CHEMISTRY

BOOKS - A2Z CHEMISTRY (HINGLISH)

COORDINATION COMPOUNDS

Basic Terms Ean Oxidation Number Coordination Number Nature Of Ligands

1. The oxidation number of Co in the complex ion $\left[CoCl(NH_3)_5\right]^{2+}$ is:

A. (a) $+2$

B. (b) $+3$

C. (c) $+4$

D. (d) $+6$

Answer: B

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2. Which is a pair of ambidentate ligands among the following?

A. (a) CN^-, NO_2^-

B. (b) NO_3^-, NO_2^-

C. (c) CNS^-, $C_2O_4^{-2}$

D. (d) $C_2O_4^{-2}$, SO_4^{-2}

Answer: A

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3. Which of the following has the highest molar conductivity in solution?

A. (a) $[Pt(NH_3)_6]Cl_4$

B. (b) $[Pt(NH_3)_5Cl]Cl_3$

C. (c) $[Pt(NH_3)_4Cl_2]Cl_2$

D. (d) $\left[Pt(NH_3)_3Cl_3\right]Cl$

Answer: A

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4. What is the co-ordination number of Cr in $K_3\left[Cr(Ox)_3\right]$

A. (a) 6

B. (b) 4

C. (c) 3

D. (d) 2

Answer: A

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5. What is the EAN of central metal in $\left[Ni(gly)_2\right]$ (At. No. of $Ni = 28$)

A. (a) 30

B. (b) 34

C. (c) 36

D. (d) 32

Answer: B

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6. In the complex $\left[Pt(py)_4\right]\left[PtCl_4\right]$, the oxidation numbers of Pt atom in former and latter part of the compund are respectively

A. (a) 0 and 0

B. (b) $+4$ and $+2$

C. (c) $+2$ and $+2$

D. (d) 0 and $+4$

Answer: C

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7. Which of the following is correct value of x in $Cr(CO)_x$?

A. (a) 2

B. (b) 4

C. (c) 6

D. (d) unpredictable

Answer: C

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8. Which among the following complexes is diamagnetic?

A. (a) $\left[Cr(NH_3)_6\right]^{3+}$

B. (b) $[CoF_6]^{3-}$

C. (c) $Ni(CO)_4$

D. (d) $[CuCl_4]^{2-}$

Answer: C

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9. $CuSO_4.5H_2O$ is represented as

A. (a) $\left[Cu(H_2O)_5\right]SO_4$

B. (b) $\left[Cu(H_2O)_3SO_4\right].2H_2O$

C. (c) $\left[Cu(H_2O)_4\right]SO_4.\ H_2O$

D. (d) All of these

Answer: C

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10. The EAN of nickel in $Ni(CO)_4$ is:

A. (a) 38

B. (b) 36

C. (c) 28

D. (d) 54

Answer: B

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11. The EAN of platinum in potassium hexachloroplatinate (IV) is:

A. (a) 86

B. (b) 46

C. (c) 36

D. (d) 84

Answer: A

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12. An imperfect complex of a complex compund is $100\,\%$ ionized, the compound is called:

A. (a) acid salt

B. (b) complex salt

C. (c) double salt

D. (d) normal salt

Answer: C

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13. $NH_2 \cdot NH_2$ serve as:

A. (a) monodenate ligand

B. (b) both (a) and (c)

C. (c) bridging ligand

D. (d) chelating ligand

Answer: B

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14. Which one is bidentate ligand?

A. (a) $C_2O_4^-$

B. (b) $NH_2 \cdot CH_2 \cdot CH_2 \cdot NH_2$

C. (c) None of these

D. (d) Both (a) and (b)

Answer: D

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15. The value of x on the $\left[Ni(CN)_4\right]^x$ is:

A. (a) $+2$

B. (b) 0

C. (c) -2

D. (d) $+4$

Answer: C

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16. The complex that violates the EAN:

A. (a) potassium ferrocyanide

B. (b) nickel carbonyl

C. (c) potassium ferricyanide

D. (d) cobalt (III) hexaammine chloride

Answer: C

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17. Some salts although containing two different metallic elements give test for one of them in solution. Such salts are:

A. (a) double salts

B. (b) complex salts

C. (c) normal salts

D. (d) none of these

Answer: B

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18. Coordination number of Ni in $\left[Ni(C_2O_4)_3\right]^{4-}$ is:

A. (a) 3

B. (b) 4

C. (c) 5

D. (d) 6

Answer: D

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19. Which of the following will exhibit maximum ionic conductivity?

A. (a) $\left[Co(NH_3)_6\right]Cl_3$

B. (b) $\left[Cu(NH_3)_4\right]Cl_2$

C. (c) $\left[Ni(CO)_4\right]$

D. (d) $K_4\left[Fe(CN)_6\right]$

Answer: D

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20. An excess of $AgNO_3$ is added to $100mL$ of a $0.01M$ solution of dichlorotetraaquachromin (III) chloride. The number of moles of $AgCl$ precipitated would be:

A. (a) 0.002

B. (b) 0.001

C. (c) 0.003

D. (d) 0.01

Answer: B

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21. The coordination number of a central metal atom in a complex is determined by:

A. (a) The number of only anionic ligard bonded to metal ion.

B. (b) the number of ligands around a metal ion bonded by sigma bonds.

C. (c) the number of ligands around a metal ion bonded by pi bonds.

D. (d) the number of ligands around a metal ion bonded by sigma and pi bonds.

Answer: B

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22. Ligands in a complex salt are:

A. (a) ions or molecules linked by coordinate bonds to a central metal atom or ion.

B. (b) molecules linked by coordinate bonds to a central metal atom or ion.

C. (c) cations linked by coordinate bonds to a central metal atom or ion.

D. (d) anions linked by coordinate bonds to a central metal atom or ion.

Answer: A

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23. Among the following which are ambidentate ligands?

(i) NO_2^-

(ii) NO_3^-

(iii) $C_2O_4^{2-}$

(iv) SCN^-

A. (a) (i) and (iv)

B. (b) (i) and (ii)

C. (c) (ii) and (iii)

D. (d) (iii) and (iv)

Answer: A

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24. How many EDTA molecules are required to make an octahedral complex with a Ca^{2+} ion?

A. (a) Two

B. (b) One

C. (c) Three

D. (d) six

Answer: B

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25. A solution containing $2.675g$ of $COCl_3.6NH_3$ (molar mass $= 267.5gmol^{-1}$) is passed through a cation exchanger, The chloride ions obtined in solution were treated with excess of $AgNO_3$ to give$4.78g$ of $AgCl\left(\text{molar mass} = 143.5gmol^{-1}\right.$.The formula of the complex is (Atomic mass of $Ag = 108u$)

A. (a) $\left[Co(NH_3)_6\right]Cl_3$

B. (b) $\left[Co(NH_3)_3Cl_3\right]_3NH_3$

C. (c) $\left[Co(NH_3)_4Cl_2\right]Cl_2NH_3$

D. (d) $\left[Co(NH_3)_5Cl\right]Cl_2NH_3$

Answer: A

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26. Ligands are

A. (a) negative, positive ions or neutral molecules

B. (b) negative ions only

C. (c) neutral molecules only

D. (d) never positive ions

Answer: A

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27. The bidenate ligand among the following is

A. (a) dipy

B. (b) PH_3

C. (c) NO

D. (d) All

Answer: A

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28. The ligard which is not bidenate

A. (a) gly

B. (b) dmg

C. (c) dien

D. (d) all

Answer: C

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29. The ligard ac ac has.....donor sites

A. (a) 4

B. (b) 3

C. (c) 2

D. (d) none

Answer: C

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30. The oxidation state of oxygen in $O_2[PtF_6]$ is

A. (a) zero

B. (b) $-1/2$

C. (c) $+1$

D. (d) $+1/2$

Answer: D

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31. Aqueous solution of which of the following complexes would exchibit the highest molar conductance?

A. (a) $K_4[Fe(CN)_6]$

B. (b) $K_2[PtCl_4]$

C. (c) $[Cr(NH_3)_3Cl_3]$

D. (d) $[Co(NH_3)_6]Cl_3$

Answer: D

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32. Number of ions produced when $[Cu(NH_3)_4]Cl_2$ is dissolved in water is/are

A. (a) 3

B. (b) 2

C. (c) 1

D. (d) 5

Answer: A

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33. The most stable ion is:

A. (a) $\left[Fe(C_2O_4)_3\right]^{2-}$

B. (b) $\left[Fe(Cl)_6\right]^{3-}$

C. (c) $\left[Fe(CN)_6\right]^{3-}$

D. (d) $\left[Fe(H_2O)_6\right]^{3+}$

Answer: A

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34. One mole of complex compound $Co(NH_3)_5Cl_3$ gives 3 moles of ions on dissolution in water. One mole of same complex reacts with two moles of $AgNO_3$ to yield two moles of $AgCl(s)$. The complex is:

A. (a) $\left[Co(NH_3)_4Cl_2\right]Cl.\ NH_3$

B. (b) $\left[Co(NH_3)_4Cl\right]Cl_2.\ NH_3$

C. (c) $\left[Co(NH_3)_5Cl\right]Cl_2$

D. (d) $\left[Co(NH_3)_3Cl_3\right].2NH_3$

Answer: C

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35. Among the properties (A) reducing(B) oxidising (C) complexing the set of properties shown by CN^{Θ} ion towards metal species is .

A. (a) a, b, c

B. (b) b. c

C. (c) c. a

D. (d) a, b

Answer: C

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36. The coordination number and the oxidation state of the element 'E' in the complex $\left[E(en)_2(C_2O_4)\right]NO_2$ (where (en) is ethylenediamine) are, respectively

A. (a) 6 and 2

B. (b) 4 and 2

C. (c) 4 and 3

D. (d) 6 and 3

Answer: D

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37. Formation of complex compound can be detected by

A. (a) Change in colour

B. (b) Change in solubility

C. (c) Change in pH

D. (d) Change in electrical conductivity

Answer: D

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38. According to effective atomic number rule the central metal acquires:

A. (a) Inert gas configuration

B. (b) Duplet

C. (c) Octet

D. (d) Quartet

Answer: A

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39. Which of the following is the most likely structure of $CrCl_3 \cdot 6H_2O$, if $1/3$ of total chlorine of the compound is precipitated by adding $AgNO_3$ to its aqueous solution:

A. $CrCl_3 \cdot 6H_2O$

B. $\left[Cr(H_2O)_3Cl_3\right].3H_2O$

C. $\left[CrCl_2(H_2O)_4\right]Cl.2H_2O$

D. $\left[CrCl(H_2O)_5\right]Cl_2H_2O$

Answer: C

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40. Pick out from the following complex compounds, a poor electrolytic conductor in solution?

A. (a) $K_2[PtCl_6]$

B. (b) $\left[Co(NH_3)_3(NO_2)_3\right]$

C. (c) $K_4\left[Fe(CN)_6\right]$

D. (d) $\left[Co(NH_3)_4\right]SO_4$

Answer: B

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41. Diethylene triamine is:

A. (a) Chelating agent

B. (b) Polydentate ligand

C. (c) Tridentate ligand

D. (d) All

Answer: D

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42. In the coordination compound $[Co(en)_2Cl_2]Cl$ (en=ethylenediamine), the coordination number and oxidation number of the central atom are, respectively:

A. (a) 4, +3

B. (b) 6, +2

C. (c) 4, +2

D. (d) 6, +3

Answer: D

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43. In dodecacarbonyl dicobalt, the oxidation state of cobalt is:

A. (a) 1

B. (b) 2

C. (c) 3

D. (d) Zero

Answer: D

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44. Which of the following is the strongest field ligand?

A. (a) CN^-

B. (b) NO_2^-

C. (c) NH_3

D. (d) en

Answer: A

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45. A sample of copper sulphate pentahydrate, $CuSO_4.5H_2O$ contains $3.782g$ of Cu. How many grams of oxygen are in this sample?

A. (a) $0.952g$

B. (b) $3.809g$

C. (c) $4.761g$

D. (d) $8.570g$

Answer: D

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46. The term cryptands refers to:

A. (a) Macrocyclic ligands with nitrogen donor

B. (b) Macrocyclic ligands with nitrogen and sulphur donors

C. (c) Macrocyclic ligands with nitrogen and oxygen donors

D. (d) Aliphatic ligands with nitrogen, sulphur and oxygen donors

Answer: C

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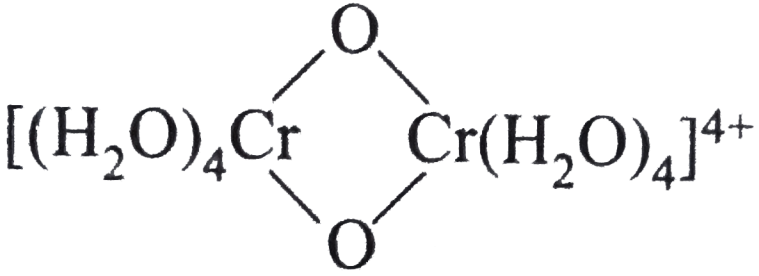
47. What is the oxidation number of chromium in the dimeric hydroxo bridged species?



A. (a) $+6$

B. (b) $+4$

C. (c) $+3$

D. (d) $+2$

Answer: B

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48. In $K_4Fe(CN)_6$

A. (a) (CN) is linked with primary valency

B. (b) (CN) is linked with secondary valency

C. (c) K is linked with secondary valency

D. (d) K is linked with non-ionic valency

Answer: B

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49. Which of the following acts as a bidentate ligand in complex formation?

A. (a) Acetate

B. (b) Oxalate

C. (c) Thiocyanate

D. (d) EDTA

Answer: B

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50. The co-ordination number of cobalt in the complex $\left[Co(en)_2Br_2\right]Cl_2$ is

A. (a) 2

B. (b) 6

C. (c) 5

D. (d) 4

Answer: B

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51. What is the co-ordination number of the metal in $\left[Co(en)_2Cl_2\right]^+$?

A. (a) 4

B. (b) 5

C. (c) 6

D. (d) 3

Answer: C

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52. The coordination number of Pt in $\left[Pt(NH_3)_4Cl_2\right]$ ion is

A. (a) 2

B. (b) 4

C. (c) 6

D. (d) 8

Answer: C

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53. Which is the example of hexadentate ligand?

A. (a) 2, 2-dipyridyl

B. (b) Dimethylglyoxime

C. (c) Aminodiacetate ion

D. (d) Ethylene diammine tetra acetate ion [EDTA]

Answer: D

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54. The coordination number of a metal in coordination compound is

A. (a) Same as primary valency

B. (b) Sum of primary and secondary valencies

C. (c) Same as secondary valency

D. (d) None of these

Answer: C

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55. Which of the following complexes shows six coordination number?

A. (a) $\left[Zn(CN)_4\right]^{2-}$

B. (b) $\left[Cr(H_2O)_6\right]^{3+}$

C. (c) $\left[Cu(CN)_4\right]^{2-}$

D. (d) $\left[Ni(NH_3)_4\right]^{2+}$

Answer: B

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56. The number of ions formed when cuprammonium sulphate is dissolved in water is

A. (a) 1

B. (b) 2

C. (c) 4

D. (d) Zero

Answer: B

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57. The coordination number of Cu in complex $\left[Cu(H_2O)_4\right]^{++}$ is

A. (a) 4

B. (b) 3

C. (c) 2

D. (d) 1

Answer: A

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58. Which one of the following forms with an excess of CN^- (Cyanide) a complex having coordination number two

A. (a) Cu^+

B. (b) Ag^+

C. (c) Ni^{2+}

D. (d) Fe^{2+}

Answer: B

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59. According to Lewis ,the ligands are

A. (a) Acidic in nature

B. (b) Basic in nature

C. (c) Neither acidic nor basic

D. (d) Some are acidic and others are basic

Answer: B

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60. Potassium ferrocyanide is a

A. (a) Normal salt

B. (b) Mixed salt

C. (c) Double salt

D. (d) Complex salt

Answer: D

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61. EDTA has coordination number

A. (a) 3

B. (b) 4

C. (c) 5

D. (d) 6

Answer: D

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62. Coordination number of Zn in ZnS (zine blende) is

A. (a) 6

B. (b) 4

C. (c) 8

D. (d) 12

Answer: B

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63. Generally, a group of atoms can function as a ligand if

A. (a) They are positively charged ions

B. (b) They are free radicals

C. (c) They are either neutral molecules or negatively charged ions

D. (d) None of these

Answer: C

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64. The ligand in potassium ferricyanide is

A. (a) K^+

B. (b) CN^-

C. (c) Fe^{3+}

D. (d) $(CN)_6$

Answer: B

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65. Co-ordination number of aluminium is

A. (a) 8

B. (b) 6

C. (c) 12

D. (d) 4

Answer: B

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66. In $K_4\left[Fe(CN)_6\right]Fe$ is in the form of

A. (a) An atom

B. (b) An ion

C. (c) Cationic complex

D. (d) Anionic complex

Answer: D

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67. Which of the following ligands is expected to bidentates?

A. (a) Br

B. (b) $C_2O_4^{2-}$

C. (c) CH_3NH_2

D. (d) $CH_3C \equiv N$

Answer: D

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68. In the compound lithium tetrahydridoaluminate, the ligand is

A. (a) H^+

B. (b) H^-

C. (c) H

D. (d) None of these

Answer: B

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69. The negative ligand is

A. (a) Aqua

B. (b) Sulphato

C. (c) Carboxyl

D. (d) Nitro sonium

Answer: B

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70. Finely divided iron combines with CO to give

A. (a) $Fe(CO)_5$

B. (b) $Fe_2(CO)_9$

C. (c) $Fe_2(CO)_{12}$

D. (d) $Fe(CO)_6$

Answer: A

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71. Carnallite in sodium of H_2O shows the properties of

A. (a) K^+, Mg^{2+}, Cl^-

B. (b) $K^+, Cl^-, SO_4^{2-}, Br^-$

C. (c) K^+, Mg^{2+}, CO_3^{2-}

D. (d) $K^+, Mg^{2+}, Cl^- Br^-$

Answer: A

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72. The formula of alum is

A. (a) $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$

B. (b) $K_4\left[Fe(CN)_6\right]$

C. (c) $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 6H_2O$

D. (d) $Na_2CO_3 \cdot 10H_2O$

Answer: A

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73. Number of ions present in $K_4[Fe(CN)_6]$

A. (a) 2

B. (b) 10

C. (c) 3

D. (d) 5

Answer: D

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74. The EAN of nickel in $Ni(CO)_4$ is:

A. (a) 34

B. (b) 35

C. (c) 32

D. (d) 36

Answer: D

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75. How many ions are produced in aqueous solution of $\left[Co(H_2O)_6\right]Cl_2$?

A. (a) 2

B. (b) 3

C. (c) 4

D. (d) 6

Answer: B

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76. In $K_4\left[Fe(CN)_6\right]$ the EAN of Fe is

A. (a) 33

B. (b) 35

C. (c) 36

D. (d) 26

Answer: C

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77. The oxidation number of chromium in sodium tetrafluorido oxochromate complex is

A. (a) II

B. (b) IV

C. (c) VI

D. (d) III

Answer: B

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78. In which of the following complexes oxidation state of metal is zero

A. (a) $\left[Pt(NH_3)_2Cl_2\right]$

B. (b) $\left[Cr(CO)_6\right]$

C. (c) $\left[Cr(NH_3)_3Cl_3\right]$

D. (d) $\left[Cr(en)_2Cl_2\right]$

Answer: B

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79. The oxidation number of Cr in $\left[Cr(NH_3)_6\right]Cl_3$ is

A. (a) 8

B. (b) 6

C. (c) 4

D. (d) 3

Answer: D

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80. In $\left[Ni(NH_3)_4\right]SO_4$, the E.A.N. of Ni is

A. (a) 34

B. (b) 35

C. (c) 36

D. (d) 37

Answer: A

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81. The oxidation number of Pt in $[Pt(C_2H_4)Cl_3)]^{\ominus}$ is

A. (a) $+1$

B. (b) $+2$

C. (c) $+3$

D. (d) $+4$

Answer: B

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82. The oxidation state of cobalt in the complex compound $\left[Co(NH_3)_6\right]Cl_3$ is

A. (a) $+3$

B. (b) $+6$

C. (c) $+5$

D. (d) $+2$

Answer: A

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83. The effective atomic number of cobalt in the complex $\left[Co(NH_3)_6\right]^{3+}$ is

A. (a) 36

B. (b) 33

C. (c) 24

D. (d) 30

Answer: A

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84. The EAN of iron in potassium ferricyanide is

A. (a) 18

B. (b) 54

C. (c) 35

D. (d) 23

Answer: C

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85. In the coordination compound, $K_4\left[Ni(CN)_4\right]$ oxidation state of nickel is

A. (a) -1

B. (b) 0

C. (c) $+1$

D. (d) $+2$

Answer: B

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86. Pick out the complex compound in which the central metal atom obeys EAN rule strictly

A. (a) $K_4\left[Fe(CN)_6\right]$

B. (b) $K_3\left[Fe(CN)_6\right]$

C. (c) $\left[Cr(H_2O)_6\right]Cl_3$

D. (d) $\left[Cu(NH_3)_4\right]SO_4$

Answer: A

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87. Which of the following is wrong statement?

A. (a) $Ni(CO)_4$ has oxidation number $+4$ for Ni

B. (b) $Ni(CO)_4$ has zero oxidation number for Ni

C. (c) Ni is metal

D. (d) CO is gas

Answer: A

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88. Oxidation state of Fe in $K_3\left[Fe(CN)_6\right]$ is

A. (a) 2

B. (b) 3

C. (c) 0

D. (d) None of these

Answer: B

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89. Which complexes have zero oxidation state?

A. (a) Carbonyl

B. (b) Ferrocyanide

C. (c) Amine

D. (d) Cyanide

Answer: A

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90. The oxidate state of Co in $\left[Co(H_2O)_5Cl\right]^{2+}$ is

A. (a) $+2$

B. (b) $+3$

C. (c) $+1$

D. (d) $+4$

Answer: B

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Nomenclature

1. The IUPAC name of the coordination compound $K_3\left[Fe(CN)_6\right]$ is:

A. (a) potassium hexacyanidoferrate (II)

B. (b) potassium hexacyanidoferrate (III)

C. (c) potassium hexacyanoiron (II)

D. (d) tripotassium hexacyanidoiron (II)

Answer: B

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2. The IUPAC name of the complex $\left[Co(NO_2)(NH_3)_5\right]Cl_2$ is

A. (a) nitro-N-pentaamminecobalt (III) chloride

B. (b) nitro-N-pentaamminecobalt (II) chloride

C. (c) pentaammine nitro-N-cobalt (II) chloride

D. (d) pentaammine nitro-N-cobalt (III) chloride

Answer: D

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3. Which among the following will be named as dibromidobis-(ethylenediamine) chromium (III) bromide?

A. (a) $\left[Cr(en)_3\right]Br_3$

B. (b) $\left[Cr(en)_2Br_2\right]Br$

C. (c) $[Cr(en)Br_4]^-$

D. (d) $[Cr(en)Br_2]Br$

Answer: B

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4. The formula of the complex tris (ethylenediamine) cobalt (III) sulphate is

A. (a) $\left[Co(en)_2SO_4\right]$

B. (b) $\left[Co(en)_3SO_4\right]$

C. (c) $\left[Co(en)_3\right]_2SO_4$

D. (d) $\left[Co(en)_3\right]_2(SO_4)_3$

Answer: D

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5. The IUPAC name of the complex $\left[Pt(NH_3)_2Cl_2\right]$ is

A. (a) platinum (II) diammino dichloride

B. (b) diammine dichlorido platinum (II)

C. (c) bis (ammino) dichloro platinum (IV)

D. (d) dichloro diammine platinum (II)

Answer: B

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6. The formula of sodium nitroprusside is

A. (a) $Na_4\left[Fe(CN)_5NOS\right]$

B. (b) $Na_2\left[Fe(CN)_5NO\right]$

C. (c) $NaFe\left[Fe(CN)_6\right]$

D. (d) $Na_2\left[Fe(CN)_6NO_2\right]$

Answer: B

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7. The IUPA name of $\left[Co(NH_3)_3(NO_2)_3\right]$ is

A. (a) triamminetrinitro-N-cobalt (III)

B. (b) trinitrotriammine cobalt (II)

C. (c) trinitrotriammine cobalt (III)

D. (d) trinitrotriammine cobaltate (III)

Answer: A

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8. The IUPAC name of $K_4\left[Fe(CN)_6\right]$ is

A. (a) potassium hexacyanidoferrate (II)

B. (b) potassium ferrocyanide

C. (c) tetrapotassium hexacyanidoferrate (II)

D. (d) tetrapotassium ferroushexacyanide (II)

Answer: A

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9. The correct nomenclature for $Fe_4\left[Fe(CN)_6\right]_3$ is

A. (a) ferroso-ferric cyanide

B. (b) ferric-ferrous hexacyanate

C. (c) iron (III) hexacyanidoferrate

D. (d) hexacynoferrate (III-II)

Answer: C

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10. The IUPAC name of compound $Na_3\left[Co(ONO)_6\right]$ will be

A. (a) hexanitritocobalt (III) sodium

B. (b) sodium cobalt nitrite

C. (c) sodium hexanitrocobaltate (III)

D. (d) sodium hexanitrito-o-cobaltate (III)

Answer: D

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11. IUPAC name of $\left[Co(ONO)(NH_3)_5Cl_2\right]$ is

A. (a) pentaammine nitro cobalt (III) chloride

B. (b) pentaammine nitrito-o-cobalt (III) chloride

C. (c) pentaammine nitroso cobalt (III) chloride

D. (d) pentaammine oxo-nitro cobalt (III) chloride

Answer: B

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12. According to IUPAC nomenclature sodium nitroprusside is named as

A. (a) sodium pentacyanonitrosyl ferrate (III)

B. (b) sodium nitroferricyanide

C. (c) sodium nitroferrocyanide

D. (d) sodium pentacyanonitrosyl ferrate (II)

Answer: A

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13. The proper name for $K_2[PtCl_6]$ is

A. (a) potassium platinum hexachloride

B. (b) potassium hexachlorido platinum IV

C. (c) potassium hexachlorido platinate IV

D. (d) potassium hexachlorido platinum

Answer: B

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14. IUPAC name of $K_3\left[Al(C_2O_4)_3\right]$ is called

A. (a) potassium alumino oxalato

B. (b) potassium aluminium (III) trioxalate

C. (c) potassium trioxalato aluminate (III)

D. (d) potassium trioxalato aluminate (IV)

Answer: C

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15. The IUPAC name of $K_3\left[Ir(C_2O_4)_3\right]$ is

A. (a) potassium trioxalato iridium (III)

B. (b) potassium trioxalato iridate (III)

C. (c) potassium tris (oxalato) iridium (III)

D. (d) potassium tris (oxalato) iridate (III)

Answer: B

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16. The IUPAC name of $\left[Co(NH_3)_6\right]Cl_3$ is

A. (a) hexammine cobalt (III) chloride

B. (b) hexammine cobalt (II) chloride

C. (c) triammine cobalt (III) trichloride

D. (d) None of these

Answer: A

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17. IUPAC name of $\left[Co(NH_3)_3(H_2O)_2Cl\right]Cl_2$ is

A. (a) diaquachloridodiammine cobalt (III) chloride

B. (b) triamminediaquachlorido cobalt (III) chloride

C. (c) chlorodiamminediaqua cobalt (III) chloride

D. (d) diamminediaquachlorido cobalt (II) chloride

Answer: B

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18. IUPAC name for $K\left[Ag(CN)_2\right]$ is

A. (a) potassium argentocyanide

B. (b) potassium silver cyanide

C. (c) potassium dicyanidoargentate (I)

D. (d) potassium dicyanidosilver (II)

Answer: C

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19. The chemical formula of diammine silver (I) chloride is

A. (a) $[Ag(NH_3)]Cl$

B. (b) $\left[Ag(NH_3)_2\right]Cl$

C. (c) $\left[Ag(NH_3)_2\right]Cl$

D. (d) $\left[Ag(NH_4)_2\right]Cl$

Answer: B

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20. IUPAC name of $\left[Co(NH_3)_5NO_2\right]Cl_2$

A. (a) pentamminentro-N-cobalt (III) chloride

B. (b) pentaamminenitrosocobalt (III) chloride

C. (c) pentaamminenitrocobalt (II) chloride

D. (d) None of these

Answer: A

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21. The pair of the compounds in which both the metals are in the highest possible oxidation state is

A. (a) $\left[Fe(CN)_6\right]^{3-}, \left[Co(CN)_6\right]^{3-}$

B. (b) CrO_2Cl_2, MnO_4^-

C. (c) TiO_3, MnO_2

D. (d) $\left[Co(CN)_6\right]^{3-}, MnO_3$

Answer: B

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22. The IUPAC name of $\left[Cr(NH_3)_6\right]^{3+}$ is

A. (a) hexamminechromium (VI) ion

B. (b) hexamminechromium (III) ion

C. (c) hexamminechromium (II) ion

D. (d) hexamminechloride

Answer: B

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23. The IUPAC name for $K_2\left[Cr^{Vl}NH_3(CN)_2O_2(O_2)\right]$ is

A. (a) potassium ammine dicyanido dioxoperoxochromate (VI)

B. (b) potassium ammine cyanido peroxo dioxo chromium (III)

C. (c) potassium ammine cyanido perxo dioxo chromium (VI)

D. (d) potassium ammine cyanido peroxo dioxo chromatic (IV)

Answer: A

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Structural Isomerism

1. Give the total number of possible structural isomers of the compound $\left[Cu(NH_3)_4\right][PtCl_4]$.

A. (a) 3

B. (b) 6

C. (c) 5

D. (d) 4

Answer: D

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2. The number of isomers possible for square planar complex $K_2[PdClBr_2SCN]$ is:

A. (a) 2

B. (b) 4

C. (c) 3

D. (d) 6

Answer: B

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3. $[Co(NH_3)_5Br]SO_4$ and $[Co(NH_3)_5SO_4]Br$ are the examples of:

A. (a) linkage isomerism

B. (b) geometrical isomerism

C. (c) optical isomerism

D. (d) ionization isomerism

Answer: D

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4. Geometrical isomerism is found in coordination compounds having coordination number:

A. (a) 6

B. (b) 3

C. (c) 4(tetrahedral)

D. (d) 2

Answer: A

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5. The type of isomerism shown by $\left[Co(en)_2(NCS)_2\right]Cl$ and $\left[Co(en)_2(NCS)Cl\right]NCS$ is:

A. (a) ionization

B. (b) coordination

C. (c) linkage

D. (d) all of these

Answer: A

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6. Which of the following square planar complexes will form two geometrical isomers?

A. (a) MA_4

B. (b) MA_3B

C. (c) MAB_3

D. (d) MA_2B_2

Answer: D

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7. The square planar complex $(MABCD)$ can show

A. (a) two optical isomers

B. (b) three geometrical isomers

C. (c) two geometrical isomers

D. (d) three optical isomers

Answer: B

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8. Out of the following which will not show geometrical isomerism?

A. (a) $\left[Pt(NH_3)_2Cl_2\right]$

B. (b) $\left[Co(en)_2Cl_2\right]Cl$

C. (c) $\left[Co(NH_3)_3Cl_3\right]$

D. (d) $\left[Cr(NH_3)_4Cl_2\right]Cl$

Answer: C

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9. $\left[Co(NH_3)_4Cl_2\right]^+$ exhibits

A. (a) optical isomers

B. (b) ionisation isomerism

C. (c) linkage isomerism

D. (d) geometrical isomerism

Answer: D

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10. The Type of isomerism present in pentaammine nitro chromium(III) perchlorate is .

A. (a) Optical

B. (b) Linkage

C. (c) Ionisation

D. (d) Polymerisation

Answer: B

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11. The most stable ion is .

A. (a) $\left[Fe(C_2O_4)_3\right]^{2-}$

B. (b) $\left[Fe(Cl)_6\right]^{3-}$

C. (c) $\left[Fe(CN)_6\right]^{3-}$

D. (d) $\left[Fe(H_2O)_6\right]^{3+}$

Answer: A

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12. Which of the following complex ions has geometrical isomers?

A. (a) $\left[Co(en)_3\right]^{3+}$

B. (b) $\left[Ni(NH_3)_5Br\right]^{+}$

C. (c) $\left[Co(NH_3)(en)_2\right]^{3+}$

D. (d) $\left[Cr(NH_3)_4(en)\right]^{3+}$

Answer: C

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13. Which of the following pairs represents linkage isomers?

A. (a) $\left[Cu(NH_3)_4\right]\left[PtCl_4\right]$ and $\left[Pt(NH_3)_4\right]\left[CuCl_4\right]$

B. (b) $\left[Pd(PPh_3)_2(NCS)_2\right.$ and $\left.\left[Pd(PPh_3)_2(SCN)_2\right]\right.$

C. (c) $\left[Co(NH_3)_5\right]NO_3SO_4$ and $\left[Co(NH_3)_5SO_4\right]NO_3$

D. (d) $\left[PtCl_2(NH_3)_4\right]Br$ and $\left[PtBr_2(NH_3)_4Cl_2\right.$

Answer: B

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14. The number of geometrical isomers of $\left[Co(NH_3)_3(NO_3)_3\right]$ are:

A. (a) 0

B. (b) 2

C. (c) 3

D. (d) 4

Answer: B

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15. A square planar complex is represented as:

A. (a) Geometrical isomers

B. (b) Optical isomerism

C. (c) Linkage isomerism

D. (d) None

Answer: A

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16. The two compounds sulphato penta-ammine cobalt (III) bromide and sulphato penta-ammine cobalt (III) chloride represent:

A. (a) Linkage isomerism

B. (b) Ionisation isomerism

C. (c) Co-ordination isomerism

D. (d) No isomerism

Answer: D

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17. Cis-trans isomerism is found in square planar complexes of molecular formula: (a and b are monodentate ligands)

A. (a) Ma_4

B. (b) Ma_3b

C. (c) Ma_2b_2

D. (d) Mab_3

Answer: C

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18. Which one of the following is an example of coordination isomerism?

A. (a) $\left[Co(NH_3)_5Br\right]SO_4$ and $\left[Co(NH_3)_5SO_4\right]Br$

B. (b) $\left[Co(NH_3)_5NO_2\right]Cl_2$ and $\left[Co(NH_3)_5ONO\right]Cl_2$

C. (c) $\left[Cr(H_2O)_6\right]Cl_3$ and $\left[Cr(H_2O)_5Cl\right]Cl_2H_2O$

D. (d) $\left[Co(NH_3)_6\right]\left[Cr(CN)_6\right]$ and $\left[Cr(NH_3)_6\right]\left[Co(CN)_6\right]$

Answer: D

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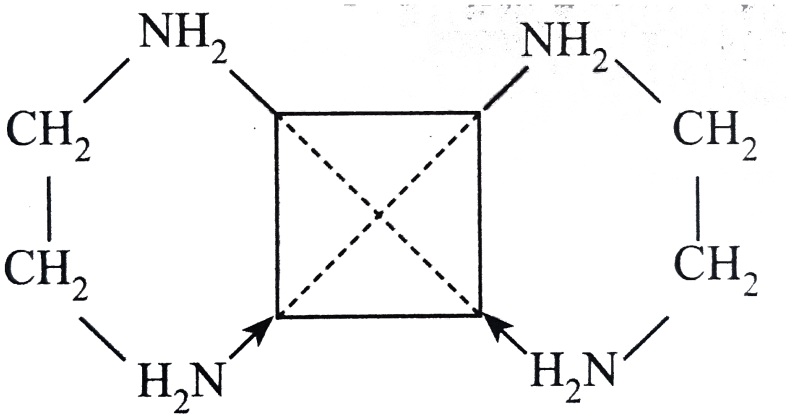
19. A square planar complex represented as:



A. (a) Geometrical isomerism

B. (b) Linkage isomerism

C. (c) Optical isomerism

D. (d) None of these

Answer: D

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20. A compound has the empirical formula $CoCl_3.5NH_3$. When an aqueous solution of this compound is mixed with excess silver nitrate, 2 mol of $AgCl$ precipitates per mol of compound. On reaction with excess HCl, no NH_4^+ is detected. Hence it is

A. (a) $\left[Co(NH_3)_5Cl_2\right]Cl$

B. (b) $\left[Co(NH_3)_5Cl\right]Cl_2$

C. (c) $\left[Co(NH_3)_5Cl_3\right]$

D. (d) $\left[Co(NH_3)_4Cl_2\right]Cl.\ NH_3$

Answer: B

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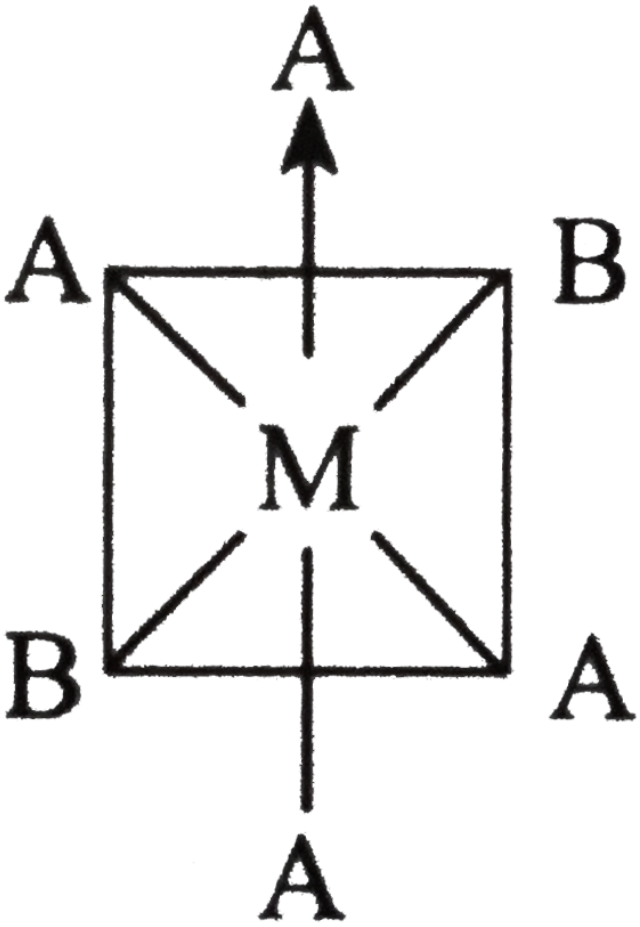
21. The isomer



A. (a) Dextro isomer

B. (b) Laevo isomer

C. (c) Cis isomer

D. (d) Trans isomer

Answer: D

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22. Which of the following octahedral complex does not show geometrical isomerism (A and B are monodentate ligands) ?

A. (a) $[MA_5B]$

B. (b) $[MA_2B_4]$

C. (c) $[MA_3B_3]$

D. (d) $[MA_4B_2]$

Answer: A

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23. $\left[Co(NH_3)_5NO_2\right]Cl_2$ and $\left[Co(NH_3)_5(ONO)Cl_2\right]$ are related to each other as

A. (a) Geometrical isomers

B. (b) Optical isomers

C. (c) Linkage isomers

D. (d) Coordination isomers

Answer: C

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24. $\left[Co(NH_3)_5Br\right]SO_4$ and $\left[CO(NH_3)_5SO_4\right]Br$ are examples of which type of isomerism

A. (a) Linkage

B. (b) Geometrical

C. (c) Ionization

D. (d) Optical

Answer: C

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25. $\left[CO(NH_3)_4Cl_2\right]NO_2$ and $\left[Co(NH_3)_4Cl \cdot NO_2\right]Cl$ are..... isomers

A. (a) Geometrical

B. (b) Optical

C. (c) Linkage

D. (d) Ionization

Answer: D

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26. Which would exhibit ionisation isomerism?

A. (a) $\left[Cr(NH_3)_6\right]Cl_3$

B. (b) $\left[Co(NH_3)_5Br\right]SO_4$

C. (c) $\left[Cr(en)_2Cl_2\right]$

D. (d) $\left[Cr(en)_3Cl_3\right]$

Answer: B

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27. Coordination isomerism is caused by the interchange of ligands between the

A. (a) Cis and trans structures

B. (b) Complex cation and complex anion

C. (c) Inner sphere and outer sphere

D. (d) Low oxidation and higher oxidation states

Answer: A

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28. Which one of the following will not show geometrical isomerism?

A. (a) $\left[Cr(NH_3)_4Cl_2\right]Cl$

B. (b) $\left[Co(en)_2Cl_2\right]Cl$

C. (c) $\left[Co(NH_3)_5NO_2\right]Cl_2$

D. (d) $\left[Pt(NH_3)_2Cl_2\right]$

Answer: C

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29. $\left[Co(NH_3)_4Cl_2\right]^+$ exhibits

A. (a) Geometrical isomerism

B. (b) Optical isomerism

C. (c) Bonding isomerism

D. (d) Ionisation isomerism

Answer: A

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30. The number of geometrical isomers for $\left[Pt(NH_3)_2Cl_2\right]$ is

A. (a) Two

B. (b) One

C. (c) Three

D. (d) Four

Answer: A

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31. The number of geometrical isomers of the complex $[Co(NO_2)_2(NH_3)_2]$ is

A. (a) 2

B. (b) 3

C. (c) 4

D. (d) 0

Answer: A

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Optical Isomerism

1. Which of the following is not optically active?

A. (a) $[Co(en)_3]^{3+}$

B. (b) $[Cr(ox)_3]^{3-}$

C. (c) $cis - \left[CoCl_2(en)_2\right]^+$

D. (d) $trans - \left[CoCl_2(en)_2\right]^+$

Answer: D

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2. Which of the following types of octahedral complexes does not show optical isomerism?

A. (a) $MA_2X_2Y_2$

B. (b) $\left[Pt(NH)_3)_4\right]^{2+}$

C. (c) $\left[M(AA)_3\right]^{n+}$

D. (d) $\left[M(AA)_2X_2\right]^{n+}$

Answer: B

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3. Type of isomerism which is shown by $[PtCl_2Br_2]^{2-}$ is also observed in:

A. (a) $[CoCl_2Br_2]^{2-}$

B. (b) $[Co(en)_3]^{3+}$

C. (c) $[PtCl_4Br_2]^{2-}$

D. (d) $[PtCl_3(NO)_2]^{2-}$

Answer: C

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4. Which of the following statements is not true about the complex ion $[Pt(en)_2Cl_2]^{2+}$?

A. (a) It has two geometrical isomers: cis and trans.

B. (b) Both the cis and trans isomers display optical activity.

C. (c) Only the cis isomer displays optical activity.

D. (d) Only the cis isomer has non-superimposable mirror image.

Answer: B

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5. Tris (ethylenediamine) cobalt (III) cation, $\left[Co(en)_3\right]^{3+}$, can have

A. (a) three stereoisomers, all chiral and optically active

B. (b) two chiral stereoisomers (enantiomers) and one achiral

C. (c) three stereisomers, all archiral

D. (d) two stereoisomers, both achiral

Answer: B

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6. Which one of the following complexes exhibit chirality?

A. (a) $\left[Cr(ox)_3\right]^{3-}$

B. (b) $cis - [PtCl_2(en)]$

C. (c) $cis - \left[RhCl_2(NH_3)_4\right]^+$

D. (d) $mer - \left[Co(NO_2)_3(dien)\right]$

Answer: A

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7. Which of the following complex will show optical activity?

A. (a) $trans - \left[Co(NH_3)_4Cl_2\right]^+$

B. (b) $[Cr(H_2O)]^{3+}$

C. (c) $cis - \left[Co(NH_3)_2(en)_2\right]^{3+}$

D. (d) $trans - \left[Co(NH_3)_2(en)_2\right]^{3+}$

Answer: C

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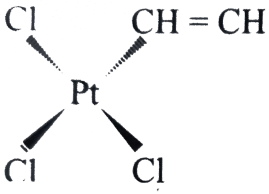
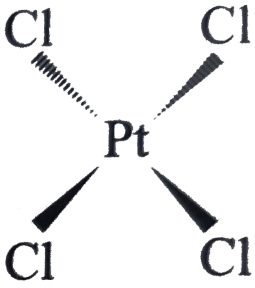
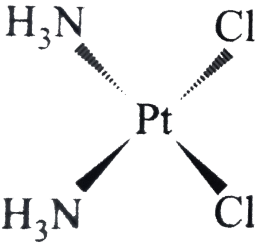
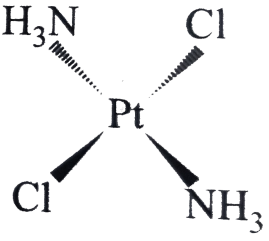
8. Which of the following is considered to be an anticancer species ?

A. (a) 

B. (b) 

C. (c) 

D. (d) 

Answer: C

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9. $\left[Co(en)_3\right]^{3+}$ ion is expected to show

A. (a) two optically active isomers: d and l forms

B. (b) d, l and meso forms

C. (c) four optically active isomers: cis, d and l isomers and trans d and l isomers

D. (d) none of these

Answer: A

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10. In which case racemic mixture is obtained on mixing its mirror images in $1:1$ molar ratio?

A. (a) $\left[Cr(en)_3\right]^{3+}$

B. (b) $\left[Ni(DMG)_2\right]$

C. (c) $cis - \left[Cu(Gly)_2\right]$

D. (d) All of these

Answer: A

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11. The complex that exists as a pair of enantiomers is

A. (a) $trans - \left[Co(H_2NCH_2CH_2CNH_2)_2Cl_2\right]^+$

B. (b) $\left[Co(H_2NCH_2CH_2NH_2)_3\right]^{3+}$

C. (c) $[Pt(PPh_3)(Cl)(Br)(CH_3)]^-$

D. (d) $cis - [CoNH_3)_4Cl_2]^+$

Answer: B

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12. Which of the following complexes exhibit optical isomerism?

A. (a) Trans-tetraamminedithiocyanatochromium (III) ion

B. (b) Cis-diamminedicarbonatocobaltate (III) ion

C. (c) Trans-diamminedicarbonatocobaltate (III) ion

D. (d) Cis-bis (glycinato) platinum (II)

Answer: B

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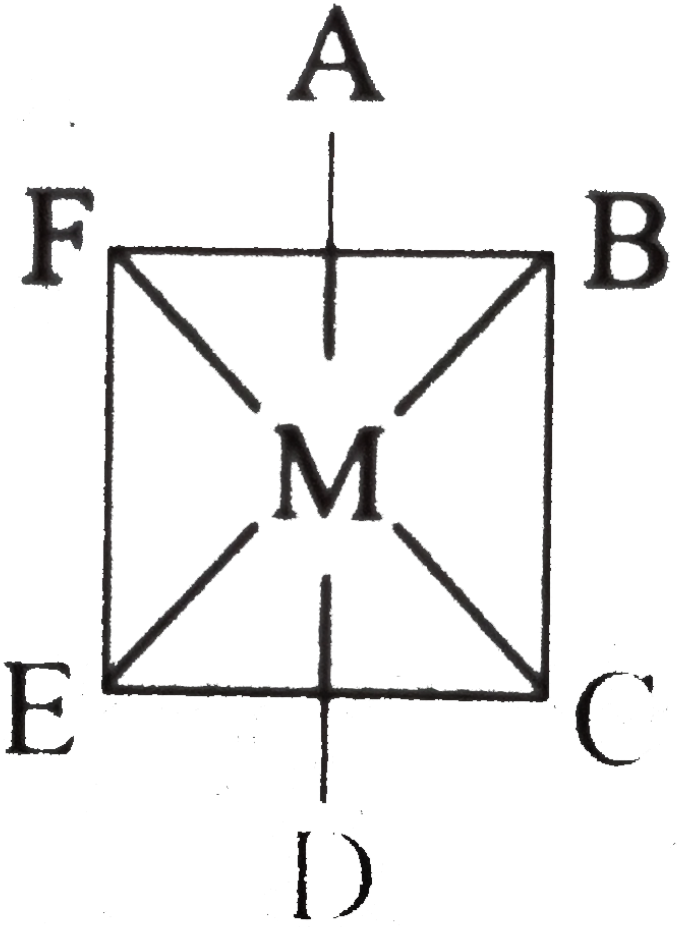
13. The complex shown below can exhibit



A. (a) optical isomerism only

B. (b) both optical and geometrical isomerism

C. (c) geometrical isomerism only

D. (d) none of the above

Answer: B

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14. Which of the following has the largest number of isomers? .

A. (a) $\left[Co(en)_2Cl_2\right]^+$

B. (b) $\left[Co(NH_3)_5Cl\right]^{2+}$

C. (c) $\left[Ir(PR_3)_2H(CO)\right]^{2+}$

D. (d) $\left[Ru(NH_3)_4Cl_2\right]^+$

Answer: A

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15. Which of the following will show optical isomerism? .

A. (a) $\left[Cu(NH_3)_4\right]^{2+}$

B. (b) $\left[ZnCl_4\right]^{2-}$

C. (c) $\left[Cr(C_2O_4)_3\right]^{3-}$

D. (d) $\left[Co(CN)_6\right]^{3-}$

Answer: C

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16. Which of the folloiwng complexes in not expected to exhibit optical isomerism? .

A. (a) $\left[Co(en)_3Cl_2\right]^{+}$

B. (b) $\left[Co(en)_2Cl_2\right]^{+}$

C. (c) $\left[Co(NH_3)_3Cl_3\right]$

D. (d) $\left[Co(en)(NH_3)Cl_2\right]^{+}$

Answer: C

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17. Which of the following has an optical isomer?

(en=ethylenediamine) ?

A. (a) $\left[Zn(en)(NH_3)_2\right]^{2+}$

B. (b) $\left[Co(en)_3\right]^{3+}$

C. (c) $\left[Co(H_2O)_4(en)\right]^{3+}$

D. (d) $\left[Zn(en)_2\right]^{2+}$

Answer: B

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18. Which of the following has an optical isomer?

A. (a) $\left[Co(NH_3)_3Cl\right]^{+}$

B. (b) $\left[Co(en)(NH_3)_2\right]^{2+}$

C. (c) $\left[Co(H_2O)_4(en)\right]^{3+}$

D. (d) $\left[Co(en)_2(NH_3)_2\right]^{3+}$

Answer: D

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19. The number of isomeric forms in which $\left[Co(NH_3)_4Cl_2\right]^+$ ion can occur is

A. (a) 2

B. (b) 3

C. (c) 4

D. (d) 1

Answer: A

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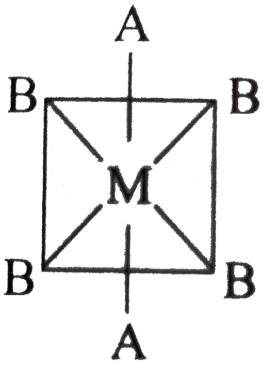
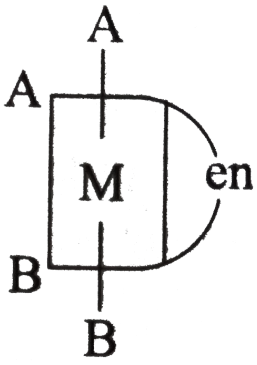
20. The phenomenon of optical activity will be shown by:

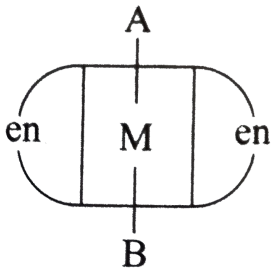
A. (a)

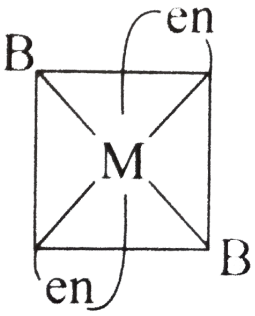


B. (b)



C. (c)





D. (d)

Answer: B

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21. Which of the following compound shows optical isomerism? (en=ethylenediamine)?

(1) $cis - \left[Co(NH_3)_4Cl_2\right]$

(2) $trans - \left[Co(en)_2Cl_2\right]$

(3) $cis - \left[Co(en)_2Cl_2\right]$

(4) $\left[Co(en)_3\right]$

Select the correct answer using the codes given below:

Codes:

A. (a) 1 and 2

B. (b) 2 and 3

C. (c) 3 and 4

D. (d) 1, 3 and 4

Answer: C

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22. When $\left[Ni(NH_3)_4\right]^{2+}$ is treated with conc HCI, two compounds having the formula $Ni(NH_3)(2)CI_2$ are formed. A solution of I reacts with oxalic acid to form $Ni(NH_3)_2(C_2O_4)$. II does not react with oxalic acid. Deduce the configuration of I and II and the geometry of Ni (II) complexes .

A. (a) (I) cis, (II) trans, both tetrahedral

B. (b) (I) cis, (II) trans, both square planar

C. (c) (I) trans, (II) cis, both tetrahedral

D. (d) (I) trans, (II) cris, both square planar

Answer: B

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Wemer Theory And Vbt

1. Match List-I (Complexes) with List-II (Hybridization) of central atom and select the correct answer using the codes given below the lists:

	$List - I$		$List - II$
A	$Ni(CO)_4$	1.	sp^3
B	$[Ni(CN)_4]^{2-}$	2.	dsp^2
C	$[Fe(CN)_6]^{4-}$	3.	sp^3d^2
D	$[MnF_6]^{4-}$	4.	d^2sp^3

A. (a)

A	B	C	D
1	3	2	4

B. (b)

A	B	C	D
5	2	4	3

C. (c)

A	B	C	D
5	3	2	4

D. (d)

A	B	C	D
1	2	4	3

Answer: D

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2. Match List-I (complex ions) with List-II (number of unpaired electrons) and select the correct answers using the codes given below lists:

$List-I$ $(Complexion)$		$List-II$ $(NumberofUnpairedElectrons)$
$A.$	$[CrF_6]^{4-}$	1. One
$B.$	$[MnF_6]^{4-}$	2. Two
$C.$	$[Cr(CN)_6]^{4-}$	3. $Three$
$D.$	$[Mn(CN)_6]^{4-}$	4. $Four$
		5. $Five$

A. (a) $\begin{matrix} A & B & C & D \\ 4 & 1 & 2 & 5 \end{matrix}$

B. (b) $\begin{matrix} A & B & C & D \\ 2 & 5 & 3 & 1 \end{matrix}$

C. (c) $\begin{matrix} A & B & C & D \\ 4 & 5 & 2 & 1 \end{matrix}$

D. (d) $\begin{matrix} A & B & C & D \\ 2 & 1 & 3 & 5 \end{matrix}$

Answer: C

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3. $Ag^{\oplus}$ forms complexes: $\left[Ag(NH_3)_2\right]^{\oplus}$, $\left[Ag(CN)_2\right]^{\Theta}$, $\left[Ag(S_2O_3)_2\right]^{3-}$.

Which of the following statements is true? .

A. (a) In these complexes, Ag^+ is a Lewis base

B. (b) The hybridisation of Ag^+ is sp^2

C. (c) The Ag^+ complexes are good reducing agents

D. (d) These complexes are all linear

Answer: D

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4. The hybridization of Fe in $K_4\left[Fe(CN)_6\right]$ complex is:

A. (a) d^2sp^2

B. (b) dsp^2

C. (c) d^2sp^3

D. (d) sp^3

Answer: C

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5. The structure of iron pentacarbonyl is:

A. (a) square planar

B. (b) triangular

C. (c) trigonal bipyramidal

D. (d) none of these

Answer: C

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6. $\left[Cr(NH_3)_6\right]^{3+}$ ion is:

A. (a) diamagnetic

B. (b) square planar

C. (c) paramagnetic

D. (d) none of these

Answer: C

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7. In hexacyanidomanganate(II) ion the Mn atom assumes d^2sp^3- hybrid states. Then the number of unpaired electrons in the complex is .

A. (a) 2

B. (b) 3

C. (c) 0

D. (d) 1

Answer: D

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8. Which is true in the case of $\left[Ni(CO)_4\right]$ complex?

A. (a) All are correct

B. (b) Tetrahedral shape of the molecule

C. (c) Hybridization of Ni is sp^3

D. (d) Diamagnetic

Answer: A

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9. Which one of the following is an outer orbital complex and exhibits paramagnetic behaviour ?

A. $\left[Co(NH_3)_6\right]^{3+}$

B. $\left[Cr(NH_3)_6\right]^{3+}$

C. $\left[Ni(NH_3)_6\right]^{2+}$

D. $\left[Zn(NH_3)_6\right]^{2+}$

Answer: C

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10. Which of the following complexes exhibits the highest paramagnetic behaviour?

where gly=glycine, en=ethylenediamine and bipy =bipyridyl

(At. no. $Ti = 22, V = 23, Fe = 26, Co = 27$)

A. (a) $\left[Ti(NH_3)_6\right]^{3+}$

B. (b) $\left[Fe(en)(bpy)(NH_3)_2\right]^{2+}$

C. (c) $\left[Co(OX)_2(OH)_2\right]^{-}$

D. (d) $\left[V(gly)_2(OH)_2(NH_3)_2\right]^{+}$

Answer: A

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11. A magnetic moment of 1.73 B.M. will be shown by one among the following:

A. (a) $\left[Cu(NH_3)_4\right]^{2+}$

B. (b) $\left[Ni(CN)_4\right]^{2-}$

C. (c) $TiCl_4$

D. (d) $[CoCl_6]^{4-}$

Answer: A

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12. A square planar complex is formed by hybridization of which atomic orbitals?

A. (a) s, p_x, p_y, d_{yz}

B. (b) s, p_x, p_y, d_{z^2}

C. (c) $s, p_x, p_y, d_{x^2-y^2}$

D. (d) s, p_x, p_y, d_{xy}

Answer: C

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13. Among the following complexes : $K_3[Fe(CN)_6]$, $[Co(NH_3)_6]Cl_3$, $Na_3[Co(ox)_3]$, $[Ni(H_2O)_6]Cl_2$, $K_2[Pt(CN)_4]$ and $[Zn(H_2O)_6(NO_3)_2]$

The diamagnetic are .

A. (a) K, L, M, N

B. (b) L, M, O, P

C. (c) K, M, O, P

D. (d) L, M, N, O

Answer: B

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14. Consider the follwing complexes ion P, Q and R

$P = [FeF_6]^{3-}$, $Q = \left[V(H_2O)_6\right]^{2+}$ and $R = \left[Fe(H_2O)_6\right]^{2+}$

The correct order of the complex ions, according to their spin only magnetic moment values (inBM) is .

A. (a) $Q < R < P$

B. (b) $R < Q < P$

C. (c) $R < P < Q$

D. (d) $Q < P < R$

Answer: A

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15. Among the following ions which one has the highest paramagnetism?

A. (a) $\left[Cr(H_2O)_6\right]^{3+}$

B. (b) $\left[Cu(H_2O)_6\right]^{2+}$

C. (c) $\left[Fe(H_2O)_6\right]^{2+}$

D. (d) $\left[Zn(H_2O)_6\right]^{2+}$

Answer: C

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16. The reaction $\left[Fe(CNS)_6\right]^{3-} \rightarrow [FeF_6]^{3-}$ takes place with:

A. (a) decrease in magnetic moment

B. (b) increase in coordination number

C. (c) decrease in coordination number

D. (d) increase in magnetic moment

Answer: D

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17. dsp^2-hybridization is found in

A. (a) $\left[Co(NH_3)_2\right]^{2+}$

B. (b) $[NiCl_4]^{2-}$

C. (c) $\left[Co(NH_3)_6\right]^{3+}$

D. (d) $[Ni(CN_4)]^{2-}$

Answer: D

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18. The primary valency of iron in $K_4\left[Fe(CN)_6\right]$ is

A. (a) 1

B. (b) 3

C. (c) 2

D. (d) 4

Answer: C

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19. The magnetic moment of $K_3\left[Fe(CN)_6\right]$ is found to be $1.7B.\ M.$ How many unpaired electron(s) is/are present per molecule?

A. (a) 2

B. (b) 3

C. (c) 4

D. (d) 1

Answer: D

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20. $\left[Cr(H_2O)_6\right]Cl_3$ (at no. of Cr = 24) has a magnetic moment of $3.83B.\ M.$ The correct distribution of $3d$ electrons the chromium of the

complex.

A. (a) $3dxy^1, 3dyz^1, 3dz^2$

B. (b) $3d^1xy, 3d^1yz, 3d^1zx$

C. (c) $3d_{(x^2-y^2)^1}, 3d^1z^2, 3d^1xz$

D. (d) $3dxy^1, 3d^1x^2 - y^2, 3d^1y^2$

Answer: B

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21. Which of the following complex is an outer orbital complex?

A. (a) $\left[Ni(NH_3)_6\right]^{2+}$

B. (b) $\left[Mn(CN)_6\right]^{4-}$

C. (c) $\left[Co(NH_3)_6\right]^{3+}$

D. (d) $\left[Fe(CN)_6\right]^{4-}$

Answer: A

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22. The correct order of magnetic moments (spin values in B.M.) among is:

A. (a) $\left[Fe(CN)_6\right]^{4-} > [CoCl_4]^{2-} > [MnCl_4]^{2-}$

B. (b) $[MnCl_4]^{2-} > \left[Fe(CN)_6\right]^{4-} > [CoCl_4]^{2-}$

C. (c) $\left[Fe(CN)_6\right]^{4-} > [MnCl_4]^{2-} > [CoCl_4]^{2-}$

D. (d) $[MnCl_4]^{2-} > [CoCl_4]^{2} > \left[Fe(CN)_6\right]^{4-}$

Answer: D

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23. Which of the following has the regular tetrahedral structure?

A. (a) $\left[Ni(CN)_4\right]^{2-}$

B. (b) SF_4

C. (c) BF_4^-

D. (d) XeF_4

Answer: C

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24. Which one of the following has lowest value of paramagnetic behaviour?

A. (a) $\left[Cr(CN)_6\right]^{3-}$

B. (b) $\left[Mn(CN)_6\right]^{3-}$

C. (c) $\left[Fe(CN)_6\right]^{3-}$

D. (d) $\left[Co(CN)_6\right]^{3-}$

Answer: D

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25. Velence bond theroy describes the bonding in complexs in terms of coordinate -covalent bond resulting from overlap filled ligand orbitals with vacant metal hybrid orbitals This theory explains magnetic behaviour and geometrical shape of coordination compounds Magnetic moment of a complex compound can be determined experimentally and theoretically by using spin only formula

Magnetic moment $\sqrt{n}(n+2)BM$ (where n = No. unpaired electrons) .

The value of of spin only magnetic moment for octahedral complex of the following configuration is $2.84BM$ The correct statement is

(a) d^4 (in weak field ligand)

(b) d^2 (in weak field and in strong field ligand)

(c) d^3 (in weak field and in strong field ligand)

(d) d^5 (in strong field ligand) .

A. (a) d^4 (in strong field ligand)

B. (b) d^2 (in weak field ligand)

C. (c) d^3 (in weak as well as in strong field ligand)

D. (d) d^5 (in strong field ligand)

Answer: B

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26. Nickel $(Z = 28)$ combines with a uninegative monodentate ligand X^- to form a paramagnetic complex $[NiX_4]^{2-}$. The number of unpaired electron(s) in the nickel and geometry of this complex ion are, respectively:

A. (a) One, tetrahedral

B. (b) Two, tetrahedral

C. (c) One, square planar

D. (d) Two, square planar

Answer: B

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27. Which one of the following has a square planar geometry?

$(Co = 27, Ni = 28, Fe = 26, Pt = 78)$

A. (a) $[CoCl_4]^{2-}$

B. (b) $[FeCl_4]^{2-}$

C. (c) $[NiCl_4]^{2-}$

D. (d) $[PtCl_4]^{2-}$

Answer: D

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28. The octahedral complex of a metal ion M^{3+} with four monodentate ligands L_1, L_2, L_3 and L_4 absorb wavelengths in the region of red,green, yellow and bule, respectively The increasing order of ligand strengh of the four ligands is

A. (a) $L_4 < L_3 < L_2 < L_1$

B. (b) $L_1 < L_3 < L_2 < L_4$

C. (c) $L_3 < L_2 < L_4 < L_1$

D. (d) $L_1 < L_2 < L_4 < L_3$

Answer: B

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29. Which of the following facts about the complex $\left[Cr(NH_3)_6\right]Cl_3$ is wrong?

A. The complex involves d^2sp^3 hybridization and is octahedral in shape

B. The complex is paramagnetic

C. The complex is an outer orbital complex

D. The complex gives white precipitate with silver nitrate solution.

Answer: C

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30. The magnetic moment (spin only) of $[NiCl_4]^{2+}$ is

A. (a) $1.82BM$

B. (b) $5.46BM$

C. (c) $2.82BM$

D. (d) $1.41BM$

Answer: C

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31. Which of the following is a low spin complex?

A. (a) $Fe(CN)_6^{3-}$

B. (b) $Co(NO_2)_6^{3-}$

C. (c) $Mn(CN)_6^{3-}$

D. (d) All

Answer: D

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32. Complexes with halide ligands are generally:

A. High spin complexes

B. Low spin complexes

C. Both

D. None

Answer: A

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33. Among the following ions, which one has the highest paramagnetism?

A. (a) $\left[Cr(H_2O)_6\right]^{3+}$

B. (b) $\left[Fe(H_2O)_6\right]^{2+}$

C. (c) $\left[Cu(H_2O)_6\right]^{2+}$

D. (d) $\left[Zn(H_2O)_6\right]^{2+}$

Answer: B

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34. Among $\left[Ni(CO)_4\right], \left[Ni(CN)_4\right]^{2-}, [NiCl_4]^{2-}$ species, the hybridization states at the Ni atom are, respectively (At. no.of $Ni = 28$)

A. (a) $Ni(CO)_4$ and $NiCl_4^{2-}$ are diagmagnetic and $Ni(CN)_4^{2-}$ is paramagnetic

B. (b) $NiCl_4^{2-}$ and $Ni(CN)_4^{2-}$ are diamagnetic and $Ni(CO)_4$ is paramagnetic

C. (c) $Ni(CO)_4$ and $Ni(Cl)_4^{2-}$ are diamagnetic and $Ni(CN)_4^{2-}$ is paramagnetic

D. (d) $Ni(CO)_4$ is diamagentic and $NiCl_4^{2-}$ and $Ni(CN)_4^{2-}$ are paramagnetic

Answer: C

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35. Which is correct in the case of $[NiCl_4]^{2-}$ complex?

A. (a) sp^3 hybridisation

B. (b) Paramagnetic & Tetrahedral

C. (c) Two unpaired electrons

D. (d) All are correct

Answer: D

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36. The shape of $\left[Cu(NH_3)_4\right]Cl_2$ is:

A. (a) Tetrahedral

B. (b) Octahedral

C. (c) Square planar

D. (d) Pyramidal

Answer: C

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37. For which transition metal ions are low spin complexes possible:

A. (a) Rh^{3+}

B. (b) Mn^{3+}

C. (c) Ru^{2+}

D. (d) All are correct

Answer: D

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38. An octahedral complex is formed when hybrid orbitals of the following type are involved

A. (a) sp^3

B. (b) dsp^2

C. (c) sp^3d^2

D. (d) sp^3d

Answer: C

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39. The primary valence of the metal ion in the coordination compound $K_2[Ni(CN)_4]$ is

A. (a) Four

B. (b) Zero

C. (c) Two

D. (d) Six

Answer: C

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40. The number of unpaired electrons in the complex ion $[CoF_6]^{3-}$ is (Atomic no. of $Co = 27$)

A. (a) Zero

B. (b) 2

C. (c) 3

D. (d) 4

Answer: D

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41. The compound which does not show paramagnetism is

A. (a) $\left[Cu(NH_3)_4\right]Cl_2$

B. (b) $\left[Ag(NH_3)_2\right]Cl$

C. (c) NO

D. (d) NO_2

Answer: B

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42. When excess of ammonia is added to $CuSO_4$ solution, the deep blue coloured complex is formed. Complex is

A. (a) tetrahedral, paramagnetic

B. (b) tetrahedral, diamagnetic

C. (c) square planar, diamagnetic

D. (d) square planar, paramagnetic

Answer: D

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Crystal Field Theory Cft

1. The crystal field splitting energy for octahedral(Δ_0) and tetrahedral (Δ_t) complexes is related as .

A. (a) $\Delta_t = \frac{4}{9}\Delta_o$

B. (b) $\Delta_t = \frac{1}{2}\Delta_o$

C. (c) $\Delta_o = \frac{1}{2}\Delta_t$

D. (d) $\Delta_o = \frac{4}{9}\Delta t$

Answer: A

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2. Which of the following is the strongest field ligand?

A. (a) NO_2^-

B. (b) CN^-

C. (c) NH_3

D. (d) En

Answer: B

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3. Considering H_2O as a weak field ligand, the number of unpaired electrons in $\left[Mn(H_2O)_6\right]^{2+}$ will be (At. no. of $Mn = 25$)

A. (a) 3

B. (b) 2

C. (c) 5

D. (d) 4

Answer: C

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4. Which of the following complex ions is expected to absorb visible light?

A. (a) $\left[Zn(NH_3)_6\right]^{2+}$

B. (b) $\left[Cr(NH_3)_6\right]^{3+}$

C. (c) $\left[Ti(en)_2(NH_3)_2\right]^{4+}$

D. (d) $\left[Sc(H_2O)_3(NH_3)_3\right]^{3+}$

Answer: B

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5. Which of the following statements are correct?

(i) In octahedral complexes, d_z2, $d_{x^2-y^2}$ orbitals have higher energy than d_{xy}, d_{yz} and d_{zx} orbitals.

(ii) In tetrahedral complexes, d_{xy}, d_{yz}, d_{zx} orbitals have higher energy than d_z2 and $d_{x^2-y^2}$ orbitals.

(iii) The colours of complexes are due to electronic transitions from one set of d-orbitals to another set of orbitals.

(iv) $\Delta_{tetrahedral} = \frac{9}{4}, \Delta_{octahedral}$

A. (a) (i), (ii) and (iii)

B. (b) (i) and (iv)

C. (c) (iii) and (iv)

D. (d) (ii), (iii) and (iv)

Answer: A

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6. In crystal field splitting for a tetrahedral complex, the number of orbitals pushed down in energy are

A. (a) 3

B. (b) zero

C. (c) 5

D. (d) 2

Answer: D

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7. In which of the following octahedral complexes of Co (at. no. 27), will the magnitude of Δ_o be the highest?

A. (a) $\left[Co(CN)_6\right]^{3-}$

B. (b) $\left[Co(C_2O_4)_3\right]^{3-}$

C. (c) $\left[Co(H_2O)_6\right]^{3+}$

D. (d) $\left[Co(NH_3)_6\right]^{3+}$

Answer: A

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8. Among the ligands NH_3, en, CN^- and CO, the correct order of their increasing field strength, is

A. (a) $CO < NH_3 < en < CN^-$

B. (b) $NH_3 < en < CN^- < CO$

C. (c) $CN^- < NH_3 < CO < en$

D. (d) $en < CN^- < NH_3 < CO$

Answer: B

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9. Which of the following is a π-acid ligand?

A. (a) NH_3

B. (b) CO

C. (c) F^-

D. (d) ethylene diamine

Answer: D

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10. In the complex ion ML_6^{n+}, M^{n+} has five d-electrons and L is a weak field ligand. According to crystal field theory, the magnetic properties of the complex ion correspond to how many unpaired electrons?

A. (a) 0

B. (b) 5

C. (c) 2

D. (d) 3

Answer: B

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11. Increasing order of Δ_0 of the following complex is

A. $Cr(NH_3)_6^{3+} < Cr(H_2O)_6^{3+} < Cr(NO_2)_6^{3-}$

B. (b) $Cr(H_2O)_6^{3+} > Cr(NH_3)_6^{3+} > Cr(NO_2)_6^{3-}$

C. (c) $Cr(H_2O)_6^{3+} < Cr(NH_3)_6^{3+} < Cr(NO_2)_6^{3-}$

D. (d) $Cr(NH_3)_6^{3+} < Cr(NO_2)_6^{3-} < Cr(H_2O)_6^{3+}$

Answer: C

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12. The value of Δ_0 for $RhCl_6^{3-}$ is $243kJ/mol$ what wavelength of light will promote an electron from. The colour of the complex is

A. (a) Blue

B. (b) Green

C. (c) Yellow

D. (d) Orange

Answer: D

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13. For the $t_{2g}^6 e_g^2$ system, the value of magnetic moment (μ) is:

A. (a) $2.83B.M$

B. (b) $1.73B.M.$

C. (c) $3.87B.M.$

D. (d) $4.92B.M.$

Answer: A

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14. Which of the following system has maximum number of unpaired electrons?

A. (a) d^5 (octahedral)

B. (b) d^9 (octahedral)

C. (c) d^7 (octahedral)

D. (d) d^6 (octahedral)

Answer: A

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15. Which ion produces a small crystal field splitting (a weak ligand field)?

A. (a) I^-

B. (b) Cl^-

C. (c) F^-

D. (d) All

Answer: D

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16. Which of the following pairs is not correctly matched?

A. (a) Effective atomic number of Pt in $[PtCl_6]^{2-} = 84$

B. (b) Absorption peak for $\left[Cr^{III}(NH_3)_6\right]^{+3} = 21680cm^{-1}$

C. (c) Crystal field stabilization energy of d^2 in weak ligand field $= (-)0.8\Delta_o$

D. (d) Example of weak ligand field for d^5 configuration $= \left[Mn^{II}F_6\right]^{-4}$

Answer: A

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Metal Carbonyls Stability Of Complexes And Applications

1. Chlorophyll is a coordination compound having central atom of:

A. (a) Ca

B. (b) K

C. (c) Na

D. (d) Mg

Answer: D

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2. A reagent used for identifying nickel ion is:

A. (a) potassium ferrocyanide

B. (b) dimethylglyoxime

C. (c) phenolphthalein

D. (d) EDTA

Answer: B

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3. The bond length of $C-O$ bond in carbon monoxide is $1.128A$ The $C-O$ bond length in $\left[Fe(CO)_5\right]$ is .

A. (a) 1.128Å

B. (b) 1.72Å

C. (c) 1.118Å

D. (d) 1.15Å

Answer: D

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4. Ammonia forms the complex $\left[Cu(NH_3)_4\right]^{2+}$ with copper ions in alkaline solution but not in acid solution. The reasons for it is:

A. (a) in alkaline solution $Cu(OH)_2$ is precipitated which is soluble in excess of alkali

B. (b) in acidic solution protons coordinates with ammonia molecule forming NH_4^+ ions and NH_3 molecules are not available.

C. (c) copper hydroxide is amphoteric

D. (d) in acidic solution hydration protects Cu^{2+} ions

Answer: B

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5. Backbonding involes the fomation of

A. (a) σ-bond

B. (b) coordinate bond

C. (c) π-bond

D. (d) none of these

Answer: B

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6. Composition of complex formed when the ore agentite is treated with NaCN is

A. (a) $Na\left[Ag(CN)_2\right]$

B. (b) $Na_3\left[Ag(CN)_6\right]$

C. (c) $Na\left[Au(CN)_2\right]$

D. (d) $Na\left[Au(CN)_6\right]$

Answer: A

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7. In quantitative analysis of second group in laboratory, H_2S gas is passed in acidic medium for precipitation. When Cu^{2+} and Cd^{2+} react with KCN, then for product true statement is

A. (a) $K_2\left[Cu(CN)_4\right]$ more soluble

B. (b) $K_2\left[Cd(CN)_4\right]$ less stable

C. (c) $K_2\left[Cd(CN)_3\right]$ more stable

D. (d) $K_3\left[Cu(CN)_2\right]$ less stable

Answer: D

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8. Which of the following compounds is brown coloured?

A. (a) $Fe\left[Fe(CN)_4\right]$

B. (b) $Fe_4\left[Fe(CN)_6\right]$

C. (c) $Fe\left[Fe(CN)_6\right]$

D. (d) $K_2Fe\left[Fe(CN)_6\right]$

Answer: C

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9. Which one of the following statement is correct?

A. (a) Ferric ions give a deep green precipitate on adding potassium ferrocyanide solution.

B. (b) On boiling a solution having K^+, Ca^{2+} and HCO_3^- ions, we get a precipitate of $K_2Ca(CO_3)_2$

C. (c) Manganese salt give a violet borax test in reducing flame

D. (d) From a mixed precipitate of $AgCl$ and AgI, ammonia solution dissolves only $AgCl$

Answer: D

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10. Coordination compounds have great importance in biological systems.

In this context which of the following statements is incorrect:

A. (a) Carboxypeptidase A is an enzyme and contains zero

B. (b) Haemoglobin is the red pigment of blood and contains iron

C. (c) Cyanocobalamin in B_{12} and contains cobalt

D. (d) Chlorophylls are green pigments in plants and contain calcium

Answer: D

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11. In $Fe(CO)_5$, the $Fe - C$ bond possesses:

A. (a) π-character only

B. (b) Both σ and π characters

C. (c) Ionic character

D. (d) σ-character only

Answer: B

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12. The equation which is balanced and represents the correct product(s) is .

A. (a) $Li_2O + 2KCl \rightarrow 2LiCl + K_2O$

B. (b) $\left[CoCl(NH_3)_5\right]^+ + 5H^+ \rightarrow CO^{2+} + 5NH_4^+ + Cl^-$

C. (c)

$$\left[Mg(H_2O)_6\right]^{2+} + (EDTA)^{4-} \xrightarrow{excessNaOH} \left[Mg(EDTA)^{2+}\right] + 6H_2O$$

D. (d) $CuSO_4 + 4KCN \rightarrow K_2\left[Cu(CN)_4\right] + K_2SO_4$

Answer: B

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13. Which of the following observations/statements is/are correct?

A. (a) Anhydrous $CuSO_4$ becomes blue in aqueous medium due to the complex formation

B. (b) $Ni(CN)_2$ dissolves in KCN giving an orange-red solution

C. (c) $Fe(OH)_3$ can be precipitated by adding NH_4OH to $K_3\left[Fe(CN)_6\right]$

D. (d) None of the above

Answer: A,B

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14. Which one of the following statements is incorrect?

A. (a) Greater the stability constant of a complex ion, greater is its stability

B. (b) Greater the charge on the central metal ion, greater is the stability of the complex

C. (c) Greater the basic character of the ligard, the greater is the stability of the complex

D. (d) Complexes have low stability constants.

Answer: D

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15. Aqua regia reacts with Pt to yeild:

A. (a) $Pt(NO_3)_4$

B. (b) H_2PtCl_6

C. (c) $PtCl_4$

D. (d) $PtCl_2$

Answer: B

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16. Which of the following is πcomplex?

A. (a) Trimethyl aluminium

B. (b) Ferrocene

C. (c) Diethyl zinc

D. (d) Nickel carbonyl

Answer: B

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17. Stability constant is more for the complex:

A. (a) $\left[Ag(NH_3)_2\right]^+$

B. (b) $\left[Cu(NH_3)_4\right]^{2+}$

C. (c) $\left[Ag(CN)_2\right]^{-1}$

D. (d) $\left[Co(NH_3)_6\right]^{3+}$

Answer: D

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18. Match List 1 and List 2, (the basis of matching being complex formation in qualitative or quantitative analysis of ions) and select the correct answer using the codes given below the lists.

$ListI$	$List2$
$Ionsinvolved$	$Complexingagent$
$a.\ Ni^{2+}$	1. $EDTA$
$b.\ Zn^{2+}$	2. $Sodiumnitroprusside$
$c.\ Cu^{2+}$	3. $Ammonia$
$d.\ S^{2-}$	4. $Dimethylglyoxime$

Codes:

A. (a)

A	B	C	D
1	2	3	4

B. (b)
A	B	C	D
4	1	3	2

C. (c)
A	B	C	D
3	4	2	1

D. (d)
A	B	C	D
4	3	1	2

Answer: B

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19. Which of the following is not true for ligard-metal complex?

A. (a) Larger the ligand, the more stable is the metal-ligand bond

B. (b) Highly charged ligand forms strong bond

C. (c) Larger the permanent dipole moment of ligand, the more stable is the bond

D. (d) Greater the ionization potential of central metal, the stronger is the bond

Answer: B

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20. In the extraction of which of the following, complex ion forms

A. (a) Cu

B. (b) Ag

C. (c) Fe

D. (d) Na

Answer: B

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21. Wilkinson's catalyst is used as a homogeneous hydrogenation catalyst for the conversion of alkenes to alkanes. It is a complex of

A. (a) Iron

B. (b) Aluminium

C. (c) Rhodium

D. (d) Cobalt

Answer: C

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22. Which of the following is an organometallic compound?

A. (a) Lithium methoxide

B. (b) Lithium dimethyl amide

C. (c) Lithium acetate

D. (d) Methyl lithium

Answer: D

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23. CH_3MgI is an organometallic compound due to

A. (a) $Mg - I$ bond

B. (b) $C - I$ bond

C. (c) $C - Mg$ bond

D. (d) $C - H$ bond

Answer: C

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Section B Assertion Reasoning

1. The question consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: The complex $\left[Cr(SCN)(NH_3)_5\right]Cl_2$ is linkage isomeric with $\left[Cr(NCS)(NH_3)_5\right]Cl_2$.

Reason: SCN^- is an ambident ligand in which there are two possible coordination sites.

A. (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: A

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2. The question consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: The IUPAC name of $K_3[Cr(CN)_6]$ is potassium hexacyano

chromate (III).

Reason: It is an anion complex.

A. (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: B

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3. The question consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: In the complex $\left[Co(NH_3)_3Cl_3\right]$, chloride ions satisfy the

primary valencies as well as the secondary valencies of cobalt metal.

Reason: $\left[Co(NH_3)_3Cl_3\right]$ shows geometrical as well as optical isomerism.

A. (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: C

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4. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: $\left[Ti(H_2O)_6\right]^{3+}$ is coloured while $\left[Sc(H_2O)_6\right]^{3+}$ is colourless.

Reason: d-d transition is not possible in $\left[Sc(H_2O)_6\right]^{3+}$.

A. (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: A

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5. The question consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: $\left[Fe(H_2O)_5NO\right]SO_4$ is paramagnetic.

Reason: The Fe in $\left[Fe(H_2O)_5NO\right]SO_4$ has three unpaired electrons.

A. (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: A

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6. The question consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: Charge on the complex of ferric ion with EDTA is minus one.

Reason: EDTA is a hexadentate ligand.

A. (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: B

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7. The question consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: Coordination entities with d^4 to d^7 ions are stable for high

spin state.

Reason: If $\Delta_o > P$, high state is more stable.

A. (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: D

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8. The question consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: $K_2[Ni(EDTA)]$ is more stable than $K_3\left[Al(C_2O_4)_3\right]$.

Reason: Nickel (Ni) is a transition element while aluminium (Al) is non-transition element.

A. (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: B

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9. The question consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: Ambidentate ligands lead to linkage isomerism.

Reason: The ionization sphere is different in different linkage isomers.

A. (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: C

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10. The question consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: $Co(NH_3)_2Cl_2$ gives white precipitate with $AgNO_3$ solution.

Reason: Chlorine is not present in the ionising sphere.

A. (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: C

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11. The question consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: The $\left[Ni(en)_3\right]Cl_2$ has higher stability than $\left[Ni(NH_3)_6\right]Cl_2$

Reason: In $\left[Ni(en)_3\right]Cl_2$, the geometry around Ni is octahedral.

A. (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: B

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12. The question consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: The complex $\left[Co(NH_3)_3Cl_3\right]$ does not give precipitate with

$AgNO_3$.

Reason: The given complex does not contain counter ions.

A. (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: A

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13. The question consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: NF_3 is weaker ligand than $N(CH_3)_3$.

Reason: NF_3 ionizes to give F^- ions in aqueous solution.

A. (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: A

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14. The question consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: In the coordination complex $\left[Pt(NH_3)_4Cl_2\right]Br_2$, a yellow

precipitate of $AgBr$ is obtained on treating it with $AgNO_3(aq)$.

Reason: Bromide ions are present as counter ions in the ionization sphere.

A. (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: A

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15. The question consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: Co-ordination number of cobalt in the complex $\left[Co(en)_3\right]^{3+}$ is six.

Reason: Ethylenediamine acts as a bidentate ligand.

A. (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: A

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Aipmt Neet Questions

1. The oxidation number of Cr in $\left[Cr(NH_3)_6\right]Cl_3$ is

A. (a) 8

B. (b) 6

C. (c) 4

D. (d) 3

Answer: D

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2. $\left[Pt(NH_3)_4Cl_2\right]Br_2$ and $\left[Pt(NH_3)_4Br_2\right]Cl_2$ are related to each other as

A. (a) optical isomers

B. (b) coordinate isomers

C. (c) ionization isomers

D. (d) linkage isomers

Answer: C

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3. Which of the following gives the maxium number of isomers?

A. (a) $\left[Co(NH_3)_4Cl_2\right]$

B. (b) $\left[Ni(en)(NH_3)_4\right]^{2+}$

C. (c) $\left[Ni(C_2O_4)(en)_2\right]$

D. (d) $\left[Cr(SCN)_2(NH_3)_4\right]^{+}$

Answer: D

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4. Which of the following organometallic compound is σ and π-bonded?

A. (a) $\left[Fe\left(\eta^5-C_5H_5\right)_2\right]$

B. (b) $\left[PtCl_3\left(\eta^2-C_2H_4\right)\right]$

C. (c) $\left[Co(CO)_5NH_3\right]^{2+}$

D. (d) $Al(CH_3)_3$

Answer: C

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5. Which statement is incorrect?

A. (a) $Ni(CO)_4$-tetrahedral, paramagnetic

B. (b) $\left[Ni(CN)_4\right]^{2-}$-square planar, diamagnetic

C. (c) $Ni(CO)_4$-tetrahedral, diamagnetic

D. (d) $[NiCl_4]^{2-}$ tetrahedral, paramagnetic

Answer: A

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6. Which of the following will exhibit maximum ionic conductivity?

A. (a) $K_4[Fe(CN)_6]$

B. (b) $[Co(NH_3)_6]Cl_3$

C. (c) $[Cu(NH_3)_4]Cl_2$

D. (d) $[Ni(CO)_4]$

Answer: A

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7. The hypothetical complex chloro diaquatriammine cobalt (II) chloride can be represented as

A. (a) $[CoCl(NH_3)_3(H_2O)_2]Cl_2$

B. (b) $[Co(NH_3)_3(H_2O)Cl_3]$

C. (c) $[Co(NH_3)_3(H_2O)_2Cl]$

D. (d) $[Co(NH_3)_3(H_2O)_3]Cl_3$

Answer: A

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8. In the silver plating of copper, $K\left[Ag(CN)_2\right]$ is used instead of $AgNO_3$. The reason is

A. (a) a thin layer of Ag is formed on Cu

B. (b) more heat is required

C. (c) Ag^+ ions are completely removed from solution

D. (d) less availability of Ag^+ ion as Cu cannot displace Ag from $Ag(CN)_2$

Answer: D

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9. Atomic numbers of Cr and Fe are respectively 24 and 26. Which of the following is paramagnetic with the spin of the electron?

A. (a) $\left[Cr(NH_3)_6\right]^{3+}$

B. (b) $\left[Fe(CO)_5\right]$

C. (c) $\left[Fe(CN)_6\right]^{4-}$

D. (d) $\left[Cr(CO)_6\right]$

Answer: A

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10. According to IUPAC nomenclature sodium nitroprusside is named as

A. (a) Sodium pentacyanonitrosyl ferrate (III)

B. (b) Sodium nitroferricyanide

C. (c) Sodium nitroferrocyanide

D. (d) Sodium pentacyanonitrosyl ferrate (II)

Answer: A

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11. Which of the following octahedral complex does not show geometrical isomerism (A and B are monodentate ligands) ?

A. (a) $[MA_5B]$

B. (b) $[MA_2B_4]$

C. (c) $[MA_3B_3]$

D. (d) $[MA_4B_2]$

Answer: A

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12. Among the following, which is not the π-bonded organometallic compound

A. (a) $(CH_3)_4Sn$

B. (b) $K[PtCl_3(\eta^2 - C_2H_4)]$

C. (c) $Fe\left(\eta^2 - C_5H_5\right)_2$

D. (d) $Cr\left(\eta^2 - C_6H_6\right)_2$

Answer: A

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13. The number of unpaired electrons in the complex ion $[CoF_6]^{3-}$ is (Atomic no. of $Co = 27$)

A. (a) Zero

B. (b) 2

C. (c) 3

D. (d) 4

Answer: D

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14. Which of the following coordination compounds would exhibit optical isomerism?

A. (a) trans-dicyanobis (ethylenediamine) chromium (III) chloride

B. (b) tris-(ethylenediamine) cobalt (III) bromide

C. (c) pentaamminenitrocobalt (III) iodide

D. (d) diamminedichloroplatinum (II)

Answer: B

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15. Among $[Ni(CO)_4]$, $[Ni(CN)_4]^{2-}$, $[NiCl_4]^{2-}$ species, the hybridization states at the Ni atom are, respectively (At. no.of $Ni = 28$)

A. (a) sp^3, sp^3, dsp^2

B. (b) dsp^2, sp^3, sp^3

C. (c) sp^3, dsp^2, dsp^2

D. (d) sp^3, sp^3, sp^3

Answer: D

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16. CN^- is a strong field ligand. This is due to the fact that

A. (a) it can accept electron from metal species

B. (b) it forms high spin complexes with metal species

C. (c) it carries negative charge.

D. (d) it is a pseudohalide

Answer: D

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17. Considering H_2O as a weak field ligand, the number of unpaired electrons in $\left[Mn(H_2O)_6\right]^{2+}$ will be (At. no. of $Mn = 25$)

A. (a) two

B. (b) four

C. (c) three

D. (d) five

Answer: D

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18. Which of the following does not have a metal carbon bond?

A. (a) $K[Pt(C_2H_4)Cl_3]$

B. (b) $Ni(CO)_4$

C. (c) $Al(OC_2H_5)_3$

D. (d) C_2H_5MgBr

Answer: C

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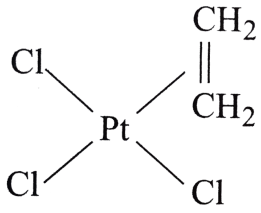
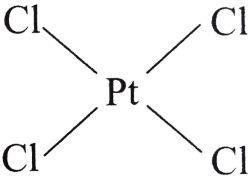
19. Which of the following is considered to be an anticancer species ?

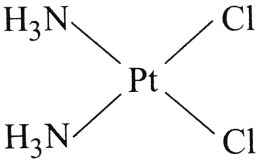
A. (a)



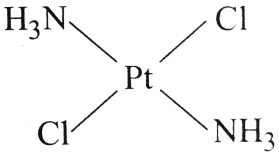
B. (b)



C. (c)



D. (d)



Answer: C

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20. Which one of the following is expected to exhibit optical isomerism (en=ethylenediamine)?

A. (a) trans-$\left[Co(en)_2Cl_2\right]$

B. (b) trans-$\left[Pt(NH_3)_2Cl_2\right]$

C. (c) cis-$\left[Pt(NH_3)_2Cl_2\right]$

D. (d) cis-$\left[Co(en)_2Cl_2\right]$

Answer: D

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21. Which one of the following is an inner orbital complex as well as diamagnetic in nature?

A. (a) $\left[Cr(NH_3)_6\right]^{3+}$

B. (b) $\left[Co(NH_3)_6\right]^{3+}$

C. (c) $\left[Ni(NH_3)_6\right]^{2+}$

D. (d) $\left[Zn(NH_3)_6\right]^{2+}$

Answer: B

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22. $\left[Cr(H_2O)_6\right]Cl_3$ (at no. of Cr = 24) has a magnetic moment of $3.83B.M.$ The correct distribution of $3d$ electrons the chromium of the complex.

A. (a) $3d_{xy}^1, 3d_{yz}^1, 3d_{xz}^1$

B. (b) $3d_{xy}^1, 3d_{yz}^1, 3d_{z^2}^1$

C. (c) $\left(3d_{x^2-y^2}^1\right), 3d_{z^2}^1, 3d_{xz}^1$

D. (d) $3d_{xy}^1, \left(3d_{x^2-y^2}^1\right), 3d_{yz}^1$

Answer: A

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23. $\left[Co(NH_2)_2\right]Cl$ exhibits

A. (a) ionization isomerism, geometrical isomerism and optical isomerism

B. (b) linkage isomerism, geometrical isomerism and optical isomerism

C. (c) linkage isomerism, ionization isomerism and optical isomerism

D. (d) linkage isomerism, ionization isomerism and geometrical isomerism

Answer: D

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24. The d- electron configurations of Mn^{2+}, Fe^{2+}, Co^{3+} and Ni^{2+} ard $3d^5$, $3d^6$, $3d^6$, $3d^8$, respectively

Which of the following aqua complexes will exhibit the minimum paramagnetic behviour ? .

A. (a) $\left[Fe(H_2O)_6\right]^{2+}$

B. (b) $\left[Ni(H_2O)_6\right]^{2+}$

C. (c) $\left[Cr(H_2O)_6\right]^{2+}$

D. (d) $\left[Mn(H_2O)_6\right]^{2+}$

Answer: B

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25. Which of the following will give a pair of enantiomorphs? .

A. (a) $\left[Cr(NH_3)_6\right]\left[Co(CN)_6\right]$

B. (b) $\left[Co(en)_2Cl_2\right]Cl$

C. (c) $\left[Pt(NH_3)_4\right]\left[PtCl_6\right]$

D. (d) $\left[Co(NH_3)_4Cl_2\right]NO_2$

Answer: B

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26. Which of the following complexes exhibits the highest paramagnetic behaviour?

where gly=glycine, en=ethylenediamine and bipy =bipyridyl

(At. no. $Ti = 22, V = 23, Fe = 26, Co = 27$)

A. (a) $\left[Fe(en)(bipy)(NH_3)_2\right]^{2+}$

B. (b) $\left[Co(OX)_2(OH)_2\right]^-$

C. (c) $\left[Ti(NH_3)_6\right]^{3+}$

D. (d) $\left[V(gly)_2(OH)_2(NH_3)_2\right]^+$

Answer: C

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27. Among $TiF_6^{2-}, CoF_6^{3-}, Cu_2C1_2$ and $NiC1_4^{2-}$ (At. No. $Ti = 22, Co = 27, Cu = 29, Ni = 28$), the colourless species are -

A. (a) CoF_6^{3-} and $NiCl_4^{2-}$

B. (b) TiF_6^{2-} and CoF_6^{3-}

C. (c) Cu_2Cl_2 and $NiCl_4^{2-}$

D. (d) TiF_6^{2-} and Cu_2Cl_2

Answer: D

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28. Which of the following complexes is not expected to exhibit isomerism?

A. (a) $\left[Ni(NH_3)_4(H_2O)_2\right]^{2+}$

B. (b) $\left[Pt(NH_3)_2Cl_2\right]$

C. (c) $\left[Ni(NH_3)_2Cl_2\right]$

D. (d) $\left[Ni(en)_3\right]^{2+}$

Answer: C

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29. $\left[Co(NH_3)_4Cl_2\right]^+$ exhibits

A. (a) linnkage isomerism

B. (b) geometrical isomerism

C. (c) coordination isomerism

D. (d) ionisation isomerism

Answer: D

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30. Which of the following complex ion(s) is/are not expected to absorb visible light?

A. (a) $\left[Zn(NH_3)_6\right]^{2+}$

B. (b) $\left[Sc(H_2O)_3(NH_3)_3\right]^{3+}$

C. (c) $\left[Ti(en)_2(NH_3)_2\right]^{4+}$

D. (d) $\left[Cr(NH_3)_6\right]^{3+}$

Answer: D

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31. Which of the following does not have optical isomer?

A. (a) $\left[Co(en)_3\right]^{3+}$

B. (b) $\left[Co(en)_2Cl_2\right]^{+}$

C. (c) $\left[Co(NH_3)_3Cl_3\right]^{0}$

D. (d) $\left[Co(en)Cl_2(NH_3)_2\right]^{+}$

Answer: C

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32. Crystal field stabilization energy for high spin d^4 octahedral complex is

A. (a) $-1.8\Delta_0$

B. (b) $-1.6\Delta_0 + p$

C. (c) $-1.2\Delta_0$

D. (d) $-0.6\Delta_0$

Answer: D

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33. Which of the following complex ion is not expected to absorb visible light?

A. (a) $\left[Ni(CN)_4\right]^{2-}$

B. (b) $\left[Cr(NH_3)_6\right]^{3+}$

C. (c) $\left[Fe(H_2O)_6\right]^{2+}$

D. (d) $\left[Ni(H_2O)_6\right]^{2+}$

Answer: A

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34. The complex, $[Pt(py)(NH_3)BrCl]$ will have how many geometrical isomers?

A. (a) 2

B. (b) 3

C. (c) 4

D. (d) 0

Answer: B

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35. $\left[Co(HN_3)_6\right]\left[Cr(CN)_6\right]$ and $\left[Cr(NH_3)_6\right]\left[Co(CN)_6\right]$ are .

A. (a) Geometrical isomerism

B. (b) Linkage isomerism

C. (c) Ionization isomerism

D. (d) Coordination isomerism

Answer: D

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36. The d-electron configurations of Cr^{2+}, Mn^{2+}, Fe^{2+} and Co^{2+} are d^4, d^5, d^6 and d^7 respectively. Which one of the following will exhibit minimum paramagnetic behavious?

A. (a) $\left[Cr(H_2O)_6\right]^{2+}$

B. (b) $\left[Mn(H_2O)_6\right]^{2+}$

C. (c) $\left[Fe(H_2O)_6\right]^{2+}$

D. (d) $\left[Co(H_2O)_6\right]^{2+}$

Answer: D

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37. Of the following complex ions, which is diamagnetic in natures?

A. (a) $[CoF_6]^{3-}$

B. (b) $[NiCl_4]^{2-}$

C. (c) $\left[Ni(CN)_4\right]^{2-}$

D. (d) $[CuCl_4]^{2-}$

Answer: C

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38. Which one of the following is an outer orbital complex and exhibits paramagnetic behaviour ?

A. (a) $\left[Cr(NH_3)_6\right]^{3+}$

B. (b) $\left[Co(NH_3)_6\right]^{3+}$

C. (c) $\left[Ni(NH_3)_6\right]^{2+}$

D. (d) $\left[Zn(NH_3)_6\right]^{2+}$

Answer: C

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39. Low spin complex of d^6-cation in an octahedral field will have the following energy:

A. (a) $\frac{-12}{5}\Delta_0 + P$

B. (b) $\frac{-12}{5}\Delta_0 + 3P$

C. (c) $\frac{-2}{5}\Delta_0 + 2P$

D. (d) $\frac{-2}{5}\Delta_0 + P$

Answer: B

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40. A magnetic moment of 1.73 B.M. will be shown by one among the following:

A. (a) $\left[Ni(CN)_4\right]^{2-}$

B. (b) $TiCl_4$

C. (c) $[CoCl_6]^{4-}$

D. (d) $\left[Cu(NH_3)_4\right]^{2+}$

Answer: D

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41. An excess of $AgNO_3$ is added to $100mL$ of a $0.01M$ solution of dichlorotetraaquachromin (III) chloride. The number of moles of $AgCl$ precipitated would be:

A. (a) 0.002

B. (b) 0.003

C. (c) 0.01

D. (d) 0.001

Answer: D

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42. Among the following complexes, the one which shows zero crystal field stabilization energy (CFSE) is

A. (a) $\left[Mn(H_2O)_6\right]^{3+}$

B. (b) $\left[Fe(H_2O)_6\right]^{3+}$

C. (c) $\left[Co(H_2O)_6\right]^{2+}$

D. (d) $\left[Co(H_2O)_6\right]^{3+}$

Answer: B

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43. The complex used as an anticancer agent is

A. (a) $mer - \left[Co(NH_3)_3Cl_3\right]$

B. (b) $cis - \left[PtCl_2(NH_3)_2\right]$

C. (c) $cis - K_2[PtCl_2Br_2]$

D. (d) Na_2CoCl_4

Answer: B

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44. Cobalt (III) chloride forms several octahedral complexes with amonia. Which of the following will not give test for chloride ions with silver nitrate at $25^{\circ} C$?

A. (a) $CoCl_3 \cdot 5NH_3$

B. (b) $CoCl_3 \cdot 6NH_3$

C. (c) $CoCl_3 \cdot 3NH_3$

D. (d) $CoCl_3 \cdot 4NH_3$

Answer: C

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45. Which of these statements about $\left[Co(CN)_6\right]^{3-}$ is true?

A. (a) $\left[Co(CN)_6\right]^{3-}$ has four unpaired electrons and will be in a high-spin configuration

B. (b) $\left[Co(CN)_6\right]^{3-}$ has no unpaired electrons and will be in a high-spin configuration

C. (c) $\left[Co(CN)_6\right]^{3-}$ has no unpaired electrons and will be in a low-spin configuration

D. (d) $\left[Co(CN)_6\right]^{3-}$ has four unpaired electrons and will be in a low-spin configuration

Answer: C

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46. The IUPAC name of the coordination compound $K_3\left[Fe(CN)_6\right]$ is:

A. (a) Tricyanoferrate (III) ion

B. (b) Hexacyanidoferrate (III) ion

C. (c) Hexacyanoiron (III) ion

D. (d) Hexacyanitoferrate (III) ion

Answer: B

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47. Both $\left[Ni(CO)_4\right]$ and $\left[Ni(CN)_4\right]^{2-}$ are diamagnetic The hybridisations of nickel in these complexes , respectively are :

A. (a) d^2sp^2

B. (b) d^2sp^3

C. (c) dsp^2

D. (d) sp^3

Answer: C

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48. The sum of coordination number and oxidation number of the metal M in the complex $\left[M(en)_2(C_2O_4)\right]Cl$ (where en is ethylenediamine) is:

A. (a) 7

B. (b) 8

C. (c) 9

D. (d) 6

Answer: C

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49. What is the co-ordination number of the metal in $\left[Co(en)_2Cl_2\right]^+$?

A. (a) 3

B. (b) 4

C. (c) 2

D. (d) 1

Answer: A

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50. Which of the following has longest $C-O$ bond length? (Free $C-O$ bond length in CO is 1.128Å).

A. (a) $\left[Mn(CO)_6\right]^+$

B. (b) $Ni(CO)_4$

C. (c) $\left[Co(CO)_4\right]^{\ominus}$

D. (d) $\left[Fe(CO)_4\right]^{2-}$

Answer: D

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51. An example of a sigma bonded organometallic compound is:

A. (a) Grignard's reagent

B. (b) Ferrocene

C. (c) Cobaltocene

D. (d) Ruthenocene

Answer: A

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52. The correct order of the stoichiometries of $AgCl$ formed when $AgNO_3$ in excess is treated with the complexes: $CoCl_3.6NH_3$, $CoCl_3.5NH_3$, $CoCl_3.4NH_3$ respectively is:

A. (a) $3AgCl$, $1AgCl$, $2AgCl$

B. (b) $3AgCl$, $2AgCl$, $1AgCl$

C. (c) $2AgCl$, $3AgCl$, $1AgCl$

D. (d) $1AgCl$, $3AgCl$, $2AgCl$

Answer: B

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53. Correct increasing order for the wavelengths of absorption in the visible region by the complexes of Co^{3+} is:

A. (a) $\left[Co(H_2O)_6\right]^{3+}, \left[Co(en)_3\right]^{3+}, \left[Co(NH_3)_6\right]^{3+}$

B. (b) $\left[Co(H_2O)_6\right]^{3+}, \left[Co(NH_3)_6\right]^{3+}, \left[Co(en)_3\right]^{3+}$

C. (c) $\left[Co(NH_3)_6\right]^{3+}, \left[Co(en)_3\right]^{3+}, \left[Co(H_2O)_6\right]^{3+}$

D. (d) $\left[Co(en)_3\right]^{3+}, \left[Co(NH_3)_6\right]^{3+}, \left[Co(H_2O)_6\right]^{3+}$

Answer: D

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54. Pick out the correct statement with respect to $\left[Mn(CN)_6\right]^{3-}$:

A. (a) It is sp^3d^2 hybridised and tetrahedral

B. (b) It is d^2sp^3 hybridised and octahedral

C. (c) It is dsp^2 hybridised and square planar

D. (d) It is sp^3d^2 hybridised and octahedral

Answer: B

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55. The type of isomersim shown by the complex $\left[CoCl_2(en)_2\right]$ is

A. (a) Geometrical isomerism

B. (b) Coordination isomerism

C. (c) Ionization isomerism

D. (d) Linkage isomerism

Answer: A

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56. The geometry and magnetic behaviour of the complex $\left[Ni(CO)_4\right]$ are

A. (a) square planar geometry and diamagnetic

B. (b) tetrahedral geometry and diamagnetic

C. (c) square planar geometry and paramangetic

D. (d) tetrahedral geometry and paramagnetic

Answer: B

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57. Iron carbonyl, $Fe(CO)_5$ is

A. (a) tetranuclear

B. (b) mononuclear

C. (c) trinuclear

D. (d) dinuclear

Answer: B

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Aiims Questions

1. Which one of the following forms with an excess of CN^- (Cyanide) a complex having coordination number two

A. (a) Cu^+

B. (b) Ag^+

C. (c) Ni^{2+}

D. (d) Fe^{2+}

Answer: B

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2. Potassium ferrocyanide is a

A. (a) normal salt

B. (b) mixed salt

C. (c) double salt

D. (d) complex salt

Answer: D

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3. EDTA has coordination number

A. (a) 3

B. (b) 4

C. (c) 5

D. (d) 6

Answer: D

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4. In the compound lithium tetrahydridoaluminate, the ligand is

A. (a) H^+

B. (b) H^-

C. (c) H

D. (d) none of the these

Answer: B

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5. Assertion: The number of unpaired electrons in $\left[Ni(CO)_4\right]$ is zero

Reason: In this compounds 4s-electrons of Ni atom enter the inner d-orbitals to facilitate the sp^3 hybridisation in Ni atom .

A. (a) zero

B. (b) one

C. (c) three

D. (d) five

Answer: A

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6. $\left[Pt(NH_3)_4Cl_2\right]Br_2$ and $\left[Pt(NH_3)_4Br_2\right]Cl_2$ are related to each other as

A. (a) optical isomers

B. (b) coordinate isomers

C. (c) ionization isomers

D. (d) linkage isomers

Answer: C

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7. Which of the following does not have optical isomer?

A. (a) $\left[Co(NH_3)_3Cl_3\right]$

B. (b) $\left[Co(en)_3\right]Cl_3$

C. (c) $\left[Co(en)_2Cl_2\right]Cl$

D. (d) $\left[Co(en)(NH_3)_2Cl_2\right]Cl$

Answer: A

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8. Among $\left[Ni(CO)_4\right]$, $\left[Ni(CN)_4\right]^{2-}$, $\left[NiCl_4\right]^{2-}$ species, the hybridization states at the Ni atom are, respectively (At. no.of $Ni = 28$)

A. (a) sp^3, sp^3, dsp^2

B. (b) dsp^2, sp^3, sp^3

C. (c) sp^3, dsp^2, dsp^2

D. (d) sp^3, dsp^2, sp^3

Answer: D

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9. Which of the following is a π-acid ligand?

A. (a) NH_3

B. (b) CO

C. (c) F^-

D. (d) Ethylene diamine

Answer: B

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10. Complex salt can be made by the combination of $\left[Co^{III}(NH_3)_5Cl\right]^x$ with

A. (a) PO_4^{3-}

B. (b) Cl^-

C. (c) $2Cl^-$

D. (d) $2K^+$

Answer: C

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11. Which of the following is formed when n-butyl lithium reacts with tin (II) chloride?

A. (a) $LiBr$

B. (b) Et_4Pb

C. (c) $(C_4H_9)_4Sn$

D. (d) $(C_2H_5)_4Pb$

Answer: C

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12. Which of the following is an organometallic compound?

A. (a) $Ti(C_2H_5)_4$

B. (b) $Ti(OC_2H_5)_4$

C. (c) $Ti(OCOCH_3)_4$

D. (d) $Ti(OC_6H_5)_4$

Answer: A

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13. Dimethyl glyoxime gives a red precipitate with Ni^{2+}, which is used for its detection. To get this precipitate readily the best pH range is

A. (a) < 1

B. (b) $2 - 3$

C. (c) $3 - 4$

D. (d) $9 - 11$

Answer: D

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14. An aqueous solution of $COCL_2$ on addition of excess of concentrated HCl turns blue due to formation of

A. (a) $\left[Co(H_2O)_4Cl_2\right]$

B. (b) $\left[Co(H_2O)_2Cl_4\right]^{2-}$

C. (c) $[CoCl_4]^{2-}$

D. (d) $\left[Co(H_2O)_2Cl_2\right]$

Answer: C

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15. The correct order for the wavelength of absorption in the visible region is

A. (a) $\left[Ni(NO_2)_6\right]^{4-} < \left[Ni(NH_3)_6\right]^{2+} < \left[Ni(H_2O)_6\right]^{2+}$

B. (b) $\left[Ni(NO_2)_6\right]^{4-} < \left[Ni(H_2O)_6\right]^{2+} < \left[Ni(NH_3)_6\right]^{2+}$

C. (c) $\left[Ni(H_2O)_6\right]^{2+} < \left[Ni(NH_3)_6\right]^{2+} < \left[Ni(NO_2)_6\right]^{4-}$

D. (d) $\left[Ni(NH_3)_6\right]^{2+} < \left[Ni(H_2O)_6\right]^{2+} < \left[Ni(NO_2)_6\right]^{4-}$

Answer: A

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16. In which of the following pairs both the complex show optical isomerism? .

A. (a) $cis-\left[Cr(C_2O_4)_2Cl_2\right]^{3-}, cis-\left[Co(NH_3)_4Cl_2\right]$

B. (b) $\left[Co(en)_3\right]Cl_3, cis-\left[Co(en)_2Cl_2\right]Cl$

C. (c) $[PtCl(dien)]Cl, [NiCl_2Br_2]^{2-}$

D. (d) $\left[Co(NO_3)_3(NH_3)_3\right], cis-\left[Pt(en)_2Cl_2\right]$

Answer: B

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17. Which of the following is diamagnetic complex

A. (a) $\left[Co(OX)_3\right]^{3-}, \left[Fe(CN)_6\right]^{3-}$

B. (b) $\left[Co(Ox)_3\right]^{3-}, [FeF_6]^{3-}$

C. (c) $\left[Fe(OX)_3\right]^{3}, [FeF_6]^{3-}$

D. (d) $\left[Fe(CN)_6\right]^{3}, [CoF_6]^{3-}$

Answer: A

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Assertion Reasoning Questions

1. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: $\left[Co(NO_2)_3(NH_3)_3\right]$ does not show optical isomerism.

Reason: It has a plane of symmetry.

A. (a) If both the assertion and reason are true and reason is a true explanation of the assertion.

B. (b) If both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. (c) If the assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: A

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2. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: $\left[Al(H_2O)_6\right]^{3+}$ is a stronger acid than $\left[Mg(H_2O)_6\right]^{2+}$.

Reason: Size of $\left[Al(H_2O)_6\right]^{3+}$ is smaller than $\left[Mg(H_2O)_6\right]^{2+}$ and posseses more effective nuclear charge.

A. (a) If both the assertion and reason are true and reason is a true explanation of the assertion.

B. (b) If both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. (c) If the assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: A

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3. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: The geometrical isomers of the complex $\left[M(NH_3)_4Cl_2\right]$ are optically inactive.

Reason: Both geometrical isomer of the complex $\left[M(NH_3)_4Cl_2\right]$ possess axis of symmetry.

A. (a) If both the assertion and reason are true and reason is a true explanation of the assertion.

B. (b) If both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. (c) If the assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: A

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4. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: $\left[Fe(CN)_6\right]^{3-}$ has d^2sp^3 type hybridisation.

Reason: $\left[Fe(CN)_6\right]^{3-}$ ion shows magnetic moment corresponding to two unpaired electrons.

A. (a) If both the assertion and reason are true and reason is a true explanation of the assertion.

B. (b) If both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. (c) If the assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: C

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5. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: In zeise's salt coordination no. of Pt is five

Reason: ethene is bidenate ligand.

A. (a) If both the assertion and reason are true and reason is a true explanation of the assertion.

B. (b) If both the assertion and reason are true but the reason is not the correct explanation of assertion.

C. (c) If the assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: D

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Section D Chapter End Test

1. Co-ordination number of Fe in the complexes $\left[Fe(CN)_6\right]^{4-}$, $\left[Fe(CN)_6\right]^{3-}$ and $\left[FeCl_4\right]^{-}$ would be respectively

A. (a) 2, 3, 3

B. (b) 6, 6, 4

C. (c) 6, 3, 3

D. (d) 6, 4, 6

Answer: B

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2. $(Me)_2SiCl_2$ on hydrolysis will produce.

A. (a) $(Me)_2Si(OH)_2$

B. (b) $(Me)_2Si=O$

C. (c) $-\left[-O-(Me)_2Si-O\right]^{\ominus}$

D. (d) $MeSiCl(OH)$

Answer: C

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3. Types of isomerism shown by $\left[Cr(NH_3)_5NO_2\right]Cl_2$ is

A. (a) Optical

B. (b) Ionisation

C. (c) Geometrical

D. (d) Linkage

Answer: D

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4. Which of the following will no give a precipate with $AgNO_3$?

A. (a) $\left[Co(NH_3)_3Cl_3\right]$

B. (b) $\left[Co(NH_3)_4Cl_2\right]Cl$

C. (c) $\left[Co(NH_3)_5Cl\right]Cl_2$

D. (d) $\left[Co(NH_3)_6\right]Cl_3$

Answer: A

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5. In the process of extraction of gold,

Roasted gold ore $+CN^- + H_2O \xrightarrow{O_2} [X] + OH^-$

$[X] + Zn \rightarrow [Y] + Au$

Identify the complexes [X] and [Y]

A. (a) $X = \left[Au(CN)_2\right]^-, Y = \left[Zn(CN)_4\right]^{2-}$

B. (b) $X = \left[Au(CN)_4\right]^{3-}, Y = \left[Zn(CN)_4\right]^{2-}$

C. (c) $X = \left[Au(CN)_2\right]^-, Y = \left[Zn(CN)_6\right]^{4-}$

D. (d) $X = \left[Au(CN)_4\right]^-, Y = \left[Zn(CN)_4\right]^{2-}$

Answer: A

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6. A reagent used for identifying nickel ion is:

A. (a) Resorcinol

B. (b) Dimethyl glyoxime [DMG]

C. (c) Diphenyl benzidine

D. (d) Potassium ferrocyanide

Answer: B

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7. Which of the following complex is an outer orbital complex?

A. (a) $\left[Co(CH_3)_6\right]^{3+}$

B. (b) $\left[Mn(CN)_6\right]^{4-}$

C. (c) $\left[Fe(CN)_6\right]^{4-}$

D. (d) $\left[Ni(NH_3)_6\right]^{2+}$

Answer: D

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8. Which of the following has the largest number of isomers? .

A. (a) $\left[Ir(PP_3)_2H(CO)\right]^{2+}$

B. (b) $\left[Co(NH_3)_5Cl\right]^{2+}$

C. (c) $\left[Ru(NH_3)_4Cl_2\right]^{+}$

D. (d) $\left[Co(en)_2Cl_2\right]^{+}$

Answer: D

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9. Which kind of isomerism is exhibited by octahedral $\left[Co(NH_3)_4Br_2\right]CI$? .

A. (a) Geometrical and Ionization

B. (b) Geometrical and Optical

C. (c) Optical and Ionization

D. (d) Geometrical only

Answer: A

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10. Which one of the following is expected to exhibit optical isomerism (en=ethylenediamine)?

A. (a) $cis - \left[Pt(NH_3)_2Cl_2\right]$

B. (b) $trans - \left[Co(en)_2Cl_2\right]$

C. (c) $trans - \left[Pt(NH_3)_2Cl_2\right]$

D. (d) $cis - \left[Co(en)_2Cl_2\right]$

Answer: D

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11. The pair of the compounds in which both the metals are in the highest possible oxidation state is

A. (a) $\left[Fe(CN)_6\right]^{3-}\left[Co(CN)_6\right]^{3-}$

B. (b) CrO_2Cl_2, MnO_4^-

C. (c) TiO_3, MnO_2

D. (d) $\left[Co(CN)_6\right]^{3-}, MnO_3$

Answer: B

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12. IUPAC name of $\left[Co(NH_3)_5NO_2\right]Cl_2$

A. (a) Pentamminenitrocobalt (III) chloride

B. (b) Pentaminenitrosocobalt (III) chloride

C. (c) Pentaminenitrocobalt (II) chloride

D. (d) None of these

Answer: A

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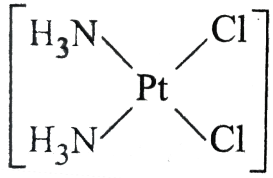
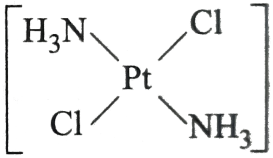
13. Which of the following is considered to be an anticancer species ?

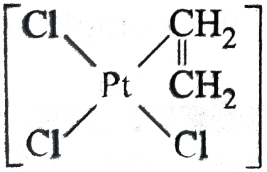
A. (a)



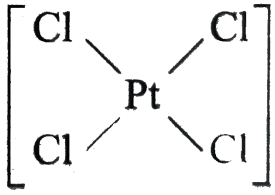
B. (b)



C. (c)



D. (d)



Answer: A

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14. An aqueous solution of $COCL_2$ on addition of excess of concentrated HCl turns blue due to formation of

A. (a) $\left[Co(H_2O)_4Cl_2\right]$

B. (b) $\left[Co(H_2O)_2Cl_4\right]^{2-}$

C. (c) $[CoCl_4]^{2-}$

D. (d) $\left[Co(H_2O)_2Cl\right]_2$

Answer: C

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15. The correct order for the wavelength of absorption in the visible region is

A. (a) $\left[Ni(NO_2)_6\right]^{4-} < \left[NI(NH_3)_6\right]^{2+} < \left[Ni(H_2O)_6\right]^{2+}$

B. (b) $\left[Ni(NO_2)_6\right]^{4-} < \left[Ni(H_2O)_6\right]^{2+} < \left[Ni(NH_3)_6\right]^{2+}$

C. (c) $\left[Ni(H_2O)_6\right]^{2+} < \left[Ni(NH_3)_6\right]^{2+} < \left[Ni(NO_2)_6\right]^{4-}$

D. (d) $\left[Ni(NH_3)_6\right]^{2+} < \left[Ni(H_2O)_6\right]^{2+} < \left[Ni(NO_2)_6\right]^{4-}$

Answer: A

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16. In which of the following pairs both the complex show optical isomerism? .

A. (a) $cis - \left[Cr(C_2O_4)_2Cl_2\right]^{3-}, cis - \left[Co(NH_3)_4Cl_2\right]$

B. (b) $\left[Co(en)_3\right]Cl_3, cis - \left[Co(en)_2Cl_2\right]Cl$

C. (c) $[PtCl(dien)Cl], [NiCl_2Br_2]^{2-}$

D. (d) $\left[Co(NO_3)_3(NH_3)_3\right], cis - \left[Pt(en)_2Cl_2\right]$

Answer: B

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17. Which of the following compounds shows optical isomerism?

A. (a) $\left[Cu(NH_3)_4\right]^{2+}$

B. (b) $\left[ZnCl_4\right]^{2-}$

C. (c) $\left[Cr(C_2O_4)_3\right]^{3-}$

D. (d) $\left[Co(CN)_6\right]^{3-}$

Answer: C

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18. CN^- is a strong field ligand. This is due to the fact that

A. (a) It can accept electron from metal species

B. (b) it forms high spin complexes with metal species

C. (c) it carries negative charge.

D. (d) it is a pseudohalide

Answer: D

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19. Considering H_2O as a weak field ligand, the number of unpaired electrons in $\left[Mn(H_2O)_6\right]^{2+}$ will be (At. no. of $Mn = 25$)

A. (a) Two

B. (b) Four

C. (c) Three

D. (d) Five

Answer: D

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20. Given the molecular formula of the hexacoordinated complexes (A) $[CoCl_3.6NH_3]$ (B) $[CoCl_3.5NH_3]$ (C) $CoCl_3.4NH_3$. If the number of

coordinated NH_3 molecules in A, B and C respectively are 6, 5 and 4, the primary valency in (A), (B) and (C) are:

A. (a) 6, 5, 4

B. (b) 3, 2, 1

C. (c) 0, 1, 2

D. (d) 3, 3, 3

Answer: B

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21. Turnbull's blue is a compound

A. (a) Ferricyanide

B. (b) Ferrous ferricyanide

C. (c) Ferrous cyanide

D. (d) Ferriferrocyanide

Answer: B

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22. Number of ions present in $K_4\left[Fe(CN)_6\right]$

A. (a) 2

B. (b) 10

C. (c) 3

D. (d) 5

Answer: D

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23. A co-ordination complex, compound of cobalt has the molecular formulae containing five ammonia molecules, one nitro group and two chloride atoms for one cobalt atom. One mole of this compound

produces three mole ions in an aqueous solution on reacting with excess of $AgNO_3$, $AgCl$ precipitate. The ionic formula for this complex would be:

A. (a) $\left[Co(NH_3)_5(NO_2)Cl_2\right.$

B. (b) $\left[Co(NH_3)_5Cl\right][Cl(NO_2)]$

C. (c) $\left[Co(NH_3)_4(No_2)Cl\right][(NH_3)Cl]$

D. (d) $\left[CO(NH_3)_5\right]\left[(NO_2)_2Cl_2\right]$

Answer: A

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24. Which would exhibit ionisation isomerism?

A. (a) $\left[Cr(NH_3)_6\right]Cl_3$

B. (b) $\left[Co(NH_3)_5Br\right]SO_4$

C. (c) $\left[Cr(en)_2Cl_2\right]$

D. (d) $\left[Cr(en)_3Cl_3\right]$

Answer: B

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25. A mixture x containing 0.02 mol of $\left[Co(NH_3)_5SO_4\right]Br$ and 0.02 mol of $\left[Co(NH_3)_5Br\right]SO_4$ was prepared in $2L$ of solution.

$1L$ of mixture $X +$ excess $AgNO_3 \rightarrow Y$

$1L$ of mixture $X +$ excess $BaCl_2 \rightarrow Z$

The number of moles of Y and Z are

A. (a) $0.01, 0.01$

B. (b) $0.02, 0.01$

C. (c) $0.01, 0.02$

D. (d) $0.02, 0.02$

Answer: A

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26. Which of the following organometallic compound is a sigma and pi bonded? .

A. (a) $Fe(CH_3)_3$

B. (b) $\left[Fe\left(\eta^5 - C_5H_5\right)_2\right]$

C. (c) $\left[Co(CO)_5NH_3\right]^{2+}$

D. (d) $K\left[PtCl_3\left(\eta^2 - C_2H_4\right)\right]$

Answer: B

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27. $\left[Co(NH_3)_4Cl_2\right]^+$ exhibits

A. (a) Geometrical isomerism

B. (b) Optical isomerism

C. (c) Bonding isomerism

D. (d) ionisation isomerism

Answer: A

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28. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: The number of unpaired electrons present in $[CuCl_2]^-$ complex is zero.

Reason: The complex is linear in the solid state with sp-hybridization.

A. (a) If both assertion and reason are true and the reason are true and reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true and reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: C

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29. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: $\left[Ti(H_2O)_6\right]^{3+}$ is coloured while $\left[Sc(H_2O)_6\right]^{3+}$ is colourless.

Reason: d-d transition is not possible in $\left[Sc(H_2O)_6\right]^{3+}$.

A. (a) If both assertion and reason are true and the reason are true and reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true and reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: A

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30. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses:

Assertion: Potassium ferrocyanide is diamagnetic whereas potassium ferricyanide is paramagnetic.

Reason: Crystal field splitting in ferrocyanide ion is greater than that of ferricyanide ion.

A. (a) If both assertion and reason are true and the reason are true and reason is the correct explanation of the assertion.

B. (b) If both assertion and reason are true and reason is not the correct explanation of the assertion.

C. (c) If assertion is true but reason is false.

D. (d) If assertion is false but reason is true.

Answer: C

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