true:-
 (1) [Co(CN)₆]³⁻ has four unpaired electrons and will be in a low-spin configuration.
 (2) [Co(CN)₆]³⁻ has four unpaired electrons and will be in a high spin configuration.
 (3) [Co(CN)₆]³⁻ has no unpaired electrons and will be in a high-spin configuration.
 (4) [Co(CN)₆]³⁻ has no unpaired electrons and will be in a low-spin configuration.

CCO119

Re-AIPMT 2015

4. The name of complex ion, [Fe(CN)₆]³⁻ is :-
 (1) Tricyanoferrate (III) ion
 (2) Hexacyanidoferrate (III) ion
 (3) Hexacyanoiron (III) ion
 (4) Hexacyanitoferrate (III) ion

CCO120

5. The hybridization involved in complex [Ni(CN)₄]²⁻ is (At.No. Ni = 28)
 (1) d²sp² (2) d²sp³ (3) dsp² (4) sp³

CCO121

6. The sum of coordination number and oxidation number of the metal M in the complex [M(en)₂(C₂O₄)]Cl (where en is ethylenediamine) is:-
 (1) 7 (2) 8 (3) 9 (4) 6

CCO122

7. Number of possible isomers for the complex [Co(en)₂Cl₂] Cl will be : (en = ethylenediamine)
 (1) 3 (2) 4 (3) 2 (4) 1

CCO123

NEET-I 2016

8. Which of the following has longest C-O bond length? (Free C-O bond length in CO is 1.128Å).
 (1) Ni(CO)₄ (2) [Co(CO)₄]⁻
 (3) [Fe(CO)₄]²⁻ (4) [Mn(CO)₆]⁺

CCO124

NEET(UG) 2017

9. An example of a sigma bonded organometallic compound is :
 (1) Grignard's reagent (2) Ferrocene
 (3) Cobaltocene (4) Ruthenocene

CCO125

10. Pick out the correct statement with respect to [Mn(CN)₆]³⁻:-
 (1) It is sp³d² hybridised and tetrahedral
 (2) It is d²sp³ hybridised and octahedral
 (3) It is dsp² hybridised and square planar
 (4) It is sp³d² hybridised and octahedral

CCO126

11. Correct increasing order for the wavelengths of absorption in the visible region the complexes of Co³⁺ is :-

- (1) [Co(H₂O)₆]³⁺, [Co(en)₃]³⁺, [Co(NH₃)₆]³⁺
 (2) [Co(H₂O)₆]³⁺, [Co(NH₃)₆]³⁺, [Co(en)₃]³⁺
 (3) [Co(NH₃)₆]³⁺, [Co(en)₃]³⁺, [Co(H₂O)₆]³⁺
 (4) [Co(en)₃]³⁺, [Co(NH₃)₆]³⁺, [Co(H₂O)₆]³⁺

CCO127

NEET(UG) 2018

12. The type of isomerism shown by the complex [CoCl₂(en)₂] is
 (1) Geometrical isomerism
 (2) Coordination isomerism
 (3) Ionization isomerism
 (4) Linkage isomerism

CCO128

13. The geometry and magnetic behaviour of the complex $[\text{Ni}(\text{CO})_4]$ are
 (1) Square planar geometry and diamagnetic
 (2) Tetrahedral geometry and diamagnetic
 (3) Square planar geometry and paramagnetic
 (4) Tetrahedral geometry and paramagnetic
CCO129

14. Iron carbonyl, $\text{Fe}(\text{CO})_5$ is
 (1) Tetranuclear (2) Mononuclear
 (3) Trinuclear (4) Dinuclear
CCO130

NEET(UG) 2019

15. What is the **correct** electronic configuration of the central atom in $\text{K}_4[\text{Fe}(\text{CN})_6]$ based on crystal field theory?
 (1) $t_{2g}^4 e_g^2$ (2) $t_{2g}^6 e_g^0$
 (3) $e^3 t_2^3$ (4) $e^4 t_2^2$
CCO131

NEET(UG) 2019 (ODISHA)

16. The Crystal Field Stabilisation Energy (CFSE) for $[\text{CoCl}_6]^{4-}$ is 18000 cm^{-1} . The CFSE for $[\text{CoCl}_4]^{2-}$ will be—
 (1) 6000 cm^{-1} (2) 16000 cm^{-1}
 (3) 18000 cm^{-1} (4) 8000 cm^{-1}
CCO132

NEET(UG) 2020

17. Which of the following is the correct order of increasing field strength of ligands to form coordination compounds?
 (1) $\text{CN}^- < \text{C}_2\text{O}_4^{2-} < \text{SCN}^- < \text{F}^-$
 (2) $\text{SCN}^- < \text{F}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
 (3) $\text{SCN}^- < \text{F}^- < \text{CN}^- < \text{C}_2\text{O}_4^{2-}$
 (4) $\text{F}^- < \text{SCN}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
CCO133
18. Urea reacts with water to form A which will decompose to form B. B when passed through Cu^{2+} (aq), deep blue colour solution C is formed. What is the formula of C from the following?
 (1) $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$ (2) CuSO_4
 (3) $[\text{Cu}(\text{NH}_3)_4]^{2+}$ (4) $\text{Cu}(\text{OH})_2$
CCO134

NEET(UG) 2021

19. Ethylene diaminetetraacetate (EDTA) ion is:
 (1) Hexadentate ligand with four "O" and two "N" donor atoms
 (2) Unidentate ligand
 (3) Bidentate ligand with two "N" donor atoms
 (4) Tridentate ligand with three "N" donor atoms
CCO135

20. Match List-I with List-II

List-I		List-II	
(a)	$[\text{Fe}(\text{CN})_6]^{3-}$	(i)	5.92 BM
(b)	$[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$	(ii)	0 BM
(c)	$[\text{Fe}(\text{CN})_6]^{4-}$	(iii)	4.90 BM
(d)	$[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$	(iv)	1.73 BM

Choose the **correct** answer from the options given below

- (1) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)
 (2) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)
 (3) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)
 (4) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

CCO136

NEET(UG) 2022

21. The IUPAC name of the complex - $[\text{Ag}(\text{H}_2\text{O})_2][\text{Ag}(\text{CN})_2]$ is:
 (1) diaquasilver(II) dicyanidoargentate(II)
 (2) dicyanidosilver(I) diaquaargentate(I)
 (3) diaquasilver(I) dicyanidoargentate(I)
 (4) dicyanidosilver(II) diaquaargentate(II)
CCO167

NEET(UG) 2023

22. Homoleptic complex from the following complexes is :
 (1) Diamminechloridonitrito-N-platinum (II)
 (2) Pentaamminecarbonatocobalt (III) chloride
 (3) Triamminetriaquachromium (III) chloride
 (4) Potassium trioxalatoaluminate (III)
CCO168

23. Which complex compound is most stable?

- (1) $[\text{Co}(\text{NH}_3)_3(\text{NO}_3)_3]$
- (2) $[\text{CoCl}_2(\text{en})_2]\text{NO}_3$
- (3) $[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_4)_3$
- (4) $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Br}](\text{NO}_3)_2$

CCO169

24. Which of the following forms a set of complex and a double salt, respectively ?

- (1) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ and $\text{CuCl}_2 \cdot 4\text{NH}_3$
- (2) $\text{PtCl}_2 \cdot 2\text{NH}_3$ and $\text{PtCl}_4 \cdot 2\text{HCl}$
- (3) $\text{K}_2\text{PtCl}_2 \cdot 2\text{NH}_3$ and $\text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$
- (4) $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$ and $\text{NiCl}_2(\text{H}_2\text{O})_4$

CCO170

25. Type of isomerism exhibited by compounds $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$, $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$, $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]\text{Cl} \cdot 2\text{H}_2\text{O}$ and the value of coordination number (CN) of central metal ion in all these compounds, respectively is :

- (1) Geometrical isomerism, CN = 2
- (2) Optical isomerism, CN = 4
- (3) Ionisation isomerism, CN = 4
- (4) Solvate isomerism, CN = 6

CCO171

NEET(UG) 2024

26. Given below are two statements :

Statement-I : Both $[\text{Co}(\text{NH}_3)_6]^{+3}$ and $[\text{CoF}_6]^{3-}$ complexes are octahedral but differ in their magnetic behaviour.

Statement-II : $[\text{Co}(\text{NH}_3)_6]^{3+}$ is diamagnetic whereas $[\text{CoF}_6]^{3-}$ is paramagnetic.

In the light of the above statements, choose the *correct* answer from the options given below :

- (1) Both statement-I and Statement-II are true
- (2) Both Statement-I and Statement-II are false
- (3) Statement-I is true but Statement-II is false
- (4) Statement-I is false but Statement-II is true

CCO172

27. Match List I with List II.

List-I (Complex)		List-II (Type of isomerism)	
A.	$[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$	I.	Solvate isomerism
B.	$[\text{Co}(\text{NH}_3)_5(\text{SO}_4)]\text{Br}$	II.	Linkage isomerism
C.	$[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$	III.	Ionization isomerism
D.	$[\text{Co}(\text{H}_2\text{O})_6]\text{Cl}_3$	IV.	Coordination isomerism

Choose the correct answer from the options given below :

- (1) A-II, B-III, C-IV, D-I
- (2) A-I, B-III, C-IV, D-II
- (3) A-I, B-IV, C-III, D-II
- (4) A-II, B-IV, C-III, D-I

CCO173

28. Given below are two statements :

Statement-I : $[\text{Co}(\text{NH}_3)_6]^{3+}$ is a homoleptic complex whereas $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ is a heteroleptic complex.

Statement-II : Complex $[\text{Co}(\text{NH}_3)_6]^{3+}$ has only one kind of ligands but $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ has more than one kind of ligands.

In the light of the above statements, choose the *correct* answer from the options given below.

- (1) Both Statement-I and Statement-II are true.
- (2) Both Statement-I and Statement-II are false.
- (3) Statement-I is true but Statement-II is false.
- (4) Statement-I is false but Statement-II is true.

CCO174

NEET(UG) 2024 (Re-examination)

29. Ethylene diaminetetraacetate ion is a/an :

- (1) hexadentate ligand
 (2) ambidentate ligand
 (3) monodentate ligand
 (4) bidentate ligand

CC0175

30. Which of the following is **not** an ambidentate ligand?

- (1) $\text{C}_2\text{O}_4^{2-}$ (2) SCN^- (3) NO_2^- (4) CN^-

CC0176

31. $[\text{Mn}_2(\text{CO})_{10}]$ and $[\text{Co}_2(\text{CO})_8]$ structures have :

- A. Metal - Metal linkage
 B. Terminal CO groups
 C. Bridging CO groups
 D. Metal in zero oxidation state

Choose the **correct** answer from the options given below :

- (1) Only A, B, C (2) Only B, C, D
 (3) Only A, C, D (4) Only A, B, D

CC0177

EXERCISE-II (Previous Year Questions)

ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	2	4	4	2	3	3	1	3	1	2	4	1	2	2	2
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	4	2	3	1	4	3	4	2	3	4	1	1	1	1	1
Question	31														
Answer	4														

EXERCISE – III (Analytical Questions)

Master Your Understanding

1. Given below are two statements :

Statement-I : Complex $[\text{Fe}(\text{H}_2\text{O})_5(\text{NO})]\text{SO}_4$ is paramagnetic.

Statement-II : The Fe in Complex $[\text{Fe}(\text{H}_2\text{O})_5(\text{NO})]\text{SO}_4$ has three unpaired electrons.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Statement-I and Statement-II are correct.
- (2) Statement-I is correct but Statement-II is incorrect.
- (3) Both Statement-I and II are incorrect.
- (4) Statement-I is incorrect but Statement-II is correct.

CC0137

2. Given below are two statements :

Statement-I : All the geometrical formers of the complex $[\text{M}(\text{NH}_3)_4\text{Cl}_2]$ are optically inactive.

Statement-II : Both geometrical isomers of the complex $[\text{M}(\text{NH}_3)_4\text{Cl}_2]$ does not possess plane of symmetry.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Statement-I and Statement-II are correct.
- (2) Statement-I is correct but Statement-II is incorrect.
- (3) Both Statement-I and II are incorrect.
- (4) Statement-I is incorrect but Statement-II is correct.

CC0138

3. Given below are two statements :

Statement-I : $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_2$ and $[\text{Fe}(\text{H}_2\text{O})_6]\text{Cl}_2$ are oxidising in nature.

Statement-II : $[\text{Fe}(\text{CN})_6]^{4-}$ ion is an outer orbital complex.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Statement-I and Statement-II are correct.
- (2) Statement-I is correct but Statement-II is incorrect.
- (3) Both Statement-I and II are incorrect.
- (4) Statement-I is incorrect but Statement-II is correct.

CC0139

4. Given below are two statements :

Statement-I : Cis-platin is used in the treatment of Cancer.

Statement-II : EDTA is used for treatment of lead poisoning.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Statement-I and Statement-II are correct.
- (2) Statement-I is correct but Statement-II is incorrect.
- (3) Both Statement-I and II are incorrect.
- (4) Statement-I is incorrect but Statement-II is correct.

CC0140

5. Given below are two statements :

Statement-I : The metal to ligand bonding creates a synergic effect which strengthens the bond between CO and the metal.

Statement-II : The complex with d^0 and d^{10} configuration show d-d transition.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Statement-I and Statement-II are correct.
- (2) Statement-I is correct but Statement-II is incorrect.
- (3) Both Statement-I and II are incorrect.
- (4) Statement-I is incorrect but Statement-II is correct.

CC0141

6. Given below are two statements : (According to Werner)

Statement-I : The primary valency are normally ionisable and are satisfied by negative ions.

Statement-II : The secondary valency are non-ionisable are satisfied by neutral molecules or negative ions.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Statement-I and Statement-II are correct.
- (2) Statement-I is correct but Statement-II is incorrect.
- (3) Both Statement-I and II are incorrect.
- (4) Statement-I is incorrect but Statement-II is correct.

CCO142

7. Given below are two statements :

Statement-I : Valence bond theory explain the colour exhibited by co-ordination compounds.

Statement-II : CFT considers the metal-ligand bond to be ionic from electrostatic interactions between the metal ion and the ligand.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Statement-I and Statement-II are correct.
- (2) Statement-I is correct but Statement-II is incorrect.
- (3) Both Statement-I and II are incorrect.
- (4) Statement-I is incorrect but Statement-II is correct.

CCO143

8. Given below are two statements :

Statement-I : d^4 to d^7 co-ordination entities are less stable for strong field as compared to weak field cases.

Statement-II : Ruby is aluminium oxide (Al_2O_3) containing about 0.5 – 1% Cr^{+2} ions (d^4). In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Statement-I and Statement-II are correct.
- (2) Statement-I is correct but Statement-II is incorrect.
- (3) Both Statement-I and II are incorrect.
- (4) Statement-I is incorrect but Statement-II is correct.

CCO144

9. Given below are two statements :

Statement-I : Decacarbonyl diamanganese (0) is made up of two square pyramidal $[Mn(CO)_5]$ units joined by a Mn–Mn bond.

Statement-II : Zero oxidation state of central metal cannot be stabilised by CO groups.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Statement-I and Statement-II are correct.
- (2) Statement-I is correct but Statement-II is incorrect.
- (3) Both Statement-I and II are incorrect.
- (4) Statement-I is incorrect but Statement-II is correct.

CCO145

10. Given below are two statements :

Statement-I : Excess of copper and iron from plant/animal systems are removed by the chelating ligands D-penicillamine and deferoxime B via the formation of Co-ordination compounds.

Statement-II : Crystal field splitting energy in tetrahedral complex is less as compared to the octahedral complexes.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Statement-I and Statement-II are correct.
- (2) Statement-I is correct but Statement-II is incorrect.
- (3) Both Statement-I and II are incorrect.
- (4) Statement-I is incorrect but Statement-II is correct.

CCO146

11. Given below are two statements :

Assertion (A) : EDTA ligand forms complex with metal ion of 3d series in the ratio of 1 : 1

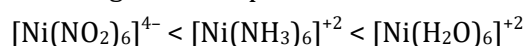
Reason (R) : EDTA ligand has four -COOH group's

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
- (3) (A) is correct but (R) is not correct.
- (4) (A) is not correct but (R) is correct.

CC0147

12. **Assertion (A) :** The correct order of the wavelength of absorption in the visible vision is



Reason (R) : The stability of different complexes depends on the strength of the ligand field of the various ligand

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
- (3) (A) is correct but (R) is not correct.
- (4) (A) is not correct but (R) is correct.

CC0148

13. **Assertion (A) :** KMnO_4 & $\text{K}_2\text{Cr}_2\text{O}_7$ both are coloured compound.

Reason (R) : The colour of the compound is only due to d-d transition.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
- (3) (A) is correct but (R) is not correct.
- (4) (A) is not correct but (R) is correct.

CC0149

14. **Assertion (A) :** Cu^{+2} ion never form complex with CN^- & I^- ions.

Reason (R) : Cu^{+2} is a stronger oxidising while CN^- & I^- both are stronger reducing agent.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
- (3) (A) is correct but (R) is not correct.
- (4) (A) is not correct but (R) is correct.

CC0150

15. **Assertion (A) :** The colour of $[\text{Co}(\text{NH}_3)_5\text{NO}_2]^{+2}$ and $[\text{Co}(\text{NH}_3)_5\text{ONO}]^{2+}$ is different.

Reason (R) : Both are linkage isomers.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
- (3) (A) is correct but (R) is not correct.
- (4) (A) is not correct but (R) is correct.

CC0151

16. Match the column :

Column-I [Complex Ion]		Column-II [Hybridisation & no. of unpaired electron]	
(1)	$[\text{Co}(\text{H}_2\text{O})_6]^{+3}$	(a)	dsp^2 , 0
(2)	$[\text{Fe}(\text{CN})_6]^{3-}$	(b)	dsp^2 , 1
(3)	$[\text{Ni}(\text{CN})_4]^{2-}$	(c)	d^2sp^3 , 0
(4)	$[\text{Co}(\text{CN})_4]^{2-}$	(d)	d^2sp^3 , 1

- (1) 1 - c, 2 - a, 3 - d, 4 - b
- (2) 1 - c, 2 - d, 3 - b, 4 - a
- (3) 1 - c, 2 - d, 3 - a, 4 - b
- (4) 1 - a, 2 - c, 3 - d, 4 - b

CC0152

Coordination Compounds

17. Match the column :

Column-I [Complex Ion]		Column-II [No. of geometrical Isomer]	
(1)	$[\text{Co}(\text{NH}_3)_6]^{+3}$	(a)	5
(2)	$[\text{Co}(\text{NH}_3)_2\text{Cl}_2\text{Br}_2]^-$	(b)	0
(3)	$[\text{Pt}(\text{NH}_3)_3\text{Cl}_3]^+$	(c)	15
(4)	$[\text{Pt}(\text{NH}_3)(\text{H}_2\text{O})(\text{Py})\text{ClBrI}]^+$	(d)	2

(1) 1 - b, 2 - d, 3 - a, 4 - c

(2) 1 - b, 2 - a, 3 - d, 4 - c

(3) 1 - a, 2 - b, 3 - d, 4 - c

(4) 1 - c, 2 - a, 3 - d, 4 - b

CC0153

18. Match the column :

Column-I (Complexion)		Column-II (Type of complex with magnetic moment)	
(1)	$[\text{Co}(\text{ox})_3]^{3-}$	(a)	Inner orbital, complex, $\mu = \sqrt{3}$
(2)	$[\text{Fe}(\text{EDTA})]^-$	(b)	Outer orbital, complex, $\mu = \sqrt{24}$
(3)	$[\text{MnF}_6]^{3-}$	(c)	Outer orbital, complex, $\mu = \sqrt{8}$
(4)	$[\text{Ni}(\text{H}_2\text{O})_6]^{+2}$	(d)	Inner orbital, complex, $\mu = 0$

(1) 1 - d, 2 - a, 3 - b, 4 - c

(2) 1 - c, 2 - a, 3 - b, 4 - d

(3) 1 - d, 2 - b, 3 - a, 4 - c

(4) 1 - a, 2 - d, 3 - b, 4 - c

CC0154

19. Match the column :

Column-I [Configuration in octahedral complex]		Column-II [Magnetic moment]	
(1)	d^4 [Low spin]	(a)	$\mu = \sqrt{3}$ BM
(2)	d^4 [High spin]	(b)	$\mu = \sqrt{35}$ BM
(3)	d^5 [Low spin]	(c)	$\mu = \sqrt{8}$ BM
(4)	d^5 [High spin]	(d)	$\mu = \sqrt{24}$ BM

(1) 1 - b, 2 - d, 3 - a, 4 - c

(2) 1 - a, 2 - d, 3 - d, 4 - b

(3) 1 - d, 2 - c, 3 - a, 4 - b

(4) 1 - c, 2 - d, 3 - a, 4 - b

CC0155

20. Match the column :

Column-I [Complex Ion]		Column-II [Total no. of chelate ring]	
(1)	$[\text{Fe}(\text{EDTA})]^-$	(a)	2
(2)	$[\text{Ni}(\text{dmg})_2]$	(b)	3
(3)	$[\text{Fe}(\text{en})_3]^{+3}$	(c)	4
(4)	$[\text{Co}(\text{en})_2\text{Cl}_2]^+$	(d)	5

(1) 1 - a, 2 - c, 3 - b, 4 - d

(2) 1 - d, 2 - c, 3 - b, 4 - a

(3) 1 - b, 2 - c, 3 - d, 4 - a

(4) 1 - c, 2 - d, 3 - b, 4 - a

CC0156

21. Match the column :

Column-I [Complex Ion]		Column-II [Value of CFSE]	
(1)	$[\text{Cr}(\text{H}_2\text{O})_6]^{+2}$	(a)	Zero
(2)	$[\text{Cr}(\text{NH}_3)_6]^{+2}$	(b)	$-0.4 \Delta_0$
(3)	$[\text{Fe}(\text{H}_2\text{O})_6]^{+3}$	(c)	$-0.6 \Delta_0$
(4)	$[\text{CoF}_6]^{3-}$	(d)	$-1.6 \Delta_0$

(1) 1 - a, 2 - c, 3 - b, 4 - d

(2) 1 - b, 2 - d, 3 - c, 4 - a

(3) 1 - c, 2 - d, 3 - a, 4 - b

(4) 1 - d, 2 - a, 3 - c, 4 - b

CC0157

22. Match the column :

Column-I (Complex compound)		Column-II (Element)	
(1)	Chlorophyll	(a)	Rhodium
(2)	Blood pigment	(b)	Cobalt
(3)	Vitamin B ₁₂	(c)	Magnesium
(4)	Wilkinson catalyst	(d)	Iron

- (1) 1 - a, 2 - d, 3 - b, 4 - c
 (2) 1 - c, 2 - d, 3 - b, 4 - a
 (3) 1 - c, 2 - b, 3 - d, 4 - a
 (4) 1 - d, 2 - a, 3 - b, 4 - c

CC0158

23. Which of the following is/are inner orbital complex(es) ?

- (A) $[\text{Fe}(\text{NH}_3)_6]^{+2}$ (B) $[\text{Co}(\text{H}_2\text{O})_6]^{+3}$
 (C) $[\text{Mn}(\text{NH}_3)_6]^{+2}$ (D) $[\text{Co}(\text{C}_2\text{O}_4)_3]^{-3}$

- (1) If (A), (B) and (C) options are correct.
 (2) If (A) and (B) both options are correct.
 (3) If (B) and (D) both options are correct.
 (4) If (A) and (C) both options are correct.

CC0159

24. The compound(s) belonging to the alum family is(are)

- (A) $\text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$
 (B) $\text{K}_2\text{SO}_4 \cdot \text{Cr}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$
 (C) $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$
 (D) $\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$

- (1) If (A), (B) and (C) options are correct.
 (2) If (A) and (B) both options are correct.
 (3) If (B) and (D) both options are correct.
 (4) If (A) and (C) both options are correct.

CC0160

25. Which of the following complexes is/are have square planar in shape

- (A) $[\text{Cu}(\text{H}_2\text{O})_4]^{+2}$ (B) $[\text{Ni}(\text{CN})_4]^{-2}$
 (C) $[\text{Pt}(\text{Gly})_2]$ (D) $[\text{Zn}(\text{Cl})_4]^{-2}$

- (1) If (A), (B) and (C) options are correct.
 (2) If (A) and (B) both options are correct.
 (3) If (B) and (D) both options are correct.
 (4) If (A) and (C) both options are correct.

CC0161

26. Which statement is/are correct :-

- (A) $[\text{Ni}(\text{CO})_4]$ tetrahedral & diamagnetic
 (B) $[\text{Ni}(\text{CN})_4]^{-2}$ square planar & diamagnetic
 (C) $[\text{Cu}(\text{NH}_3)_4]^{+2}$ tetrahedral and diamagnetic
 (D) $[\text{NiCl}_4]^{-2}$ tetrahedral and paramagnetic

- (1) If (A), (B) and (C) options are correct.
 (2) If (A) and (B) and (D) options are correct.
 (3) If (B) and (C) both options are correct.
 (4) If (A) and (C) both options are correct.

CC0162

27. Which of the following complexes are paramagnetic in nature ?

- (A) $[\text{Ni}(\text{CO})_4]$ (B) $[\text{Mn}(\text{CN})_6]^{-3}$
 (C) $[\text{Co}(\text{H}_2\text{O})_6]^{+3}$ (D) $[\text{Ni}(\text{NH}_3)_6]^{+2}$

- (1) If (A), (B) and (C) options are correct.
 (2) If (A) and (B) both options are correct.
 (3) If (B) and (D) both options are correct.
 (4) If (A) and (C) both options are correct.

CC0163

28. Correct match is/are -

- (A) Nessler's reagent - $\text{K}_2[\text{HgI}_4] + \text{KOH}$
 (B) Ferrocene - $[\text{Fe}\{\eta^5\text{-C}_5\text{H}_5\}_2]$
 (C) Chromocene - $[\text{Cr}(\eta^6\text{-C}_6\text{H}_6)_2]$
 (D) Zeigler Natta catalyst - $[(\text{Ph}_3\text{P})_3\text{RhCl}]$

- (1) If (A), (B) and (C) options are correct.
 (2) If (A) and (B) both options are correct.
 (3) If (B) and (D) both options are correct.
 (4) If (A) and (C) both options are correct.

CC0164

29. Which is true for EDTA^{-4} ligand :-

- (A) Chelating ligand
- (B) Flexidentate ligand
- (C) Polydentate ligands
- (D) Ambidentate ligands
- (1) If (A), (B) and (C) options are correct.
- (2) If (A) and (B) both options are correct.
- (3) If (B) and (D) both options are correct.
- (4) If (A) and (C) both options are correct.

CC0165

30. Which of the following are organometallic compounds

- (A) Zeise's salt
- (B) Ferrocene
- (C) Grignard reagent
- (D) Cis-platin
- (1) If (A), (B) and (C) options are correct.
- (2) If (A) and (B) both options are correct.
- (3) If (B) and (D) both options are correct.
- (4) If (A) and (C) both options are correct.

CC0166

EXERCISE-III (Analytical Questions)

ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	1	2	3	1	2	1	4	3	2	1	3	2	3	1	1
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	3	2	1	4	2	3	2	3	2	1	2	3	1	1	1

Important Notes