CHEMISTRY

BOOKS - DISHA PUBLICATION CHEMISTRY (HINGLISH)

COORDINATION COMPOUNDS

Exercise

1. Which of the following complexes will show geometrical isomerism ?

A. Potassium tris(oxalato) chromate (III)

B. Pentaaquachlorochromium (III) chloride

C. Aquachlorobis (ethylenediamine) cobalt (II) chloride

D. Potassium aminetrichloroplatinate (II)

Answer: C

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2. In Wilkinson's catalyst, the hybridization of central metal ion and its shape are respectively :

A. sp^3d, trigonal bipyramidal

B. d^2sp^3 octahedral

C. dsp^2 , square planar

D. sp^3, tetrahedral

Answer: C

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3. Four statements for the following reaction given below

$$\left[CoCl_2(NH_3)_4\right]^+ \rightarrow \left[CoCl_3(NH_3)_3\right] + NH_3$$

(P) Only one isomer is produced if the ractant complex ion is a trans isomer

(Q) Three isomers are produced if the reactant complex ion is a cis isomer

(R) Two isomers are produced if the reactant complex ion is trans isomer

(S) Two isomers are produced if the reactant complex is cis isomer

The correct statements are :

A. (I) and (II)

B. (I) and (III)

C. (III) and (IV)

D. (II) and (IV)

Answer: B

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4. $\left[Co_2(CO)_8\right]$ displays :

A. one Co-Co bond, six terminal CO and two bridging CO

B. one Co-Co bond, four terminal CO and four bridging CO

C. no Co-Co bond, six terminal CO and two bridging CO

D. no Co-Co bond, four terminal CO and four bridging CO

Answer: A

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5. On treatment of 100 mL of 0.1 M solution of $COCl_3.6H_2O$ with excess of $AgNO_3$, 1.2×10^{22} ions are precipitated. The complex is

A. $\left[Co(H_2O)_4Cl_2\right]Cl.\ 2H_2O$

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

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

D. $\left[Co(H_2O)_5Cl\right]Cl_2.\ H_2O$

Answer: D

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6. Which one of the following complexes will consume more equivalent of aqueous solution of $Ag(NO_3)$?

A. $Na_2[CrCl_5(H_2O)]$

B. $Na_3[CrCl_6]$

C. $\left[Cr(H_2O)_5Cl\right]Cl_2$

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

Answer: D

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7. Identify the correct trend given below:

(Atomic No = $Ti: 22$, $Cr: 24$ and Mo : 42)

A. Δ_o of $\left[Cr(H_2O)_6\right]^{2+} > \left[Mo(H_2O)_6\right]^{2+}$ and

Δ_o of $\left[Ti(H_2O)_6\right]^{3+} > \left[Ti(H_2O)_6\right]^{2+}$

B. Δ_o of

$\left[Cr(H_2O)_6\right]^{2+} > \left[Mo(H_2O)_6\right]^{2+}$ and Δ_o

of $\left[Ti(H_2O)_6\right]^{3+} < \left[Ti(H_2O)_6\right]^{2+}$

C. Δ_o of $[Cr(H_2O)_6]^{2+} < [Mo(H_2O)_6]^{2+}$ and Δ_o of $[Ti(H_2O)_6]^{3+} > [Ti(H_2O)_6]^{2+}$

D. Δ_o of $[Cr(H_2O)_6]^{2+} < [Mo(H_2O)_6]^{2+}$ and Δ_o of $[Ti(H_2O)_6]^{3+} < [Ti(H_2O)_6]^{2+}$

Answer: C

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8. Which of the following is an example of homoleptic complex ?

A. $[Co(NH_3)_6]Cl_3$

B. $[Pt(NH_3)_2Cl_2]$

C. $[Co(NH_3)_4Cl_2]$

D. $[Co(NH_3)_5cl]Cl_2$

Answer: A

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9. Which one of the following complexes shows optical isomerism ?

(en=ethylenediamine)

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

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

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

D. cis $\left[Co(em)_2Cl_2\right]Cl$

Answer: D

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10. The pair having the same magnetic moment is

[at. No.

$Cr = 24, Mn = 25, Fe = 26$ and $Co = 27$]

A. $[Mn(H_2O)_6]^{2+}$ and $[Cr(H_2O)_6]^{2+}$

B. $[Co(Cl_4]^{2-}$ and $[Fe(H_2O)_6]^{2+}$

C. $[Cr(H_2O)_6]^{2+}$ and $[CoCl_4]^{2-}$

D. $[Cr(H_2O)_6]^{2+}$ and $[Fe(H_2O)_6]^{2+}$

Answer: D

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11. Which molecule/ion among the following cannot act as a ligand in complex compounds ?

A. CH_4

B. CO

C. CN^-

D. Br^-

Answer: A

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12. The correct statement on the isomerism associated with the following complex ions.

$I\left[Ni(H_2O)_5NH_3\right]^{2+}$

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

$III.\ \left[Ni(H_2O)_3(NH_3)_3\right]^{2+}$

A. (A) and (B) show only geometrical isomerism

B. (A) and (B) show geometrical and optical isomerism

C. (B) and (C) show geometerical and optical isomerism

D. (B) and (C) show only geometrical isomerism.

Answer: C

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13. The number of geometric isomers that can exist for square planner complex ion

$[Pt(CI)(PY)(NH_3)(NH_2OH)]^+$ is (Py = pyridine)

:

A. 4

B. 6

C. 2

D. 3

Answer: D

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14. An octahedral complex of Co^{3+} is diamagnetic .

The hydridisation involved in the formation of the

complex is :

A. sp^3d^2

B. dsp^2

C. d^2sp^3

D. sp^3d

Answer: C

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15. The correct statement about the magnetic properties of $\left[Fe(CN)_6\right]^{3-}$ and $\left[FeF_6\right]^{3-}$ is : (Z=26)

A. both are paramagnetic

B. both are diamagnetic

C. $\left[Fe(CN)_6\right]^{3-}$ is diamagnetic $\left[FeF_6\right]^{3-}$ is paramagnetic .

D. $\left[Fe(CN)_6\right]^{3-}$ is paramagnetic , $\left[FeF_6\right]^{3-}$ is diamagnetic

Answer: A

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16. An octahedral complex with molecular composition M.5 $NH_3, Cl. SO_4$ has two isomers, A

and B . The solution of A gives a white precipitate with $AgNO_3$ solution and the solution of B gives white precipitate with $BaCl_2$ solution. The type of isomerism exhibited by the complex is :

A. Linkage isomerism

B. Ionisation isomerism

C. Coordinate isomerism

D. Geometrical isomerism

Answer: B

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17. 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. $L_4 < L_3 < L_2 < L_1$

B. $L_1 < L_3 < L_2 < L_4$

C. $L_3 < L_2 < L_4 < L_4$

D. $L_1 < L_2 < L_4 < L_3$

Answer: B

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18. The correct $IUPAC$ name for

$\left[Pt(C_5H_5N)_4\right]\left[PtCI_4\right]$ complex

A. Tetrapyridineplatinate(II)

tetrachloridoplantinate(II)

B. Tetrapyridineplatinum(II)

tetrachloridoplantinum(II)

C. Tetrapyridineplatinate(II)

tetrachloridoplantinum(II)

D. Tetrapyridineplatinum(II)

tetrachloridoplantinate(II)

Answer: D

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

A. Hydrated as well as ionization isomerism

B. Ionization as well as geometrical isomerism

C. Linkage as well as geometrical isomerism

D. Ionization as well as optical isomerism

Answer: B

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20. The pair of compounds having metals in their highest oxidation state is

A. MnO_2 and CrO_2Cl_2

B. $[NiCl_4]^{2-}$ and $[CoCl_4]^{2-}$

C. $[Fe(CN)_6]^{3-}$ and $[Cu(CN)_2]^{2-}$

D. $[FeCl_4]^{-}$ and Co_2O_3

Answer: A

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21. The number of geometric isomers that can exist for square planner complex ion $[Pt(CI)(PY)(NH_3)(NH_2OH)]^+$ is (Py = pyridine) :

A. 2 isomers (Geometrical)

B. 3 isomers (Geometrical)

C. 6 isomers (Geometrical)

D. 4 isomers (Geometrical)

Answer: B

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22. The geometries of $Ni(CO)_4$ and $Ni(PPh_3)_2Cl_2$ are .

A. both square planar

B. tetrahedral and square planar

C. both tetrahedral

D. None of these

Answer: C

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

A. cis isomer

B. trans isomer

C. cis or trans isomers

D. None of these

Answer: A

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24. $[Pt(NH_3)_4Cl_2]Br_2$ and $[Pt(NH_3)_4Br_2]Cl_2$ are related to each other as

A. Linkage and optical

B. Geometrical and linkage

C. Optical and ionization

D. Linkage and geometrical

Answer: B

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

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

B. $[Pt(NH_3)(NH_2OH)(NO_2)(C_6H_5N)]NO_2$

C. $\left[Pt(NH_2CH_2COO)_2\right]$

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

Answer: D

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26. Which statement about coordination number of a cation is true?

A. Most metal ions exhibit only a single characteristic coordination number

B. The coordination number is equal to the number of ligands bonded to the metal atom

C. The coordination number is determined solely by the tendency to surround the metal atom with the same number of electrons as one of the inert gases

D. For most cations, the coordination number depends on the size, and charge of the cation

Answer: D

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27. Select the correct code about complex $\left[Cr(NO_2)(NH_3)_5\right][ZnCl_4]$:

(I) IUPAC name of compoun is pentaamminenitrito $-N-$ chromium (III) tetrachlorozincate (II)

(II) It shows geometrical isomerism

(III) It shows linkage isomerism

(IV) It shows coordination isomerism`

A. III, IV

B. I, III and IV

C. II, III and IV

D. I, II , III and IV

Answer: B

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28. In which of the following pairs both the complex show optical isomerism? .

A. cis

$-\left[Cr(C_2O_4)_2Cl_2\right]^{2-}$ $\quad$ $\text{cis}\left[Co(NH_3)_4Cl_2\right]$

B. $\left[Co(\text{en})_3\right]Cl_3,$ $\quad$ $\text{cis}-\left[Co(\text{en})_2Cl_2\right]Cl$

C. $\left[Co(NO_3)_3(NH_3)_3\right],$ $\quad$ $\text{cis}-\left[Pt(\text{en})_2Cl_2\right]$

D. $[PtCl(\text{en})Cl],$ $\quad$ $\left[NiCl_2Br_2\right]^{2-}$

Answer: B

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29. The total number possible isomers for the complex compound $\left[Cu^{II}(NH_3)_4\left[Pt^{II}CI_4\right]\right.$ are

A. 3

B. 6

C. 5

D. 4

Answer: D

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30. Which of the following will give maximum number of isomer ?

A. $\left[Ni(C_2O_4)(\text{en})_2\right]^{2-}$

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

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

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

Answer: C

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31. Which of the following compounds shows optical isomerism?

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

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

C. $[ZnCl_4]^{2-}$

D. $[Cu(NH_3)_4]^{2+}$

Answer: B

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32. The ionisation isomer of $[Cr(H_2O)_4Cl(NO_2)]Cl$

A. $[Cr(H_2O)_4(O_2N)]Cl_2$

B. $[Cr(H_2O)_4Cl_2](NO_2)$

C. $[Cr(H_2O)_4Cl(ONO)]Cl$

D. $\left[Cr(H_2O)_4Cl_2(NO_2)\right].H_2O$

Answer: B

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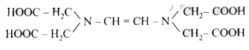
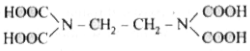
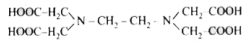
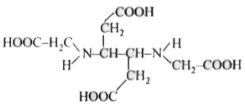
33. The correct structure of ethylenediamineteraacetic acid $(EDTA)$ is .

A. 

B. 

C. 

D. 

Answer: C

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34. Which one of the following complex is not expected to exhibit isomerism

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

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

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

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

Answer: D

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35. The complexes $[Co(NH_3)_6][Cr(CN)_6]$ and $[Cr(NH_3)_6][Co(CN)_6]$ are the examples of which type of isomerism ?

A. Linkage isomerism

B. Ionization isomerism

C. Coordination isomerism

D. Geometrical isomerism

Answer: C

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36. The complex, $[Pt(py)(NH_3)BrCl]$ will have how many geometrical isomers?

A. 3

B. 4

C. 0

D. 2

Answer: A

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37. 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. 9

B. 6

C. 7

D. 8

Answer: A

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38. 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. $CrCl_3 . 6H_2O$

B. $\left[Cr(H_2O)_3Cl_3\right] . (H_2O)_3$

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

D. $\left[CrCl(H_2O)_5\right]Cl_2 . H_2O$

Answer: C

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39. Which of the following is not chelating agent

(a) Thiosulphate

(b) Oxalato

(c) Glycinato

(d) Ethylene diamine .

A. thiosulphato

B. oxalato

C. glycinato

D. ethylene diamine

Answer: A

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40. Which of the following species is not expected to be a ligand?

A. $\overset{+}{N}O$

B. NH_4^+

C. $NH_2 - NH_3^+$

D. CO

Answer: B

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41. Which is the pair of ambidentate ligand?

A. CN^-, NO_2^-

B. NO_3^-, SCN^-

C. N_3^-, NO_2^-

D. $NCS^-, C_2O_4^{2-}$

Answer: A

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42. Number of water molecules acting as ligands in

$CuSO_4.5H_2O, ZnSO_4.5H_2O, FeSO_4.7H_2O$

respectively are .

A. 5,5,7

B. 4,5,4

C. 4,4,6

D. 4,4,7

Answer: C

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43. Which of the following pair of complexes have the same EAN of the central metal atoms/ions?

A. $[Cu(NH_3)_4]SO_4$ and $K_3[Fe(CN)_6]$

B. $K_4[Fe(CN)_6]$ and $[Co(NH_3)_6]Cl_3$

C. $K_3[Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6]Cl(NO_2)_2$

D. All of the above

Answer: D

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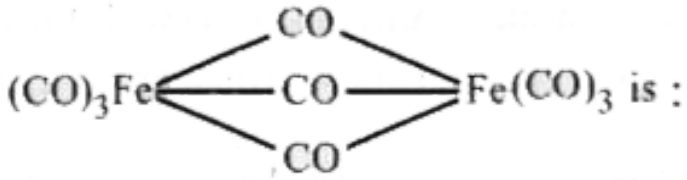
44. The correct name of



is :

A. Tri- μ carbonylbis (tricarbonyl iron (0))

B. Hexacarbonyliron (III) μ-tricarbonylferrate (0)

C. Tricarbonyliron (0) μ-tricarbonyliron (0)

D. Nonacarbonyl iron

Answer: A

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45. In octaamine $-\mu$-dihydroxodiiron(III)sulphate, the number of bridging ligands is:

A. 2

B. 1

C. 3

D. none of these

Answer: A

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46. Ammonia will not form complex with

A. Ag^{2+}

B. Pb^{2+}

C. Cu^{2+}

D. Cd^{2+}

Answer: B

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47. Which of the following complex compound is low spin, inner orbital , diamagnetic complex ?

A. $[Ni(NH_3)_6]Cl_2$

B. $K_3[Fe(CN)_6]$

C. $K_2[PtCl_6]$

D. $[Cr(H_2O)_6]Cl_3$

Answer: C

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48. An aqueous solution of titanium bromide shows zero magnetic moment. Assuming the complex as octahedral in aqueous solution, the formula of the complex is .

A. $[TiBr_6]^{3-}$

B. $[Ti(H_2O)]Br_4$

C. $[TiBr_6]^{2-}$

D. $\left[Ti(H_2O)_4Br_2\right]$

Answer: B

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49. Which of the following complexes have a maximum number of unpaired electrons ?

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

B. $\left[Co(NH_3)_4(NO_2)_2\right]^+$

C. $\left[Ag(CN)_2\right]^- a$

D. $\left[CuBr_4\right]^{2-}$

Answer: D

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50. The degeneracy of d-orbitals is lost under:

(I) Strong field ligand

(II) Weak field ligand

(III) Mixed field lagand

(IV) Chelated Ligand field

Choose the correct code:

A. I, II and IV

B. I and II

C. I, II, III and IV

D. I, II and III

Answer: C

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51. Relative to the average energy in the spherical crystal field the t_{2g} orbitals in tetrahedral field is .

A. raised by (2/5) Δ_t

B. lowered by (2/5) Δ_t

C. raised by (3/5) Δ_t

D. lowered by (1/5) Δ_t

Answer: A

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52. Which of the following outer orbital complex has the highest magnetic moment ?

A. $\left[Mn(NH_3)_6\right]Cl_2$

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

C. $\left[Ni(NH_3)_6\right]Cl_2$

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

Answer: A

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53. the correct IUPAC name of the following compound $\left[Cr(NH_3)_5(NCS)\right][ZnCl_4]$ is

A. colourless and diamagnetic

B. green coloured and diamagnetic

C. green coloured and shows coordination isomerism

D. diamagnetic and shows linkage isomerism

Answer: C

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54. Mn^{2+} forms a complex with Br– ion. The magnetic moment of the complex is 5.92 B. M. What could not be the probable formula and geometry of the complex?

A. $[MrBr_6]^{4-}$, octahedral

B. $[MnBr_4]^{2-}$, square planar

C. $[MnBr_4]^{2-}$, tetrahedral

D. $[MnBr_5]^{3-}$, trigonal bipyramidal

Answer: C

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55. Which of the following hydrate is diamagnetic ?

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

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

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

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

Answer: C

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56. Which one of the following will show paramagnetism corresponding to 2 unpaired

electrons?

(Atomic numbers: Ni = 28, Fe=26)

A. $[FeF_6]^{3-}$

B. $[NiCl_4]^{2-}$

C. $[Fe(CN)_6]^{3-}$

D. $[Ni(CN)_4]^{2-}$

Answer: B

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

A. it carries negative charge

B. it is a pseudohalide

C. it can accept electrons from metal species

D. it forms high spin complexes with metal species

Answer: B

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58. $\left[Se(H_2O)_6\right]^{3+}$ ion is

A. colourless and diamagnetic

B. coloured and octahedral

C. colourless and paramagnetic

D. coloured and paramagnetic

Answer: A

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59. The crystal field stabilization energy (CFSE) is the highest for

A. $[CoF_4]^{2-}$

B. $Co(NCS)_4]^{2-}$

C. $[Co(NH_3)_6]^{3+}$

D. $[CoCl_4]^{2-}$

Answer: C

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60. Which of the following complex ion is not expected to absorb visible light?

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

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

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

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

Answer: A

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61. Crystal field stabilization energy for high spin d^4 octahedral complex is

A. $-1.8\Delta_0$

B. $-1.6\Delta_0 + P$

C. $-1.2\Delta_0$

D. $-0.6\Delta_0$

Answer: D

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62. A solution containing 2.675 g of $CoCl_3.6NH_3$ (molar mass $= 267.5 gmol^{-1}$) is passed through a cation exchanger. The chloride ions obtained is solution were treated with excess of $AgNO_3$ to give 4.73 g of $AgCl$ (molar mass = $143.5 gmol^{-1}$). The formula of the complex is (At. mass of Ag = 108 u)

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

B. $\left[CoCl_2(NH_3)_4\right]Cl$

C. $[CoCl_3(NH_3)_3]$

D. $[CoCl(NH_3)_5]Cl_2$

Answer: A

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63. Of the following complex ions, which is diamagnetic in natures?

A. $[NiCl_4]^{2-}$

B. $[Ni(CN)_4]^{2-}$

C. $[CuCl_4]^{2-}$

D. $[CoF_6]^{3-}$

Answer: B

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64. 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. $[Mn(H_2O)_6]^{2+}$

B. $[Fe(H_2O)_6]^{2+}$

C. $[Co(H_2O)_6]^{2+}$

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

Answer: C

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65. Which of the following complex compounds will exhibit highest paramagnetic behaviour ?

(At. No. : Ti = 22, Cr= 24, Co=27, Zn=30)

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

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

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

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

Answer: B

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

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

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

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

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

Answer: A

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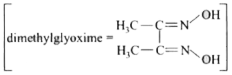
67. Red precipitae is obtained when ethanol solution of dimethylglyoxime is added to ammoniacal $Ni(II)$. Which of the following statement is not true?

A. Red complex has a square planar geometry.

B. Complex has symmetrical H-bonding

C. Red complex has a tetrahedral geometry.

D. Dimethylglyoxime functions as bidentate ligand.



Answer: C

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68. Low spin complex of d^6-cation in an octahedral field will have the following energy:

A. $\frac{-12}{5}\Delta_0 + P$

B. $\frac{-12}{5}\Delta_0 + 3P$

C. $\frac{-2}{5}\Delta_0 + 2P$

D. $\frac{-2}{5}\Delta_0 + P$

Answer: B

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69. Among the following complexes, the one which shows zero crystal field stabilization energy (CFSE) is

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

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

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

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

Answer: B

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70. Which of the following complexes is used as an anti-cancer agent:

A. mer-$\left[Co(NH_3)_3Cl_3\right]$

B. cis-$\left[PtCl_2(NH_3)_2\right]$

C. cis-$K_2[PtCl_2Br_2]$

D. Na_2CoCl_4

Answer: B

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71. 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. $CoCl_3 \cdot 4NH_3$

B. $CoCl_3 \cdot 5NH_3$

C. $CoCl_3 \cdot 6NH_3$

D. $CoCl_3 \cdot 3NH_3$

Answer: D

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72. $HgCl_2$ and I_2 both when dissolved in water containing I^- ions the pair of species formed is:

A. HgI_2, I^-

B. HgI_4^{2-}

C. Hg_2I_2, I^-

D. HgI_2, I_3^-

Answer: B

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73. Correct increasing order for the wavelength of absorption in the visible region for the complexes of Co^{3+} is:

A.

$[Co(H_2O)_6]^{3+}, [Co(en)_3]^{3+}, [Co(NH_3)_6]^{3+}$

B.

$[Co(H_2O)_6]^{3+}, [Co(NH_3)_6]^{3+}, [Co(en)_3]^{3+}$

C.

$[Co(NH_3)_6]^{3+}, [Co(en)_3]^{3+}, [Co(H_2O)_6]^{3+}$

D.

$[Co(en)_3]^{3+}, [Co(NH_3)_6]^{3+}, [Co(H_2O)_6]^{3+}$

Answer: D

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74. Pick out the correct statement with respect to $\left[Fe(CN)_6\right]^{3-}$

A. It is sp^3d^2 hybridised and tetrahedral.

B. It is d^2sp^3 hybridised and octahedral.

C. It is dsp^2 hybridised and square planar.

D. It is sp^3d^2 hybridised and octahedral.

Answer: B

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75. The molar ionic conductances of octahedral complexes.

(I) $PtCl_4.5NH_3$ (II) $PtCl_4.4NH_3$

(III) $PtCl_4.3NH_3$ (IV) $PtCl_4.2NH_3$

A. $I < II < III < IV$

B. $IV < III < II < I$

C. $III < IV < II < I$

D. $IV < III < I < II$

Answer: B

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

A. Diamminedichloroplatinum (II)

B. Tetraamminedichlorocobalt(III) chloride

C. Potassium hexacyanoferrate (II)

D. Hexaaquachromium(III) chloride

Answer: C

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77. Consider the following complex

$[Co(NH_3)_5CO_3]ClO_4$

The coordination number, oxidation number number of d-electrons and number of unpaired d-electrons on the metal are respectively

A. 6,3,6,0

B. 7,2,7,1

C. 7,1,6,4

D. 6,2,7,3

Answer: A

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78. Nickel (Z=28) combines with a uninegative monodenatate ligands to form a diamagnetic complex $[NiL_4]^{2-}$. The hybridisation involved and the number of unpaired electrons present in the complex are respectively:

A. sp^3, two

B. dsp^2, zero

C. dsp^2, one

D. sp^3 ,zero

Answer: A

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79. Ferrocene is

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

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

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

D. $\left[(C_5H_5)_2Fe\right]$

Answer: D

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80. An example of organometallic compound is

A. $Ti(OCOCH_3)_4$

B. $Ti(C_2H_4)_4$

C. $Ti(OC_6H_5)_4$

D. $Ti(OC_2H_5)_4$

Answer: B

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

A. $Al(OC_2H_5)_3$

B. C_2H_5MgBr

C. $K[Pt(C_2H_4)Cl_3]$

D. $Ni(CO)_4$

Answer: A

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82. Which of the following is an organometallic compound?

A. Lithium methoxide

B. Lithium acetate

C. Lithium dimethylamide

D. Methyl lithium

Answer: D

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

A. ionic character

B. σ-character only

C. π-character

D. both σ and π characters

Answer: D

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84. Which of the following is not considered as an organometallic compound?

A. Nickel tetracarbonyl

B. Chlorophyll

C. $K_3\left[Fe(C_2O_4)_3\right]$

D. $\left[Co(en)_3\right]Cl_3$

Answer: B

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85. CH_3MgBr is an organometallic compound due to

A. Mg-Br bond

B. C-Mg bond

C. C-Br bond

D. C-H bond

Answer: B

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86. Oxidation state of "V" in $Rb_4K[HV_{10}O_{28}]$ is .

A. $+5$

B. $+6$

C. $+\frac{7}{5}$

D. $+4$

Answer: A

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87. Following Sidgwick's rule of EAN, $Co(CO)_x$ will be.

A. $Co_2(CO)_4$

B. $Co_2(CO)_3$

C. $Co_2(CO)_8$

D. $Co_2(CO)_{10}$

Answer: C

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88. Coordination compounds have great importance in biological systems. In this context which of the following statements is incorrect:

A. Cyanocobalamin is B_{12} and contains cobalt

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

C. Chlorophylls are green pigments in plants and contain calcium

D. Carboxypeptidase - A is an exzyme and contains zinc.

Answer: C

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89. Carbonyls are organometallic compounds .

A. Ferrocene

B. Diethyl zinc

C. Tetraethyl lead (TEL)

D. All of these

Answer: D

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90. Which of the following carbonyls will have the strongest C-O bond

A. $\left[Mn(CO)_6\right]^+$

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

C. $\left[V(CO)_6\right]^-$

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

Answer: A

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91. Which of the following has longest $C-O$ bond length? (Free $C-O$ bond length in CO is 1.128Å).

A. $Ni(CO)_4$

B. $\left[Co(CO)_4\right]^-$

C. $\left[Fe(CO)_4\right]^{2-}$

D. $\left[Mn(CO)_6\right]^+$

Answer: C

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92. An example of a sigma bonded organometallic compound is:

A. Grignard's reagent

B. Ferrocene

C. Cobaltocene

D. Ruthenocene

Answer: A

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93. Facial-meridional isomers is associated with which one of the following complex ($M =$ central metal) .

A. $\left[M(AA)_2\right]$

B. $[MA_3B_3]$

C. $[MABCD]$

D. $\left[M(AA)_3\right]$

Answer: B

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94. The IUPAC name of the red coloured complex $\left[Fe(C_4H_7O_2N_2)_2\right]$ obtained from the reaction of Fe^{2+} and dimethyl glyoxime

A. bis (dimethyl oxime) ferrate (II)

B. bis (dimethyl oxime) iron (II)

C. bis (2, 3- butanediol dioximato) iron (II)

D. bis (2, 3- butanedione dioximato) iron (II)

Answer: D

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95. The complexes $[Co(NH_3)_6][Cr(CN)_6]$ and $[Cr(NH_3)_6][Co(CN)_6]$ are the examples of which type of isomerism ?

A. by measurement of their conductivity

B. by titration method

C. by precipitation method with $AgNO_3$

D. by electrolysis of their aqueous solutions

Answer: D

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96. $\left[Co(NH_3)_4(NO_2)_2\right]Cl$ exhibits

A. linkage isomerism, ionization isomerism and geometrical isomerism

B. ionization isomerism, geometrical isomerism and optical isomerism

C. linkage isomerism, geometrical isomerism and optical isomerism

D. linkage isomerism, ionization isomerism and optical isomerism

Answer: A

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97. The total number of possible coordination isomer for the given compounds $\left[Pt(NH_3)_4Br_2\right][PtBr_4]$ is .

A. 2

B. 4

C. 5

D. 3

Answer: B

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98. Incorrect matching for given complex compound/ion and its characteristics:

(a)	$[CrBrCl(en)_2]Br$	Ionization and optical isomerism
(b)	$[CoBr_3(H_2O)_3]$	Fac-mer and hydrate isomerism
(c)	$[PtCl_2(NH_3)_4]$ $[Co(SCN)_4]$	Linkage isomerism and paramagnetic character
(d)	$[Co(ox)_3]^{3-}$	Inner orbital complex and optical isomerism

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99. For complex ion/compound formation reactions

(I) $Co^{3+}(aq) + EDTA^{4-} \rightarrow P$

(II) $Ni^{2+}(aq) + \text{dmg (excess)} \xrightarrow{NH_4OH} Q$

(III) $Zn^{2+}(aq) + \text{gly (excess)} \rightarrow R$

(IV) Pt^{4+} aq + en (excess $\rightarrow$ S

Which of the following complex ion/compound does not exhibit optical activity ?

A. P

B. Q

C. R

D. S

Answer: B

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

A. $\left[CoCl(NH_3)_3(H_2O)\right]Cl_2$

B. $\left[Co(NH_3)_3(H_2O)Cl_3\right]$

C. $\left[Co(NH_2)_3(H_2O)_2Cl\right]$

D. $\left[Co(NH_3)_3(H_2O)\right]Cl_3$

Answer: A

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101. 50 ml of 0.2 M solution of a compound with empirical formula $CoCl_3.4NH_3$ on treatment with excess of $AgNO_3(aq)$ yields 1.435 g of AgCl. Ammonia is not removed by treatment with concentrated H_2SO_4. The formula of the compound is

A. $Co(NH_3)_4Cl_3$

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

C. $\left[Co(NH_3)_4\right]Cl_3$

D. $[CoCl_3(NH_3)](NH_3)_3$

Answer: B

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102. $\left[Cr(H_2O)_6\right]Cl_3$ (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. $3d_{xy}^1.\ 3d_{yz}^1,\ 3d_{zx}^1$

B. $3d_{xy}^1,\ 3d_{yz}^1,\ 3d_{z^2}^1$

C. $3d^1_{(x^2-y^2}, 3d^1_{z^2}, 3d^1_{zx})$

D. $3d^1_{xy}, 3d^1_{(x^2-y^2}, 3d^1_{xz})$

Answer: A

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103. Arrange the following in increasing value of magnetic moments.

(i) $\left[Fe(Cn)_6\right]^{4-}$ (ii) $\left[Fe(CN)_6\right]^{3-}$

(iii) $\left[Cr(NH_3)_6\right]^{3+}$ (iv) $\left[Ni(H_2O)_4\right]^{2+}$

A. I,III

B. I,II

C. III,IV

D. only IV

Answer: B

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

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

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

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

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

Answer: A

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105. Which of the following order of stability of complex ion is Incorrect ?

A. $\left[Fe(C_2O_4)_3\right]^{3-} < \left[Fe(H_2O)_6\right]^{3+}$

B. $\left[Fe(edta)\right]^{-} > \left[Fe(H_2O)_6\right]^{3+}$

C. $\left[Ni(en)_2\right]^{2+} > \left[Ni(DMG)_2\right]$

D. $\left[Fe(CN)_6\right]^{3-} > \left[Fe(CN)_6\right]^{4-}$

Answer: C

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106. 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. $3AgCl$, $1AgCl$, $2AgCl$

B. $3AgCl$, $2AgCl$, $1AgCl$

C. $2AgCl$, $3AgCl$, $1AgCl$

D. $1AgCl$, $3AgCl$, $2AgCl$

Answer: B

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107. Which of the following statement is correct for the complex $Ca_2\left[Fe(CN)_5O_2\right]$ having t_{2g}^6, e_g^0 electronic configuration ? .

A. d^2sp^3 hybridised and diamagnetic

B. sp^3d^2 hybridised and paramagnetic

C. sp^3d^2 hybridised and diamagnetic

D. d^2sp^3 hybridised and paramagnetic

Answer: D

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108. The magnetic moment of complex (A) of Co was found to be $4.89BM$ and the EAN as 36, complex (B) with magnetic moment $3.87BM$ and EAN as 37 and complex (C) with EAN as 36 but diamagnetic. Which of the following statements is true?

A. The oxidation states of Co in (A) , (B) and (C) are +3 , +2 and +3, respectively.

B. Complexes (A) and (B) have sp^3d^2 hybridisation state while (C) has dsp^3 hybridisation state.

C. The spin multiplicities of Co in (A), (B) and (C) are 3,2 and 1 , respectively.

D. The oxidation states of Co in (A) , (B) and (C) are +6, +8 and +1 respectively.

Answer: A

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109. In which of the following species the hybrid state of the central atom is same ?

A. $\left[Ni(PF_3)_4\right]$

B. $\left[Fe(dmg)_2\right]$

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

D. $\left[Ni(Pme_3)_4\right]^{2+}$

Answer: B

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110. Which of the following molecule do not have the same number of unpaired electron?

A. $\left[Co(CO)_4^-, INi(CN)_4\right]^{4-}$

B. $\left[Co(H_2O)_6\right]^{3+}, \left[NiF_6\right]^{2-}$

C. $\left[Ni(en)_3\right]^{2+}\Big], \left[Cr(CN)_6\right]^{4-}\Big]$

D. $\left[Co(CN)_6\right]^{4-}\left[Cr(NH_3)_6\right]^{3+}$

Answer: D

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

A. $\left[Sc(H_2O_3)(NH_3)\right]^{3+}$

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

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

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

Answer: C

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112. 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. $\left[Co(H_2O)_6\right]^{2+}$

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

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

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

Answer: A

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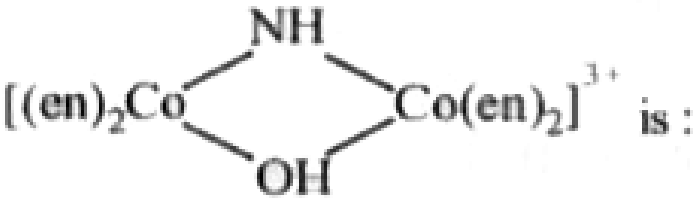
113. The oxidation number of Co in the complex ion



A. $+2$

B. $+3$

C. $+4$

D. $+6$

Answer: B

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114. Match the geometry (given in columnA) with the complexes (given in column B) in

	Column A	Column B
I.	Octahedral	P : $[Ni(CN)_4]^2$
II.	Square planar	Q : $[Ni(CO)_4]$
III.	Tetrahedral	R : $[Fe(CN)_6]^4$

	I	II	III
(a)	P	Q	R
(b)	R	Q	P
(c)	R	P	Q
(d)	Q	P	R

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115. $\left[Fe(en)_2(H_2O)_2\right]^{2+} + en \rightarrow \quad \text{complex(X)}.$

The correct statement about the complex (X) is

A. it is a low spin complex

B. it is diamagnetic

C. it shows geometrical isomerism

D. (a) and (b) both

Answer: D

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116. $\left[NiCl_2\left\{P(C_2H_5)_2(C_6H_5)\right\}_2\right]$ exhibits temperature dependent magnetic behaviour. The coordination geometries of Ni^{2+} in the paramagnetic and diamagnetic states are:

A. tetrahedral and tetrahedral

B. square planar and square planar

C. tetrahedral and square planar

D. square planar and tetrahedral

Answer: C

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117. Which of the following organometallic compound is a sigma and pi bonded? .

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

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

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

D. $\left[Fe(CH_3)_3\right]$

Answer: C

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

A. $(CH_3)_4Pb$

B. $\left[Cr\left(\eta^6 - C_6H_6\right)_2\right]$

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

D. $K\left[PtCl_3\left(\eta^2 - C_2H_4\right)\right]$

Answer: A

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119. The coordination number, EAN of the central metal atom and geometry of the complex ion obtained by adding $CuSO_4$ to excess of aqueous KCN are respectively.

A. $4, 35, sp^2d$

B. $6, 36, sp^3d^2$

C. $4, 36, sp^2d$

D. $4, 35, sp^3$

Answer: C

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120. The π - bounded organometallic compound which has ethylene as one of its component is

A. Zeise's salt

B. Ferrocene

C. Dibenzene chromium

D. Tetraethyl tin

Answer: A

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121. In isolated condition $C-C$ bond length of C_2H_4 is x, then the bond length of $C-C$ bond of C_2H_4 in Zeise's salt is .

A. Greater than x

B. Less than x

C. Equal to x

D. None of these

Answer: A

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122. The number of sigma and π-bonds in $Fe_2(CO)_9$ is .

A. 22σ and 15π

B. 22σ and 16π

C. 23σ and 15π

D. 15σ and 8π

Answer: A

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