CHEMISTRY

BOOKS - VK JAISWAL ENGLISH

CO-ORDINATION COMPOUNDS

LEVEL 1

1. The common features among the species CN^{-}, CO and NO^{+}

A. bond order three and dimagnetic

B. Bond order three and weak field ligands

C. Paramagnetic and strong field ligands

D. Paramagnetic and π-acceptor ligands

Answer: A

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2. Ni^{+2} ion can be estimated by using dimethyl glyoxime and forms a cherry-red precipitate. The complex is stablized by:

A. Ioinc bonds

B. Coordinate covalent bonds

C. Dative π-bonds

D. Hydrogenn bonds

Answer: D

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

A. In alkline solution $Cu(OH)_2$ is precipitated which is soluble in exces of alkali

B. Copper hydroxide is amphoteric substance

C. in acidic solution hydration protects Cu^{2+} ions.

D. In acidic solution protons are coordinated with ammonia molecules forming $NH_4 +^+$ ion.

Answer: D

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4. EAN of a metal carbonyl $M(CO)_x$ is 36. If atomic number of metal M is 26, what is the value of x?

A. 5

B. 4

C. 6

D. none of these

Answer: C

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5. Which of the following is ann oxidizing agent?

A. $Mn(CO)_5$

B. $Fe(CO)_5$

C. $Mn_2(CO)_{10}$

D. $Fe_2(CO)_9$

Answer: A

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6. The effective atomic number of $Co(CO)_4$ is 35 and hence is less stable. It attains stability by

A. Oxidation of Co

B. Reduction of Co

C. Dimerisation

D. Both (b) and (c)

Answer: D

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7. In which of the follwing pair the EAN of central metal atom is not same ?

A. $\left[Fe(CN)_6\right]^{3-}$ and $\left[Fe\left(NH_3\right)_6\right]^{3+}$

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

C. $\left[FeF_6\right]^{3-}$ and $\left[Fe\left(CN_6\right)\right]^{3-}$

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

Answer: D

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8. $\left[PdCl_2\left(PMe_3\right)_2\right]$ is a diamagnetic complex of Pd (II). How many unpaired electrons are presennt in analogous complex of Ni (II)?

A. Zero

B. 1

C. 2

D. 3

Answer: C

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9. Magnetic moment (spin only) of octahedron complex having CFSE=-$0.8\Delta_0$ and surrounded by weak field ligands can be:

A. $\sqrt{15}$ BM

B. $\sqrt{8}$BM

C. (a) and (b) both

D. none of these

Answer: C

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10. Consider the following complex $\left[Co\left(NH_3\right)_5CO_3\right]ClO_4$

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

A. 6,2,7,3

B. 7,2,7,1

C. 5,3,6,4

D. 6,3,6,0

Answer: D

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11. Consider the following complex $\left[Co\left(NH_3\right)_5CO_3\right]ClO_4$

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

A.

Coordination no.	Oxidation no.	No. of d-electrons	Unpaired d-electron
6	3	6	0

B.

Coordination no.	Oxidation no.	No. of d-electrons	Unpaired d-electron
7	2	7	1

C.

Coordination no.	Oxidation no.	No. of d-electrons	Unpaired d-electron
7	1	6	4

D.

Coordination no.	Oxidation no.	No. of d-electrons	Unpaired d-electron
6	2	7	3

Answer: A

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12. The magnetic moment of complex given below are in the order:

(I) $\left[Ni(CO)_4\right]$

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

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

(IV) $\left[CoF_6\right]^{3-}$

A. IgtIIgtIIIgtIV

B. $I < II < III < IV$

C. $IVtII > I > III$

D. $IV < II < I < III$

Answer: B

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13. Which is a low spin complex?

A. $\left[Fe\left(CN_6\right)\right]^{3-}$

B. $\left[Co\left(NO_2\right)_6\right]^{3-}$

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

D. all of these

Answer: D

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14. Which of the following are diamagnetic?

(I) $K_4\left[Fe(CN)_6\right]$

(II) $K_3\left[Cr(CN)_6\right]$

(III) $K_3\left[Co(CN)_6\right]$

(IV) $K_2\left[Ni(CN)_4\right]$

Select the correct answer using the codes given below:

A. I, II and IV

B. I,III and IV

C. II and III

D. I and IV

Answer: B

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15. The spin magnetic moment of cobalt in the compound $Hg\left[Co(SCN)_4\right]$ is

A. $\sqrt{3}$

B. $\sqrt{8}$

C. $\sqrt{15}$

D. $\sqrt{24}$

Answer: C

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16. The species having tetrahedral shape is

A. $\left[PdCl_4\right]^{2-}$

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

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

D. $\left[NiCl_4\right]^{2-}$

Answer: D

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

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

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

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

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

Answer: D

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18. Which of the following statements is correct?

A. $\left[CoF_6\right]^{3-}$ and $\left[Co\left(NH_3\right)_6\right]^{3+}$ both are paramagnetic complexes

B. $\left[CoF_6\right]^{3-}$ and $\left[Co\left(NH_3\right)_6\right]^{3+}$ both are high spin complexes

C. $\left[CoF_6\right)]^{3-}$ is octahedral while $\left[Co\left(NH_3\right)_6\right]^{3+}$ has a pentagonal pyramid shape

D. $\left[CoF_6\right]^{3-}$ is outer orbital complex while $\left[Co\left(NH_3\right)_6\right]^{3+}$ is inner orbital complex

Answer: D

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19. The magnetic moment of a complex ion is $2.83BM$ The complex ion is

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

(b) $\left[Cu(CN)_6\right]^{2-}$

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

(d) $\left[MnCI_4\right]^{2-}$.

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

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

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

D. $\left[MnCl_4\right]^{2-}$

Answer: A

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20. Which of the followimg complex compound(s) is/are paramagnetic and low spin? (I) $K_3\left[Fe\left(CN_6\right)\right]$

(II) $\left[Ni(CO)_4\right]^0$

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

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

A. I

B. II

C. III

D. IV

Answer: A and C

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21. The diamagnetic species is:

A. $\left[Co\left(H_2O\right)_6\right]^{4-}$

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

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

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

Answer: C

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22. The species which has four unpaired electron is:

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

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

C. $\left[FeCl_4\right]^{2-}$

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

Answer: C

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23. Which of the following is a low spin (spin-paired) complex?

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

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

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

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

Answer: D

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24. The structure of $K\left[PtCl_3\left(C_2H_5\right)\right]$ and hybridisation of Pt respectively are:

A. square planar, sp^2d^2

B. square planar, dsp^2

C. tetrahedral, sp^3

D. octahedral, d^2sp^3

Answer: B

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25. For which of the following types of ions is the number of unpaired electrons in octahedral complexes fixed at the same number as in the free ion no matter, how weak or strong the crystal field is?

A. d^3

B. d^4

C. d^5

D. d^6

Answer: A

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26. Among the following pairs of complexes, in which case the Δ_0 value is higher for the first one?

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

B. $\left[CoF_6\right]^{3-}$ and $\left[Co\left(NH_3\right)_6\right]^{3+}$

C. $\left[Co\left(H_2O\right)_6\right]^{2+}$ and $\left[Co\left(H_2O\right)_6\right]^{3+}$

D. $\left[Rh\left(H_2O\right)_6\right]^{3+}$ and $\left[Co\left(H_2O_6\right]^{3+}$

Answer: D

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27. Dimethyl glyoxime forms a square planar complex with Ni^{2+} . This complex should be :

A. diamagnetic

B. paramagnetic having 1 unpaired electron

C. Paramagnetic having 2 unpaired electrons

D. ferromagnetic

Answer: A

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28. What is the magnetic moment (spin only) and hybridisation of the brown ring complex $\left[Fe\left(H_2O\right)_5NO\right]SO_4$?

A. $\sqrt{3}BM, sp^3d^2$

B. $\sqrt{3}BM, d^2sp^3$

C. sqrt(15)BM,sp^(3)d^(2)`

D. $\sqrt{15}BM, d^2sp^3$

Answer: C

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29. Choose incorrect stability order:

A. $\left[Cu\left(NH_3\right)_4\right]^{2+} < \left[Cu(en)_2\right]^{2+} < [Cu(\text{trien})]^{2+}$

B. $\left[Fe\left(H_2O\right)_6\right]^{3+} < \left[Fe\left(NO_2\right)_6\right]^{3-} < \left[Fe\left(NH_3\right)_6\right]^{3+}$

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

D. $\left[Cr\left(NH_3\right)_6\right]^{1+} < \left[Cr\left(NH_3\right)_6\right]^{2+} < \left[Cr\left(NH_3\right)_6\right]^{3+}$

Answer: B

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30. Aqueous solution of Ni^{2+} contains $\left[Ni\left(H_2O\right)_6\right]^{2+}$ and its magnetic moment is 2.83 B.M. When ammonia is added in it, the predicted change in the magnetic moment of solution is:

A. It will remain same

B. it increases from 2.83 BM

C. it decreases from 2.83 BM

D. It cannot be predicated theoretically

Answer: A

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31. The correct order of energies of d-orbitals of metal ion in a square planar complex is

A. $d_{xy} = d_{yz} = d_{zx} > d_{x^2-y^2} = d_{z^2}$

B. $d_{x^2-y^2} = d_{z^2} > d_{xy} = d_{yz} = d_{zx}$

C. $d_{x^2-y^2} > d_{z^2} > d_{xy} = d_{yz} = d_{zx}$

D. $d_{x^2-y^2} > d_{xy} > d_{z^2} > d_{zx} = d_{yz}$

Answer: D

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32. Which of the following is true about the complex $\left[PtCl_2\left(H_2O\right)\left(NH_3\right)\right]$?

A. It exhibits geomettrical isomerism

B. It is paramagnetic complex

C. its geometry is tetrahedron

D. platinum is sp^3 hybridised

Answer: A

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33. The crystal field stabilisation energy of $\left[Co\left(NH_3\right)_6\right]Cl_3$ is:

A. $-7.2\Delta_0$

B. $-0.4\Delta)$

C. $-2.4\Delta_0$

D. $-3.6\Delta_0$

Answer: C

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34. The magnitude of crystal field stabilisation energy in octaheral field depends on:

(I) the nature of the ligand

(II) the charge on the metal ion.

(III) whether the metal is in the first, second or third row of the transition elements

A. I, II, III only correct

B. I, II only correct

C. II, III only correct

D. III only correct

Answer: A

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35. Complex compound $[Cr(NCS)\left(NH_3\right)_5]\left[ZnCl_4\right]$ will be,

A. colourless and diamagnetic

B. greenn coloured and diamagnetic

C. green coloured and shows coordination isomerism

D. diamagnetic and shows linkage isomerism

Answer: C

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36. The most stable ion is:

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

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

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

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

Answer: B

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37. In the complex $K_2Fe\left[Fe(CN)_6\right]$:

A. both Fe atoms are in the same oxidation state

B. Both Fe atoms are in different oxidation state

C. the coordination number of ion is 4

D. the complex is a high spin complex

Answer: A

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38. In $Na_2\left[Fe(CN)_5NO\right]$, sodium nitroprusside:

A. oxidation state of Fe is +2

B. this has NO^+ as ligand

C. both are correct

D. none is correct

Answer: C

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39. 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. $\left[Ti\left(H_2O\right)_6\right]Cl_2$

B. $\left[Ti\left(H_2O\right)_6\right]Cl_4$

C. $\left[TiCl_3\left(H_2O\right)_3\right]$

D. $\left[TiCl_2\left(H_2O\right)_4\right]$

Answer: B

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40. Which of the following pairs of complexes are isomeric with each their but their aqueous solutions exhibit different molar conductivities ?

A. $\left[PtCl_2\left(NH_3\right)_4\right]Br_2$ and $\left[PtBr_2\left(NH_3\right)_4\right]Cl_2$

B. $\left[CoCl_2\left(NH_3\right)_4\right]NO_2$ and $\left[CoCl\left(NO_2\right)\left(NH_3\right)_4\right]Cl$

C. $\left[Co\left(NO_2\right)\left(NH_3\right)_5\right]Cl_2$ and $\left[Co(ONO)\left(NH_3\right)_5\right]Cl_2$

D. $\left[CoBr\left(NH_3\right)_5\right]SO_4$ and $\left[Co(SO)_4\right)\left(NH_3\right)_5\right]Br$

Answer: D

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41. Few isomers are given below . Mark the correct statement regarding them .

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

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

(iii) $\left[Cr\left(H_2O\right)_4Cl_2\right]Cl \cdot 2H_2O$

A. linkage isomerism

B. geometrical isomerism

C. ionization isomerism

D. hydrate isomerism

Answer: D

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42. Which one of the following pairs of isomers ad ytpes of isomerism are correctly mathced?

(i) $[Co\left(NH_3\right)_5\left(NO_2\right)\Big]Cl_2$ and $\left[Co\left(NH_3\right)_5(ONO)\right]Cl_2 \ldots$ (Linkage)

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

(iii) $\left[PtCl_2\left(NH_3\right)_4\right]Br_2$ and $\left[PtBr_2\left(NH_3\right)_4\right]Cl_2$ . . (Ionization)

Select the correct answer using the codes given below:

A. (ii) and (iii)

B. (i), (ii) and (iii)

C. (i) and (iii)

D. (i) and (ii)

Answer: B

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

A. Linkage isomersm

B. Ionization isomerism

C. Coordination isomerism

D. No isomerism

Answer: D

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

(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, IV

C. II, III and IV

D. I, II, III and IV

Answer: B

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45. A six coordination complex of formula $CrCl_3 \cdot 6H_2O$ has green colour. A 0.1 M solution of the complex when treated with excess of $AgNO_3$ gas 28.7g of white precipitate. The formula of the complex would be:

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

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

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

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

Answer: B

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46. A complex has a composition corresponding to the formula $CoBr_2Cl.4NH_3$. What is the structural formula if conductance measurements show two ions per formula unit ? Silver nitrate solution given an immediate precipitate of AgCl but AgBr :-

A. $\left[CoBrCl\left(NH_3\right)_4\right]Br$

B. $\left[CoCl\left(NH_3\right)_4\right]Br_2$

C. $\left[CoBr_2Cl\left(NH_3\right)_4\right]$

D. $\left[CoBr_2\left(NH_3\right)_4\right]Cl$

Answer: D

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47. A mixture x containing 0.02 mol of $\left[Co\left(NH_3\right)_5SO_4\right]Br$ and 0.02 mol of $\left[Co\left(NH_3\right)_5Br\right]SO_4$ 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. 0.01, 0.02

B. 0.02, 0.01

C. 0.01, 0.01

D. 0.02, 0.02

Answer: C

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48. A complex of platinum, ammonia and chloride produces four ions per molecule in the solution. The structure consistent with the observation is:

A. $\left[Pt\left(NH_3\right)_5Cl\right]Cl_3$

B. $\left[Pt\left(NH_3\right)_6\right]Cl_4$

C. $\left[Pt\left(NH_3\right)_2Cl_4\right]$

D. $\left[Pt\left(NH_3\right)_4Cl_2\right]Cl_2$

Answer: A

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49. The coordination number of a centrla metal atom in a complex is determined by :

A. The number of only anionic ligands bonded to the metal ion

B. the number of monodentate lingands around a metal ion bonded by pi-bonds

C. the number of monodentate lingands around a metal ion bonded by σ and pi-bonds both

D. the number of monodentate ligands around a metal ion bonded by σ-bonds

Answer: D

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50. 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 ligannds 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 rare gases

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

Answer: D

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51. In the Iso-electronic series of metal carbonyls, the C-O bond strength is expected to increase in the order:-

A. $\left[Mn(CO)_6\right]^+ < \left[Cr(CN)_6\right] < \left[V(CO)_6\right]^-$

B. $\left[V(CO)_6\right]^- < \left[Cr(CO)_6\right] < \left[Mn(CO)_6\right]^+$

C. $\left[V(CO)_6\right]^- < \left[Mn(CO)_6\right]^+ < \left[Cr(CO)_6\right]$

D. $\left[Cr(CO)_6\right] < \left[Mn(CO)_6\right]^+ < \left[V(CO)_6\right]^-$

Answer: D

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52. Which is not true about metal carbonyls?

A. Here CO acts as a Lewis base as well Lewis acid

B. here metal acts as lewis base as well as lewis acid

C. here $d\pi$ - $p\pi$ back bonding takes place

D. Here $p\pi$ - $p\pi$ ack bonding takes place

Answer: D

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53. There are four complexes of Ni. Select the complex(es) which will be attracted by magnetic field:

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

(II) $\left[NiCl_4\right]^{2-}$

(III) $Ni\left(CO_4\right)$

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

A. I only

B. IV only

C. II, III and IV

D. II and IV

Answer: D

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

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

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

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

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

Answer: A

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

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

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

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

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

Answer: A

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56. The magnetic moment of $\left[MnX_4\right]^{2-}$ is 5.9 BM. The geometry of the complex ion is: (X=monodentate halide ion)

A. tetrahedral

B. square planar

C. both are possible

D. none of these

Answer: A

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57. The geometry of $Ni(CO)_4$ and $Ni\left(PPh_3\right)Cl_2$ are

A. both square planar

B. tetrahedral and square planar respectively

C. both are tetrahedral

D. square planar and tetrahedral respectively

Answer: C

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58. $\left[Fe\left(H_2O\right)_6\right]^{2+}$ and $\left[Fe(CN)_6\right]^{4-}$ differ in :

A. geometry, magnetic moment

B. geometry, hybridization

C. magnetic moment, colour

D. hybridization number of d-electrons

Answer: C

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59. Which of the following order is correct in spectrochemical series of ligands?

A. $Cl^{-} < F^{-} < C_2O_4^{2-} < NO_2^{-} < CN^{-}$

B. $NO_2^{-} < C_2O_4^{2-} < Cl^{-} < F^{-} < CN^{-}$

C. $C_2O_4^{2-} < F^{-} < Cl^{-} < NO_2^{-} < CN^{-}$

D. $F^{-} < Cl^{-} < NO_2^{-} < CN^{-} < C_2O_4^{2-}$

Answer: A

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60. The species with spin only magnetic moment of sqrt(24)` BM is:

A. $\left[CoF_3\left(H_2O\right)_3\right]$

B. $\left[CoCl_4\right]^{2-}$

C. $\left[NiCl_4\right]^{2-}$

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

Answer: A

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61. For the complexes showing the square pyramidal structure, the d-orbital involved in the hybridisation is:

A. $d_{x^2-y^2}$

B. d_{x^2}

C. d_{xy}

D. d_{xz}

Answer: A

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62. Which of the following aquated metal ions has the highest paramagnetism?

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

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

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

D. $\left[Zn\left(H_2O\right)_2\right]^{2+}$

Answer: B

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63. The hybridization states of the central atom in the complexes $\left[Fe(CN)_6\right]^{3-}$, $\left[Fe(CN)_6\right]^{4-}$ and $\left[Co\left(NO_2\right)_6\right]^{3-}$ are:

A. d^2sp^3, sp^3d^2 and dsp^2 respectively

B. d^2sp^3, sp^3d^2 and sp^3d^2 respectively

C. d^2sp^3, sp^3d^2 and d^2sp^3 respectively

D. all d^2sp^3

Answer: D

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64. Which of the following is incorrectly matched?

Complex Number of unpaired electrons

A. $\left\{FeF_6\right]^{3-}$ 5

Complex Number of unpaired electrons

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

Complex Number of unpaired electrons

C. $\left[Co\left(NH_3\right)_6\right]^{3+}$ 4

Complex Number of unpaired electrons

D. $\left\{Mn\left(H_2O\right)_6\right]^{2+}$ 5

Answer: C

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65. Which of the follownig complexes have a maximum number of unpaired electrons?

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

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

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

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

Answer: D

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66. 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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67. The complex ion $\left[Fe(CN)_6\right]^{4-}$ contains:

A. total of 36 electrons on Fe^{2+} cation

B. sp^3d^2 hybrid orbitals with octahedral structure

C. total of 104 electrons

D. six sigma bonds

Answer: A

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68. In $\left[Pt\left(NH_3\right)_2Cl_2\right]$, pt-Cl bond length is 2 Å and Cl-Cl distance is 2.88 Å then the compound is:

A. tetrahedral

B. square pyramidal

C. cis-square planar

D. trans-square planar

Answer: C

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69. Which of the following isomerism, exhibited by $\left[CrCl_2(OH)_2\left(NH_3\right)_2\right]^-$?

A. Ionization

B. Linkage

C. Geometrical

D. Hydrate

Answer: C

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70. Which kind of isomerism is exhibited by octahedral $\left[Co\left(NH_3\right)_4Br_2\right]CI$? .

A. Geometrical and ionization

B. Geometrical and optical

C. Optical and ionization

D. Geometrical only

Answer: A

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71. A metal complex of coordination number six having three different types of ligands a, b and c of composition $Ma_2b_2c_2$ can exist in several geometrical isomeric forms, the total number of such isomers is:

A. 3

B. 5

C. 7

D. 9

Answer: B

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72. How many geometrical isomers and stereoisomers are possible for $\left[Pt\left(NO_2\right)\left(NH_3\right)\left(NH_2OH\right)(Py)\right]^+$ and $\left[Pt(Br)(Cl)(I)\left(NO_2\right)\left(NH_3\right)(Py)\right]$ respectively?

A. 3 and 15

B. 3 and 30

C. 4 and 15

D. 4 and 30

Answer: B

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73. Complexes given below show:

A. optical isomerism

B. coordinate isomerism

C. Geometrical isomerism

D. Bridge isomerism

Answer: C

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74. Fac, mer isomerism is associated with which of the following general formula ?

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

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

C. $[MABCD]$

D. $\left[MA_3B_3\right]$

Answer: D

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75. Which of the following will have two stereoisomeric forms?

(I) $\left[Cr\left(NO_3\right)_3\left(NH_3\right)_3\right]$

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

(III) $\left[CoCl_2(en)_2\right]^+$

(IV) $\left[CoBrCl(ox)_2\right]^{3-}$

A. I only

B. I and II

C. III and IV

D. All of these

Answer: B

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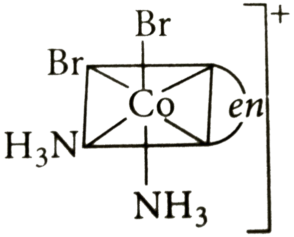
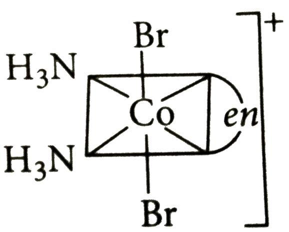
76. Three arrangement are shown for the complex , $\left[Co(en)\left(NH_3\right)_2Br_2\right]^+$. Which one is the wrong statement ?

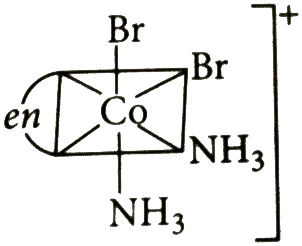
(I)



(II)



(III)



A. I and II are geometrical isomers

B. II and III are optically active isomers

C. I and III are optically active isomers

D. II and III are geometrical isomers

Answer: B

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77. Which of the following is not optically active?

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

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

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

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

Answer: D

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78. Where among the following metal complexes the one which exhiibits optical activity is: (AA=bidentate ligand, A, X=monodentate ligand)

A. cis-$\left[MA_4X_2\right]$

B. trans-$\left[MA_4X_2\right]$

C. cis-$\left[M(AA)_2X_2\right]$

D. trans-$\left[M(AA)_2X_2\right]$

Answer: C

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79. The optically active species among the following is:

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

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

C. $\left[Co(gly)_3\right]$

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

Answer: C

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80. Cis-trans isomerism is exhibited by:

A. $\left[PtCl\left(NH_3\right)_3\right]^{+}$

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

C. $\left[PtCl_4\right]^{2-}$

D. $\left[PtCl_2\left(NH_3\right)_2\right]$

Answer: D

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81. Which of the following will show optical isomers?

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

(II) trans-$\left[IrCl_2\left(C_2O_4\right)_2\right]^{3-}$

(III) $\left[Rh(en)_3\right]^{3+}$

(IV) cis-$\left[IR\left(H_2O\right)_3Cl_3\right]$

A. I, III only correct

B. II, IV only correct

C. I, III, IV only correct

D. III only correct

Answer: A

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82. The complex with a maximum number of stereoisomers is:

A. $\left[PtCl_3\left(C_2H_4\right)\right]^-$

B. $\left[CuBr_2Cl_2\right]^{2-}$

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

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

Answer: D

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83. A complex with the composition $\left[MA_3B\right]^{n\pm}$ is found to have no geometrical isomers. The possible structure (s) of the complex is (where A and B are monodentate ligands)

A. tetrahedral

B. Square planar

C. Both (a) and (b)

D. cannot be predicted

Answer: C

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84. Which of the following isomerism is not possible for complexes having molecular formulae?

(I) $Pt(SCN)_2 \cdot 3PEt_3$,

(II) $CoBr \cdot SO_4 \cdot 5NH_3$

(III) $FeCl_2 \cdot 6H_2O$

A. Optical

B. Linkage

C. Ionisation

D. Hydrate

Answer: A

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

A. Carboxypeptidase-A is an ennzyme and contains zinc

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

C. Cyanocobalamin is B^{12} and contains cobalt

D. Chlorophylls are green pigments in plants and contains calcium

Answer: D

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86. Which one of the following platinum complexes is used in cancer chemotherapy?

A. cis$[PtCl_2(NH_3)_2]$

B. trans-$[PtCl_2(NH_3)]$

C. $\left\{t\left(NH_3\right)_4\right]^{2+}$

D. $\left[Pt\left(Cl_4\right)\right]^{2-}$

Answer: A

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87. The cyanide complex of silver formed in the silver extraction in Mac-Arthur's Forrest cyanide process is:

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

B. $K_2\left[Ag(CN)_3\right]$

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

D. $Na_2\left[Ag(CN)_4\right]$

Answer: A

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88. Complexes formed in the following methods are:

(I) Mond's process for purification of nickel

(II) Removal of ureacted AgBr from photographic plate

(III) Removal of lead poisoning from the body

A.
$I \quad II \quad III$
$Ni(CO)_4 \quad \left[Ag(CN)_2\right]^- \quad [Pb(EDTA)]^{2-}$

B.
$I \quad II \quad III$
$Ni(CO)_4 \quad \left[Ag\left(S_2O_3\right)_2\right]^{3-} \quad [Pb(EDTA)]^{2-}$

C. $(I, II, III), \left(Ni(CO)_6, Ag\left(S_2O_3\right)_2\right]^{3-}, \left([Pb(EDTA)]^{4-}\right)$

D.
$I \quad II \quad III$
$Ni(CO)_6 \quad \left[Ag\left(S_2O_3\right)\right]^- \quad [Pb(EDTA)]^{2-}$

Answer: B

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89. What is the oxidation number of Fe in $\left[Fe\left(H_2O\right)_5(NO)\right]^{2+}$ ion?

A. $+2$

B. $+3$

C. $+1$

D. 0

Answer: C

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90. What will be oxidation state iron in given complex (Product)?

$$Na_2\left[Fe(CN)_5NO\right] + Na_2S \rightarrow Na_4\left[Fe(CN)_5NOS\right]$$

A. $+1$

B. $+2$

C. $+3$

D. zero

Answer: B

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91. According to IUPAC system, the name of the complex, $\left[Co(en)_2Cl(ONO)\right]^+$ is :

A. chlorobis(ethylenediamine)nitrito-O-cobaltate (III) ion

B. chlorodiethyldiaminenitrito-O-cobalt (III) ion

C. chloronitrito-O-diethyldiamine cobaltate (III) ion

D. chlorobis(ethylenediamine) nitrito-O-cobalt (III) ion

Answer: D

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92. IUPAC name of $\left[Fe\left(O_2\right)(CN)_4Cl\right]^{4-}$ is:

A. Chlorotetracyano dioxoferrate (II) ion

B. Chlorotetracyano peroxoferrate (II) ion

C. Chlorotetracyano superoxoferrate (II)ion

D. Tetracyanochloro superoxoferrate (II)ion

Answer: C

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93. The IUPAC name of Wilkinsons catalyst $\left[RhCl\left(PPh_3\right)_3\right]$ is

A. Chlorotris (triphenylphosphine) rhodium (I)

B. Chlorotris (triphenylphophine) rhodium (IV)

C. Chlorotris (triphenylphosphine) rhodium (0)

D. Chlorotris (triphenylphosphine) rhodium (VI)

Answer: A

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94. The correct formula of diammine dichlorodicyano chromate (III) is :-

A. $\left[CrCl_2(CN)_2\left(NH_3\right)_2\right]^{3+}$

B. $\left[CrCl_2(CN)_2\left(NH_3\right)_2\right]^{3-}$

C. $\left[CrCl_2(CN)_2\left(NH_3\right)_2\right]$

D. $\left[CrCl_2(CN)_2\left(NH_3\right)_2\right]^{-}$

Answer: D

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95. The IUPAC name for $K_2\left[Cr(CN)_2O_2\left(O_2\right)NH_3\right]$ is:

A. Potassium amminedicyanotetraoxo chromium (III)

B. Potassium amminedicyanodioxygendioxo chromate (IV)

C. Potassium amminedicyanosuperoxoperoxo chromate (III)

D. Potassium amminedicyanodioxoperoxo chromate (VI)

Answer: D

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96. IUPAC name of $H_2\left[PtCl_6\right]$ is

A. Hydrogen hexachloroplatinate (IV)

B. dihydrogen hexachloroplatinate (IV)

C. hydrogen hexachloroplatinic (IV) acid

D. hexachloroplatinic (IV) acid

Answer: D

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97. The IUPAC name for $\left[PtCl\left(NH_2CH_3\right)\left(NH_3\right)_2\right]Cl$ is:

A. diamminechloro(methylamine)platinum(II)chloride

B. (dimethylamine)chlorodiamminoplatinum(II)chloride

C. bis(ammine)chloro(methylamine)platinate(II)chloride

D. diaminechloro(methylamine)platinum(II)chloride

Answer: A

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98. The IUPAC nomenclature for the complex $Na\left[PtBrCl\left(NO_2\right)\left(NH_3\right)\right]$ is:

A. Sodium amminechlorobromonitro-N-platinum (II)

B. Sodium nitrochlorobromoammine-N-platinate(II)

C. Sodium amminebromochloronitro-N-Platinate(II)

D. Sodium amminebromochloronitro-N-platinum(II)

Answer: C

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99. The IUPAC name of $Xe\left[PtF_6\right]$ is:

A. Hexafluoroplatinate(VI) xenon

B. Xenonhexafluoroplatinate(IV)

C. Xenonhexafluoroplatinate(VI)

D. Xenoniumhexafluoroplatinum(V)

Answer: B

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100. The magnetic moment of $\left[NiX_4\right]^{2-}$ ion is found to be zero. Then the ion is : `(X=monodentate anionic ligand)

A. sp^3 hybridised

B. spd^2 hybridised

C. dsp^2 hybridised

D. d^2sp hybridised

Answer: C

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101. The hybridised orbitals used by silver in the complex $\left[Ag\left(NH_3\right)_2\right]^+$ are of the type:

A. sp^2

B. sp

C. sp^3

D. dsp^2

Answer: B

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102. The common features among the species CN^-, CO and NO^+ are

A. bond order three and dimagnetic

B. Bond order three and weak field ligands

C. Paramagnetic and strong field ligands

D. Paramagnetic and π-acceptor ligands

Answer: A

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103. Ni^{+2} ion can be estimated by using dimethyl glyoxime and forms a cherry-red precipitate. The complex is stablized by:

A. Ioinc bonds

B. Coordinate covalent bonds

C. Dative π-bonds

D. Hydrogenn bonds

Answer: D

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104. Ammonia forms the complex $\left[Cu\left(NH_3\right)_4\right]^{2+}$ will copper ions in alkaline solution but not in acidic solution. The reason for this is

A. In alkline solution $Cu(OH)_2$ is precipitated which is soluble in exces of alkali

B. Copper hydroxide is amphoteric substance

C. in acidic solution hydration protects Cu^{2+} ions.

D. In acidic solution protons are coordinated with ammonia molecules forming $NH_4 +^{+}$ ion.

Answer: D

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105. If EAN of central metal cation M^{2+} in an non-chelating complex is 36 and atomic no. of metal M is 26, then the number of monodentate ligand in this complex are

A. 5

B. 4

C. 6

D. none of these

Answer: C

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106. Which of the following is ann oxidizing agent?

A. $Mn(CO)_5$

B. $Fe(CO)_5$

C. $Mn_2(CO)_{10}$

D. $Fe_2(CO)_9$

Answer: A

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107. An effective atomic number of $Co(CO)_4$ is 35 annd hence is less stable. It attains stability by:

A. Oxidation of Co

B. Reduction of Co

C. Dimerisation

D. Both (b) and (c)

Answer: D

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108. Which of the following pair of EAN of central metal atom is not same?

A. $\left[Fe(CN)_6\right]^{3-}$ and $\left[Fe\left(NH_3\right)_6\right]^{3+}$

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

C. $\left[FeF_6\right]^{3-}$ and $\left[Fe\left(CN_6\right)\right]^{3-}$

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

Answer: D

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109. $[PdCl_2\left(PMe_3\right)_2\big]$ is a diamagnetic complex of Pd (II). How many unpaired electrons are presennt in analogous complex of Ni (II)?

A. Zero

B. 1

C. 2

D. 3

Answer: C

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110. Magnetic moment (spin only) of octahedron complex having SFSE=-$0.8\Delta_0$ and surrounded by weak field ligands can be:

A. $\sqrt{15}$ BM

B. $\sqrt{8}$BM

C. (a) and (b) both

D. none of these

Answer: C

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111. Consider the following: $\left[Co\left(CO_3\right)\left(NH_3\right)_5\right]ClO_4$

mark the correct option:

A. 6,2,7,3

B. 7,2,7,1

C. 5,3,6,4

D. 6,3,6,0

Answer: D

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112. Consider the following: $\left[Co\left(CO_3\right)\left(NH_3\right)_5\right]ClO_4$

mark the correct option:

A.

Coordination no.	Oxidation no.	No. of d-electrons	Unpaired d-electron
6	3	6	0

B.

Coordination no.	Oxidation no.	No. of d-electrons	Unpaired d-electron
7	2	7	1

C.

Coordination no.	Oxidation no.	No. of d-electrons	Unpaired d-electron
7	1	6	4

D.

Coordination no.	Oxidation no.	No. of d-electrons	Unpaired d-electron
6	2	7	3

Answer: A

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113. The magnetic moment of complex given below are in the order:

(I) $\left[Ni(CO)_4\right]$

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

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

(IV) $\left[CoF_6\right]^{3-}$

A. IgtIIgtIIIgtIV

B. $I < II < III < IV$

C. $IVtII > I > III$

D. $IV < II < I < III$

Answer: B

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114. Which is low spin complex?

A. $\left[Fe\left(CN_6\right)\right]^{3-}$

B. $\left[Co\left(NO_2\right)_6\right]^{3-}$

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

D. all of these

Answer: D

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115. Which of the following are diamagnetic?

(I) $K_4\left[Fe(CN)_6\right]$

(II) $K_3\left[Cr(CN)_6\right]$

(III) $K_3\left[Co(CN)_6\right]$

(IV) $K_2\left[Ni(CN)_4\right]$

Select the correct answer using the codes given below:

A. I, II and IV

B. I,III and IV

C. II and III

D. I and IV

Answer: B

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116. The spin magnetic moment of cobalt in $Hg\left[Co(SCN)_5\right]$ is

A. $\sqrt{3}$

B. $\sqrt{8}$

C. $\sqrt{15}$

D. $\sqrt{24}$

Answer: C

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117. The species having tetrahedral shape is:

A. $\left[PdCl_4\right]^{2-}$

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

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

D. $\left[NiCl_4\right]^{2-}$

Answer: D

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118. Which one of the following has lowest value of magnetic behaviour?

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

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

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

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

Answer: D

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119. Which of the following statements is correct?

A. $\left[CoF_6\right]^{3-} a \cap d \left[Co\left(NH_3\right)_6\right]^{3+}$ both are paramagnetic complexes

B. $\left[CoF_6\right]^{3-}$ and $\left[Co\left(NH_3\right)_6\right]^{3+}$ both are high spin complexes

C. $\left[CoF_6\right)]^{3-}$ is octahedral while $\left[Co\left(NH_3\right)_6\right]^{3+}$ has a pentagonal pyramid shape

D. $\left[CoF_6\right]^{3-}$ is outer orbital complex while $\left[Co\left(NH_3\right)_6\right]^{3+}$ is inner orbital complex

Answer: D

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120. Consider that a d^6 metal ion $\left(M^{2+}\right)$ forms a complex with aqua ligands , and the spin only magnetic moment of the complex is 4.90 BM . The geometry and the crystal field stabilization energy of the complex is :

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121. Which of the followimg complex compound(s) is/are paramagnetic and low spin? (I) $K_3\left[Fe\left(CN_6\right)\right]$

(II) $\left[Ni(CO)_4\right]^0$

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

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

A. I only

B. II and III

C. I and IV

D. IV only

Answer: C

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122. The diamagnetic species is:

A. $\left[Co\left(H_2O\right)_6\right]^{4-}$

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

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

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

Answer: C

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123. The species which has four unpaired electron is:

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

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

C. $\left[FeCl_4\right]^{2-}$

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

Answer: C

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124. Which of the following is a low spin (spin-paired) complex?

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

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

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

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

Answer: D

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125. The structure of $K\left[PtCl_3\left(C_2H_4\right)\right]$ and hybridisation of Pt respectively are:

A. square planar, sp^2d^2

B. square planar, dsp^2

C. tetrahedral, sp^3

D. octahedral, d^2sp^3

Answer: B

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126. For which of the following types of ions is the number of unpaired electrons in octahedral complexes fixed at the same number as in the free ion no matter, how weak or strong the crystal field is?

A. d^3

B. d^4

C. d^5

D. d^6

Answer: A

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127. Among the following pairs of complexes, in which case the Δ_0 value is higher for the first one?

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

B. $\left[CoF_6\right]^{3-}$ and $\left[Co\left(NH_3\right)_6\right]^{3+}$

C. $\left[Co\left(H_2O\right)_6\right]^{2+}$ and $\left[Co\left(H_2O\right)_6\right]^{3+}$

D. $\left[Rh\left(H_2O\right)_6\right]^{3+}$ and $\left[Co\left(H_2O_6\right]^{3+}$

Answer: D

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128. Dimethyl glyoxime forms a square planar compelx with Ni^{2+}. This complex should be:

A. diamagnetic

B. paramagnetic having 1 unpaired electron

C. Paramagnetic having 2 unpaired electrons

D. ferromagnetic

Answer: A

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129. What is the magnetic moment (spin only) and hybridisation of the brown ring complex $[Fe(H_2O_5NO]SO_4$?

A. $\sqrt{3}BM, sp^3d^2$

B. $\sqrt{3}BM, d^2sp^3$

C. sqrt(15)BM,sp^(3)d^(2)`

D. $\sqrt{15}BM, d^2sp^3$

Answer: C

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130. Choose incorrect stability order:

A. $\left[Cu\left(NH_3\right)_4\right]^{2+} < \left[Cu(en)_2\right]^{2+} < [Cu(\text{trien})]^{2+}$

B. $\left[Fe\left(H_2O\right)_6\right]^{3+} < \left[Fe\left(NO_2\right)_6\right]^{3-} < \left[Fe\left(NH_3\right)_6\right]^{3+}$

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

D. $\left[Cr\left(NH_3\right)_6\right]^{1+} < \left[Cr\left(NH_3\right)_6\right]^{2+} < \left[Cr\left(NH_3\right)_6\right]^{3+}$

Answer: B

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131. Aqueous solution of Ni^{2+} contains $\left[Ni\left(H_2O\right)_6\right]^{2+}$ and its magnetic moment is 2.83 BM. When ammonia is added in it, comment on the magnetic moment of solution:

A. It will remain same

B. it increases from 2.83 BM

C. it decreases from 2.83 BM

D. It cannot be predicated theoretically

Answer: A

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132. The correct order of energies of d-orbitals of metal ion in a square planar complex is

A. $d_9xy\Big) = d_{yz} = d_{zx} > d_{x^2-y^2} = d_{x^2}$

B. $d_{x^2-y^2} = d_{x^2} > d_{xy} = d_{yz} = d_{zx}$

C. $d_{x^2-y^2} > d_{x^2} > d_{xy} = d_{yz} = d_{zx}$

D. $d_{x^2-y^2} > d_{xy} > d_{x^2} > d_{zx} = d_{yz}$

Answer: D

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133. Which of the following is true about the complex $\left[PtCl_2\left(H_2O\right)\left(NH_3\right)\right]$?

A. It exhibits geomettrical isomerism

B. It is paramagnetic complex

C. its geometry is tetrahedron

D. platinum is sp^3 hybridised

Answer: A

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134. The crystal field stabilisation energy of $\left[Co\left(NH_3\right)_6\right]Cl_3$ is:

A. $-7.2\Delta_0$

B. $-0.4\Delta)$

C. $-2.4\Delta_0$

D. $-3.6\Delta_0$

Answer: C

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135. The magnitude of crystal field stabilisation energy in octaheral field depends on:

(I) the nature of the ligand

(II) the charge on the metal ion.

(III) whether the metal is in the first, second or third row of the transition elements

A. I, II, III only correct

B. I, II only correct

C. II, III only correct

D. III only correct

Answer: A

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136. Complex compound $[Cr(NCS)\left(NH_3\right)_5\Big][\left[ZnCl_4\right]$ will be,

A. colourless and diamagnetic

B. greenn coloured and diamagnetic

C. green coloured and shows coordination isomerism

D. diamagnetic and shows linkage isomerism

Answer: C

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137. The most stable ion is:

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

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

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

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

Answer: B

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138. In the complex $K_2Fe\left[Fe(CN)_6\right]$:

A. both Fe atoms are in the same oxidation state

B. Both Fe atoms are in different oxidation state

C. the coordination number of ion is 4

D. the complex is a high spin complex

Answer: A

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139. In $Na_2\left[Fe(CN)_5NO\right]$, sodium nitroprusside:

A. oxidation state of Fe is +2

B. this has NO^+ as ligand

C. both are correct

D. none is correct

Answer: C

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140. An aqueous solution of titanium chloride, when subjected to magnetic measurement, meaured zero magnetic moment. Assuming the octahedral complex in aqueous solution, the formulae of the complex is:

A. $\left[Ti\left(H_2O\right)_6\right]Cl_2$

B. $\left[Ti\left(H_2O\right)_6\right]Cl_4$

C. $\left[TiCl_3\left(H_2O\right)_3\right]$

D. $\left[TiCl_2\left(H_2O\right)_4\right]$

Answer: B

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141. Which of the following pairs of complexes are isomerric with each other but their aqueous solution exhibit different molar conductivities?

A. $\left[PtCl_2\left(NH_3\right)_4\right]Br_2$ and $\left[PtBr_2\left(NH_3\right)_4\right]Cl_2$

B. $\left[CoCl_2\left(NH_3\right)_4\right]NO_2$ and $\left[CoCl\left(NO_2\right)\left(NH_3\right)_4\right]Cl$

C. $\left[Co\left(NO_2\right)\left(NH_3\right)_5\right]Cl_2$ and $\left[Co(ONO)\left(NH_3\right)_5\right]Cl_2$

D. $\left[CoBr\left(NH_3\right)_5\right]SO_4$ and $[Co(SO)_4)(NH_3)_5]Br$

Answer: D

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142. Few isomers are given below . Mark the correct statement regarding them .

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

(ii) $\left[Cr\left(H_2O\right)_5Cl\right][Cl_2\cdot H_2O$

(iii) $\left[Cr\left(H_2O\right)_4Cl_2\right]Cl\cdot 2H_2O$

A. linkage isomerism

B. geometrical isomerism

C. ionization isomerism

D. hydrate isomerism

Answer: D

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143. Which one of the following pairs of isomers ad ytpes of isomerism are correctly mathced?

(i) $[Co(NH_3)_5(NO_2)]Cl_2$ and $[Co(NH_3)_5(ONO)]Cl_2 \ldots$ (Linkage)

(ii) $[Cu(NH_3)_4][PtCl_4]$ and $[Pt(NH_3)_4][CuCl_4] \ldots$ (coordination)

(iii) $[PtCl_2(NH_3)_4]Br_2$ and $[PtBr_2(NH_3)_4]Cl_2 \ldots$ (Ionization)

Select the correct answer using the codes given below:

A. (ii) and (iii)

B. (i), (ii) and (iii)

C. (i) and (iii)

D. (i) and (ii)

Answer: B

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144. the two compounds pentaamminesulphatocobalt (III) bromide and pentaamminesulphatocobalt (III) chloride represent:

A. Linkage isomersm

B. Ionization isomerism

C. Coordination isomerism

D. No isomerism

Answer: D

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

(I) IUPAC anem of compound 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, IV

C. II, III and IV

D. I, II, III and IV

Answer: B

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146. A six coordinate complex of formula $CrCl_3.6H_2O$ has green colour . A 0.1 M solution of the complex when treated with excess of $AgNO_3$ gave 28.7 g of white precipitate . The formula of the complex would be

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

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

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

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

Answer: B

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147. A complex has a composition corresponding to the formula $CoBr_2Cl.4NH_3$. What is the structural formula if conductance measurements show two ions per formula unit? Silver nitrate solution given an immediate precipitate of AgCl but no AgBr.

A. $\left[CoBrCl\left(NH_3\right)_4\right]Br$

B. $\left[CoCl\left(NH_3\right)_4\right]Br_2$

C. $\left[CoBr_2Cl\left(NH_3\right)_4\right]$

D. $\left[CoBr_2\left(NH_3\right)_4\right]Cl$

Answer: D

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148. A mixture x containing 0.02 mol of $\left[Co\left(NH_3\right)_5SO_4\right]Br$ and 0.02 mol of $\left[Co\left(NH_3\right)_5Br\right]SO_4$ 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. 0.01, 0.02

B. 0.02, 0.01

C. 0.01, 0.01

D. 0.02, 0.02

Answer: C

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149. A Pt complex of ammonia and chlorine produces four ions per molecule in the solution is

A. $\left[Pt\left(NH_3\right)_5Cl\right]Cl_3$

B. $\left[Pt\left(NH_3\right)_6\right]Cl_4$

C. $\left[Pt\left(NH_3\right)_2Cl_4\right]$

D. $\left[Pt\left(NH_3\right)_4Cl_2\right]Cl_2$

Answer: A

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

A. The number of only anionic ligands bonded to the metal ion

B. the number of monodentate lingands around a metal ion bonded by pi-bonds

C. the number of monodentate lingands around a metal ion bonded by σ and pi-bonds both

D. the number of monodentate ligands around a metal ion bonded by σ-bonds

Answer: D

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151. 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 ligannds 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 rare gases

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

Answer: D

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152. In the isoelectronic series of metal carbonyl, the CO bond strength is expected to increase in the order:

A. $\left[Mn(CO)_6\right]^+ < \left[Cr(CN)_6\right] < \left[V(CO)_6\right]^-$

B. $\left[V(CO)_6\right]^- < \left[Cr(CO)_6\right] < \left[Mn(CO)_6\right]^+$

C. $\left[V(CO)_6\right]^- < \left[Mn(CO)_6\right]^+ < \left[Cr(CO)_6\right]$

D. $\left[Cr(CO)_6\right] < \left[Mn(CO)_6\right]^+ < \left[V(CO)_6\right]^-$

Answer: D

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153. Which is not true about metal carbonyls?

A. Here CO acts as a Lewis base as well Lewis acid

B. here metal acts as lewis base as well as lewis acid

C. here $d\pi$ - $p\pi$ back bonding takes place

D. Here $p\pi$ - $p\pi$ ack bonding takes place

Answer: B

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154. There are four complexes of Ni. Select the complex(es) which will be attracted by magnetic field:

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

(II) $\left[NiCl_4\right]^{2-}$

(III) $Ni\left(CO_4\right)$

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

A. I only

B. IV only

C. II, III and IV

D. II and IV

Answer: D

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

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

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

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

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

Answer: A

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

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

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

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

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

Answer: A

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157. The magnetic moment of $\left[MnX_4\right]^{2-}$ is 5.9 BM. The geometry of the complex ion is: (X=monodentate halide ion)

A. tetrahedral

B. square planar

C. both are possible

D. none of these

Answer: A

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158. The geometry of $Ni(CO)_4$ and $Ni\left(PPh_3\right)Cl_2$ are

A. both square planar

B. tetrahedral and square planar respectively

C. both are tetrahedral

D. square planar and tetrahedral respectively

Answer: C

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159. $\left[Fe\left(H_2O\right)_6\right]^{2+}$ and $\left[Fe(CN)_6\right]^{4-}$ differ in:

A. geometry, magnetic moment

B. geometry, hybridization

C. magnetic moment, colour

D. hybridization number of d-electrons

Answer: C

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160. Which of the following order is correct in spectrochemical series of ligands?

A. $Cl^- < F^- < C_2O_4^{2-} < NO_2^- < CN^-$

B. $NO_2^- < C_2O_4^{2-} < Cl^- < F^- < CN^-$

C. $C_2O_4^{2-} < F^- < Cl^- < NO_2^- < CN^-$

D. $F^- < Cl^- < NO_2^- < CN^- < C_2O_4^{2-}$

Answer: A

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161. The species with spin only magnetic moment of sqrt(24)` BM is:

A. $\left[CoF_3\left(H_2O\right)_3\right]$

B. $\left[CoCl_4\right]^{2-}$

C. $\left[NiCl_4\right]^{2-}$

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

Answer: A

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162. For the complexes showing the square pyramidal structure, the d-orbital involved in the hybridisation is:

A. $d_{x^2-y^2}$

B. d_{x^2}

C. d_{xy}

D. d_{xz}

Answer: A

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163. Which of the following aquated metal ions has the highest paramagnetism?

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

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

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

D. $\left[Zn\left(H_2O\right)_2\right]^{2+}$

Answer: B

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164. The hybridization states of the central atom in the complexes $\left[Fe(CN)_6\right]^{3-}$, $\left[Fe(CN)_6\right]^{4-}$ and $\left[Co\left(NO_2\right)_6\right]^{3-}$ are:

A. d^2sp^3, sp^3d^2 and dsp^2 respectively

B. d^2sp^3, sp^3d^2 and sp^3d^2 respectively

C. d^2sp^3, sp^3d^2 and d^2sp^3 respectively

D. all d^2sp^3

Answer: D

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165. Which of the following is incorrectly matched?

A. $\begin{array}{ll} \text{Complex} & \text{Number of unpaired electrons} \\ \{FeF_6]^{3-} & 5 \end{array}$

B. $\begin{array}{ll} \text{Complex} & \text{Number of unpaired electrons} \\ \left[Cr(en)_3\right]^{2+} & 2 \end{array}$

C. $\begin{array}{ll} \text{Complex} & \text{Number of unpaired electrons} \\ \left[Co\left(NH_3\right)_6\right]^{3+} & 4 \end{array}$

D. $\begin{array}{ll} \text{Complex} & \text{Number of unpaired electrons} \\ \left\{Mn\left(H_2O\right)_6\right]^{2+} & 5 \end{array}$

Answer: C

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166. Which of the follownig complexes have a maximum number of unpaired electrons?

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

B. $\left[Co\left(NH_3\right)_4\left(NO_2\right)O_2\right]^+$

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

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

Answer: D

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167. 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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168. The complex ion $\left[Fe(CN)_6\right]^{4-}$ contains:

A. total of 36 electrons on Fe^{2+} cation

B. sp^3d^2 hybrid orbitals with octahedral structure

C. total of 104 electrons

D. six sigma bonds

Answer: A

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169. In $\left[Pt\left(NH_3\right)_2Cl_2\right]$, pt-Cl bond length is 2 Å and Cl-Cl distance is 2.88 Å then the compound is:

A. tetrahedral

B. square pyramidal

C. cis-square planar

D. trans-square planar

Answer: C

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170. Which of the following isomerism, exhibited by $\left[CrCl_2(OH)_2\left(NH_3\right)_2\right]^-$?

A. Ionization

B. Geometrical

C. Hydrate

D. Linkage

Answer: B

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171. Which kind of isomerism is exhibited by octahedral $\left[Co\left(NH_3\right)_2Br_2\right]Cl$?

A. Geometrical and ionization

B. Geometrical and optical

C. Optical and ionization

D. Geometrical only

Answer: A

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172. A metal complex of coordination number six having three different types of ligands a, b and c of composition $Ma_2b_2c_2$ can exist in several geometrical isomeric forms, the total number of such isomers is:

A. 3

B. 5

C. 7

D. 9

Answer: B

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173. How many geometrical isomers and stereoisomers are possible for $\left[Pt\left(NO_2\right)\left(NH_3\right)\left(NH_2OH\right)(Py)\right]^+$ and $\left[Pt(Br)(Cl)(I)\left(NO_2\right)\left(NH_3\right)(Py)\right]$ respectively?

A. 3 and 15

B. 3 and 30

C. 4 and 15

D. 4 and 30

Answer: B

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174. Complexes given below show:

A. optical isomerism

B. coordinate isomerism

C. Geometrical isomerism

D. Bridge isomerism

Answer: C

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175. Fac and Mer isomerism is associated with which of the following general formula?

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

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

C. $[MABCD]$

D. $\left[MA_3B_3\right]$

Answer: D

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176. Which of the following will have two stereoisomeric forms?

(I) $\left[Cr\left(NO_3\right)_3\left(NH_3\right)_3\right]$

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

(III) $\left[CoCl_2(en)_2\right]^+$

(IV) $\left[CoBrCl(ox)_2\right]^{3-}$

A. I only

B. I and II

C. III and IV

D. All of these

Answer: B

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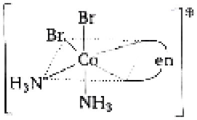
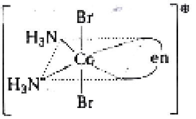
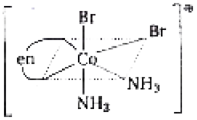
177. Three arrangements are shown for the complexes $\left[CoBr_2\left(NH_3\right)_2(en)\right]^{\oplus}$. Which one is wrong statement?



(I)



(II)



(III)

A. I and II are geometrical isomers

B. II and III are optically active isomers

C. I and III are optically active isomers

D. II and III are geometrical isomers

Answer: B

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178. Which of the following is not optically active?

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

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

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

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

Answer: D

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179. Where among the following metal complexes the one which exhiibits optical activity is: (AA=bidentate ligand, A, X=monodentate ligand)

A. cis-$\left[MA_4X_2\right]$

B. trans-$\left[MA_4X_2\right]$

C. cis-$\left[M(AA)_2X_2\right]$

D. trans-$\left[M(AA)_2X_2\right]$

Answer: C

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180. The optically active species among the following is:

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

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

C. $\left[Co(gly)_3\right]$

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

Answer: C

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181. Cis-trans isomerism is exhibited by:

A. $\left[PtCl\left(NH_3\right)_3\right]^{+}$

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

C. $\left[PtCl_4\right]^{2-}$

D. $\left[PtCl_2\left(NH_3\right)_2\right]$

Answer: D

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182. Which of the following will show optical isomers?

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

(II) trans-$\left[IrCl_2\left(C_2O_4\right)_2\right]^{3-}$

(III) $\left[Rh(en)_3\right]^{3+}$

(IV) cis-$\left[IR\left(H_2O\right)_3Cl_3\right]$

A. I, III only correct

B. II, IV only correct

C. I, III, IV only correct

D. III only correct

Answer: A

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183. The complex with a maximum number of stereoisomers is:

A. $\left[PtCl_3\left(C_2H_4\right)\right]^-$

B. $\left[CuBr_2Cl_2\right]^{2-}$

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

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

Answer: D

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184. A complex with the composition $\left[MA_3B\right]^{n\pm}$ is found to have no geometrical isomers. The possible structure (s) of the complex is (where

A and B are monodentate ligands)

A. tetrahedral

B. Square planar

C. Both (a) and (b)

D. cannot be predicted

Answer: C

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185. Which of the following isomerism is not possible for complexes having molecular formulae?

(I) $Pt(SCN)_2 \cdot 3PEt_3$,

(II) $CoBr \cdot SO_4 \cdot 5NH_3$

(III) $FeCl_2 \cdot 6H_2O$

A. Optical

B. Linkage

C. Ionisation

D. Hydrate

Answer: A

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

A. Carboxypeptidase-A is an ennzyme and contains zinc

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

C. Cyanocobalamin is B^{12} and contains cobalt

D. Chlorophylls are green pigments in plants and contains calcium

Answer: D

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187. Which one of the following platinum complexes is used in cancer chemotherapy?

A. cis$[PtCl_2(NH_3)_2]$

B. trans-$[PtCl_2(NH_3)]$

C. $\{t(NH_3)_4]^{2+}$

D. $[Pt(Cl_4)]^{2-}$

Answer: A

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188. The cyanide complex of silver formed in the silver extraction in Mac-Arthur's Forrest cyanide process is:

A. $[Ag(CN)_2]^-$

B. $K_2[Ag(CN)_3]$

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

D. $Na_2\left[Ag(CN)_4\right]$

Answer: A

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189. Complexes formed in the following methods are:

(I) Mond's process for purification of nickel

(II) Removal of unreacted AgBr from photographic plate

(III) Removal of lead poisoning from the body

A. $\begin{array}{ccc} I & II & III \\ Ni(CO)_4 & \left[Ag(CN)_2\right]^- & [Pb(EDTA)]^{2-} \end{array}$

B. $\begin{array}{ccc} I & II & III \\ Ni(CO)_4 & \left[Ag\left(S_2O_3\right)_2\right]^{3-} & [Pb(EDTA)]^{2-} \end{array}$

C. $(I, II, III), \left(Ni(CO)_6, Ag\left(S_2O_3\right)_2\right]^{3-}, \left([Pb(EDTA)]^{4-}\right)$

D. $\begin{array}{ccc} I & II & III \\ Ni(CO)_6 & \left[Ag\left(S_2O_3\right)\right]^- & [Pb(EDTA)]^{2-} \end{array}$

Answer: B

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190. What is the oxidation number of Fe in $\left[Fe\left(H_2O\right)_5(NO)\right]^{2+}$ ion?

A. $+2$

B. $+3$

C. $+1$

D. 0

Answer: C

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191. What will be oxidation state iron in given complex (Product)?

$$Na_2\left[Fe(CN)_5NO\right] + Na_2S \rightarrow Na_4\left[Fe(CN)_5NOS\right]$$

A. $+1$

B. $+2$

C. $+3$

D. zero

Answer: B

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192. According to IUPAC system, the name of the complex, $\left[Co(en)_2Cl(ONO)\right]^+$ is :

A. chlorobis(ethylenediamine)nitrito-O-cobaltate (III) ion

B. chlorodiethyldiaminenitrito-O-cobalt (III) ion

C. chloronitrito-O-diethyldiamine cobaltate (III) ion

D. chlorobis(ethylenediamine) nitrito-O-cobalt (III) ion

Answer: D

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193. IUPAC name of $\left[Fe\left(O_2\right)(CN)_4Cl\right]^{4-}$ is:

A. Chlorotetracyano dioxoferrate (II) ion

B. Chlorotetracyano peroxoferrate (II) ion

C. Chlorotetracyano superoxoferrate (II)ion

D. Tetracyanochloro superoxoferrate (II)ion

Answer: C

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194. The IUPAC name of the Wilkinson's catalyst $\left[RhCl\left(PPh_3\right)_3\right]$ is:

A. Chlorotris (triphenylphosphine) rhodium (I)

B. Chlorotris (triphenylphophine) rhodium (IV)

C. Chlorotris (triphenylphosphine) rhodium (0)

D. Chlorotris (triphenylphosphine) rhodium (VI)

Answer: A

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195. The correct formula of diammine dichlorodicyano chromate (III) is:

A. $\left[CrCl_2(CN)_2\left(NH_3\right)_2\right]^{3+}$

B. $\left[CrCl_2(CN)_2\left(NH_3\right)_2\right]^{3-}$

C. $\left[CrCl_2(CN)_2\left(NH_3\right)_2\right]$

D. $\left[CrCl_2(CN)_2\left(NH_3\right)_2\right]^{-}$

Answer: D

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196. The IUPAC name for $K_2\left[Cr(CN)_2O_2(O)_2NH_3\right]$ is:

A. Potassium amminedicyanotetraoxo chromium (III)

B. Potassium amminedicyanodioxygendioxo chromate (IV)

C. Potassium amminedicyanosuperoxoperoxo chromate (III)

D. Potassium amminedicyanodioxoperoxo chromate (VI)

Answer: D

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197. IUPAC name of $H_2\left[PtCl_6\right]$ is

A. Hydrogen hexachloroplatinate (IV)

B. dihydrogen hexachloroplatinate (IV)

C. hydrogen hexachloroplatinic (IV) acid

D. hexachloroplatinic (IV) acid

Answer: D

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198. The IUPAC name for $\left[PtCl\left(NH_2CH_3\right)\left(NH_3\right)_2\right]Cl$ is:

A. diamminechloro(methylamine)platinum(II)chloride

B. (dimethylamine)chlorodiamminoplatinum(II)chloride

C. bis(ammine)chloro(methylamine)platinate(II)chloride

D. diaminechloro(methylamine)platinum(II)chloride

Answer: A

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199. The IUPAC nomenclature for the complex $Na\left[PtBrCl\left(NO_2\right)\left(NH_3\right)\right]$ is:

A. Sodium amminechlorobromonitro-N-platinum (II)

B. Sodium nitrochlorobromoammine-N-platinate(II)

C. Sodium amminebromochloronitro-N-Platinate(II)

D. Sodium amminebromochloronitro-N-platinum(II)

Answer: C

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200. The IUPAC name of $Xe\left[PtF_6\right]$ is:

A. Hexafluoroplatinate(VI) xenon

B. Xenonhexafluoroplatinate(IV)

C. Xenonhexafluoroplatinate(VI)

D. Xenoniumhexafluoroplatinum(V)

Answer: B

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201. The magnetic moment of $\left[NiX_4\right]^{2-}$ ion is found to be zero. Then the ion is : `(X=monodentate anionic ligand)

A. sp^3 hybridised

B. spd^2 hybridised

C. dsp^2 hybridised

D. d^2sp hybridised

Answer: C

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202. The hybridised orbitals used by silver in the complex $\left[Ag\left(NH_3\right)_2\right]^+$ are of the type:

A. sp^2

B. sp

C. sp^3

D. dsp^2

Answer: B

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LEVEL 2

1. Which of the following ligand does not as π - acid ligand?

A. N_2

B. CO

C. C_2H_4

D. O_2^{2-}

Answer: D

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2. If EAN of central metal cation M^{2+} in an non-chelating complex is 36 and atomic no. of metal M is 26, then the number of monodentate ligand in this complex are

A. 5

B. 4

C. 6

D. none of these

Answer: A

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3. $\left[Mn(CO)_4NO\right]$ is diamagnetic because:

A. Mn metal is diamagnetiic in free state

B. Mn is in +1 oxidation state in this complex

C. No is present as positive ligand

D. All of these

Answer: D

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4. Choose the correct option regarding the following complex compound which follwos (F) and does not follow (NF) the Sidgwick EAN rule:

(I) $\left[Ph_3P\right)_2PdCl_2PdCl_2\right]$

(II) $[NiBrCl(en)]$

(III) $Na_4\left[Fe(CN)_5NOS\right]$

(IV) $Cr(CO)_3(NO)_2$

A. (I)-NF,(II)-NF,(III)-NF,(IV)-NF

B. (I)-F,(II)-F,(III)-NF,(IV)-F

C. (I)-NF,(II)-NF,(III)-F,(IV)-F

D. (I)-NF,(II)-NF,(III)-F,(IV)-NF

Answer: C

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5. If CO ligands are substituted by NO in respective neutral carbonyl compounds then which of the following will not be correct formula?

A. $Cr(CO)_3(NO)_2$

B. $Fe(CO)_2(NO)_2$

C. $Cr(NO)_4$

D. $Ni(CO)_2(NO)_2$

Answer: D

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6. Which of the following species can act as reducing agent ?

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

B. $Mn(CO)_6$

C. $Mn(CO)_5$

D. $Cr(CO)_6$

Answer: D

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7. If $\Delta_0 < P$, the correct electronic configuration for d^4 system will be (P = paiting energy)

A. $t_{2g}^4 e_g^0$

B. $e_g^4 t_{2g}^0$

C. $t_{2g}^3 e_g^1$

D. $e_g^2 t_{2g}^2$

Answer: A

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8. Which of the following statement is not correct?

A. Bis(glycinato)Zinc(II) is optically active

B. $\left[NiCl_4\right]^{2-}$ and $\left[PtCl_4\right]^{2-}$ have different shape

C. $\left[Ni(CN)_4\right]^{4-}$ is square planar complex

D. $\left[Ni(CN)_4\right]^{2-}$ and $\left[Ni(CO)_4\right]$ have the same magnetic moment

Answer: D

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9. Give the correct of initials T or F for following statements. Use T if statements is true and F if it is false.

(I) Co(III) is stabilised in presence of weak field ligands, while Co(II) is stabilised in presence of strong field ligand.

((II) Four coordinated complexes of Pd(II) and Pt(II) are diamagnetic and square planar.

(III) $\left[Ni(CN)_4\right]^{4-}$ ion and $\left[Ni(CO)_4\right]$ are diamagnetic tetrahedral and square planar respectively.

(IV) Ni^{2+} ion does not form inner orbital octahedral complexes

A. TFTF

B. TTTF

C. TTFT

D. FTFT

Answer: D

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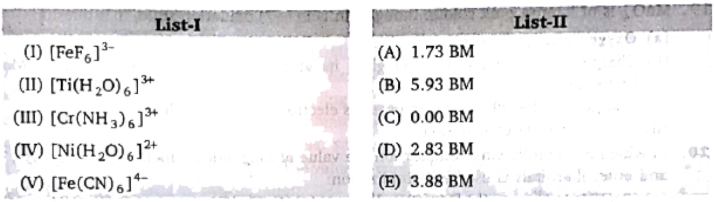
10.



List-I	List-II
(I) $[FeF_6]^{3-}$	(A) 1.73 BM
(II) $[Ti(H_2O)_6]^{3+}$	(B) 5.93 BM
(III) $[Cr(NH_3)_6]^{3+}$	(C) 0.00 BM
(IV) $[Ni(H_2O)_6]^{2+}$	(D) 2.83 BM
(V) $[Fe(CN)_6]^{4-}$	(E) 3.88 BM

match List-I with list-II and select the correct answer using the codes given below:

A. I-B,II-A,III-C,IV-D,V-E

B. I-B,II-A,III-E,IV-D,V-C

C. I-B,II-C,III-D,IV-E,V-A

D. I-D,II-E,III_A,IV-B,V-C

Answer: D

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11. The value of 'spin only' magnetic moment for one of the following configuration is $2.84 B.M.$ The correct one is:

A. d^4 (in strong field ligand)

B. d^2 (in weak field ligand)

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

D. d^5 (in strong field ligand)

Answer: B

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

A. $\left[Fe(CN)_6\right]^{4-} > \left[ClCl_4\right]^{2-} > \left[MnCl_4\right]^{2-}$

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

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

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

Answer: D

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13. Which of the following statements is incorrect?

A. The stability constant of $\left[Co\left(NH_3\right)_6\right]^{3+}$ is greater that of $\left[Co\left(NH_3\right)_6\right]^{2+}$

B. The cyano complexes are far more stable than those formed by halide ions

C. The stability of halide complexes follows the order $I^- < Br^- < Cl^-$

D. The stability constant of $\left[Cu\left(NH_3\right)_4\right]^{2+}$ is greater than that of $\left[Cu(en)_2\right]^{2+}$

Answer: D

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14. Set of d-orbitals which is used by central metal during formation of MnO_4^-?

A. $d_{x^2-y^2}, d_{x^2}, d_{xy}$

B. d_{xy}, d_{yz}, d_{xz}

C. $d_{x^2-y^2}, d_{xy}, d_{xz}$

D. $d_{x^2-y^2}, d_{z^2}, d_{xz}$

Answer: B

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15. $FeSO_4$ is a very good absorber for NO, the new compound formed by this process is found to contain number of unpaired electrons:

A. 4

B. 5

C. 3

D. 6

Answer: C

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16. A $\left[M\left(H_2O\right)_6\right]^{2+}$ complex typically absorbs at around 600 n. it is allowed to react with ammonia to form a new compelx $\left[M\left(NH_3\right)_6\right]^{2+}$ that should have absorption at:

A. 800 nm

B. 580 nm

C. 620 nm

D. 320 nm

Answer: B

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17. Given that the energy of the photons of different colours decreases in the order of VIBGYOR (Violet $>$ Indigo $>$ Blue $>$ Green $>$ Yellow $>$ Red) and that if complex absorbs a photon of low energy then it shows colour of high energy photon. If an ion , M^{2+}, forms the complexes $\left[M\left(H_2O\right)_6\right]^{2+}$, $\left[MBr_6\right]^{4-}$, and $\left[M(en)_3\right]^{2+}$. The colours of the complexes, though not necessarily in order, are green, red, and blue. Match the complexes with the appropriate colour. (Do not use the table of complementry colours for this question)

A. Green, blue and red

B. Blue, and greenn

C. Green, red and blue

D. Red, blue and green

Answer: D

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18. The CFSE for octahedral $\left[CoCl_6\right]^{4-}$ is $18,000cm^{-1}$. The CFSE for tetrahedral $\left[CoCl_4\right]^{2-}$ will be

A. 18000 cm^{-1}

B. 16000 cm^{-1}

C. 8000 cm^{-1}

D. 2000 cm^{-1}

Answer: D

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19. MnO_4^- is of intense pink colour, though Mn is in$(+7)$ oxidation state.It is due to:

A. oxygen gives colour to it

B. Charge transfer when Mn(+7) gives its electron to oxygenn and oxidise to Mn (+8) temporarily

C. Charge transfer when oxygen gives its electron to Mn(+7) changing in Mn(+6) None is correct explanation.

D.

Answer: C

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20. In which of the following complex ion the value of magnetic moment (spin only) is $\sqrt{3}$B.M. and oute rd-orbitals is used in hybridization:

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

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

C. $\left[CuCl_5\right]^{2-}$

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

Answer: A

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21. Which of the following order of CFSE is incorrect?

A. $\left[Co(en)_3\right]^{3+} > \left[Co\left(NH_3\right)_6\right]^{3+} > \left[Co\left(H_2O\right)_6\right]^{3+}$

B. $\left[PtCl_4\right]^{2-} > \left[PdCl_4\right]^{2-} > \left[NiCl_4\right]^{2-}$

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

D. $\left[Co(ox)_3\right]^{3-} < \left[Co(en)_3\right]^{3+}$

Answer: B

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22. For which of the followng d^n configuration complexes, can not exist in both high spin and low spin forms:

(I) d^3

(II) d^5

(III) d^6

(IV) d^8

A. I, II & III

B. II, III & IV

C. I & IV

D. none of these

Answer: B

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23. Consider the following complex: $\left[Co\left(NH_3\right)_5CO_3\right]ClO_4$

The coordination number, oxidation number, no. of d-electrons an dnumber of unpaired d-electrons on the metal are respectively:

A. 6,3,6

B. 6,2,7

C. 5,3,6

D. 5,3,7

Answer: A

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24. The π acid ligand which uses it d-orbital during synergic bonding in its complex compound.

A. CN^-

B. PR_3

C. NO

D. N_2

Answer: B

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25. The IR stretchin frequencies of free CO, and CO $\left[V(CO)_6\right]^-$, $\left[Cr(CO)_6\right]^-$ and $\left[Mn(CO)_6\right]^-$ are 2143 $cm^{-1}, 1860cm^{-1}\Big), 2000cm^{-1}$ and $2090cm^{-1}$, respectively. Then correct statemet about metal carbonyl is:

A. C-O' bond is strongest in the cation and weakest in the anion.

B. C-O' bond is weakest in the cation and strongest in the anion

C. C-O' bond is longer in the cation than in the anion

D. M-C' pi bonding is higher in the cation

Answer: B

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26. The π acid ligand which uses it d-orbital during synergic bonding in its complex compound.

A. NO^+

B. PR_3

C. C_6H_6

D. CO

Answer: A

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27. Correct sequence of CO bond order in given compounds is:

(P) $Fe(CO)_5$

(Q) CO

(R) $H_3B \leftarrow CO$

(S) $\left[Mn(CO)_5\right]^-$

A. $P > R > S > Q$

B. $S > P > R > Q$

C. $Q > S > P > R$

D. $R > Q > P > S$

Answer: B

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28. Select correct statement regarding $\left[Ni(DMG)_2\right]$ complex compound.

A. it acts as oxidising agnet because Ni^{2+} cation is having E.A.N. 34.

B. It is extra stabilized by hydrogen bonding

C. It's IUPAC name is Bis(dimethylyoximato)nickelate(II)

D. It's ligand contains two different donar sites

Answer: C

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29. In which of the following ion the value of magentic moment (spin only) is $\sqrt{3}$ BM and outer d-orbitals is used in hybridization.

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

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

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

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

Answer: D

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30. The inner orbital complex which exhibits both geometrical as well as optical isomerism.

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

B. $\left[IrF_3\left(H_2O\right)_2\left(NH_3\right)\right]$

C. $\left[NiCl_2(en)_2\right]$

D. $\left[Co(CN)_2(ox)_2\right]^{3-}$

Answer: D

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31. Select correct statement regarding $\left[Ni(DMG)_2\right]$ complex compound.

A. It acts as oxidising agent because Ni^{2+} cation is having EAN 34.

B. It is extra-stabilized byhydrogenn bonding

C. It's IUPAC name is Bis(dimethylglyoximato) nickelate (II)

D. It's ligand contains two different donar sites

Answer: D

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32. Which of the following correctly matched?

A. $\left[Fe(CN)_6\right]^{4-}$ and $\left[Fe(CN)_6\right]^{3-}$-both are octahedral and diamagnetic with d^2sp^3. Hybridisation.

B. $Ni(CO)_4$ and $\left[Ni(CN)_4\right]^{2-}$-both are tetrahedral and diamagnetic with sp^3-hybridisation

C. $Ni(CO)_4$ and $\left[Co(CO)_4\right]^{-}$-both are tetrahedral and diamagnetic

D. $\left[Co\left(H_2O\right)_6\right]^{3+}$ and $\left[Cr\left(H_2O\right)_6\right]^{3+}$-both are paramagnetic annd metal is d^2sp^3-hybridised

Answer: C

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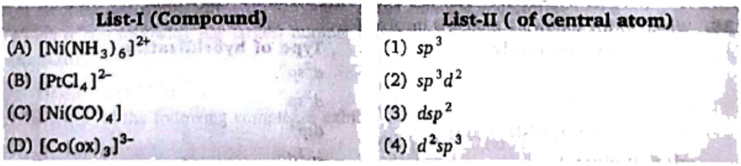
33. Match List-I and Li-st II and select the correct answer using the codes given below the slits:



List-I (Compound)	List-II (of Central atom)
(A) $[Ni(NH_3)_6]^{2+}$	(1) sp^3
(B) $[PtCl_4]^{2-}$	(2) sp^3d^2
(C) $[Ni(CO)_4]$	(3) dsp^2
(D) $[Co(ox)_3]^{3-}$	(4) d^2sp^3

A. A-2,B-1,C-3,D-4

B. A-2,B-3,C-1,D-4

C. A-4,B-1,C-3,D-2

D. A-4,B-3,C-1,D-2

Answer: A

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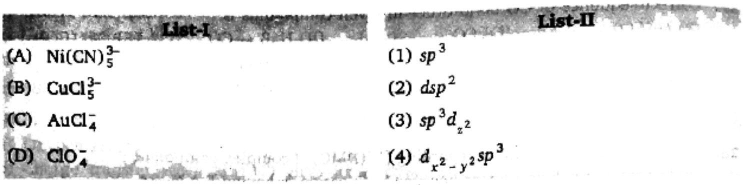
34. Match List-I and Li-st II and select the correct answer using the codes given below the slits:



List-I	List-II
(A) $Ni(CN)_5^{3-}$	(1) sp^3
(B) $CuCl_5^{3-}$	(2) dsp^2
(C) $AuCl_4^-$	(3) $sp^3d_{z^2}$
(D) ClO_4^-	(4) $d_{x^2-y^2}sp^3$

A. A-1,B-3,C-2,D-4

B. A-3,B-4,C-2,D-1

C. A-4,B-2,C-1,D-3

D. A-4,B-3,C-2,D-1

Answer: D

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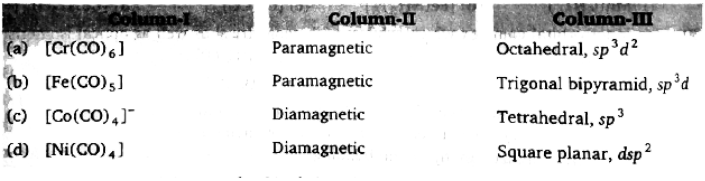
35. Which of the following is correct matched?



Column-I	Column-II	Column-III
(a) $[Cr(CO)_6]$	Paramagnetic	Octahedral, sp^3d^2
(b) $[Fe(CO)_5]$	Paramagnetic	Trigonal bipyramid, sp^3d
(c) $[Co(CO)_4]^-$	Diamagnetic	Tetrahedral, sp^3
(d) $[Ni(CO)_4]$	Diamagnetic	Square planar, dsp^2

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36. The hybridization of the complex $\left[CrCl_2\left(NO_2\right)_2\left(NH_3\right)_2\right]^-$ is:

A. sp^3d^2

B. d^2sp^3

C. sp^3d

D. cannot be predicted

Answer: C

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37. Which of the following statement is not true for the reaction given below:

$$\left[Cu\left(H_2O\right)_4\right]^{2+} + 4NH_4 \Leftrightarrow \left[Cu\left(NH_3\right)_4\right]^{2+} + 4H_2O$$

A. It is ligand substitution reaction

B. NH_3 is a relatively strong field ligand while H_2O is a weak field ligand

C. During the reaction, there is a change in colour from light blue to dark blue

D. $\left[Cu\left(NH_3\right)_4\right]^{2+}$, has a tetrahedral structure and is paramagnetic

Answer: D

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38. Which of the following match is incorrect?

Complex compounds		Type of hybridization
(a) $[V(NH_3)_6]^{3+}$	:	d^2sp^3
(b) $[CrCl_3(NMe_3)_3]$	:	d^2sp^3
(c) $[Cu(CN)(NO_2)(NH_3)(py)]$	:	dsp^2
(d) $K_3[Co(ox)_3]$	:	sp^3d^2

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39. Select the correct code of TRUE and FALSE for given statements:

(a) Peroxide ion as well as dioxygen molecule both are paramagnetic species

(b) In set of isomers, $\left[Cr\left(H_2O\right)_6\right]Cl_3$ and $\left[CrCl\left(H_2O\right)_5\right]Cl_2 \cdot H_2O$, both compounds can easily loose water molecule on treatment with conc. H_2SO_4

(c) During transformation $NO \rightarrow NO^+$, bond length and magnetic behaviour decreases

(d) An ether is more volatile than alcohol both having same molecular formula

A. FFTT

B. FTFT

C. FTTT

D. TFFT

Answer: D

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40. The total possible co-ordination isomers for the following compounds respectively are

(i) $\left[Co(en)_3\right]\left[Cr\left(C_2O_4\right)_3\right]$

(ii) $\left[Cu\left(NH_3\right)_4\right]\left[CuCl_4\right]$

(iii) $\left[Ni(en)_3\right]\left[Co\left(NO_2\right)_6\right]$

A. 4,4,4

B. 2,2,2

C. 2,2,4

D. 4,2,3

Answer: D

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41. Select the incorrect match:

A. $[Co(NO_2)(H_{20O}(en)_2]Cl_2$, $[CoCl(NO_2)(en)_2]Cl \cdot H_2O$: Hydrate isomerism

B. $[Cu(NH_3)_4][PtCl_4]$, $[CuCl(NH_3)_3][\}tCl_3(NH_3)]$: Co-ordinatino isomersm

C. $[Ni(CN)(H_2O)(NH_3)_4]Cl$, $[NiCl(H_2O)(NH_3)_4]CN$: Ionization isomerism

D. $[Cr(NO_2)(NH_3)_5][ZnCl_4]$, $[Cr(NO_3)(NH_3)_5][ZnCl_4]$: Linkage isomerism

Answer: A

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42. Select the correct code about complex $[Cr(NO_2)(NH_3)_5][ZnCl_4]$:

(I) IUPAC anem of compound is pentaamminenitrito-N-chromium (III) tetrachlorozincate (II)

(II) it shows geometrical isomerism

(III) It shows linkage isomerism

(IV) it shows coordination isomerism

A. It shows co-ordination isomersm

B. it shows optical activity

C. It shows linkage isomerism

D. IUPAC name of the compound is pentaamminenitrito-N-chromium(III) tetrathiocyanato-S-zincate(II)

Answer: B

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43. The magnetic property, dipole moment, plane of symmetry, colour and absorption band cann be helpful in structure elucidation of complex compounds:

Q. Complex compound() having even number of space (stereo) isomers is/are: (Where AA-symmetrical bidentate ligand ad a,b,c,d,e-monodentate ligands)

A. $\left[M(AA)_2b_2\right]^{n\pm}$

B. $\left[Ma_3b_3\right]n^{\pm}$

C. $\left[Ma_3bdc\right]^{n\pm}$

D. $\left[Ma_2bcde\right]^{n\pm}$

Answer: B

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44. Which of the following isomerism is not possible for complexes having molecular formulae?

(I) $Pt(SCN)_2 \cdot 3PEt_3$,

(II) $CoBr \cdot SO_4 \cdot 5NH_3$

(III) $FeCl_2 \cdot 6H_2O$

A. Optical

B. Linkage

C. Ionisation

D. Hydrate

Answer: D

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45. Unmatched characteristic of complex $\left[PdCl_2(H_2O)_2(NH_3)_2\right]^{2+}$ is:

A. Diamagnetic

B. Low spin

C. Geometrical isomerism

D. Fac. And Mer. Form

Answer: D

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46. Which one of the following has largest number of isomers ? (R = alkyl group , en = ethylenediamine)

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

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

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

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

Answer: A

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47. Which one of the following complexes exhibit chirality?

A. $\left[Cr(ox)_3\right]^3$

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

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

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

Answer: A

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48. Consider the following isomerism:

(i) Ionization

(ii) Hydrate

(iii) Coordination

(iv) Geometrical

(v) Optical

Which of the above isomerism are exhibited by $\left[Cr\left(NH_3\right)_2(O)_2Cl_2\right]^-$?

A. (i) and (v)

B. (ii) and (iii)

C. (iii), (ii) and (i)

D. (iv) and (v)

Answer: C

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49. Which complex is likely to show optical activity :

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

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

C. cis-$\left[Co\left(NH_3\right)_2(en)_2\right]$

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

Answer: A

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50. Which of the following statement is true?

A. In $\left[PtCl_2\left(NH_3\right)_2\right]^{2+}$ the cis form is optically inactive while trans form is optically active

B. In $\left[Fe\left(C_2O_4\right)_3\right]^{3-}$, geometrical isomerism does not exist while optical isomerism exists

C. In Mabcd, square planar complexes show both optical as well as geometrical isomerism

D. In Mabcd tetrahedral compoex, optical isomerism cannot be observed

Answer: B

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51. The following complexs are given?

trans-$\left[Co\left(NH_3\right)_4 1_2\right]^{\oplus}$

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

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

$\left[NiI_4\right]^{2-}$

$\left[TiF_6\right]^{2-}$

$\left[CoF_6\right]^{3-}$

Choose the correct code .

A. (1), (2) are optically active, (3) is optically inactive

B. (2) is optically active, (1), (3) are optically inactive

C. (4),(5) are coloured and (6) is colourless

D. (4) is coloured and (5), (6) are colourless

Answer: D

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52. Which of the following can show geometrical isomerism?

A. $\left[Pt\left(NH_2 - C \mid CH_3H - C \mid CH_3H - NH_2\right)_2\right]^{2+}$

B. $\left[Co(en)_2NH_3Cl\right]^{2+}$

C. Both (a) and (b)

D. none of these

Answer: B

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53. Which of the following compounds will exhibit cis-trans (geometrical) isomerism ?

A. [CoCl(NH_(3))_(4)(H_(2)O)]`

B. $\left[CoCl_3\left(NH_3\right)_3\right]$

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

D. All of these

Answer: D

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54. Which of the following will have two stereoisomeric forms?

(I) $\left[Cr\left(NO_3\right)_3\left(NH_3\right)_3\right]$

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

(III) $\left[CoCl_2(en)_2\right]^{+}$

(IV) $\left[CoBrCl(ox)_2\right]^{3-}$

A. (iii) and (iv)

B. (i), (iii) and (iv)

C. (iv) only

D. all four

Answer: A

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55. A coordination complex of type MX_2Y_2 (M-metal ion: X, Y-monodentate lingads), can have either a tetrahedral or a square planar geometry. The maximum number of posible isomers in these two cases are respectively:

A. 1 and 2

B. 2 and 1

C. 1 and 3

D. 3 and 2

Answer: A

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56. The ratio of cis and trans-isomers of the complex $\left[Ma_2bcde\right]^{n\pm}$ is:

A. $5:3$

B. $2:1$

C. $7:3$

D. $3:1$

Answer: B

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57. $[PdCl_2(PMe_3)_2]$ is a diamagnetic complex of Pd (II). How many unpaired electrons are presennt in analogous complex of Ni (II)?

A. zero

B. 1

C. 2

D. 3

Answer: B

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58. Complex compounds(s) which is optical active and does ot dpeend upon the orientation of the ligands around metal cation:

(i) $\left[CoCl_3\left(NH_3\right)_3\right]$

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

(iii) $\left[Co\left(C_2O_4\right)_2\left(NH_3\right)_2\right]^-$

(iv) $\left[CrCl_2\left(NH_3\right)_2(en)\right]^+$

A. (ii), (iii) and (iv)

B. (i), (ii) and (iv)

C. (ii) and (iv)

D. only (ii)

Answer: A

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59. Choose the correct code regarding, possible number of geometrical isomers exhibited by following complexes:

(I) $\left[CrCl_2\left(NO_2\right)_2\left(NH_3\right)_2\right]^-$

(II) $\left[Co\left(NO_2\right)_3\left(NH_3\right)_3\right]$

(III) $\left[PtCl\left(NO_2\right)\left(NH_3\right)(py)\right]$

(IV) $[PtBrCl(en)]$

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

B. (I)-5,(II)-2,(III)-4,(IV)-0

C. (I)-3,(II)-2,(III)-0,(IV)-1

D. (I)-5,(II)-2,(III)-3,(IV)-0

Answer: C

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60. How many geometrical isomers are possible for complex $\left[Mab(AB)_2\right]^{n\pm}$?

A. 5

B. 4

C. 3

D. 6

Answer: D

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61. $\left[CoCl_2\left(NH_3\right)_4\right]^+ + Cl^- \rightarrow \left[CoCl_3\left(NH_3\right)_3\right] + NH_3$. If in this reaction two isomers of the produt are obtained, which is true for the iniital (reactant) complex:

A. compound is in cis-form

B. compound is in trans-form

C. compound is in both (cis and trans)

D. can't be predicted

Answer: A

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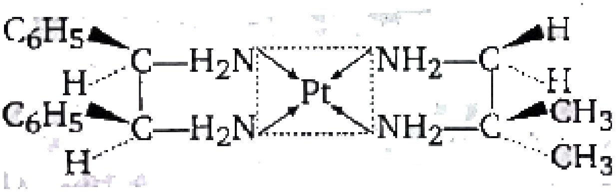
62. Select the correct statement about given square planar complex.



A. It has no geometrical isomer

B. it is optically active because it does not have plane of symmetry

C. it is optically inactive because square planar complex have plane of symmetry

D. it is optically active because it has symmetric carbon

Answer: B

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63. Select the correct code regarding total number of space isomers for the following compounds:

(I) $\left[Ma_3b_2c\right]^{n\pm}$

(II) $\left[M(AB)_3\right]^{n\pm}$

(III) $\left[Ma_2b_2c_2\right]^{n\pm}$

A. (I)-4,(II)-4,(III)-6

B. (I)-4,(II)-3,(III)-5

C. (I)-3,(II)-3,(III)-5

D. (I)-3,(II)-4,(III)-6

Answer: D

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64. How many geometrical isomers are possible for $\left[Pd^{2+}\left(NH_2 - CH\left(CH_3\right) - CO_2^-\right)_2\right]^0$

A. 2

B. 3

C. 5

D. 6

Answer: C

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65. How many geometrical isomers are possible $\left[Co(acac)_2BrCl\right]^{\Theta}$ are:

A. 4

B. 3

C. 6

D. 2

Answer: D

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66. Which of the following compounds will exhibit geometrical isomerism ?

A. $\left[Fe(DMG)_2\right]$

B. $\left[Be(gly)_2\right]$

C. $[PdClBr(gly)]^-$

D. $\left[Cd\left(NH_3\right)Cl(gly)\right]$

Answer: C

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67. In which case racemic mixture is obtained on mixing its mirror images (d & l form) is 1:1 molar ratio:

A. trans-$\left[Co(gly)_3\right]$

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

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

D. $[Zn(en)(gly)]^+$

Answer: D

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68. Which of the following compound show optical isomerism?

A. cis-$\left[CrCl_3\left(NH_3\right)_3\right]$

B. cis-$\left[Co\left(NH_3\right)_4Cl_2\right]^+$

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

D. trans-$\left[Co(en)_2Cl_2\right]^+$

Answer: B

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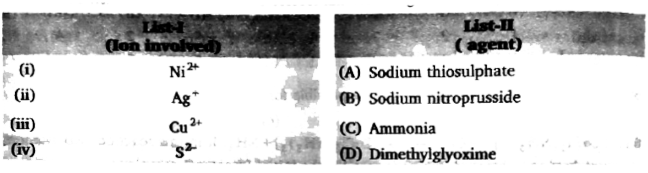
69. Match List-II with List-II and select the correct answer using the codes given below:



	List-I (Ion involved)	List-II (agent)
(i)	Ni^{2+}	(A) Sodium thiosulphate
(ii)	Ag^+	(B) Sodium nitroprusside
(iii)	Cu^{2+}	(C) Ammonia
(iv)	S^{2-}	(D) Dimethylglyoxime

A. (i)-C,(ii)-A,(iii)-D,(iv)-B

B. (i)-D,(ii)-C,(iii)-A,(iv)-B

C. (i)-D,(ii)-C,(iii)-B,(iv)-A

D. (i)-D,(ii)-A,(iii)-C,(iv)-B

Answer: A

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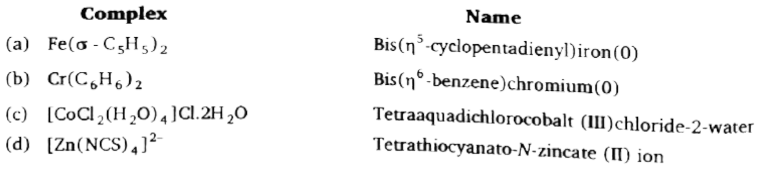
70. A complex whose IUPAC name is not correctly writtein is:



	Complex	Name
(a)	$Fe(\sigma - C_5H_5)_2$	Bis(η^5-cyclopentadienyl)iron(0)
(b)	$Cr(C_6H_6)_2$	Bis(η^6-benzene)chromium(0)
(c)	$[CoCl_2(H_2O)_4]Cl.2H_2O$	Tetraaquadichlorocobalt (III)chloride-2-water
(d)	$[Zn(NCS)_4]^{2-}$	Tetrathiocyanato-*N*-zincate (II) ion

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71. Which of the following is correct IUPAC name of any compound.

A. Tris(acetylacetonato)iron(III)chloride

B. Heachloroplatinum(IV)tetraammine dicyano platinate(IV)

C. Ammine bromochloro methylamine platinum(II)

D. cis-dichloro (ethylenediamine) platinum (II)

Answer: D

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72. Find out correct IUPAC name of complex compound

A. Triamminetricyanidochromium(III)hexanitrito-N-irridate(III)

B. Pentaamminecyanidochromium(III)hexanitrito-N-irridium(III)

C. Hexanitrito-N-irridium(III)pentaamminecyanidochromate(II)

D. Pentaamminecyanidochromium(III)hexanitrito-n-irridate(III)

Answer: d

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73. Which of the following ligand does not as π - acid ligand?

A. N_2

B. CO

C. C_2H_4

D. O_2^{2-}

Answer: C

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74. If EAN of central metal cation M^{2+} in an non-chelating complex is 36 and atomic no. of metal M is 26, then the number of monodentate ligand in this complex are

A. 5

B. 4

C. 6

D. none of these

Answer: A

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75. $\left[Mn(CO)_4NO\right]$ is diamagnetic because:

A. Mn metal is diamagnetiic in free state

B. Mn is in +1 oxidation state in this complex

C. No is present as positive ligand

D. All of these

Answer: D

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76. Choose the correct option regarding the following complex compound which follwos (F) and does not follow (NF) the Sidgwick EAN rule:

(I) $\left[\left(Ph_3P\right)_2PdCl_2\right]$

(II) $[NiBrCl(en)]$

(III) $Na_4\left[Fe(CN)_5NOS\right]$

(IV) $Cr(CO)_3(NO)_2$

A. (I)-NF,(II)-NF,(III)-NF,(IV)-NF

B. (I)-F,(II)-F,(III)-NF,(IV)-F

C. (I)-NF,(II)-NF,(III)-F,(IV)-F

D. (I)-NF,(II)-NF,(III)-F,(IV)-NF

Answer: D

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77. If CO ligands are substituted by NO in respective neutral carbonyl compounds then which of the following will not be correct formula?

A. $Cr(CO)_3(NO)_2$

B. $Fe(CO)_2(NO)_2$

C. $Cr(NO)_4$

D. $Ni(CO)_2(NO)_2$

Answer: D

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78. Which of the following species can act as reducing agent?

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

B. $Mn(CO)_6$

C. $Mn(CO)_5$

D. $Cr(CO)_6$

Answer: D

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79. What is electronic arrangement of metal atom/ion in octahedral complex with d^4 configuration, if $\Delta_0 <$ pairing energy?

A. $t_{2g}^4 e_g^0$

B. $e_g^4 t_{2g}^0$

C. $t_{2g}^{3}e_{g}^{1}$

D. $e_{g}^{2}t_{2g}^{2}$

Answer: A

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80. Which of the following statement is not correct?

A. Bis(glycinatio)Zinc(II) is optically active

B. $\left[NiCl_4\right]^{2-}$ and $\left[PtCl_4\right]^{2-}$ have different shape

C. $\left[Ni(CN)_4\right]^{4-}$ is square planar complex

D. $\left[Ni(CN)_4\right]^{2-}$ and $\left[Ni(CO)_4\right]$ have the same magnetic moment

Answer: D

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81. Give the correct of initials T or F for following statements. Use T if statements is true and F if it is false.

(I) Co(III) is stabilised in presence of weak field ligands, while Co(II) is stabilised in presence of strong field ligand.

((II) Four coordinated complexes of Pd(II) and Pt(II) are diamagnetic and square planar.

(III) $\left[Ni(CN)_4\right]^{4-}$ ion and $\left[Ni(CO)_4\right]$ are diamagnetic tetrahedral and square planar respectively.

(IV) Ni^{2+} ion does not form inner orbital octahedral complexes

A. TFTF

B. TTTF

C. TTFT

D. FTFT

Answer: D

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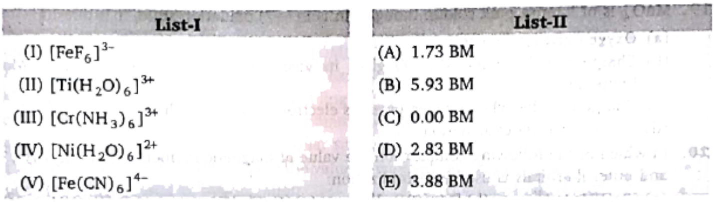
82.



List-I	List-II
(I) $[FeF_6]^{3-}$	(A) 1.73 BM
(II) $[Ti(H_2O)_6]^{3+}$	(B) 5.93 BM
(III) $[Cr(NH_3)_6]^{3+}$	(C) 0.00 BM
(IV) $[Ni(H_2O)_6]^{2+}$	(D) 2.83 BM
(V) $[Fe(CN)_6]^{4-}$	(E) 3.88 BM

match List-I with list-II and select the correct answer using the codes given below:

A. I-B,II-A,III-C,IV-D,V-E

B. I-B,II-A,III-E,IV-D,V-C

C. I-B,II-C,III-D,IV-E,V-A

D. I-D,II-E,III_A,IV-B,V-C

Answer: D

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83. The value of the spin only magnetic moment for one of the following configuration is 2.84 . B.M. The correct one is

A. d^4 (in strong field ligand)

B. d^2 (in weak field ligand)

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

D. d^5 (in strong field ligand)

Answer: B

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84. The correct order of magnetic moments (spin values in BM) among is:

A. $\left[Fe(CN)_6\right]^{4-} > \left[ClCl_4\right]^{2-} > \left[MnCl_4\right]^{2-}$

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

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

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

Answer: D

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85. Which of the following statements is incorrect?

A. The stability constant of $\left[Co\left(NH_3\right)_6\right]^{3+}$ is greater that of $\left[Co\left(NH_3\right)_6\right]^{2+}$

B. The cyano complexes are far more stable than those formed by halide ions

C. The stability of halide complexes follows the order $I^- < Br^- < Cl^-$

D. The stability constant of $\left[Cu\left(NH_3\right)_4\right]^{2+}$ is greater than that of $\left[Cu(en)_2\right]^{2+}$

Answer: B

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86. Set of d-orbitals which is used by central metal during formation of MnO_4^-?

A. $d_{x^2-y^2}, d_{x^2}, d_{xy}$

B. d_{xy}, d_{yz}, d_{xz}

C. $d_{x^2-y^2}, d_{xy}, d_{xz}$

D. $d_{x^2-y^2}, d_{z^2}, d_{xz}$

Answer: B

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87. $FeSO_4$ is a very good absorber for NO, the new compound formed by this process is found to contain number of unpaired electrons:

A. 4

B. 5

C. 3

D. 6

Answer: D

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88. A $\left[M\left(H_2O\right)_6\right]^{2+}$ complex typically absorbs at around 600 nm. it is allowed to react with ammonia to form a new compelx $\left[M\left(NH_3\right)_6\right]^{2+}$ that should have absorption at:

A. 800 nm

B. 580 nm

C. 620 nm

D. 320 nm

Answer: A

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89. An ion M^{2+}, forms the complexes $\left[M\left(H_2O\right)_6\right]^{2+}$, $\left[M(en)_3\right]^{2+}$ and $\left[MBr_6\right]^{4-}$, match the complex with the appropriate colour:

A. Green, blue and red

B. Blue, and greenn

C. Green, red and blue

D. Red, blue and green

Answer: D

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90. The SCSE for $\left[(CoCl)_6\right]^{4-}$ complex is 18000 cm^{-1}. The Δ for $\left[CoCl_4\right]^{2-}$ will be:

A. 18000 cm^{-1}

B. 16000 cm^{-1}

C. 8000 cm^{-1}

D. 2000 cm^{-1}

Answer: D

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91. MnO_4^- is of intense pink colour, though Mn is in (+7) oxidation state, it is due to:

A. oxygen gives colour to it

B. Charge transfer when Mn(+7) gives its electron to oxygen and oxidise to Mn (+8) temporarily

C. Charge transfer when oxygen gives its electron to Mn(+7) changing in Mn(+6)

D. none is correct explanation

Answer: C

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92. In which of the following complex ion the value of magnetic moment (spin only) is $\sqrt{3}$B.M. and oute rd-orbitals is used in hybridization:

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

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

C. $\left[CuCl_5\right]^{2-}$

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

Answer: A

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93. Which of the following order of CFSE is incorrect?

A. $\left[Co(en)_3\right]^{3+} > \left[Co\left(NH_3\right)_6\right]^{3+} > \left[Co\left(H_2O\right)_6\right]^{3+}$

B. $\left[PtCl_4\right]^{2-} > \left[PdCl_4\right]^{2-} > \left[NiCl_4\right]^{2-}$

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

D. $\left[Co(ox)_3\right]^{3-} < \left[Co(en)_3\right]^{3+}$

Answer: B

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94. For which of the following d^n configuration of octahedral complex(es), cannot exist in both high spin and low spin forms?

A. I, II & III

B. II, III & IV

C. I & IV

D. none of these

Answer: B

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95. Consider the following: $\left[Co\left(CO_3\right)\left(NH_3\right)_5\right]ClO_4$

mark the correct option:

A. 6,3,6

B. 6,2,7

C. 5,3,6

D. 5,3,7

Answer: A

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96. The π acid ligand which uses it d-orbital during synergic bonding in its complex compound.

A. CN^-

B. PR_3

C. NO

D. N_2

Answer: C

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97. The IR stretching frequencies of free CO, and CO in $\left[V(CO)_6\right]^-$, $\left[Cr(CO)_6\right]$ and $\left[Mn(CO)_6\right]^+$ are 2143 $cm^{-1}, 1860cm^{-1}\Big)$, $2000cm^{-1}$ and $2090cm^{-1}$, respectively. Then correct statemet about metal carbonyl is:

A. C-O' bond is strongest in the cation and weakest in the anion.

B. C-O' bond is weakest in the cation and strongest in the anion

C. C-O' bond is longer in the cation than in the anion

D. M-C' pi bonding is higher in the cation

Answer: B

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98. The π acid ligand which uses it d-orbital during synergic bonding in its complex compound.

A. NO^{+}

B. PR_3

C. C_6H_6

D. CO

Answer: A

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99. Correct sequence of CO bond order in given compounds is:

(P) $Fe(CO)_5$

(Q) CO

(R) $H_3B \leftarrow CO$

(S) $\left[Mn(CO)_5\right]^-$

A. $P > R > S > Q$

B. SgtPgtRgtQ

C. QgtSgtPgtR

D. RgtQgtPgtS

Answer: B

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100. Select correct statement(s) regarding $\left[Ni(DMG)_2\right]$ complex compound:

A. it acts as oxidinsing agnet because Ni^{2+} cation is having E.A.N. 34.

B. It is extra stabilized by hydrogen bonding

C. It's IUPAC name is Bis(dimethylyoximato)nickelate(II)

D. It's ligand contains two different donar sites

Answer: C

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101. In which of the following ion the value of magentic moment (spin only) is $\sqrt{3}$ BM and outer d-orbitals is used in hybridization.

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

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

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

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

Answer: D

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102. The inner orbital complex which exhibits both geometrical as well as optical isomerism.

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

B. $\left[IrF_3\left(H_2O\right)_2\left(NH_3\right)\right]$

C. $\left[NiCl_2(en)_2\right]$

D. $\left[Co(CN)_2(ox)_2\right]^{3-}$

Answer: D

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103. Select correct statement(s) regarding $\left[Ni(DMG)_2\right]$ complex compound:

A. It acts as oxidising agent because Ni^{2+} cation is having EAN 34.

B. It is extra-stabilized byhydrogenn bonding

C. It's IUPAC name is Bis(dimethylglyoximato) nickelate (II)

D. It's ligand contains two different donar sites

Answer: D

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104. Which of the following correctly matched?

A. $\left[Fe(CN)_6\right]^{4-}$ and $\left[Fe(CN)_6\right]^{3-}$-both are octahedral and diamagnetic with d^2sp^3. Hybridisation.

B. $Ni(CO)_4$ and $\left[Ni(CN)_4\right]^{2-}$-both are tetrahedral and diamagnetic with sp^3-hybridisation

C. $Ni(CO)_4$ and $\left[Co(CO)_4\right]^{-}$-both are tetrahedral and diamagnetic

D. $\left[Co\left(H_2O\right)_6\right]^{3+}$ and $\left[Cr\left(H_2O\right)_6\right]^{3+}$-both are paramagnetic annd metal is d^2sp^3-hybridised

Answer: C

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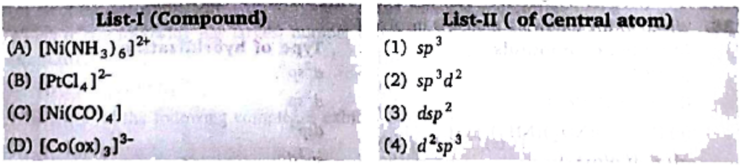
105. Match List-I and Li-st II and select the correct answer using the codes given below the slits:



List-I (Compound)	List-II (of Central atom)
(A) $[Ni(NH_3)_6]^{2+}$	(1) sp^3
(B) $[PtCl_4]^{2-}$	(2) sp^3d^2
(C) $[Ni(CO)_4]$	(3) dsp^2
(D) $[Co(ox)_3]^{3-}$	(4) d^2sp^3

A. A-2,B-1,C-3,D-4

B. A-2,B-3,C-1,D-4

C. A-4,B-1,C-3,D-2

D. A-4,B-3,C-1,D-2

Answer: A

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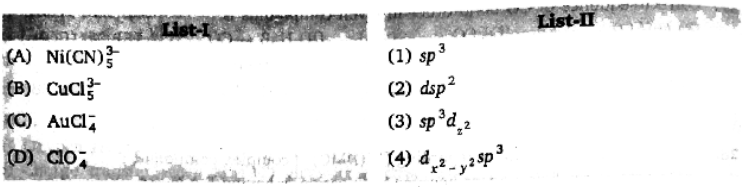
106. Match List-I and Li-st II and select the correct answer using the codes given below the slits:



List-I	List-II
(A) $Ni(CN)_5^{3-}$	(1) sp^3
(B) $CuCl_5^{3-}$	(2) dsp^2
(C) $AuCl_4^-$	(3) $sp^3d_{z^2}$
(D) ClO_4^-	(4) $d_{x^2-y^2}sp^3$

A. A-1,B-3,C-2,D-4

B. A-3,B-4,C-2,D-1

C. A-4,B-2,C-1,D-3

D. A-4,B-3,C-2,D-1

Answer: A

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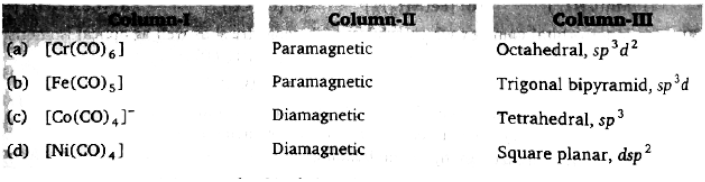
107. Which of the following is correct matched?



Column-I	Column-II	Column-III
(a) $[Cr(CO)_6]$	Paramagnetic	Octahedral, sp^3d^2
(b) $[Fe(CO)_5]$	Paramagnetic	Trigonal bipyramid, sp^3d
(c) $[Co(CO)_4]^-$	Diamagnetic	Tetrahedral, sp^3
(d) $[Ni(CO)_4]$	Diamagnetic	Square planar, dsp^2

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108. The hybridization of the complex $\left[CrCl_2\left(NO_2\right)_2\left(NH_3\right)_2\right]^-$ is:

A. sp^3d^2

B. d^2sp^3

C. sp^3d

D. cannot be predicted

Answer: C

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109. Which of the following statement is not true for the reaction given below:

$$\left[Cu\left(H_2O\right)_4\right]^{2+} + 4NH_4 \Leftrightarrow \left[Cu\left(NH_3\right)_4\right]^{2+} + 4H_2O$$

A. It is ligand substitution reaction

B. NH_3 is a relatively strong field ligand while H_2O is a weak field ligand

C. During the reaction, there is a change in colour from light blue to dark blue

D. $\left[Cu\left(NH_3\right)_4\right]^{2+}$, has a tetrahedral structure and is paramagnetic

Answer: B

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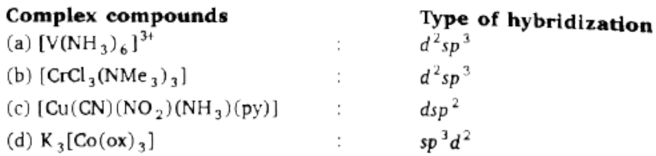
110. Which of the following match is incorrect?



Complex compounds		Type of hybridization
(a) $[V(NH_3)_6]^{3+}$	:	d^2sp^3
(b) $[CrCl_3(NMe_3)_3]$	:	d^2sp^3
(c) $[Cu(CN)(NO_2)(NH_3)(py)]$	:	dsp^2
(d) $K_3[Co(ox)_3]$	:	sp^3d^2

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111. Select the correct code of TRUE and FALSE for given statements:

(a) Peroxide ion as well as dioxygen molecule both are paramagnetic species

(b) In set of isomers, $\left[Cr\left(H_2O\right)_6\right]Cl_3$ and $\left[CrCl\left(H_2O\right)_5\right]Cl_2 \cdot H_2O$, both compounds can easily loose water molecule on treatment with conc. H_2SO_4

(c) During transformation $NO \rightarrow NO^+$, bond length and magnetic behaviour decreases

(d) An ether is more volatile than alcohol both having same molecular formula

A. FFTT

B. FTFT

C. FTTT

D. TFFT

Answer: D

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112. The total possible coordination isomers for the following compounds respectively are :

$$\left[Co(en)_3\right]\left[Cr\left(C_2O_4\right)_3\right]$$

$$\left[Cu\left(NH_3\right)_4\right]\left[CuCl_4\right]$$

$$\left[Ni(en)_3\right]\left[Co\left(NO_2\right)_6\right]$$

A. 4,4,4

B. 2,2,2

C. 2,2,4

D. 4,2,3

Answer: D

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113. Select the incorrect match:

A. $\left[Co\left(NO_2\right)\left(H_{20O}(en)_2\right]Cl_2, \left[CoCl\left(NO_2\right)(en)_2\right]Cl \cdot H_2O$: Hydrate isomerism

B. $\left[Cu\left(NH_3\right)_4\right]\left[PtCl_4\right], \left[CuCl\left(NH_3\right)_3\right][\}tCl_3\left(NH_3\right)\Big]$: Co-ordinatino isomersm

C. $\left[Ni(CN)\left(H_2O\right)\left(NH_3\right)_4\right]Cl, \left[NiCl\left(H_2O\right)\left(NH_3\right)_4\right]CN$: Ionization isomerism

D. $\left[Cr\left(NO_2\right)\left(NH_3\right)_5\right]\left[ZnCl_4\right], \left[Cr\left(NO_3\right)\left(NH_3\right)_5\right]\left[ZnCl_4\right]$: Linkage isomerism

Answer: A

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114. Select incorrect statement about complex $\left[Cr\left(NO_2\right)\left(NH_3\right)_5\right]\left[Zn(SCN)_4\right]$:

A. It shows co-ordination isomersm

B. it shows optical activity

C. It shows linkage isomerism

D. IUPAC name of the compound is pentaaminenitrito-N-chromium(III) tetrathiocyanato-S-zincate(II)

Answer: C

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115. The magnetic property, dipole moment, plane of symmetry, colour and absorption band cann be helpful in structure elucidation of complex compounds:

Q. Complex compound() having even number of space (stereo) isomers is/are: (Where AA-symmetrical bidentate ligand ad a,b,c,d,e-monodentate ligands)

A. $\left[M(AA)_2b_2\right]^{n\pm}$

B. $\left[Ma_3b_3\right]n^{\pm}$

C. $\left[Ma_3bdc\right]^{n\pm}$

D. $\left[Ma_2bcde\right]^{n\pm}$

Answer: C

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116. Which of the following isomerism is not possible for complexes having molecular formulae?

(I) $Pt(SCN)_2 \cdot 3PEt_3$,

(II) $CoBr \cdot SO_4 \cdot 5NH_3$

(III) $FeCl_2 \cdot 6H_2O$

A. Optical

B. Linkage

C. Ionisation

D. Hydrate

Answer: D

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117. Unmatched characteristic of complex $\left[PdCl_2\left(H_2O\right)_2\left(NH_3\right)_2\right]^{2+}$ is:

A. Diamagnetic

B. Low spin

C. Geometrical isomerism

D. Fac. And Mer. Form

Answer: D

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

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

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

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

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

Answer: A

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119. Which one of the following complexes does not exhibit chirality?

A. $\left[Cr(ox)_3\right]^3$

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

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

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

Answer: C

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120. Consider the following isomerism:

(i) Ionization

(ii) Hydrate

(iii) Coordination

(iv) Geometrical

(v) Optical

Which of the above isomerism are exhibited by $\left[Cr\left(NH_3\right)_2(O)_2Cl_2\right]^-$?

A. (i) and (v)

B. (ii) and (iii)

C. (iii), (ii) and (i)

D. (iv) and (v)

Answer: C

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121. Which complex is likely to show optical activity?

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

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

C. cis-$\left[Co\left(NH_3\right)_2(en)_2\right]$

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

Answer: A

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122. Which of the following statement is true?

A. In $\left[PtCl_2\left(NH_3\right)_2\right]^{2+}$ the cis form is optically inactive while trans form is optically active

B. In $\left[Fe\left(C_2O_4\right)_3\right]^{3-}$, geometrical isomerism does not exist while optical isomerism exists

C. In Mabcd, square planar complexes show both optical as well as geometrical isomerism

D. In Mabcd tetrahedral compoex, optical isomerism cannot be observed

Answer: C

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123. The following complexes are given:

(1) trans-$\left[Co\left(NH_3\right)_4Cl_2\right]^+$

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

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

(4) $NiCl_4^{2-}$

(5) TiF_6^{2-}

(6) CoF_6^{3-}

Choose the correct code:

A. (1), (2) are optically active, (3) is optically inactive

B. (2) is optically active, (1), (3) are optically inactive

C. (4),(5) are coloured and (6) is colourless

D. (4) is coloured and (5), (6) are colourless

Answer: D

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124. Which of the following can show geometrical isomerism?

A. $\left[Pt\left(NH_2 - C \mid CH_3H - C \mid CH_3H - NH_2\right)_2\right]^{2+}$

B. $\left[Co(en)_2NH_3Cl\right]^{2+}$

C. Both (a) and (b)

D. none of these

Answer: A

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125. Which of the following complex compound exhibits cis-trans isomerism?

A. [CoCl(NH_(3))_(4)(H_(2)O)]`

B. $\left[CoCl_3\left(NH_3\right)_3\right]$

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

D. All of these

Answer: C

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126. Which of the following will have three stereoisomeric forms?

(i) $\left[Cr\left(NO_3\right)_3\left(NH_3\right)_3\right]$

(ii) $K_3\left[Co\left(C_2O_4\right)_3\right]$

(iii) $K_3\left[CoCl_2\left(C_2O_4\right)_2\right]$

(iv) $\left[CoBrCl(en)_2\right]$

A. (iii) and (iv)

B. (i), (iii) and (iv)

C. (iv) only

D. all four

Answer: C

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127. A coordination complex of type MX_2Y_2 (M-metal ion: X, Y-monodentate lingads), can have either a tetrahedral or a square planar geometry. The maximum number of posible isomers in these two cases are respectively:

A. 1 and 2

B. 2 and 1

C. 1 and 3

D. 3 and 2

Answer: A

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128. The ratio of cis and trans-isomers of the complex $\left[Ma_2bcde\right]^{n\pm}$ is:

A. $5:3$

B. $2:1$

C. $7:3$

D. $3:1$

Answer: B

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129. $\left[PdCl_2(PMe_3)_2\right]$ is a diamagnetic complex of $Pd(II)$. How many total isomers are possible of analogous paramagnetic complex of $Ni(II)$?

A. zero

B. 1

C. 2

D. 3

Answer: B

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130. Complex compounds(s) which is optical active and does ot dpeend upon the orientation of the ligands around metal cation:

(i) $\left[CoCl_3(NH_3)_3\right]$

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

(iii) $\left[Co\left(C_2O_4\right)_2\left(NH_3\right)_2\right]^-$

(iv) $\left[CrCl_2\left(NH_3\right)_2(en)\right]^+$

A. (ii), (iii) and (iv)

B. (i), (ii) and (iv)

C. (ii) and (iv)

D. only (ii)

Answer: A

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131. Choose the correct code regarding, possible number of geometrical isomers exhibited by following complexes:

(I) $\left[CrCl_2\left(NO_2\right)_2\left(NH_3\right)_2\right]^-$

(II) $\left[Co\left(NO_2\right)_3\left(NH_3\right)_3\right]$

(III) $\left[PtCl\left(NO_2\right)\left(NH_3\right)(py)\right]$

(IV) $[PtBrCl(en)]$

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

B. (I)-5,(II)-2,(III)-4,(IV)-0

C. (I)-3,(II)-2,(III)-0,(IV)-1

D. (I)-5,(II)-2,(III)-3,(IV)-0

Answer: C

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132. How many geometrical isomers are possible for complex $\left[Mab(AB)_2\right]^{n\pm}$?

A. 5

B. 4

C. 3

D. 6

Answer: A

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133. $\left[CoCl_2(NH_3)_4\right]^+ + Cl^- \rightarrow \left[CoCl_3(NH_3)_3\right] + NH_3$. If in this reaction two isomers of the produt are obtained, which is true for the iniital (reactant) complex:

A. compound is in cis-form

B. compound is in trans-form

C. compound is in both (cis and trans)

D. can't be predicted

Answer: B

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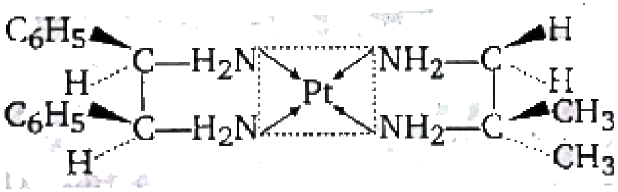
134. Select the correct statement about given square planar complex.



A. It has no geometrical isomer

B. it is optically active because it does not have plane of symmetry

C. it is optically inactive because square planar complex have plane of symmetry

D. it is optically active because it has symmetric carbon

Answer: D

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135. Select the correct code regarding total number of space isomers for the following compounds:

(I) $\left[Ma_3b_2c\right]^{n\pm}$

(II) $\left[M(AB)_3\right]^{n\pm}$

(III) $\left[Ma_2b_2c_2\right]^{n\pm}$

A. (I)-4,(II)-4,(III)-6

B. (I)-4,(II)-3,(III)-5

C. (I)-3,(II)-3,(III)-5

D. (I)-3,(II)-4,(III)-6

Answer: D

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136. How many geometrical isomerms are possible or

$\left[Pd^{2+}\left(NH_2-CH\left(CH_3\right)-CO_2^-\right)_2\right]$

A. 2

B. 3

C. 5

D. 6

Answer: C

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137. How many geometrical isomers are possible $\left[Co(acac)_2BrCl\right]^{\Theta}$ are:

A. 4

B. 3

C. 6

D. 2

Answer: D

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138. Which of the following complex compound exhibits geometrical isomerism?

A. $\left[Fe(DMG)_2\right]$

B. $\left[Be(gly)_2\right]$

C. $[PdClBr(gly)]$

D. $\left[Cd\left(NH_3\right)Cl(gly)\right]$

Answer: C

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139. In which case racemic mixture is obtained on mixing its mirror images (d & l form) is 1:1 molar ratio:

A. trans-$\left[Co(gly)_3\right]$

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

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

D. $[Zn(en)(gly)]^+$

Answer: A

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140. Which of the following compound show optical isomerism?

A. cis-$\left[CrCl_3\left(NHl_3\right)_3\right]$

B. cis-$\left[Co\left(NH_3\right)_4Cl_2\right]^+$

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

D. trans-$\left[Co(en)_2Cl_2\right]^+$

Answer: B

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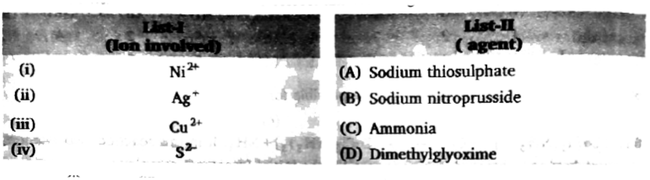
141. Match List-II with List-II and select the correct answer using the codes given below:



	List-I (Ion involved)	List-II (agent)
(i)	Ni^{2+}	(A) Sodium thiosulphate
(ii)	Ag^{+}	(B) Sodium nitroprusside
(iii)	Cu^{2+}	(C) Ammonia
(iv)	S^{2-}	(D) Dimethylglyoxime

A. (i)-C,(ii)-A,(iii)-D,(iv)-B

B. (i)-D,(ii)-C,(iii)-A,(iv)-B

C. (i)-D,(ii)-C,(iii)-B,(iv)-A

D. (i)-D,(ii)-A,(iii)-C,(iv)-B

Answer: A

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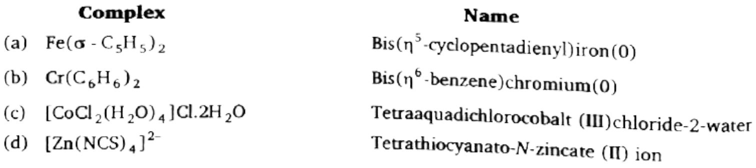
142. A complex whose IUPAC name is not correctly writtein is:



	Complex	Name
(a)	$Fe(\sigma - C_5H_5)_2$	Bis(η^5-cyclopentadienyl)iron(0)
(b)	$Cr(C_6H_6)_2$	Bis(η^6-benzene)chromium(0)
(c)	$[CoCl_2(H_2O)_4]Cl.2H_2O$	Tetraaquadichlorocobalt (III)chloride-2-water
(d)	$[Zn(NCS)_4]^{2-}$	Tetrathiocyanato-*N*-zincate (II) ion

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143. Which of the following is correct IUPAC name of any compolex compound?

A. Tris(acetylacetonato)iron(III)chloride

B. Heachloroplatinum(IV)tetraammine dicyano platinate(IV)

C. Ammine bromochloro methylamine platinum(II)

D. cis-dichloro (ethylenediamine) platinum (II)

Answer: D

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144. Find out correct IUPAC name of complex compound

A. Triamminetricyanidochromium(III)hexanitrito-N-irridate(III)

B. Pentaamminecyanidochromium(III)hexanitrito-N-irridium(III)

C. Hexanitrito-N-irridium(III)pentaamminecyanidochromate(II)

D. Pentaamminecyanidochromium(III)hexanitrito-n-irridate(III)

Answer: A

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LEVEL 3 (PASSAGE TYPE)

1. Magnetic moment, ionic conductance and colligative properties are useful in deciding structure/constitution of a given unknown complex compound.

Q. if molar conductivity of complex is almost equal to that of NaCl and it does not exhibits stereioisomerism then the complex will be:

A. $\left[Co\left(CO_3\right)(en)_2\right]Br$

B. $\left[Co\left(CO_3\right)\left(H_2O\right)_2\left(NH_3\right)_2\right]Br$

C. $\left[Co(CN)\left(NH_3\right)_5\right]Br_2$

D. $\left[Co\left(CO_3\right)\left(NH_3\right)_4\right]Br$

Answer: D

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2. Magnetic moment, ionic conductance and colligative properties are useful in deciding structure/constitution of a given unknown complex compound.

Q. A metal M having elecftronic configuration $(n-1)d^8ns^2$ forms complexes with co-ordination No.=4 and 6, if it forms diamagnetic complexes then permissible oxidation states of metal cation and geometry is:

A. $+2$, octahedral

B. $+4$, octahedral

C. $+2$, square planar

D. (b) and (c) both

Answer: D

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3. Magnetic moment, ionic conductance and colligative properties are useful in deciding structure/constitution of a given unknown complex compound.

Q. The cyano complex that exhibit highest value of paramagnetism is:

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

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

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

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

Answer: D

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4. The crystal field theory assumes interaction between metal ion and the ligands as a purely electrostatic and ligands are supposed to be point charges.

Q. Which of the following order of CFSE in incorrect?

A. $\left[Cr\left(NO_2\right)_6\right]^{3-} > \left[Cr\left(NH_3\right)_6\right]^{3+} > \left[Cr\left(H_2O\right)_6\right]^{3+}$

B. $\left[PtF_4\right]^{2-} > \left[PdF_4\right]^{2-} > \left[NiF_4\right]^{2-}$

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

D. $[Co(EDTA)]^{-} > \left[Co(en)_3\right]^{3+}$

Answer: C

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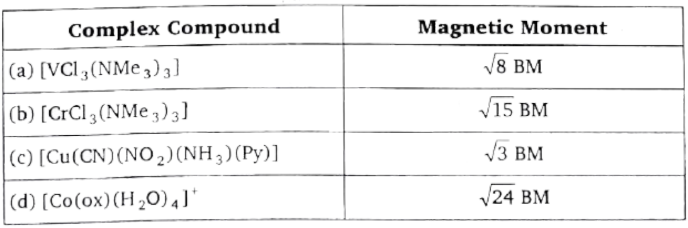
5. The crystal field theory assumes interaction between metal ion and the ligands as a purely electrostatic and ligands are supposed to be point charges.

Q. Which of the following match are incorrect?



Complex Compound	**Magnetic Moment**
(a) $[VCl_3(NMe_3)_3]$	$\sqrt{8}$ BM
(b) $[CrCl_3(NMe_3)_3]$	$\sqrt{15}$ BM
(c) $[Cu(CN)(NO_2)(NH_3)(Py)]$	$\sqrt{3}$ BM
(d) $[Co(ox)(H_2O)_4]^+$	$\sqrt{24}$ BM

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6. The crystal field theory assumes interaction between metal ion and the ligands as a purely electrostatic and ligands are supposed to be point charges.

Q. Amongst the following complexes which has square planar geometry?

A. $\left[RhCl(CO)\left(PPh_3\right)_2\right]$

B. $K_2[Cu(SCN)_4]$

C. $K_2[Ni(PPH_3)_2Cl_2]$

D. MnO_4^{2-}

Answer: A

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7. The magnetic property, dipole moment, plane of symmetry, colour and absorption band cann be helpful in structure elucidation of complex compounds:

Q. Which of the following complex ion is expected to absorb light in 4000 Å to 7800 Å region?

A. $[Ti(en)_3]^{4+}$

B. $[Cr(H_2O)_6]^{3+}$

C. $[Sc(NH_3)_4(H_2O)_2]^{3+}$

D. $Zn(en)_2(NH_3)_2]^{2+}$

Answer: B

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8. The magnetic property, dipole moment, plane of symmetry, colour and absorption band cann be helpful in structure elucidation of complex compounds:

Q. Compound 'x' has molecular formula $CrCl_2Br \cdot 6H_2O$ can show type of isomerism.

(i) hydrate isomerism

(ii) ionization isomerism

(iii) geometrical isomerism

(iv) optical isomerism

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

B. (i) and (ii) only

C. (i), (ii), (iii) and (iv)

D. (i) and (iii) only

Answer: A

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9. The magnetic property, dipole moment, plane of symmetry, colour and absorption band cann be helpful in structure elucidation of complex compounds:

Q. Complex compound() having even number of space (stereo) isomers is/are: (Where AA-symmetrical bidentate ligand ad a,b,c,d,e-monodentate ligands)

A. $\left[M(AA)_2b_2\right]^{n\pm}$

B. $\left[Ma_3b_3\right]n^{\pm}$

C. $\left[Ma_3bcd\right]^{n\pm}$

D. $\left[Ma_2bcde\right]^{n\pm}$

Answer: B

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10. Ligands are broadly classified into two classes classical and non-classical ligands, depending on their donor annd acceptor ability. Classical ligands form classical complexes while non-classical ligands form non-classical complex. Bonding mechanism in non-classical is called synergic bonding.

Q. Synergic bonding is absent in:

A. $\left[Mo(CO)_6\right]$

B. $\left[Cr(CO)_3\left(B_3N_3H_6\right]\right.$

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

D. $\left[Ni(CN)_4\right]^{4-}$

Answer: C

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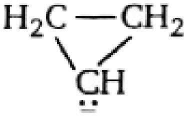
11. Ligands are broadly classified into two classes classical and non-classical ligands, depending on their donor annd acceptor ability. Classical ligands form classical complexes while non-classical ligands form non-classical complex. Bonding mechanism in non-classical is called synergic bonding.

Q. Which is not π-acceptor ligand?

A. 

B. σ - $C_5H_5^-$

C. PH_3

D. B_(3)N_(3)H_(6)`

Answer: A

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12. Ligands are broadly classified into two classes classical and non-classical ligands, depending on their donor annd acceptor ability. Classical ligands form classical complexes while non-classical ligands form non-classical complex. Bonding mechanism in non-classical is called synergic bonding.

Q. In compound $\left[M(CO)_n\right]^x$, the correct match for highest 'M-C' bond length for given M, n and z respectively:

A. M-Cr, n-6, z-0

B. M-V, n-6, z- -1

C. M-Ti, n-6, z- -2

D. M-Mn, n-6, z- $+1$

Answer: D

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13. An isomerr of the complex $CoBrCl_2(en)_2\left(H_2O\right)$, on reaction with concentrated H_2SO_4 (dehydrating agent), suffers no loss in weight and on reaction with $AgNO_3$ solution it gives only white precipitate, which is soluble in NH_3 solution.

Q. The incorrect statement about complex is:

A. It can show geometrical isomerism

B. cis isomer is optically active

C. Trans isomer is optically active

D. it can exhibit solvate isomerism

Answer: C

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14. An isomerr of the complex $CoBrCl_2(en)_2\left(H_2O\right)$, on reaction with concentrated H_2SO_4 (dehydrating agent), suffers no loss in weight and on reaction with $AgNO_3$ solution it gives only white precipitate, which is soluble in NH_3 solution.

Q. The correct formula of the complex is:

A. $\left[CoBrH_2O(en)_2\right]Cl_2$

B. $\left[CoCl(en)_2H_2O\right]BrCl$

C. $\left[CoBrCl(en)_2\right]Cl \cdot H_2O$

D. $\left[CoCl_2(en)_2\right]Br \cdot H_2O$

Answer: A

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15. Crystal field theory provides correct electronic distribution of central metal under surrounding ligannd field, hence it clearly explains magnetic moment, colour of a complex.

Q. Which of the following complex is high spin?

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

B. $\left[PtCl_4\right]^{2-}$

C. $\left[CoF_6\right]^{3-}$

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

Answer: C

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16. Crystal field theory provides correct electronic distribution of central metal under surrounding ligannd field, hence it clearly explains magnetic moment, colour of a complex.

Q. In which of the following complex transition of electron occurs from one shell to other shell of central metal.

A. $\left[Fe\left(H_2O\right)_5(NO)\right]^{2+}$

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

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

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

Answer: C

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17. Crystal field theory provides correct electronic distribution of central metal under surrounding ligannd field, hence it clearly explains magnetic moment, colour of a complex.

Q. Which of the following hydrated complex ion has high intensity colour in aqueous solution.

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

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

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

D. $\left[Mn\left(H_{20O}-(6)\right]^{2+}$

Answer: A

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18. Two important physical evidence support the synergic bonding in non-classical complexes-bond lengths and vibrational spectra. Vibrational spectra is based on the fact that the compression and extension of a bond may be analogous to the behaviour of spring and obeys Hooke's law.

$\bar{v} = \frac{1}{2\pi c}\sqrt{\frac{K}{\mu}} cm^{-1}$ Where, K=force constant of the bond which is directly proportional to bond strngth

μ = reduced mass of ligand

$\bar{v}$ = stretching frequency of the CO bond

C = velocity of light

In which of the following complex, stretching frquency for C-O bond is least as well as bond energy of M-C bond is highest ?

A. (dien) $Mo(CO)_3$

B. $\left(Et_3P\right)_3 Mo(CO)_3$

C. $\left(F_3P\right)_3 Mo(CO)_3$

D. $\left(Cl_3P\right)_3 Mo(CO)_3$

Answer: A

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19. Two important physical evidences supporting the synergic bonding in non-classical complexes are bond lengths and vibrational spectra. Vibrational spectra is based on the fact that the compression and extension of a bond may be analogous to the behaviour of a spring and obeys Hook's law.

$$\bar{v} = \frac{1}{2\pi c}\sqrt{\frac{k}{\mu}}cm^{-1}$$

where, k=force force constant of the bond which is directly proportional to bonnd strength of CO μ = reduced mass of ligand

$\bar{v}$=stretching frequency of the CO bond

c=velocity of light

Q. In $Mn_2(CO)_{10}$ carbonyl complex, the d-orbital of Mn-atom which can not be involved in synergic bonding betwee Mn and CO ligands:

A. d_{xz}

B. d_{xy}

C. d_{yz}

D. none of these

Answer: B

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20. Two important physical evidences supporting the synergic bonding in non-classical complexes are bond lengths and vibrational spectra. Vibrational spectra is based on the fact that the compression and extension of a bond may be analogous to the behaviour of a spring and obeys Hook's law.

$$\bar{v} = \frac{1}{2\pi c}\sqrt{\frac{k}{\mu}}cm^{-1}$$

where, k=force force constant of the bond which is directly proportional to bonnd strength of CO μ = reduced mass of ligand

$\bar{v}$=stretching frequency of the CO bond

c=velocity of light

Q. In which of the following ligand, σ-bond order does not change during synergic bonding in their respective complexes:

A. CO

B. N_2

C. $CH_2 = CH_2$

D. PEt_3

Answer: D

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21. Complex compounds that have the same molecular formula but have different structural/space arrangements of ligands around central metal atom/ion are called isomers, these are of two types namely structural and stereoisomers.

Q. Which of the following is different among structural isomers?

A. Oxidation state

B. Co-ordination number

C. IUPAC name

D. None of these

Answer: C

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22. Complex compounds that have the same molecular formula but have different structural/space arrangements of ligands around central metal atom/ion are called isomers, these are of two types namely structural and stereoisomers.

Q. Type of isomerism exhibited by $\left[CrCl_2(NO)_2\right)_2\left(NH_3\right)_2]^-$ complex ion are:

A. ionisation optical

B. hydrate, optical

C. geometrical, opticl

D. co-ordinate, geometrical

Answer: C

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23. Complex compounds that have the same molecular formula but have different structural/space arrangements of ligands around central metal atom/ion are called isomers, these are of two types namely structural and stereoisomers.

Q. Complex species that exhibits isomerism is:

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

B. $\left[Co\left(NO_2\right)\left(NH_3\right)_5\right]^{2+}$

C. $\left[PtCl_2(en)\right]$

D. $\left[CoCl\left(NH_3\right)_5\right]^{2-}$

Answer: B

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24. A complex compound of chromium chromium contains five NH_3 molecules, one nitro group and two chloride ions for one Cr^{3+} cation. One molecule of this compound produces three ions in aq. Solution, on reacting with excess of $AgNO_3$ solution, two moles of $AgCl$ get precipitated ltBrgt Q. The formula of the complex compound is:

A. $\left[CrCl(NO_2)(NH_3)_4\right]NH_3 \cdot Cl$

B. $\left[CrCl(NH_3)_5\right]Cl \cdot NO_2$

C. $\left[Cr(NO_2)(NH_3)_5\right]Cl_2$

D. $\left[Cr(NH_3)_5\right]NO_2 \cdot Cl_2$

Answer: C

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25. A complex compound of chromium chromium contains five NH_3 molecules, one nitro group and two chloride ions for one Cr^{3+} cation. One molecule of this compound produces three ions in aq. Solution, on reacting with excess of $AgNO_3$ solution, two moles of $AgCl$ get precipitated

Q. The types of isomerism shown by the complex compound is:

A. geometrical, ionization

B. ionization, linkage

C. linkage, optical

D. geometrical, optical

Answer: B

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26. A complex compound of chromium chromium contains five NH_3 molecules, one nitro group and two chloride ions for one Cr^{3+} cation.

One molecule of this compound produces three ions in aq. Solution, on reacting with excess of $AgNO_3$ solution, two moles of $AgCl$ get precipitated

Q. Magnetic moment off complex compound is:

A. 0 BM

B. $\sqrt{24}$ BM

C. $\sqrt{15}$ BM

D. $\sqrt{3}$ BM

Answer: C

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27. According to C.F.T, attraction between the central metal ion and ligands in a complex is purely electrostatic. The transition metal which forms the central atom cation in the complex is regarded as a positive ion. It is surrounded by negative ligands or neutral molecules which have a lone apir of electrons, if the ligand is a neutral molecule such as NH_3, the negative and of the dipole in the molecule is directed towards the metal cation. the electrons on the central metal ion are under repulsive forces from those on the ligands. thus the electrons occupy the d-orbitals remain away from the direction of approach ligands. ltBrgt Q. Correct relationship between pairing energy (P) and C.F.S.E. $\left(\Delta_o\right)$ in

A. $\Delta_o < P$

B. $\Delta_o > P$

C. $\Delta_o = P$

D. cannot comment

Answer: B

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28. According to C.F.T, attraction between the central metal ion and ligands in a complex is purely electrostatic. The transition metal which forms the central atom cation in the complex is regarded as a positive ion. It is surrounded by negative ligands or neutral molecules which have a lone apir of electrons, if the ligand is a neutral molecule such as NH_3, the negative and of the dipole in the molecule is directed towards the metal cation. the electrons on the central metal ion are under repulsive forces from those on the ligands. thus the electrons occupy the d-orbitals remain away from the direction of approach ligands. ltBrgt Q. The crystal field-spliting order for Cr^{3+} cation is octahedral field for ligands $CH_3COO^-, NH_3, H_2O, CN^-$ is:

A. $CH_3COO^- < H_2O < NH_3 < CN^-$

B. $CH_3COO^- < NH_3 < H_2O < CN^-$

C. $H_2O < CH_3COO^- < NH_3 < CN^-$

D. $NH_3 < CH_3COO^- < H_2O < CN^-$

Answer: A

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29. According to C.F.T, attraction between the central metal ion and ligands in a complex is purely electrostatic. The transition metal which forms the central atom cation in the complex is regarded as a positive ion. It is surrounded by negative ligands or neutral molecules which have a lone apir of electrons, if the ligand is a neutral molecule such as NH_3, the negative and of the dipole in the molecule is directed towards the metal cation. the electrons on the central metal ion are under repulsive forces from those on the ligands. thus the electrons occupy the d-orbitals remain away from the direction of approach ligands. ltBrgt Q. The value of 'x' in the complex $H_x\left[Co(CO)_4\right]$ (on the basis of EAN rule), and geometry arround Co ion respectively is:

A. 1, square planar

B. 2, tetrahedral

C. 1, tetrahedral

D. 2, square planar

Answer: C

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30. An isomer of the complex $Co(en)_2(H_2O)ICl_2$, on reaction with concentrated H_2SO_4, it suffers loss in weight and on reaction with $AgNO_3$ solution gives a yellow precipitated which is isoluble in NH_3 solution.

Q. If all the ligandsin the co-ordination sphere of the above complex are replaced by CN^- ion, then the magnetic moment of the complex ion will be:

A. 0.0 BM

B. 5.9 BM

C. 4.9 BM

D. 1.73 BM

Answer: A

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31. An isomer of the complex $Co(en)_2(H_2O)ICl_2$, on reaction with concentrated H_2SO_4, it suffers loss in weight and on reaction with $AgNO_3$ solution gives a yellow precipitated which is isoluble in NH_3 solution.

Q. If one mole of original is treated with excess $Pb(NO_3)_2$ solution, then the number of moles of white precipitate formed will be

A. 2.0

B. 1.0

C. 0.0

D. 3.0

Answer: C

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32. An isomer of the complex $Co(en)_2\left(H_2O\right)ICl_2$, on reaction with concentrated H_2SO_4, it suffers loss in weight and on reaction with $AgNO_3$ solution gives a yellow precipitated which is isoluble in NH_3 solution.

Q. Total number of space isomers of the formula of the above complex is:

A. 2

B. 3

C. 4

D. 1

Answer: B

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33. In complexes off wea field ligands, $\Delta_o < P$ (pairing energy), the energy difference between t_{2g} and e_g sets is relatively less. Under the

unfluence of strong field ligands, $\Delta_O > p$ (Pairing energy), the energy difference between t_{2g} and e_g sets is relatively high.

Q. Which of the following is correct statement?

A. Complex $\left[Co\left(H_2O\right)_6\right]^{2+}$ is more stable than $\left[Co\left(H_2O\right)_6\right]^{3+}$

B. All compounds of $Ni(II)$ are bound to be outer-d-orbital complexes

C. Stability constant for $\left[Ni(en)_3\right]^{2+}$ is greater than stability constant for $\left[Ni\left(NH_3\right)_6\right]^{2+}$

D. Δ_{oct} for $\left[Cr\left(H_2O\right)_6\right]^{3+}$ is greater than Δ_{oct} for $\left[Cr\left(NH_3\right)_6\right]^{3+}$

Answer: C

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34. In complexes off wea field ligands, $\Delta_o < P$ (pairing energy), the energy difference between t_{2g} and e_g sets is relatively less. Under the unfluence of strong field ligands, $\Delta_O > p$ (Pairing energy), the energy difference between t_{2g} and e_g sets is relatively high.

Q. Select the correct increasing order of 10 Dq. value of chromium complexes:

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

(2) $\left[Cr(ox)_3\right]^{3-}$ ltBrgt (3) $\left[CrF_6\right]^{3-}$

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

A. $4 < 3 < 1 < 2$

B. $3 < 4 < 2 < 1$

C. $4 < 3 < 2 < 1$

D. $3 < 4 < 1 < 2$

Answer: B

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35. In complexes off wea field ligands, $\Delta_o < P$ (pairing energy), the energy difference between t_{2g} and e_g sets is relatively less. Under the unfluence of strong field ligands, $\Delta_O > p$ (Pairing energy), the energy difference between t_{2g} and e_g sets is relatively high.

Q. Select the correct statement regarding $\left[Cr(en)_2Cl_2\right]^+$ and $\left[Co\left(C_2O_4\right)_2\left(NH_3\right)_2\right]^-$ complex ions:

A. Both are equally stable complexes

B. Both have equal number of stereoisomers

C. Both are diamagnetic complexes

D. a and c both

Answer: B

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36. Complex compounds are molecular compounds which retain their identities even when dissolved in water. They do not give all the simple ions in solution but instead furnish complex ions. The complex compounds are often called coordination compounds because certain groups called ligands are attached to the central metal ion by coordinate or dative bonds. coordination compounds exhibit isomerism, both structural and stereoisomerism. the structure, magnetic property, colour and electrical properties of complexes are explained by various theories:

Q. Arrange the following compounds in order of their molar conductance:

(i) $K\left[Co\left(NO_2\right)_4\left(NH_3\right)_2\right]$

(ii) $\left[Cr(ONO)_3\left(NH_3\right)_2\right]$

(iii) $\left[Cr\left(NO_2\right)\left(NH_3\right)_5\right]_3\left[Co\left(NO_2\right)_6\right]_2$

(iv) $Mg\left[Cr\left(NO_2\right)_5\left(NH_3\right)\right]$

A. $(ii) < (i) < (iv) < (iii)$

B. $(i) < (ii) < (iii) < (iv)$

C. $(ii) < (i) < (iii) < (iv)$

D. $(iv) < (iii) < (ii) < (i)$

Answer: A

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37. Complex compounds are molecular compounds which retain their identities even when dissolved in water. They do not give all the simple ions in solution but instead furnish complex ions. The complex compounds are often called coordination compounds because certain groups called ligands are attached to the central metal ion by coordinate or dative bonds. coordination compounds exhibit isomerism, both structural and stereoisomerism. the structure, magnetic property, colour and electrical properties of complexes are explained by various theories:

Q. The oxidation number, coordination number and magnetic moment in the following complex is:

$$\left[Cr\left(C_2O_4\right)_2\left(NH_3\right)_2^-\right]$$

A. O.N.=+3,C.N.=6, M.M.=$\sqrt{15}BM$

B. O.N.=-1, C.N.=6, M.M.=$\sqrt{15}BM$

C. O.N.=+3, C.N.=6, M.M=$\sqrt{3}BM$

D. O.N.+3,C.N.=6, M.M.=$\sqrt{12}BM$

Answer: A

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38. Complex compounds are molecular compounds which retain their identities even when dissolved in water. They do not give all the simple ions in solution but instead furnish complex ions. The complex compounds are often called coordination compounds because certain groups called ligands are attached to the central metal ion by coordinate or dative bonds. coordination compounds exhibit isomerism, both structural and stereoisomerism. the structure, magnetic property, colour and electrical properties of complexes are explained by various theories:

Q. In which of the following pairs, both the complexes have the same geometry?

A. $\left[NiCl_4\right]^{2-}, \left[Ni(CN)_4\right]^{2-}$

B. $\left[CoF_6\right]^{3-}, \left[Co\left(NH_3\right)_6\right]^{3+}$

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

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

Answer: B

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39. Recent X-ray work, IR and other spectroscopic methods have proved that Turnbull's blue is identical to Prussian blue.

Q. What is the common formula of Turnbull's blue and Prussian blue?

A. $Fe_3\left[Fe(CN)_6\right]_2$

B. $Fe_4\left[Fe(CN)_6\right]_3$

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

D. $KFe_2\left[Fe(CN)_6\right]$

Answer: C

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40. Recent X-ray work, IR and other spectroscopic methods have proved that Turnbull's blue is identical to Prussian blue.

Q. Intense blue colour arises as a result of:

A. electron transfer between $Fe(II)$ and $Fe(I)$

B. electron transfer between Fe(II) and Fe(III)

C. d-d transition

D. spin magnetic moment

Answer: B

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41. On the basic of stability of complex ion in the solution, complexes may be of two types, perfect and imperfect complexes. The stability depends upon the extent of dissociation which in turn depends upon charge on central metal atom, basic nature of ligand, chelation, and nature of metal ion and ligand according to HSAB principle.

Qgt Which one of the following does not follow EAN rule?

A. $Fe(CO)_5$

B. $V(CO)_6$

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

D. $Mn_2(CO)_{10}$

Answer: B

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42. On the basic of stability of complex ion in the solution, complexes may be of two types, perfect and imperfect complexes. The stability depends upon the extent of dissociation which in turn depends upon charge on central metal atom, basic nature of ligand, chelation, and nature of metal ion and ligand according to HSAB principle.

Q Which complex is most stable?

A. $\left[Cu(CN)_2\right]^{-} K_d = 1 \times 10^{-16}$

B. $\left[Fe(CN)_6\right]^{4-} K_d = 1 \times 10^{-37}$

C. $\left[Fe(CN)_6\right]^{3-} K_d = 1 \times 10^{-44}$

D. $\left[Ag(CN)_2\right]^{-} K_d = 1 \times 10^{-20}$

Answer: C

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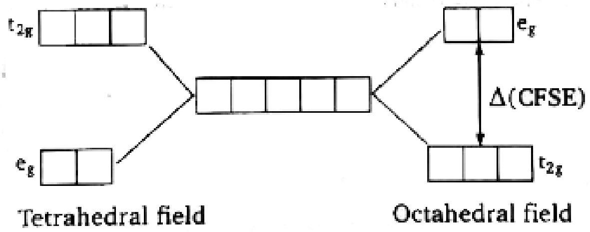
43. When degenerate d-orbitals of an isolated atom/ion come under influence of magnetic field of ligands, the degeneray is lost. The two set $t_{2g}\left(d_{xy}, d_{yz}, d_{xz}\right)$ and $e_g\left(d_{x^2} - d_{x^2-y^2}\right.$ are either stabilized or destabilized depending upon the nature of magnetic field. it can be expressed diagrammatically as:



Value of CFSE depends upon nature of ligand and a spectrochemical series has been made experimentally, for tetrahedral complexes, Δ is about 4/9 times to Δ_0 (CFSE for octahedral complex). this energy lies in visible region and i.e., why electronic transition are responsible for colour. such transition are not possible with d^0 and d^{10} configuration.

Q. The vlaue of CFSE $\left(\Delta_0\right)$ for completes given below follow the order,

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

(II) $\left[Rh\left(NH_3\right)_6\right]^{3+}$

(III) $\left[IR\left(NH_3\right)_6\right]^{3+}$

A. $I < II < III$

B. $I > II > III$

C. $I < II > III$

D. $I = II = III$

Answer: A

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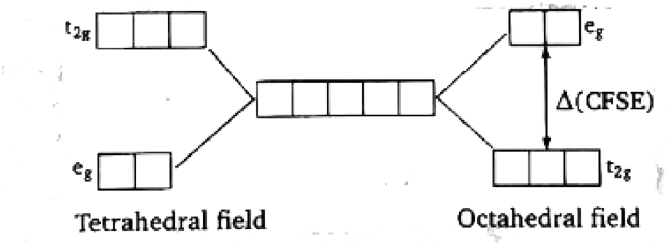
44. When degenerate d-orbitals of an isolated atom/ion come under influence of magnetic field of ligands, the degeneray is lost. The two set $t_{2g}\left(d_{xy}, d_{yz}, d_{xz}\right)$ and $e_g\left(d_{x^2} - d_{x^2-y^2}\right.$ are either stabilized or destabilized depending upon the nature of magnetic field. it can be expressed diagrammatically as:



Value of CFSE depends upon nature of ligand and a spectrochemical series has been made experimentally, for tetrahedral complexes, Δ is about 4/9 times to Δ_0 (CFSE for octahedral complex). this energy lies in visible region and i.e., why electronic transition are responsible for colour. such transition are not possible with d^0 and d^{10} configuration.

Q. Cr^{3+} form four complexes with four different ligands which are

$\left[Cr(Cl)_6\right]^{3-}$, $\left[Cr\left(H_2O\right)_6\right]^{3+}$, $\left[Cr\left(NH_3\right)_6\right]^{3+}$ and $\left[Cr(CN)_6\right]^{3-}$, the order of CFSE $\left(\Delta_0\right)$ in these complexes in the order:

A. $\left[CrCl_6\right]^{3-} = \left[Cr\left(H_2O\right)_6\right]^{3+} = \left[Cr\left(NH_3\right)_6\right]^{3+} = \left[Cr(CN)_6\right]^{3-}$

B. $\left[CrCl_6\right]^{3-} < \left[Cr\left(H_2O\right)_6\right]^{3+} < \left[Cr\left(NH_3\right)_6\right]^{3+} < \left[Cr(CN)_6\right]^{3-}$

C. $\left[CrCl_6\right]^{3-} > \left[Cr\left(H_2O\right)_6\right]^{3+} > \left[Cr\left(NH_3\right)_6\right]^{3+} > \left[Cr(CN)_6\right]^{3-}$

D. $\left[CrCl_6\right]^{3-} < \left[Cr\left(H_2O\right)_6\right]^{3+} = \left[Cr\left(NH_3\right)_6\right]^{3+} < \left[Cr(CN)_6\right]^{3-}$

Answer: B

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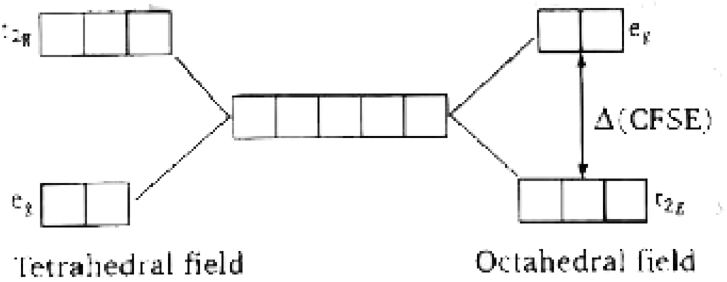
45. When degenerate d-orbitals of an isolated atom/ion come under influence of magnetic field of ligands, the degeneray is lost. The two set $t_{2g}\left(d_{xy}, d_{yz}, d_{xz}\right)$ and $e_g\left(d_{z^2} - d_{x^2-y^2}\right.$ are either stabilized or destabilized depending upon the nature of magnetic field. it can be expressed diagrammatically as:



Tetrahedral field Octahedral field

Value of CFSE depends upon nature of ligand and a spectrochemical series has been made experimentally, for tetrahedral complexes, Δ is about 4/9 times to Δ_0 (CFSE for octahedral complex). this energy lies in visible region and i.e., why electronic transition are responsible for colour. such transition are not possible with d^0 and d^{10} configuration.

Q. The d-orbitals, which are stabillized in an octahedral magnetic field, are:

A. d_{xy} and d_{x^2}

B. $d_{x^2-y^2}$ and d_{x^2}

C. d_{xy}, d_{xz} and d_{yz}

D. d_{x^2} only

Answer: C

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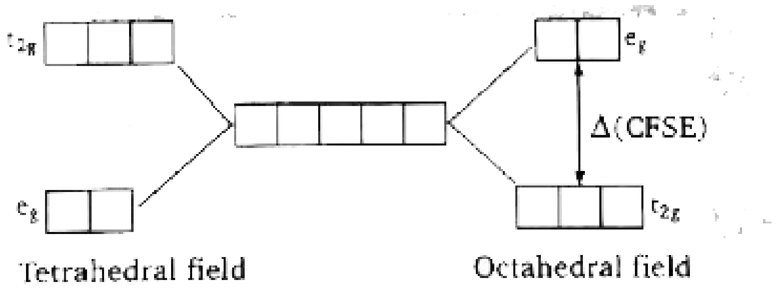
46. When degenerate d-orbitals of an isolated atom/ion come under influence of magnetic field of ligands, the degeneray is lost. The two set $t_{2g}\left(d_{xy}, d_{yz}, d_{xz}\right)$ and $e_g\left(d_{x^2} - d_{x^2-y^2}\right.$ are either stabilized or destabilized depending upon the nature of magnetic field. it can be expressed diagrammatically as:



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Q. For an octahedral complex, which of the followin d-electron configuration will give maximum CFSE?

A. High spin d^6

B. Low spin d^4

C. Low spin d^5

D. High spin d^7

Answer: C

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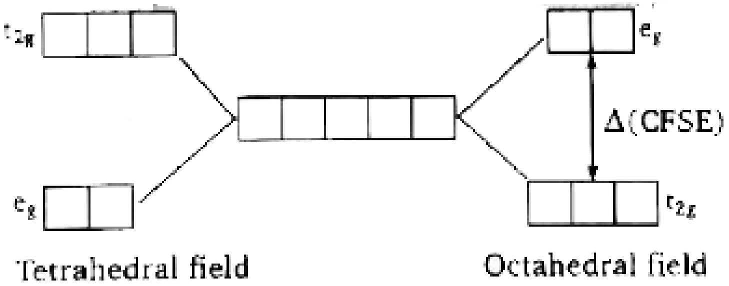
47. When degenerate d-orbitals of an isolated atom/ion come under influence of magnetic field of ligands, the degeneray is lost. The two set $t_{2g}\left(d_{xy}, d_{yz}, d_{xz}\right)$ and $e_g\left(d_{x^2} - d_{x^2-y^2}\right.$ are either stabilized or destabilized depending upon the nature of magnetic field. it can be expressed diagrammatically as:



Value of CFSE depends upon nature of ligand and a spectrochemical series has been made experimentally, for tetrahedral complexes, Δ is about 4/9 times to Δ_0 (CFSE for octahedral complex). this energy lies in visible region and i.e., why electronic transition are responsible for colour. such transition are not possible with d^0 and d^{10} configuration.

Q. $Ti^{3+}(aq)$. is purple while $Ti^{4+}(aq)$. is colourless because:

A. there is not crystal field effec in Ti^{4+}

B. The energy difference between t_{2g} and $e_g Ti^{4+}$ is quite high and does not fall in the visible region

C. Ti^{4+} has d^0 configuration

D. Ti^{4+} is very small in comparison to Ti^{3+} and hence does not absorb any radiation

Answer: C

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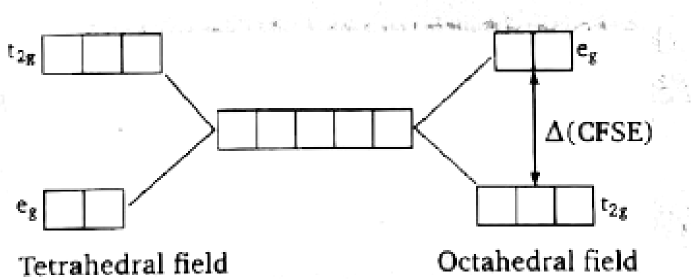
48. When degenerate d-orbitals of an isolated atom/ion come under influence of magnetic field of ligands, the degeneray is lost. The two set $t_{2g}\left(d_{xy}, d_{yz}, d_{xz}\right)$ and $e_g\left(d_{x^2} - d_{x^2-y^2}\right.$ are either stabilized or destabilized depending upon the nature of magnetic field. it can be expressed diagrammatically as:



Value of CFSE depends upon nature of ligand and a spectrochemical series has been made experimentally, for tetrahedral complexes, Δ is about 4/9 times to Δ_0 (CFSE for octahedral complex). this energy lies in visible region and i.e., why electronic transition are responsible for colour. such transition are not possible with d^0 and d^{10} configuration.

Q. Which of the following is correct arrangement of ligand in terms of the Dq values of their complexes with any particularr 'hard' metal ion:

A. $Cl^- < F^- < NCS^- < NH_3 < CN^-$

B. $NH_3 < F^- < Cl^- < NCS^- < CN^-$

C. $Cl^- < F^- < NCS^- < CN^- < NH_3$

D. $NH_3 < CN^- < NCS^- < Cl^- < F^-$

Answer: A

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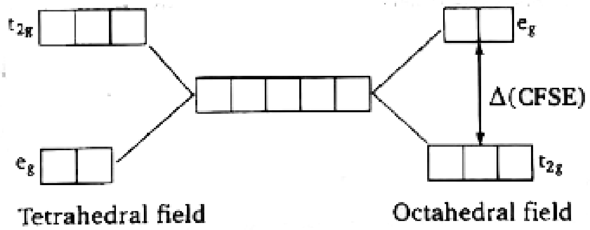
49. When degenerate d-orbitals of an isolated atom/ion come under influence of magnetic field of ligands, the degeneray is lost. The two set $t_{2g}\left(d_{xy}, d_{yz}, d_{xz}\right)$ and $e_g\left(d_{x^2} - d_{x^2-y^2}\right.$ are either stabilized or destabilized depending upon the nature of magnetic field. it can be expressed diagrammatically as:



Value of CFSE depends upon nature of ligand and a spectrochemical series has been made experimentally, for tetrahedral complexes, Δ is about 4/9 times to Δ_0 (CFSE for octahedral complex). this energy lies in visible region and i.e., why electronic transition are responsible for colour. such transition are not possible with d^0 and d^{10} configuration.

Q. The extent of crystal field splitting in octahedral complexes of the given metal with particular weak field ligand are:

A. $Fe(III) < Cr(III) < Rh(III) < Ir(III)$

B. $Cr(III) < Fe(III) < (Rh(III) < Ir(III)$

C. $Ir(III) < Rh(III) < Fe(III) < Cr(III)$

D. $Fe(III) = Cr(III) < Rh(III) < Ir(III)$

Answer: A

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50. Magnetic moment, ionic conductance and colligative properties are useful in deciding structure/constitution of a given unknown complex compound.

Q. if molar conductivity of complex is almost equal to that of NaCl and it does not exhibits stereioisomerism then the complex will be:

A. $\left[Co\left(CO_3\right)(en)_2\right]Br$

B. $\left[Co\left(CO_3\right)\left(H_2O\right)_2\left(NH_3\right)_2\right]Br$

C. $\left[Co(CN)\left(NH_3\right)_5\right]Br_2$

D. $\left[Co\left(CO_3\right)\left(NH_3\right)_4\right]Br$

Answer: D

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51. Magnetic moment, ionic conductance and colligative properties are useful in deciding structure/constitution of a given unknown complex compound.

Q. A metal M having elecftronic configuration $(n-1)d^8ns^2$ forms complexes with co-ordination No.=4 and 6, if it forms diamagnetic complexes then permissible oxidation states of metal cation and geometry is:

A. $+2$, octahedral

B. $+4$, octahedral

C. $+2$, square planar

D. (b) and (c) both

Answer: D

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52. Magnetic moment, ionic conductance and colligative properties are useful in deciding structure/constitution of a given unknown complex compound.

Q. The cyano complex that exhibit highest value of paramagnetism is:

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

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

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

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

Answer: D

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53. The crystal field theory assumes interaction between metal ion and the ligands as a purely electrostatic and ligands are supposed to be point charges.

Q. Which of the following order of CFSE in incorrect?

A. $\left[Cr\left(NO_2\right)_6\right]^{3-} > \left[Cr\left(NH_3\right)_6\right]^{3+} > \left[Cr\left(H_2O\right)_6\right]^{3+}$

B. $\left[PtF_4\right]^{2-} > \left[PdF_4\right]^{2-} > \left[NiF_4\right]^{2-}$

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

D. $[Co(EDTA)]^{-} > \left[Co(en)_3\right]^{3+}$

Answer: C

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54. The crystal field theory assumes interaction between metal ion and the ligands as a purely electrostatic and ligands are supposed to be point charges.

Q. Which of the following match are incorrect?

Complex Compound	Magnetic Moment
(a) $[VCl_3(NMe_3)_3]$	$\sqrt{8}$ BM
(b) $[CrCl_3(NMe_3)_3]$	$\sqrt{15}$ BM
(c) $[Cu(CN)(NO_2)(NH_3)(Py)]$	$\sqrt{3}$ BM
(d) $[Co(ox)(H_2O)_4]^+$	$\sqrt{24}$ BM

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55. The crystal field theory assumes interaction between metal ion and the ligands as a purely electrostatic and ligands are supposed to be point charges.

Q. Amongst the following complexes which has square planar geometry?

A. $\left[RhCl(CO)\left(PPh_3\right)_2\right]$

B. $K_2\left[Cu(SCN)_4\right]$

C. $K_2\left[Ni\left(PH_3\right)_2Cl_2\right]$

D. MnO_4^{2-}

Answer: A

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56. The magnetic property, dipole moment, plane of symmetry, colour and absorption band cann be helpful in structure elucidation of complex compounds:

Q. Which of the following complex ion is expected to absorb light in 4000 Å to 7800 Å region?

A. $\left[Ti(en)_3\right]^{4+}$

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

C. $\left[Sc\left(NH_3\right)_4\left(H_2O\right)_2\right]^{3+}$

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

Answer: B

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57. The magnetic property, dipole moment, plane of symmetry, colour and absorption band cann be helpful in structure elucidation of complex compounds:

Q. Compound 'x' has molecular formula $CrCl_2Br \cdot 6H_2O$ can show type of isomerism.

(i) hydrate isomerism

(ii) ionization isomerism

(iii) geometrical isomerism

(iv) optical isomerism

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

B. (i) and (ii) only

C. (i), (ii), (iii) and (iv)

D. (i) and (iii) only

Answer: A

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58. The magnetic property, dipole moment, plane of symmetry, colour and absorption band cann be helpful in structure elucidation of complex compounds:

Q. Complex compound() having even number of space (stereo) isomers is/are: (Where AA-symmetrical bidentate ligand ad a,b,c,d,e-monodentate ligands)

A. $\left[M(AA)_2b_2\right]^{n\pm}$

B. $\left[Ma_3b_3\right]n^{\pm}$

C. $\left[Ma_3bcd\right]^{n\pm}$

D. $\left[Ma_2bcde\right]^{n\pm}$

Answer: B

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59. Ligands are broadly classified into two classes classical and non-classical ligands, depending on their donor annd acceptor ability. Classical ligands form classical complexes while non-classical ligands form non-classical complex. Bonding mechanism in non-classical is called synergic bonding.

Q. Synergic bonding is absent in:

A. $\left[Mo(CO)_6\right]$

B. $\left[Cr(CO)_3\left(B_3N_3H_6\right]$

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

D. $\left[Ni(CN)_4\right]^{4-}$

Answer: C

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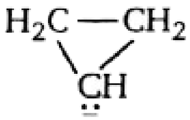
60. Ligands are broadly classified into two classes classical and non-classical ligands, depending on their donor annd acceptor ability. Classical ligands form classical complexes while non-classical ligands form non-classical complex. Bonding mechanism in non-classical is called synergic bonding.

Q. Which is not π-acceptor ligand?

A. 

B. σ - $C_5H_5^-$

C. PH_3

D. B_(3)N_(3)H_(6)`

Answer: A

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61. Ligands are broadly classified into two classes classical and non-classical ligands, depending on their donor annd acceptor ability. Classical ligands form classical complexes while non-classical ligands form non-classical complex. Bonding mechanism in non-classical is called synergic bonding.

Q. In compound $\left[M(CO)_n\right]^z$, the correct match for highest 'M-C' bond length for given M, n and z respectively:

A. M-Cr, n-6, z-0

B. M-V, n-6, z- -1

C. M-Ti, n-6, z- -2

D. M-Mn, n-6, z- $+1$

Answer: D

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62. An isomerr of the complex $CoBrCl_2(en)_2\left(H_2O\right)$, on reaction with concentrated H_2SO_4 (dehydrating agent), suffers no loss in weight and on reaction with $AgNO_3$ solution it gives only white precipitate, which is soluble in NH_3 solution.

Q. The incorrect statement about complex is:

A. It can show geometrical isomerism

B. cis isomer is optically active

C. Trans isomer is optically active

D. it can exhibit solvate isomerism

Answer: C

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63. An isomerr of the complex $CoBrCl_2(en)_2\left(H_2O\right)$, on reaction with concentrated H_2SO_4 (dehydrating agent), suffers no loss in weight and on reaction with $AgNO_3$ solution it gives only white precipitate, which is soluble in NH_3 solution.

Q. The correct formula of the complex is:

A. $\left[CoBrH_2O(en)_2\right]Cl_2$

B. $\left[CoCl(en)_2H_2O\right]BrCl$

C. $\left[CoBrCl(en)_2\right]Cl\cdot H_2O$

D. $\left[CoCl_2(en)_2\right]Br\cdot H_2O$

Answer: A

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64. Crystal field theory provides correct electronic distribution of central metal under surrounding ligannd field, hence it clearly explains magnetic moment, colour of a complex.

Q. Which of the following complex is high spin?

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

B. $\left[PtCl_4\right]^{2-}$

C. $\left[CoF_6\right]^{3-}$

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

Answer: C

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65. Crystal field theory provides correct electronic distribution of central metal under surrounding ligannd field, hence it clearly explains magnetic moment, colour of a complex.

Q. In which of the following complex transition of electron occurs from one shell to other shell of central metal.

A. $\left[Fe\left(H_2O\right)_5(NO)\right]^{2+}$

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

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

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

Answer: C

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66. Crystal field theory provides correct electronic distribution of central metal under surrounding ligannd field, hence it clearly explains magnetic moment, colour of a complex.

Q. Which of the following hydrated complex ion has high intensity colour in aqueous solution.

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

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

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

D. $\left[Mn\left(H_{20O}-(6)\right]^{2+}$

Answer: A

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67. Two important physical evidences supporting the synergic bonding in non-classical complexes are bond lengths and vibrational spectra. Vibrational spectra is based on the fact that the compression and extension of a bond may be analogous to the behaviour of a spring and obeys Hook's law.

$$\bar{\nu} = \frac{1}{2\pi c}\sqrt{\frac{k}{\mu}}cm^{-1}$$

where, k=force force constant of the bond which is directly proportional to bonnd strength of CO μ = reduced mass of ligand

$\bar{\nu}$=stretching frequency of the CO bond

c=velocity of light

Q. In which of the following complex stretching frequecy for CO ligand is least as well as bond energy of M-C bond is higher.

A. (dien) $Mo(CO)_3$

B. $\left(Et_3P\right)_3Mo(CO)_3$

C. $\left(F_3P\right)_3Mo(CO)_3$

D. $\left(Cl_3P\right)_3Mo(CO)_3$

Answer: A

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68. Two important physical evidences supporting the synergic bonding in non-classical complexes are bond lengths and vibrational spectra. Vibrational spectra is based on the fact that the compression and extension of a bond may be analogous to the behaviour of a spring and obeys Hook's law.

$$\bar{v} = \frac{1}{2\pi c}\sqrt{\frac{k}{\mu}} cm^{-1}$$

where, k=force force constant of the bond which is directly proportional to bonnd strength of CO μ = reduced mass of ligand

$\bar{v}$=stretching frequency of the CO bond

c=velocity of light

Q. In $Mn_2(CO)_{10}$ carbonyl complex, the d-orbital of Mn-atom which can not be involved in synergic bonding betwee Mn and CO ligands:

A. d_{xz}

B. d_{xy}

C. d_{yz}

D. none of these

Answer: B

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69. Two important physical evidences supporting the synergic bonding in non-classical complexes are bond lengths and vibrational spectra. Vibrational spectra is based on the fact that the compression and extension of a bond may be analogous to the behaviour of a spring and obeys Hook's law.

$$\bar{v} = \frac{1}{2\pi c}\sqrt{\frac{k}{\mu}}cm^{-1}$$

where, k=force force constant of the bond which is directly proportional to bonnd strength of CO μ = reduced mass of ligand

$\bar{v}$=stretching frequency of the CO bond

c=velocity of light

Q. In which of the following ligand, σ-bond order does not change during synergic bonding in their respective complexes:

A. CO

B. N_2

C. $CH_2 = CH_2$

D. PEt_3

Answer: D

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70. Complex compounds that have the same molecular formula but have different structural/space arrangements of ligands around central metal atom/ion are called isomers, these are of two types namely structural and stereoisomers.

Q. Which of the following is different among structural isomers?

A. Oxidation state

B. Co-ordination number

C. IUPAC name

D. None of these

Answer: C

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71. Complex compounds that have the same molecular formula but have different structural/space arrangements of ligands around central metal atom/ion are called isomers, these are of two types namely structural and stereoisomers.

Q. Type of isomerism exhibited by $\left[CrCl_2(NO)_2\right)_2\left(NH_3\right)_2]^-$ complex ion are:

A. ionisation, optical

B. hydrate, optical

C. geometrical, opticl

D. co-ordinate, geometrical

Answer: C

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72. Complex compounds that have the same molecular formula but have different structural/space arrangements of ligands around central metal atom/ion are called isomers, these are of two types namely structural and stereoisomers.

Q. Complex species that exhibits isomerism is:

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

B. $\left[Co\left(NO_2\right)\left(NH_3\right)_5\right]^{2+}$

C. $\left[PtCl_2(en)\right]$

D. $\left[CoCl\left(NH_3\right)_5\right]^{2-}$

Answer: B

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73. A complex compound of chromium chromium contains five NH_3 molecules, one nitro group and two chloride ions for one Cr^{3+} cation. One molecule of this compound produces three ions in aq. Solution, on reacting with excess of $AgNO_3$ solution, two moles of $AgCl$ get precipitated

Q. The formula of the complex compound is:

A. $\left[CrCl(NO_2)(NH_3)_4\right]NH_3 \cdot Cl$

B. $\left[CrCl(NH_3)_5\right]Cl \cdot NO_2$

C. $\left[Cr(NO_2)(NH_3)_5\right]Cl_2$

D. $\left[Cr(NH_3)_5\right]NO_2 \cdot Cl_2$

Answer: C

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74. A complex compound of chromium chromium contains five NH_3 molecules, one nitro group and two chloride ions for one Cr^{3+} cation. One molecule of this compound produces three ions in aq. Solution, on reacting with excess of $AgNO_3$ solution, two moles of $AgCl$ get precipitated

Q. The types of isomerism shown by the complex compound is:

A. geometrical, ionization

B. ionization, linkage

C. linkage, optical

D. geometrical, optical

Answer: B

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75. A complex compound of chromium chromium contains five NH_3 molecules, one nitro group and two chloride ions for one Cr^{3+} cation.

One molecule of this compound produces three ions in aq. Solution, on reacting with excess of $AgNO_3$ solution, two moles of $AgCl$ get precipitated

Q. Magnetic moment off complex compound is:

A. 0 BM

B. $\sqrt{24}$ BM

C. $\sqrt{15}$ BM

D. $\sqrt{3}$ BM

Answer: C

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76. According to C.F.T, attraction between the central metal ion and ligands in a complex is purely electrostatic. The transition metal which forms the central atom cation in the complex is regarded as a positive ion. It is surrounded by negative ligands or neutral molecules which have a lone apir of electrons, if the ligand is a neutral molecule such as NH_3, the negative and of the dipole in the molecule is directed towards the metal cation. the electrons on the central metal ion are under repulsive forces from those on the ligands. thus the electrons occupy the d-orbitals remain away from the direction of approach ligands. ltBrgt Q. Correct relationship between pairing energy (P) and C.F.S.E. (Δ_o) in

A. $\Delta_o < P$

B. $\Delta_o < P$

C. $\Delta_o = P$

D. cannot comment

Answer: B

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77. According to C.F.T, attraction between the central metal ion and ligands in a complex is purely electrostatic. The transition metal which forms the central atom cation in the complex is regarded as a positive ion. It is surrounded by negative ligands or neutral molecules which have a lone apir of electrons, if the ligand is a neutral molecule such as NH_3, the negative and of the dipole in the molecule is directed towards the metal cation. the electrons on the central metal ion are under repulsive forces from those on the ligands. thus the electrons occupy the d-orbitals remain away from the direction of approach ligands.

Q. The crystal field-spliting order for Cr^{3+} cation is octahedral field for ligands $CH_3COO^-, NH_3, H_2O, CN^-$ is:

A. $CH_3COO^- < H_2O < NH_3 < CN^-$

B. $CH_3COO^- < NH_3 < H_2O < CN^-$

C. $H_2O < CH_3COO^- < NH_3 < CN^-$

D. $NH_3 < CH_3COO^- < H_2O < CN^-$

Answer: A

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78. According to C.F.T, attraction between the central metal ion and ligands in a complex is purely electrostatic. The transition metal which forms the central atom cation in the complex is regarded as a positive ion. It is surrounded by negative ligands or neutral molecules which have a lone apir of electrons, if the ligand is a neutral molecule such as NH_3, the negative and of the dipole in the molecule is directed towards the metal cation. the electrons on the central metal ion are under repulsive forces from those on the ligands. thus the electrons occupy the d-orbitals remain away from the direction of approach ligands. ltBrgt Q. The value of 'x' in the complex $H_x\left[Co(CO)_4\right]$ (on the basis of EAN rule), and geometry arround Co ion respectively is:

A. 1, square planar

B. 2, tetrahedral

C. 1, tetrahedral

D. 2, square planar

Answer: C

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79. An isomer of the complex $Co(en)_2\left(H_2O\right)ICl_2$, on reaction with concentrated H_2SO_4, it suffers loss in weight and on reaction with $AgNO_3$ solution gives a yellow precipitated which is isoluble in NH_3 solution.

Q. If all the ligandsin the co-ordination sphere of the above complex are replaced by CN^- ion, then the magnetic moment of the complex ion will be:

A. 0.0 BM

B. 5.9 BM

C. 4.9 BM

D. 1.73 BM

Answer: A

80. An isomer of the complex $Co(en)_2\left(H_2O\right)ICl_2$, on reaction with concentrated H_2SO_4, it suffers loss in weight and on reaction with $AgNO_3$ solution gives a yellow precipitated which is isoluble in NH_3 solution.

Q. If one mole of original is treated with excess $Pb\left(NO_3\right)_2$ solution, then the number of moles of white precipitate formed will be

A. 2.0

B. 1.0

C. 0.0

D. 3.0

Answer: C

81. An isomer of the complex $Co(en)_2(H_2O)ICl_2$, on reaction with concentrated H_2SO_4, it suffers loss in weight and on reaction with $AgNO_3$ solution gives a yellow precipitated which is isoluble in NH_3 solution.

Q. Total number of space isomers of the formula of the above complex is:

A. 2

B. 3

C. 4

D. 1

Answer: B

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82. In complexes off wea field ligands, $\Delta_o < P$ (pairing energy), the energy difference between t_{2g} and e_g sets is relatively less. Under the

unfluence of strong field ligands, $\Delta_O > p$ (Pairing energy), the energy difference between t_{2g} and e_g sets is relatively high.

Q. Which of the following is correct statement?

A. Complex $\left[Co\left(H_2O\right)_6\right]^{2+}$ is more stable than $\left[Co\left(H_2O\right)_6\right]^{3+}$

B. All compounds of $Ni(II)$ are bound to be outer-d-orbital complexes

C. Stability constant for $\left[Ni(en)_3\right]^{2+}$ is greater than stability constant for $\left[Ni\left(NH_3\right)_6\right]^{2+}$

D. Δ_{oct} for $\left[Cr\left(H_2O\right)_6\right]^{3+}$ is greater than Δ_{oct} for $\left[Cr\left(NH_3\right)_6\right]^{3+}$

Answer: C

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83. In complexes off wea field ligands, $\Delta_o < P$ (pairing energy), the energy difference between t_{2g} and e_g sets is relatively less. Under the unfluence of strong field ligands, $\Delta_O > p$ (Pairing energy), the energy difference between t_{2g} and e_g sets is relatively high.

Q. Select the correct increasing order of 10 Dq. value of chromium complexes:

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

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

(3) $\left[CrF_6\right]^{3-}$

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

A. $4 < 3 < 1 < 2$

B. $3 < 4 < 2 < 1$

C. $4 < 3 < 2 < 1$

D. $3 < 4 < 1 < 2$

Answer: B

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84. In complexes off wea field ligands, $\Delta_o < P$ (pairing energy), the energy difference between t_{2g} and e_g sets is relatively less. Under the

unfluence of strong field ligands, $\Delta_O > p$ (Pairing energy), the energy difference between t_{2g} and e_g sets is relatively high.

Q. Select the correct statement regarding $\left[Cr(en)_2Cl_2\right]^+$ and $\left[Co\left(C_2O_4\right)_2\left(NH_3\right)_2\right]^-$ complex ions:

A. Both are equally stable complexes

B. Both have equal number of stereoisomers

C. Both are diamagnetic complexes

D. a and c both

Answer: B

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85. Complex compounds are molecular compounds which retain their identities even when dissolved in water. They do not give all the simple ions in solution but instead furnish complex ions. The complex compounds are often called coordination compounds because certain groups called ligands are attached to the central metal ion by coordinate or dative bonds. coordination compounds exhibit isomerism, both structural and stereoisomerism. the structure, magnetic property, colour and electrical properties of complexes are explained by various theories:

Q. Arrange the following compounds in order of their molar conductance:

(i) $K\left[Co\left(NO_2\right)_4\left(NH_3\right)_2\right]$

(ii) $\left[Cr(ONO)_3\left(NH_3\right)_2\right]$

(iii) $\left[Cr\left(NO_2\right)\left(NH_3\right)_5\right]_3\left[Co\left(NO_2\right)_6\right]_2$

(iv) $Mg\left[Cr\left(NO_2\right)_5\left(NH_3\right)\right]$

A. $(ii) < (i) < (iv) < (iii)$

B. $(i) < (ii) < (iii) < (iv)$

C. $(ii) < (i) < (iii) < (iv)$

D. $(iv) < (iii) < (ii) < (i)$

Answer: A

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86. Complex compounds are molecular compounds which retain their identities even when dissolved in water. They do not give all the simple ions in solution but instead furnish complex ions. The complex compounds are often called coordination compounds because certain groups called ligands are attached to the central metal ion by coordinate or dative bonds. coordination compounds exhibit isomerism, both structural and stereoisomerism. the structure, magnetic property, colour and electrical properties of complexes are explained by various theories:

Q. The oxidation number, coordination number and magnetic moment in the following complex is:

$\left[Cr\left(C_2O_4\right)_2\left(NH_3\right)_2^-\right]$

A. O.N.=+3,C.N.=6, M.M.=$\sqrt{15}BM$

B. O.N.=-1, C.N.=6, M.M.=$\sqrt{15}BM$

C. O.N.=+3, C.N.=6, M.M=$\sqrt{3}BM$

D. O.N.+3,C.N.=6, M.M.=$\sqrt{12}BM$

Answer: A

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87. Complex compounds are molecular compounds which retain their identities even when dissolved in water. They do not give all the simple ions in solution but instead furnish complex ions. The complex compounds are often called coordination compounds because certain groups called ligands are attached to the central metal ion by coordinate or dative bonds. coordination compounds exhibit isomerism, both structural and stereoisomerism. the structure, magnetic property, colour and electrical properties of complexes are explained by various theories:

Q. In which of the following pairs, both the complexes have the same geometry?

A. $\left[NiCl_4\right]^{2-}, \left[Ni(CN)_4\right]^{2-}$

B. $\left[CoF_6\right]^{3-}, \left[Co\left(NH_3\right)_6\right]^{3+}$

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

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

Answer: B

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88. Recent X-ray work, IR and other spectroscopic methods have proved that Turnbull's blue is identical to Prussian blue.

Q. What is the common formula of Turnbull's blue and Prussian blue?

A. $Fe_3\left[Fe(CN)_6\right]_2$

B. $Fe_4\left[Fe(CN)_6\right]_3$

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

D. $KFe_2\left[Fe(CN)_6\right]$

Answer: C

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89. Recent X-ray work, IR and other spectroscopic methods have proved that Turnbull's blue is identical to Prussian blue.

Q. Intense blue colour arises as a result of:

A. electron transfer between $Fe(II)$ and $Fe(I)$

B. electron transfer between Fe(II) and Fe(III)

C. d-d transition

D. spin magnetic moment

Answer: B

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90. On the basic of stability of complex ion in the solution, complexes may be of two types, perfect and imperfect complexes. The stability depends upon the extent of dissociation which in turn depends upon charge on central metal atom, basic nature of ligand, chelation, and nature of metal ion and ligand according to HSAB principle.

Q> Which one of the following does not follow EAN rule?

A. $Fe(CO)_5$

B. $V(CO)_6$

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

D. $Mn_2(CO)_{10}$

Answer: B

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91. On the basic of stability of complex ion in the solution, complexes may be of two types, perfect and imperfect complexes. The stability depends upon the extent of dissociation which in turn depends upon charge on central metal atom, basic nature of ligand, chelation, and nature of metal ion and ligand according to HSAB principle.

Q Which complex is most stable?

A. $\left[Cu(CN)_2\right]^{-}K_d = 1 \times 10^{-16}$

B. $\left[Fe(CN)_6\right]^{4-}K_d = 1 \times 10^{-37}$

C. $\left[Fe(CN)_6\right]^{3-} = 1x10^{-44}$

D. $\left[Ag(CN)_2\right]^{-}K_d = 1x10^{-20}$

Answer: C

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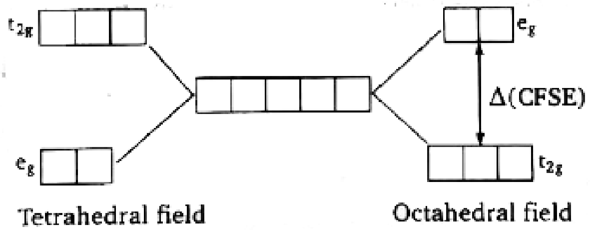
92. When degenerate d-orbitals of an isolated atom/ion come under influence of magnetic field of ligands, the degeneray is lost. The two set $t_{2g}\left(d_{xy}, d_{yz}, d_{xz}\right)$ and $e_g\left(d_{x^2} - d_{x^2-y^2}\right.$ are either stabilized or destabilized depending upon the nature of magnetic field. it can be expressed diagrammatically as:



Value of CFSE depends upon nature of ligand and a spectrochemical series has been made experimentally, for tetrahedral complexes, Δ is about 4/9 times to Δ_0 (CFSE for octahedral complex). this energy lies in visible region and i.e., why electronic transition are responsible for colour. such transition are not possible with d^0 and d^{10} configuration.

Q. The vlaue of CFSE (Δ_0) for completes given below follow the order,

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

(II) $\left[Rh\left(NH_3\right)_6\right]^{3+}$

(III) $\left[IR\left(NH_3\right)_6\right]^{3+}$

A. $I < II < III$

B. $I > II > III$

C. $I < II > III$

D. $I = II = III$

Answer: A

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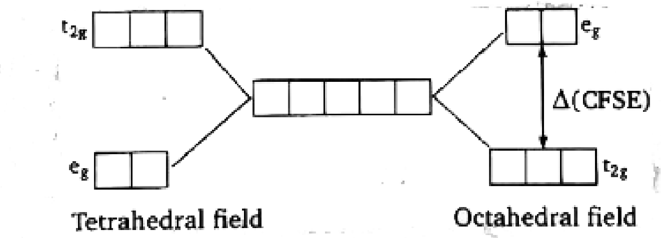
93. When degenerate d-orbitals of an isolated atom/ion come under influence of magnetic field of ligands, the degeneray is lost. The two set $t_{2g}\left(d_{xy}, d_{yz}, d_{xz}\right)$ and $e_g\left(d_{x^2} - d_{x^2-y^2}\right.$ are either stabilized or destabilized depending upon the nature of magnetic field. it can be expressed diagrammatically as:



Value of CFSE depends upon nature of ligand and a spectrochemical series has been made experimentally, for tetrahedral complexes, Δ is about 4/9 times to Δ_0 (CFSE for octahedral complex). this energy lies in visible region and i.e., why electronic transition are responsible for colour. such transition are not possible with d^0 and d^{10} configuration.

Q. Cr^{3+} form four complexes with four different ligands which are

$\left[Cr(Cl)_6\right]^{3-}$, $\left[Cr\left(H_2O\right)_6\right]^{3+}$, $\left[Cr\left(NH_3\right)_6\right]^{3+}$ and $\left[Cr(CN)_6\right]^{3-}$, the order of CFSE $\left(\Delta_0\right)$ in these complexes in the order:

A. $\left[CrCl_6\right]^{3+}$ and $\left[Cr(CN)_6\right]^{3+} = \left[Cr\left(NH_3\right)_6\right]^{3+} = \left[Cr(CN)_6\right]^{3-}$

B. $\left[CrCl_6\right]^{3-} < \left[Cr\left(H_2O\right)_6\right]^{3+} < \left[Cr\left(NH_3\right)_6\right]^{3+} < \left[Cr(CN)_6\right]^{3-}$

C. $\left[CrCl_6\right]^{3-} > \left[Cr\left(H_2O\right)_6\right]^{3+} > \left[Cr\left(NH_3\right)_6\right]^{3+} > \left[Cr(CN)_6\right]^{3-}$

D. $\left[CrCl_6\right]^{3-} < \left[Cr\left(H_2O\right)_6\right]^{3+} = \left[Cr\left(NH_3\right)_6\right]^{3+} < \left[Cr(CN)_6\right]^{3-}$

Answer: B

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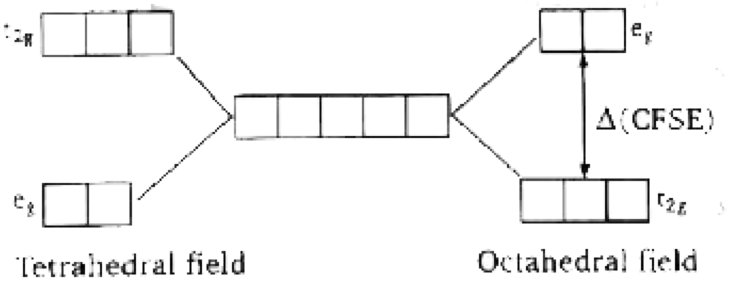
94. When degenerate d-orbitals of an isolated atom/ion come under influence of magnetic field of ligands, the degeneray is lost. The two set $t_{2g}\left(d_{xy}, d_{yz}, d_{xz}\right)$ and $e_g\left(d_{z^2} - d_{x^2-y^2}\right.$ are either stabilized or destabilized depending upon the nature of magnetic field. it can be expressed diagrammatically as:



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Q. The d-orbitals, which are stabillized in an octahedral magnetic field, are:

A. d_{xy} and d_{x^2}

B. $d_{x^2-y^2}$ and d_{x^2}

C. d_{xy}, d_{xz} and d_{yz}

D. d_{x^2} only

Answer: C

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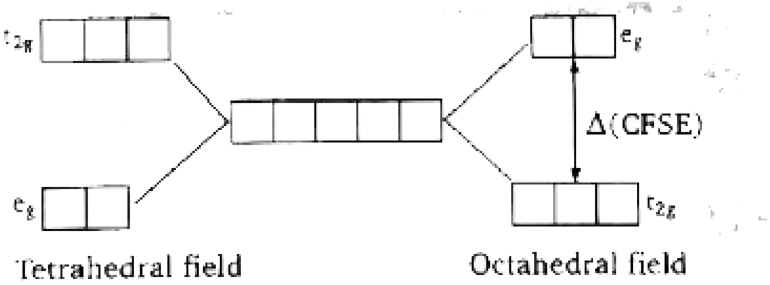
95. When degenerate d-orbitals of an isolated atom/ion come under influence of magnetic field of ligands, the degeneray is lost. The two set $t_{2g}\left(d_{xy}, d_{yz}, d_{xz}\right)$ and $e_g\left(d_{x^2} - d_{x^2-y^2}\right.$ are either stabilized or destabilized depending upon the nature of magnetic field. it can be expressed diagrammatically as:



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Q. For an octahedral complex, which of the followin d-electron configuration will give maximum CFSE?

A. High spin d^6

B. Low spin d^4

C. Low spin d^5

D. High spin d^7

Answer: C

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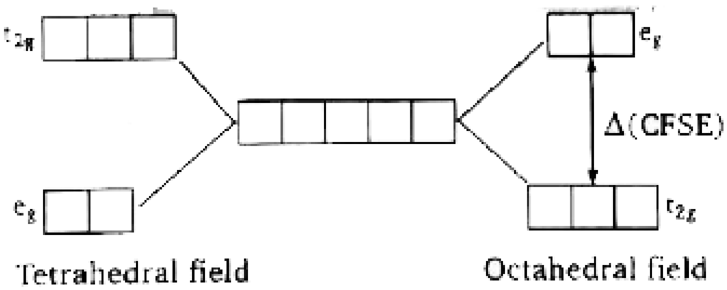
96. When degenerate d-orbitals of an isolated atom/ion come under influence of magnetic field of ligands, the degeneray is lost. The two set $t_{2g}\left(d_{xy}, d_{yz}, d_{xz}\right)$ and $e_g\left(d_{x^2} - d_{x^2-y^2}\right.$ are either stabilized or destabilized depending upon the nature of magnetic field. it can be expressed diagrammatically as:



Value of CFSE depends upon nature of ligand and a spectrochemical series has been made experimentally, for tetrahedral complexes, Δ is about 4/9 times to Δ_0 (CFSE for octahedral complex). this energy lies in visible region and i.e., why electronic transition are responsible for colour. such transition are not possible with d^0 and d^{10} configuration.

Q. $Ti^{3+}(aq)$. is purple while $Ti^{4+}(aq)$. is colourless because:

A. there is not crystal field effec in Ti^{4+}

B. The energy difference between t_{2g} and $e_g Ti^{4+}$ is quite high and does not fall in the visible region

C. Ti^{4+} has d^0 configuration

D. Ti^{4+} is very small in comparison to Ti^{3+} and hence does not absorb any radiation

Answer: C

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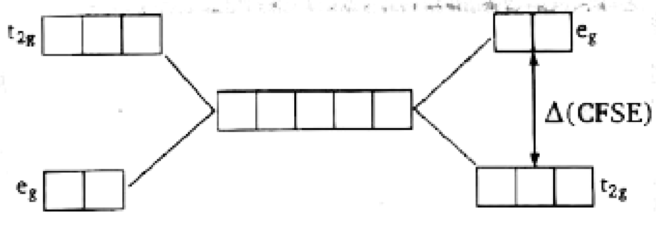
97. When degenerate d-orbitals of an isolated atom/ion come under influence of magnetic field of ligands, the degeneray is lost. The two set $t_{2g}\left(d_{xy}, d_{yz}, d_{xz}\right)$ and $e_g\left(d_{x^2} - d_{x^2-y^2}\right.$ are either stabilized or destabilized depending upon the nature of magnetic field. it can be expressed diagrammatically as:



Tetrahedral field Octahedral field

Value of CFSE depends upon nature of ligand and a spectrochemical series has been made experimentally, for tetrahedral complexes, Δ is about 4/9 times to Δ_0 (CFSE for octahedral complex). this energy lies in visible region and i.e., why electronic transition are responsible for colour. such transition are not possible with d^0 and d^{10} configuration.

Q. Which of the following is correct arrangement of ligand in terms of the Dq values of their complexes with any particularr 'hard' metal ion:

A. $Cl^- < F^- < NCS^- < NH_3 < CN^-$

B. $NH_3 < F^- < Cl^- < NCS^- < CN^-$

C. $Cl^- < F^- < NCS^- < CN^- < NH_3$

D. $NH_3 < CN^- < NCS^- < Cl^- < F^-$

Answer: A

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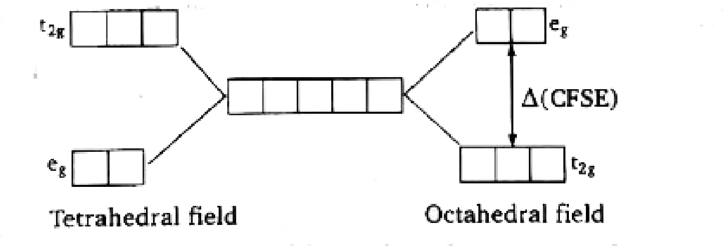
98. When degenerate d-orbitals of an isolated atom/ion come under influence of magnetic field of ligands, the degeneray is lost. The two set $t_{2g}\left(d_{xy}, d_{yz}, d_{xz}\right)$ and $e_g\left(d_{x^2} - d_{x^2-y^2}\right.$ are either stabilized or destabilized depending upon the nature of magnetic field. it can be expressed diagrammatically as:



Value of CFSE depends upon nature of ligand and a spectrochemical series has been made experimentally, for tetrahedral complexes, Δ is about 4/9 times to Δ_0 (CFSE for octahedral complex). this energy lies in visible region and i.e., why electronic transition are responsible for colour. such transition are not possible with d^0 and d^{10} configuration.

Q. The extent of crystal field splitting in octahedral complexes of the given metal with particular weak field ligand are:

A. $Fe(III) < Cr(III) < Rh(III) < Ir(III)$

B. $Cr(III) < Fe(III) < (Rh(III) < Ir(III)$

C. $Ir(III) < Rh(III) < Fe(III) < Cr(III)$

D. $Fe(III) = Cr(III) < Rh(III) < Ir(III)$

Answer: A

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ONE OR MORE ANSWERS IS/ARE CORRECT

1. Consider the following two reactions:

$$Cd^{2+}(aq.) + 4CH_3NH_2 \xrightarrow{K_1} 'A', \Delta G_1^\circ$$

$$Cd^{2+}(aq.) + 2H_2NCH_2CH_2NH_2 \xrightarrow{K_2} 'B', \Delta G_2^\circ.$$ According to given information the correct statement(s) is/are:

A. ΔG_2° is more negative than ΔG_1°

B. Compound 'A" is optically inactive

C. Compound 'B' is optically active

D. Formation constant K_2 is greater than formation constant K_1

Answer: A::B::D

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2. Complex compound $\left[Co(SCN)_2\left(NH_3\right)_4\right]Cl$ exhibits:

A. Ionization isomerism

B. Geometrical isomerism

C. Optical isomerism

D. Linakge isomerism

Answer: A::B::D

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3. Which of the following compound has/have effective atomic number equal to the atomic number of a noble gas?

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

B. $K_2\left[Fe(CO)_4\right]$

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

D. $\left[CoCl_3\left(H_2O\right)_3\right]$

Answer: A::B::D

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4. Select correct statement(s) regarding octahedron complex having CFSE = $-1.2\Delta_0$.

A. Compound is neither low spin nor high spin complex

B. Type of hybridisation complex does not depend upon nature of ligands

C. Magnetic moment of complex compounds is either $\sqrt{15}B.M$ or $\sqrt{8}B.M.$

D. All are incorrect statements

Answer: A::B::C

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5. Consider the following two carbonyl compounds

(i) $\left[Tc(CO)_6\right]^+$ and $(ii)\left[Nb(CO)_6\right]^-$

Select incorrect statement(s) for given carbonyl compounds.

A. $\{Tc(CO)_6]^+$ acts as reducing agent and $[Nb(CO)_6]^-$ acts as oxidizing agent

B. $[Nb(CO)_6]^-$ acts as reducing agent and $[Tc(CO)_6]^+$ acts as oxidizing agent

C. Nb-C bond order in $[Nb(CO)_6]^-$ is greater than in $\{Tc(CO)_6]^+$

D. "CO" bond order is greater in $[Nb(CO)_6]^-$ than in $[Tc(CO)_6]^+$

Answer: A::B::D

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6. Which of the following ligand does not as π - acid ligand?

A. σ-cyclopentadienyl

B. π-allyl

C. $B_3N_3H_6$

D. π-cyclopentadienyl

Answer: A::B::C::D

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7. Find out correct IUPAC name of complex compound

A. Pentaamminecyanidochromium(II) hexanitrito-N-irridate(III)

B. Triamminetricyanidochromium(III)hexanitrito-N-irridate(III)

C. Hexanitrito-N-irridium(III)pentaamminecyanidochromate(II)

D. Pentaamminecyanidochromium(III)hexanitrito-N-irridate(III)

Answer: A::D

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8. Consider the following reactions of complex compounds A,B and C

(i) $CoCl_2Br \cdot 5NH_3 + excess \quad Ag^+(aq) \rightarrow 1AgCl(s)$

(ii) $CoCl_2Br \cdot 5NH_3 \text{Compound B} + \text{excess } Ag^+(aq) \rightarrow 2AgCl(s)$

(iii) $CoCl_2Br \cdot 4NH_3 \text{Compound C} + \text{excess } Ag^+(aq.) \rightarrow 1AgCl(s)$

Then according to the given information the correct statement(s) is/are:

A. Compounds(A) and (B) are ionisation isomers

B. Molar conductivity of compounds (A) and (B) are almost same

C. Compounds (A), (B) and (C) do not exhibit geometrical isomerism

D. Order of CFSE values, $\Delta_0(A) > \Delta_0(B) > \Delta_0(C)$

Answer: A::B::D

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9. Which complex species does/do not exhibit geometrical and only have two stereoisomers.

A. $[Co(EDTA)]^-$

B. $[PtBrCl(gly)]^-$

C. $\left[Co(acac)_2(en)\right]^+$

D. $\left[Pd\left(NO_2\right)(ox)(gly)\right]$

Answer: A::C

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10. Which of the following complex(s) can not exhibit both geometrical and optical isomerism?

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

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

C. $\left[PtBrCl\left(H_2O\right)NH_3\right]$

D. $\left[FeBr_2(en)_2\right]^+$

Answer: B

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11. Complex ions $\left[NiCl_6\right]^{4-}$, $\left[Ni(CN)_6\right]^{4-}$ similar in their given properties:

A. oxidation state, geometryq

B. co-ordination number, EAN

C. magnetic moment, geometry

D. stability, colour

Answer: A::B::C

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12. Select correct statement(s) regarding given complexes:

A. $\left[Fe(CO)_5\right]$, the orbitals used for hybridisation in Fe atom are s, p_x, p_y, p_z, d_{z^2} and it is high spin complex

B. $\left[Pt\left(NH_3\right)_2Cl_2\right]$, the orbtials used for hybridization on Pt atom are s,$p_x, p_y, d_{x^2-y^2}$ and it is low spin complex

C. $\left[Cr\left(H_2O\right)_6\right]^{3+}$, the orbitals used for hybridization in Cr atom are s,$p_x, p_y, p_z, p_{x^2}, d_{x^2-y^2}$ and it is high spin complex

D. $Ni(CO)_4$, the orbitals used of rhybridization in Ni atom are s, p_x, p_y, p_z, and it is low spi complex

Answer: B::D

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13. Complex compound $\left[Co(SCN)_2\left(NH_3\right)_4\right]Cl$ exhibits:

A. Ionization isomerism

B. geometrical isomerism

C. optical isomerismm

D. linkage isomerism

Answer: A::B::D

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14. Which of the following compound has/have effective atomic number equal to the atomic number of a noble gas?

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

B. $K_2\left[Fe(CO)_4\right]$

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

D. $\left[CoCl_3\left(H_2O\right)_3\right]$

Answer: A::B::D

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15. $K_2\left[Ni(CN)_4\right] \xrightarrow{\text{K in liq.}} NH_3X'$

Regarding this reaction correct statement is/are:

A. X' is $K_4\left[Ni(CN)_4\right]$

B. The oxidation state of Ni changed +2 to zero

C. The structure of 'X' is tetrahedral

D. $\left[Ni(CN)_4\right]^{2-}$ is square planar complex

Answer: A::B::C::D

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16. Which of the following statement(s) is/are correct?

A. The oxidation state of iron in sodium nitro prosside $Na_2\left[Fe(CN)_5(NO)\right]$ is+II

B. $\left[Ag\left(NH_3\right)_2\right]^+$ is linear in shape

C. In $\left[Fe\left(H_2O\right)_6\right]^+$, Fe is d^2sp^3 hybridized

D. In $\left[Co\left(H_2O\right)_6\right]^{3+}$ complex ion, Co is d^2sp^3 hybridized

Answer: A::B::D

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17. Which one of the following statement(s) is/are false?

A. weak ligands like F^-, Cl^- and and OH^- usually form low spin complexes

B. Strong ligand like CN^- and NO_2^-, generally form high spin complexes

C. $\left[FeF_6\right]^{3-}$ is high spin complex

D. $\left[Ni(CO)_4\right]$ is high spin complex

Answer: A::B::D

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18. A d-block element forms octahedral complex but its spin magnetic moment remains same either in strong field or in weak field ligand. Which of the following is/are correct ?

A. Element always forms colourless compound

B. Number of electron in t_{2g} orbitals are higher than in e_g orbitals

C. It can have either $d^3 \text{ or } d^8$ configuration

D. It can have either $d^7 \text{ or } d^8$ configuration

Answer: B::C

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19. In which of the following entropy increases?

A. d^3

B. d^5

C. d^6

D. d^8

Answer: A::D

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

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

B.

$\left[Co\left(NH_3\right)_3\left(H_2O\right)_2Cl\right]Br_2$ and $\left[Co\left(NH_3\right)_3\left(H_2O\right)Cl\cdot Br\right]Br\cdot H_2O$

C. $\left[Pt\left(NH_3\right)_4Cl_2\right]Br_2$ and $\left[Pt\left(NH_3\right)_3B_2\right]Cl_2$

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

Answer: A::D

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21. Which would exhibit coordination isomerism

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

(b) $\left[Cr(en)_2CI_2\right]^{\oplus}$

(c) $\left[Cr\left(NH_3\right)_6\right]CI_3$

(d) $[Cr(edta)]^-$.

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

B. $\left[Cr\left(NH_3\right)_4(CN)_2\right]\left[Co(CN)_4\left(NH_3\right)_2\right]$

C. $\left[Cr\left(NH_3\right)_3(CN)_3\right]\left[Co\left(NH_3\right)_3(CN)_3\right]$

D. none of these

Answer: A::B

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22. Which of the following statements is not true about the complex ion $\left[CrCl\left(NO_2\right)(en)_2\right]^+$?

A. It has two geometrical isomers cis and trans

B. cis and trans forms are not diastereomers to each other

C. only the cis isomer displays optical activity

D. it has three optically active isomers: d, l and trans forms

Answer: B::D

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23. Which of the following statement(s) is/are incorrect?

A. In $\left[CrBrCl(en)_2\right]^+$ geometrical isomerism exists, while optical isomerism does not exist

B. Potassium aquadicyanosuperoxoperoxoperoxoch-romate(III) is IUPAC name $K_2\left[Br(N)_2O_2\left(O_2\right)\left(H_2O\right)\right]$

C. There are 3 geometriacl and 15 stereoisomers possible for $\left[Pt\left(NO_2\right)\left(NH_3\right)\left(NH_2OH\right)(py)\right]^+$ and $\left[PtBrCl\left(NO_2\right)\left(NH_3\right)(py)\right]$ respectively

D. cis and trans forms are not diastereomers to each other

Answer: A::B::C::D

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24. Which of the following statement is true about the complex $\left[CrCl_3(OH)_2\left(NH_3\right)\right]^{2-}$ ion?

A. It has three geometrical isomers

B. Only one space isomers is optically active and remaining are inactive

C. There are total four space isomers

D. The magnetic moment of complex ion is 3.89 BM

Answer: A::D

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25. Which of the following is correct about Tetraamminedithiocyanato-s cobalt(III) tris(oxalato)cobaltate(III)?

A. Formula of the complex is $\left[Co(SCN)_2\left(NH_3\right)_4\right]\left[Co(ox)_3\right]$

B. It is a chelating complex and show linkage isomerism

C. it shows optical isomerism

D. it shows geometrical isomerism

Answer: B::C::D

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26. Which of the followingg statement(s) is/are false?

A. In $\left[PtCl_2\left(NH_3\right)_4\right]^{2+}$ complex ion, the cis-form is optically active, while trans-form is optically inactive

B. In $\left[Fe\left(C_2O_4\right)_3\right]^{3-}$, geometrical isomerism does not exist, while optical isomerism exist

C. In $[Mabcd]^{n\pm}$ tetrahedral complexes, optical isomerism cannot be observed

D. In $[Mabcd]^{n\pm}$ square planar complex, optical isomerism can be observed

Answer: A::C::D

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27. Which of the following statement(s) is/are true?

A. In metal carbonyl complexes d_{C-O} increases compared to that in CO molecule

B. The pair of compounds $\left[Cr\left(H_2O\right)_6\right]Cl_3$ and $\left[CrCl_3\left(H_2O\right)_3\right]\cdot 3H_2O$ show hydrte isomerism

C. d_{x^2} orbital of central metal atom/ion is used in dsp^2 hybridisation

D. Facial and Meridonial isomers associated with $\left[Ma_3b_3\right]^{n\pm}$ type complex compound, both are optically inactive.

Answer: A::D

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28. Select the correct statement:

A. Chelation effect is maximum for five and six membered rings

B. Greater the charge on the central metal cation, greater the value of $\Delta(CFSE)$

C. In complex ion $\left[CoF_6\right]^{3-}, F^-$ is a weak field ligand, so that $\Delta_{oct} < P$(Pairng energy) and it is low spin complex

D. $\left[CoCl_2\left(NH_3\right)_2(en)\right]^{\oplus}$ complex ion will have four different isomers

Answer: A::B::D

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29. Which of the following statement(s) is/are true?

A. In ferrocyanide ion, the effective atomic number is 36.

B. Chelating ligands are atleast bidentate ligand

C. $\left[CrCl_2(CN)_2\left(NH_3\right)_2\right]^{\ominus}$ and $\left[CrCl_3\left(NH_3\right)_3\right]$ both have d^2sp^3 hybridization

D. As the number of rings in complex increases, stability of complex (chelate) also increases

Answer: A::B::C::D

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30. In test of NO_3^- ion, the dark brown ring complex is formed, which is true of this complex?

A. the colour is due to charge transfer spectra

B. iron and NO both have +1 charge

C. The complex species can be represented as $\left[Fe^I\left(H_2O\right)_5NO\right]^{2+}$

D. Iron has +2 oxidation state and NO is neutral

Answer: A::B::C

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31. The complex(es) which is/are blue in colour:

A. $Fe_4\left[Fe(CN)_6\right]_3$

B. $Zn_2\left[Fe(CN)_6\right]$

C. $Cu_2\left[Fe(CN)_6\right]$

D. $Fe_3\left[Fe(CN)_6\right]_2$

Answer: A::D

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32. What is/are the coordination number(s) of Au in the complexes formed by Au?

A. 6

B. 4

C. 5

D. 2

Answer: B::D

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33. The d-orbitals involved in sp^3d^2 or d^2sp^3 hybridization of the central metal ion are:

A. $d_{x^2-y^2}$

B. d_{xy}

C. d_{yz}

D. dx_{z^2}

Answer: A::D

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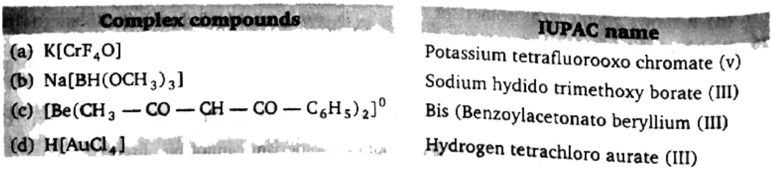
34. Which is not correctly matched?



Complex compounds	IUPAC name
(a) $K[CrF_4O]$	Potassium tetrafluorooxo chromate (v)
(b) $Na[BH(OCH_3)_3]$	Sodium hydido trimethoxy borate (III)
(c) $[Be(CH_3-CO-CH-CO-C_6H_5)_2]^0$	Bis (Benzoylacetonato beryllium (III)
(d) $H[AuCl_4]$	Hydrogen tetrachloro aurate (III)

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35. Which of the following statement(s) is(are) correct?

A. The complexes $\left[NiCl_4\right]^{2-}$ and $\left[NiCN_4\right]^{2-}$ differ in the magnetic properrties

B. The complexes $\left[NiCl_4\right]^{2-}$ and $[NiCN)_4]^{2-}$ differ in the geometry

C. The complexes $\left[NiCl_4\right]^{2-}$ and $\left[NiCN_4\right]^{2-}$ differ in primarry valancies of nickel

D. The complexes $\left[NiCl_4\right]^{2-}$ and $\left[NiCN_4\right]^{2-}$ differ in the state of hybridization of nickel

Answer: A::B::D

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36. Which is/are correct statement(s)?

A. $\left[Ag\left(NH_3\right)_2\right]^+$ is linear with sp hybridisation Ag^+ ions

B. $NiCl_4^{2-}, CrO_4^{2-}$ annd MnO_4^- have tetrahedral geometry

C. $\left[Cu\left(NH_3\right)_4\right]^{2+}, \left[\left[Pt\left(NH_3\right)_4\right]^{2+}\right.$ and $\left[Ni(CN)_4\right]^{2-}$ have dsp^2 hybridisation of the metal ion

D. $Fe(CO)_5$ has trigonal bipyramidal structure with $d_{z^2}sp^3$ hybridised ion

Answer: A::B::C::D

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37. Consider the following two reactions:

$Cd^{2+}(aq.) + 4CH_3NH_2 \xrightarrow{K_1} 'A', \Delta G_1^\circ$

$Cd^{2+}(aq.) + 2H_2NCH_2CH_2NH_2 \xrightarrow{K_2} 'B', \Delta G_2^\circ$. According to given information the correct statement(s) is/are:

A. ΔG_2° is more negative than ΔG_1°

B. Compound 'A" is optically inactive

C. Compound 'B' is optically active

D. Formation constant K_2 is greater than formation constant K_1

Answer: A::B::D

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38. Complex compound $\left[Co(SCN)_2(NH_3)_4\right]Cl$ exhibits:

A. Ionization isomerism

B. Geometrical isomerism

C. Optical isomerism

D. Linakge isomerism

Answer: A::B::D

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39. Which of the following compound has/have effective atomic number equal to the atomic number of a noble gas?

A. $K\left[Co(CN)_4\right]$

B. $K_2\left[Fe(CO)_4\right]$

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

D. $\left[CoCl_3\left(H_2O\right)_3\right]$

Answer: A::B::D

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40. Select correct statement(s) regarding octahedron complex having CFSE = $-1.2\Delta_0$.

A. Compound is neither low spin nor high spin complex

B. Type of hybridisation complex does not depend upon nature of ligands

C. Magnetic moment of complex compounds is either $\sqrt{15}B.M$ or $\sqrt{8}B.M.$

D. All are incorrect statements

Answer: A::B::C

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41. Consider the following two carbonyl compounds

(i) $\left[Tc(CO)_6\right]^+$ and $(ii)\left[Nb(CO)_6\right]^-$

Select incorrect statement(s) for given carbonyl compounds.

A. $\left\{t(CO)_6\right\}^+$ acts as reducing agent and $\left[Nb(CO)_6\right]^-$ acts as oxidizing agennt

B. $\left[Nb(CO)_6\right]^-$ acts as reducing agent and $\left[Tc(CO)_6\right]^+$ acts as oxidizing agent

C. Nb-C bond order in $\left[Nb(CO)_6\right]^-$ than in $\left\{Tc(CO)_6\right]^+$

D. "CO" bond order is greater in $\left[Nb(CO)_6\right]^-$ than in $\left[Tc(CO)_6\right]^+$

Answer: A::B::D

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42. Which of the following ligand does not as π - acid ligand?

A. σ-cyclopentadienyl

B. π-allyl

C. $B_3N_3H_6$

D. π-cyclopentadienyl

Answer: A::B::C::D

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43. Find out correct IUPAC name of complex compound

A. Pentaamminecyanidochromium(II) hexanitrito-N-irridate(III)

B. Triamminetricyanidochromium(III)hexanitrito-N-irridate(III)

C. Hexanitrito-N-irridium(III)pentaamminecyanidochromate(II)

D. Pentaamminecyanidochromium(III)hexanitrito-N-irridate(III)

Answer: A::D

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44. Consider the following reactions of complex compounds A,B and C

(i) $ClCl_2Br \cdot 5NH_3 + excess \quad Ag^+(aq) \rightarrow 1AgCl(s)$

(ii) $CoCl_2Br \cdot 5NH_3\text{Compound B} + \text{excess } Ag^+(aq) \rightarrow 2AgCl(s)$

(iii) $CoCl_2Br \cdot 4NH_3\text{Compound C} + \text{excess } Ag^+(aq.) \rightarrow 1AgCl(s)$

Then according to the given information the correct statement(s) is/are:

A. Compounds(A) and (B) are ionisation isomers

B. Molar conductivity of compounds (A) and (B) are almost same

C. Compounds (A), (B) and (C) do not exhibit geometrical isomerism

D. Order of CFSE values, $\Delta_0(A) > \Delta_0(B) > \Delta_0(C)$

Answer: A::B::D

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45. Which complex species does/do not exhibit geometrical and only have two stereoisomers.

A. $[Co(EDTA)]^-$

B. $[PtBrCl(gly)]^-$

C. $\left[Co(acac)_2(en)\right]^+$

D. $\left[Pd\left(NO_2\right)(ox)(gly)\right]$

Answer: A::C

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46. Which of the following complex(s) can not exhibit both geometrical and optical isomerism?

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

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

C. $\left[PtBrCl\left(H_2O\right)NH_3\right]$

D. $\left[FeBr_2(en)_2\right]^+$

Answer: B

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47. Complex ions $\left[NiCl_6\right]^{4-}, \left[Ni(CN)_6\right]^{4-}$ similar in their given properties:

A. oxidation state, geometryq

B. co-ordination number, EAN

C. magnetic moment, geometry

D. stability, colour

Answer: A::B::C

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48. Select correct statement(s) regarding given complexes:

A. $\left[Fe(CO)_5\right]$, the orbitals used for hybridisation in Fe atom are s, p_x, p_y, p_z, d_{z^2} and it is high spin complex

B. $\left[Pt\left(NH_3\right)_2Cl_2\right]$, the orbtials used for hybridization on Pt atom are

s,$p_x, p_y, d_{x^2-y^2}$ and it is low spin complex

C. $\left[Cr\left(H_2O\right)_6\right]^{3+}$, the orbitals used for hybridization in Cr atom are

s,$p_x, p_y, p_z, p_{x^2}, d_{x^2-y^2}$ and it is high spin complex

D. $Ni(CO)_4$, the orbitals used of rhybridization in Ni atom are s,

$p_x, p_y, p_z,$ and it is low spi complex

Answer: B::D

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49. Complex compound $\left[Co(SCN)_2\left(NH_3\right)_4\right]Cl$ exhibits:

A. Ionization isomerism

B. geometrical isomerism

C. optical isomerismm

D. linkage isomerism

Answer: A::B::D

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50. Which of the following compound has/have effective atomic number equal to the atomic number of a noble gas?

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

B. $K_2\left[Fe(CO)_4\right]$

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

D. $\left[CoCl_3\left(H_2O\right)_3\right]$

Answer: A::B::D

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51. $K_2\left[Ni(CN)_4\right]\overset{\text{K in liq.}}{\rightarrow} NH_3X'$

Regarding this reaction correct statement is/are:

A. X' is $K_4\left[Ni(CN)_4\right]$

B. The oxidation state of Ni changed +2 to zero

C. The structure of 'X' is tetrahedral

D. $\left[Ni(CN)_4\right]^{2-}$ is square planar complex

Answer: A::B::C::D

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52. Which of the following statement(s) is/are correct?

A. The oxidation state of iron in sodium nitro prosside $Na_2\left[Fe(CN)_5(NO)\right]$ is+II

B. $\left[Ag\left(NH_3\right)_2\right]^+$ is linear in shape

C. In $\left[Fe\left(H_2O\right)_6\right]^+$, Fe is d^2sp^3 hybridized

D. In $\left[Co\left(H_2O\right)_6\right]^{3+}$ complex ion, Co is d^2sp^3 hybridized

Answer: A::B::D

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53. Which one of the following statement(s) is/are false?

A. weak ligands like F^-, Cl^- and and OH^- usually form low spin complexes

B. Strong ligand like CN^- and NO_2^-, generally form high spin complexes

C. $\left[FeF_6\right]^{3-}$ is high spin complex

D. $\left[Ni(CO)_4\right]$ is high spin complex

Answer: A::B::D

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54. A d-block element forms octahedral complex but its magnetic moment remains same either in strong field or in weak field ligand. Which of the following is/are correct?

A. Element always forms colourless compound

B. Number of electron in t_{2g} orbitals are higher than in e_g orbitals

C. It can have either $d^3 \text{ or } d^8$ configuration

D. It can have either $d^7 \text{ or } d^8$ configuration

Answer: B::C

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55. For which of the followng d^n configuration complexes, can not exist in both high spin and low spin forms:

(I) d^3

(II) d^5

(III) d^6

(IV) d^8

A. d^3

B. d^5

C. d^6

D. d^8

Answer: A::D

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56. Which of the following pairs show coordination isomerism?

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

B.

$$\left[Co\left(NH_3\right)_3\left(H_2O\right)_2Cl\right]Br_2 \text{ and } \left[Co\left(NH_3\right)_3\left(H_2O\right)Cl \cdot Br\right]Br \cdot H_2O$$

C. $\left[Pt\left(NH_3\right)_4Cl_2\right]Br_2$ and $\left[Pt\left(NH_3\right)_3B_2\right]Cl_2$

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

Answer: A::D

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57. Which of the following are coordination isomers of $\left[Co\left(NH_3\right)_6\right]\left[Cr(CN)_6\right]$?

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

B. $\left[Cr\left(NH_3\right)_4(CN)_2\right]\left[Co(CN)_4\left(NH_3\right)_2\right]$

C. $\left[Cr\left(NH_3\right)_3(CN)_3\right]\left[Co\left(NH_3\right)_3(CN)_3\right]$

D. none of these

Answer: A::B

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58. Which of the following statements is not true about the complex ion $\left[CrCl\left(NO_2\right)(en)_2\right]^+$?

A. It has two geometrical isomers cis and trans

B. cis and trans forms are not diastereomers to each other

C. only the cis isomer displays optical activity

D. it has three optically active isomers: d, l and trans forms

Answer: B::D

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59. Which of the following statement(s) is/are incorrect?

A. In $\left[CrBrCl(en)_2\right]^+$ geometrical isomerism exists, while optical isomerism does not exist

B. Potassium aquadicyanosuperoxoperoxoperoxoch-romate(III) is IUPAC name $K_2\left[Br(N)_2O_2\left(O_2\right)\left(H_2O\right)\right]$

C. There are 3 geometriacl and 15 stereoisomers possible for $\left[Pt\left(NO_2\right)\left(NH_3\right)\left(NH_2OH\right)(py)\right]^+$ and $\left[PtBrCl\left(NO_2\right)\left(NH_3\right)(py)\right]$ respectively

D. cis and trans forms are not diastereomers to each other

Answer: A::B::C::D

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60. Which of the following statement is true about the complex $\left[CrCl_3(OH)_2\left(NH_3\right)\right]^{2-}$ ion?

A. It has three geometrical isomers

B. Only one space isomers is optically active and remaining are inactive

C. There are total four space isomers

D. The magnetic moment of complex ion is 3.89 BM

Answer: A::D

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61. Which of the following is correct about Tetraamminedithiocyanato-s cobalt(III) tris(oxalato)cobaltate(III)?

A. Formula of the complex is $\left[Co(SCN)_2\left(NH_3\right)_4\right]\left[Co(ox)_3\right]$

B. It is a chelating complex and show linkage isomerism

C. it shows optical isomerism

D. it shows geometrical isomerism

Answer: B::C::D

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62. Which of the followingg statement(s) is/are false?

A. In $\left[PtCl_2(NH_3)_4\right]^{2+}$ complex ion, the cis-form is optically active, while trans-form is optically inactive

B. In $\left[Fe(C_2O_4)_3\right]^{3-}$, geometrical isomerism does not exist, while optical isomerism exist

C. In $[Mabcd]^{n\pm}$ tetrahedral complexes, optical isomerism cannot be observed

D. In $[Mabcd]^{n\pm}$ square planar complex, optical isomerism can be observed

Answer: A::C::D

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63. Which of the following statement(s) is/are true?

A. In metal carbonyl complexes d_{C-O} increases compared to that in CO molecule

B. The pair of compounds $\left[Br\left(H_2O\right)_6\right]Cl_3$ and $\left[CrCl_3\left(H_2O\right)_3\right]\cdot 3H_2O$ show hydrte isomerism

C. d_{x^2} orbital of central metal atom/ion is used in dsp^2 hybridisation

D. Facid Meridional isomers associated with $\left[Ma_3b_3\right]^{n\pm}$ type complex compound, both are optically inactive.

Answer: A::D

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64. Select the correct statement:

A. Chelation effect is maximum for five and six membered rings

B. Greater the charge on the central metal cation, greater the value of $\Delta(CFSE)$

C. In complex ion $\left[CoF_6\right]^{3-}, F^-$ is a weak field ligand, so that $\Delta_{oct} < P$(Pairng energy) and it is low spin complex

D. $\left[CoCl_2\left(NH_3\right)_2(en)\right]^{\oplus}$ complex ion will have four different isomers

Answer: A::B::D

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65. Which of the following statement(s) is/are true?

A. In ferrocyanide ion, the effective atomic number is 36.

B. Chelating ligands are atleast bidentate ligand

C. $\left[CrCl_2(CN)_2\left(NH_3\right)_2\right]^{\ominus}$ and $\left[CrCl_3\left(NH_3\right)_3\right]$ both have d^2sp^3 hybridization

D. As the number of rings in complex increases, stability of complex (chelate) also increases

Answer: A::B::C::D

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66. In test of NO_3^- ion, the dark brown ring complex is forme,d which is true of thic complex?

A. the colour is due to charge transfer spectra

B. iron and NO both have +1 charge

C. The complex species can be represented as $\left[Fe^1\left(H_2O\right)(5)NO\right]^{3+}$

D. Iron has +2 oxidation state and NO is neutral

Answer: A::B::C

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67. The complex(es) which is/are blue in colour:

A. $Fe_4\left[Fe(CN)_6\right]_3$

B. $Zn_2\left[Fe(CN)_6\right]$

C. $Cu_2\left[Fe(CN)_6\right]$

D. $Fe_3\left[Fe(CN)_6\right]_2$

Answer: A::D

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68. What is/are the coordination number(s) of Au in the complexes formed by Au?

A. 6

B. 4

C. 5

D. 2

Answer: B::D

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69. The d-orbitals involved in sp^3d^2 or d^2sp^3 hybridization of the central metal ion are:

A. $d_{x^2-y^2}$

B. d_{xy}

C. d_{yz}

D. dx_{z^2}

Answer: A::D

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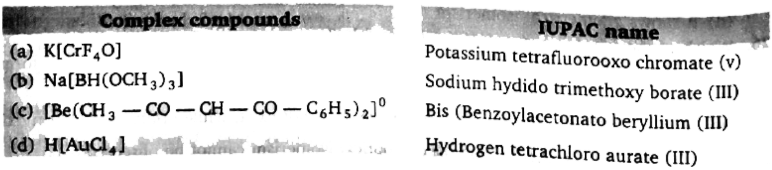
70. Which is not correctly matched?



Complex compounds	IUPAC name
(a) $K[CrF_4O]$	Potassium tetrafluorooxo chromate (v)
(b) $Na[BH(OCH_3)_3]$	Sodium hydido trimethoxy borate (III)
(c) $[Be(CH_3-CO-CH-CO-C_6H_5)_2]^0$	Bis (Benzoylacetonato beryllium (III)
(d) $H[AuCl_4]$	Hydrogen tetrachloro aurate (III)

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71. Which of the following statement(s) is(are) correct?

A. The complexes $\left[NiCl_4\right]^{2-}$ and $\left[NiCN_4\right]^{2-}$ differ in the magnetic properrties

B. The complexes $\left[NiCl_4\right]^{2-}$ and $[NiCN)_4]^{2-}$ differ in the geometry

C. The complexes $\left[NiCl_4\right]^{2-}$ and $\left[NiCN_4\right]^{2-}$ differ in primarry valancies of nickel

D. The complexes $\left[NiCl_4\right]^{2-}$ and $\left[NiCN_4\right]^{2-}$ differ in the state of hybridization of nickel

Answer: A::B::D

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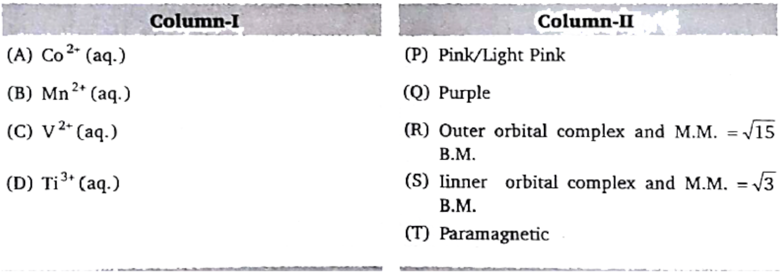
MATCH THE COLUMN

1. Match the following columns



Column-I	Column-II
(A) Co^{2+} (aq.)	(P) Pink/Light Pink
(B) Mn^{2+} (aq.)	(Q) Purple
(C) V^{2+} (aq.)	(R) Outer orbital complex and M.M. $=\sqrt{15}$ B.M.
(D) Ti^{3+} (aq.)	(S) Iinner orbital complex and M.M. $=\sqrt{3}$ B.M.
	(T) Paramagnetic

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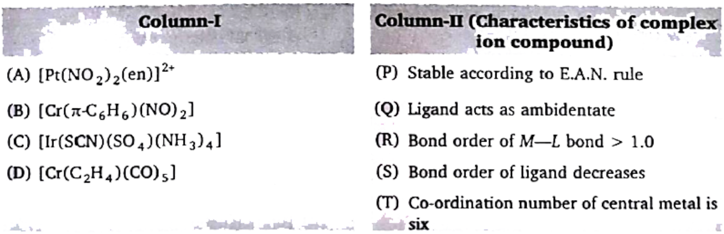

Column-I	Column-II (Characteristics of complex ion compound)
(A) $[Pt(NO_2)_2(en)]^{2+}$	(P) Stable according to E.A.N. rule
(B) $[Cr(\pi\text{-}C_6H_6)(NO)_2]$	(Q) Ligand acts as ambidentate
(C) $[Ir(SCN)(SO_4)(NH_3)_4]$	(R) Bond order of M—L bond > 1.0
(D) $[Cr(C_2H_4)(CO)_5]$	(S) Bond order of ligand decreases
	(T) Co-ordination number of central metal is six

2.

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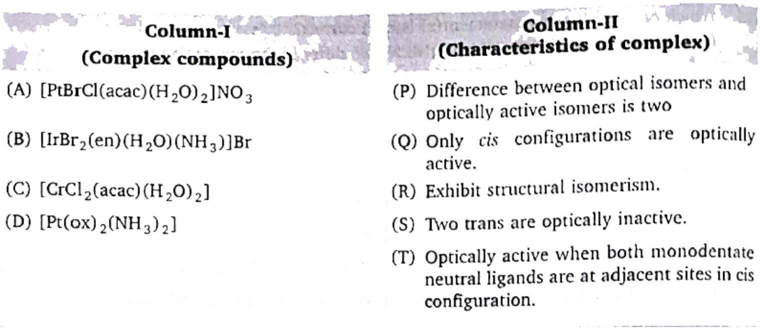
3.



Column-I (Complex compounds)	Column-II (Characteristics of complex)
(A) $[PtBrCl(acac)(H_2O)_2]NO_3$	(P) Difference between optical isomers and optically active isomers is two
(B) $[IrBr_2(en)(H_2O)(NH_3)]Br$	(Q) Only *cis* configurations are optically active.
(C) $[CrCl_2(acac)(H_2O)_2]$	(R) Exhibit structural isomerism.
(D) $[Pt(ox)_2(NH_3)_2]$	(S) Two trans are optically inactive.
	(T) Optically active when both monodentate neutral ligands are at adjacent sites in cis configuration.

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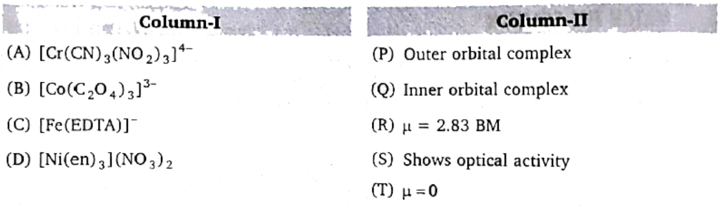
4.



Column-I	Column-II
(A) $[Cr(CN)_3(NO_2)_3]^{4-}$	(P) Outer orbital complex
(B) $[Co(C_2O_4)_3]^{3-}$	(Q) Inner orbital complex
(C) $[Fe(EDTA)]^-$	(R) $\mu = 2.83$ BM
(D) $[Ni(en)_3](NO_3)_2$	(S) Shows optical activity
	(T) $\mu = 0$

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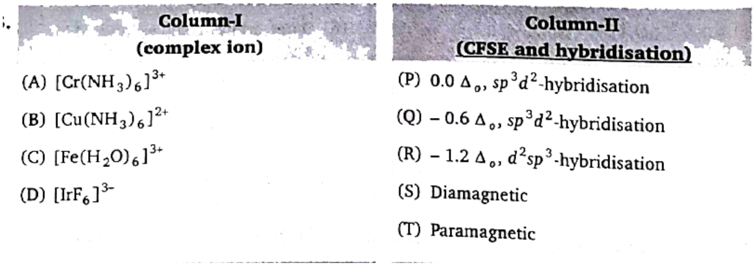

Column-I (complex ion)	Column-II (CFSE and hybridisation)
(A) $[Cr(NH_3)_6]^{3+}$	(P) $0.0\ \Delta_o$, sp^3d^2-hybridisation
(B) $[Cu(NH_3)_6]^{2+}$	(Q) $-0.6\ \Delta_o$, sp^3d^2-hybridisation
(C) $[Fe(H_2O)_6]^{3+}$	(R) $-1.2\ \Delta_o$, d^2sp^3-hybridisation
(D) $[IrF_6]^{3-}$	(S) Diamagnetic
	(T) Paramagnetic

5.

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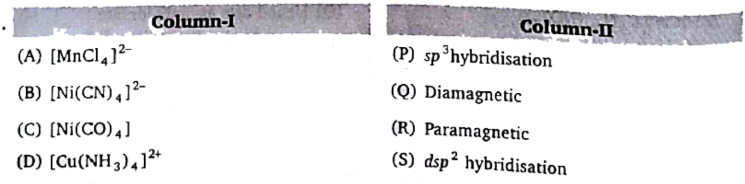
6. Match the following columns



Column-I	Column-II
(A) $[MnCl_4]^{2-}$	(P) sp^3hybridisation
(B) $[Ni(CN)_4]^{2-}$	(Q) Diamagnetic
(C) $[Ni(CO)_4]$	(R) Paramagnetic
(D) $[Cu(NH_3)_4]^{2+}$	(S) dsp^2 hybridisation

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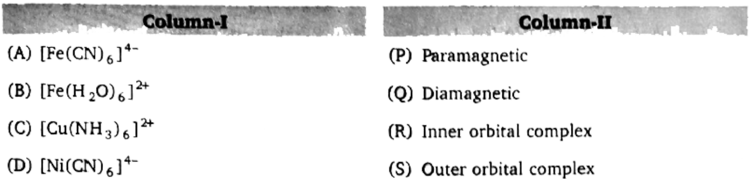
7. Match the following columns



Column-I	Column-II
(A) $[Fe(CN)_6]^{4-}$	(P) Paramagnetic
(B) $[Fe(H_2O)_6]^{2+}$	(Q) Diamagnetic
(C) $[Cu(NH_3)_6]^{2+}$	(R) Inner orbital complex
(D) $[Ni(CN)_6]^{4-}$	(S) Outer orbital complex

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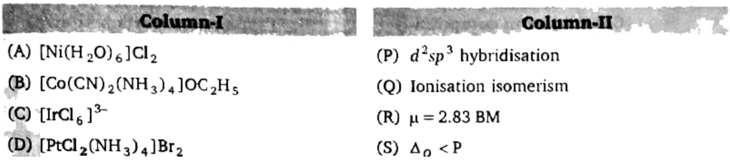
8.



Column-I	Column-II
(A) $[Ni(H_2O)_6]Cl_2$	(P) d^2sp^3 hybridisation
(B) $[Co(CN)_2(NH_3)_4]OC_2H_5$	(Q) Ionisation isomerism
(C) $[IrCl_6]^{3-}$	(R) $\mu = 2.83$ BM
(D) $[PtCl_2(NH_3)_4]Br_2$	(S) $\Delta_o < P$

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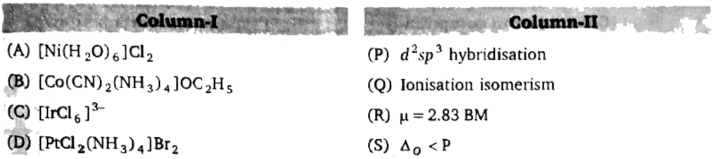
9.



Column-I	Column-II
(A) $[Ni(H_2O)_6]Cl_2$	(P) d^2sp^3 hybridisation
(B) $[Co(CN)_2(NH_3)_4]OC_2H_5$	(Q) Ionisation isomerism
(C) $[IrCl_6]^{3-}$	(R) $\mu = 2.83$ BM
(D) $[PtCl_2(NH_3)_4]Br_2$	(S) $\Delta_o < P$

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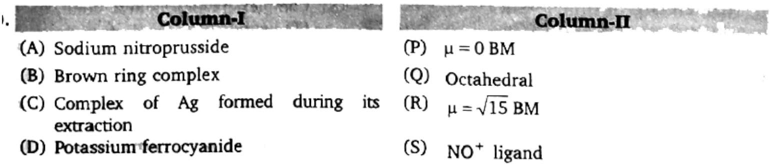

Column-I	Column-II
(A) Sodium nitroprusside	(P) $\mu = 0$ BM
(B) Brown ring complex	(Q) Octahedral
(C) Complex of Ag formed during its extraction	(R) $\mu = \sqrt{15}$ BM
(D) Potassium ferrocyanide	(S) NO^+ ligand

10.

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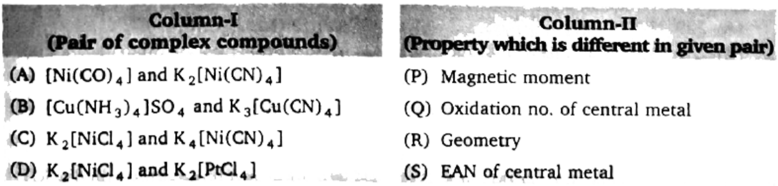

Column-I (Pair of complex compounds)	Column-II (Property which is different in given pair)
(A) $[Ni(CO)_4]$ and $K_2[Ni(CN)_4]$	(P) Magnetic moment
(B) $[Cu(NH_3)_4]SO_4$ and $K_3[Cu(CN)_4]$	(Q) Oxidation no. of central metal
(C) $K_2[NiCl_4]$ and $K_4[Ni(CN)_4]$	(R) Geometry
(D) $K_2[NiCl_4]$ and $K_2[PtCl_4]$	(S) EAN of central metal

11.

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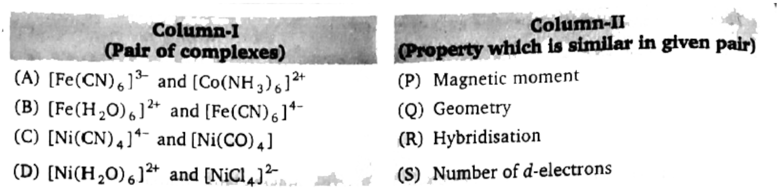

Column-I (Pair of complexes)	Column-II (Property which is similar in given pair)
(A) $[Fe(CN)_6]^{3-}$ and $[Co(NH_3)_6]^{2+}$	(P) Magnetic moment
(B) $[Fe(H_2O)_6]^{2+}$ and $[Fe(CN)_6]^{4-}$	(Q) Geometry
(C) $[Ni(CN)_4]^{4-}$ and $[Ni(CO)_4]$	(R) Hybridisation
(D) $[Ni(H_2O)_6]^{2+}$ and $[NiCl_4]^{2-}$	(S) Number of *d*-electrons

12.

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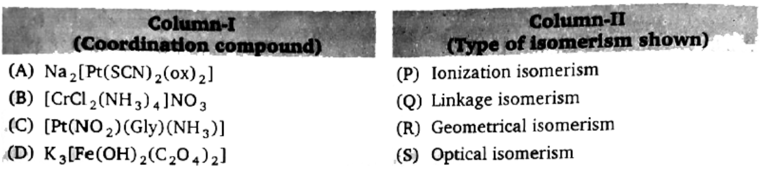
13. Match the following columns



Column-I (Coordination compound)	Column-II (Type of isomerism shown)
(A) $Na_2[Pt(SCN)_2(ox)_2]$	(P) Ionization isomerism
(B) $[CrCl_2(NH_3)_4]NO_3$	(Q) Linkage isomerism
(C) $[Pt(NO_2)(Gly)(NH_3)]$	(R) Geometrical isomerism
(D) $K_3[Fe(OH)_2(C_2O_4)_2]$	(S) Optical isomerism

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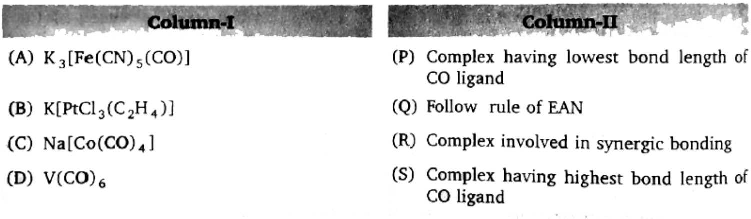
14. Match the following columns



Column-I	Column-II
(A) $K_3[Fe(CN)_5(CO)]$	(P) Complex having lowest bond length of CO ligand
(B) $K[PtCl_3(C_2H_4)]$	(Q) Follow rule of EAN
(C) $Na[Co(CO)_4]$	(R) Complex involved in synergic bonding
(D) $V(CO)_6$	(S) Complex having highest bond length of CO ligand

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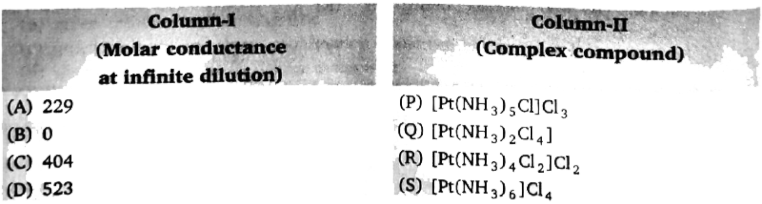
15. Match the following columns



Column-I (Molar conductance at infinite dilution)	Column-II (Complex compound)
(A) 229	(P) $[Pt(NH_3)_5Cl]Cl_3$
(B) 0	(Q) $[Pt(NH_3)_2Cl_4]$
(C) 404	(R) $[Pt(NH_3)_4Cl_2]Cl_2$
(D) 523	(S) $[Pt(NH_3)_6]Cl_4$

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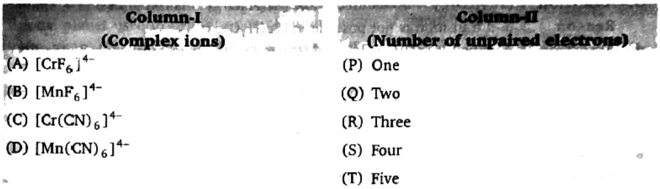
16. Match the following columns



Column-I (Complex ions)	Column-II (Number of unpaired electrons)
(A) $[CrF_6]^{4-}$	(P) One
(B) $[MnF_6]^{4-}$	(Q) Two
(C) $[Cr(CN)_6]^{4-}$	(R) Three
(D) $[Mn(CN)_6]^{4-}$	(S) Four
	(T) Five

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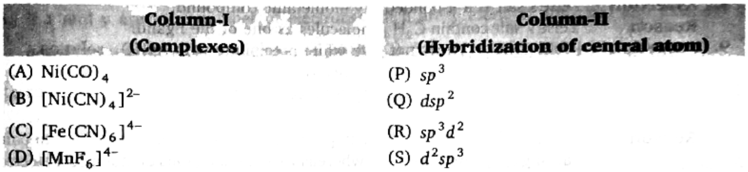
17. Match the following columns



Column-I (Complexes)	Column-II (Hybridization of central atom)
(A) $Ni(CO)_4$	(P) sp^3
(B) $[Ni(CN)_4]^{2-}$	(Q) dsp^2
(C) $[Fe(CN)_6]^{4-}$	(R) sp^3d^2
(D) $[MnF_6]^{4-}$	(S) d^2sp^3

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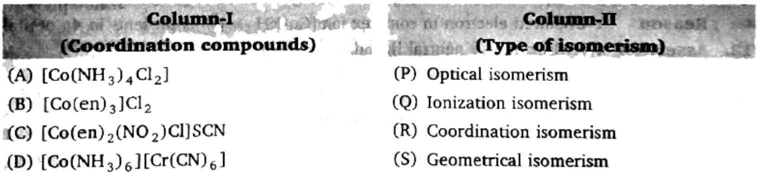
18. Match the following columns



Column-I (Coordination compounds)	Column-II (Type of isomerism)
(A) $[Co(NH_3)_4Cl_2]$	(P) Optical isomerism
(B) $[Co(en)_3]Cl_2$	(Q) Ionization isomerism
(C) $[Co(en)_2(NO_2)Cl]SCN$	(R) Coordination isomerism
(D) $[Co(NH_3)_6][Cr(CN)_6]$	(S) Geometrical isomerism

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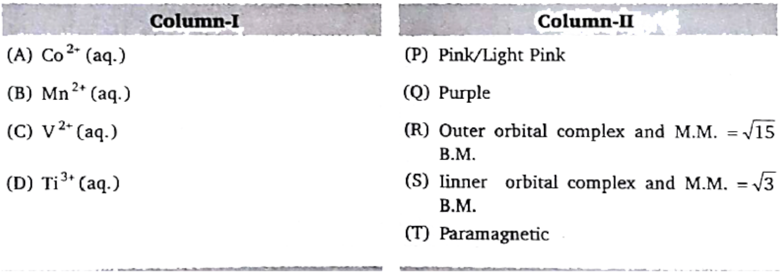
19. Match the following columns



Column-I	Column-II
(A) Co^{2+} (aq.)	(P) Pink/Light Pink
(B) Mn^{2+} (aq.)	(Q) Purple
(C) V^{2+} (aq.)	(R) Outer orbital complex and M.M. $= \sqrt{15}$ B.M.
(D) Ti^{3+} (aq.)	(S) Iinner orbital complex and M.M. $= \sqrt{3}$ B.M.
	(T) Paramagnetic

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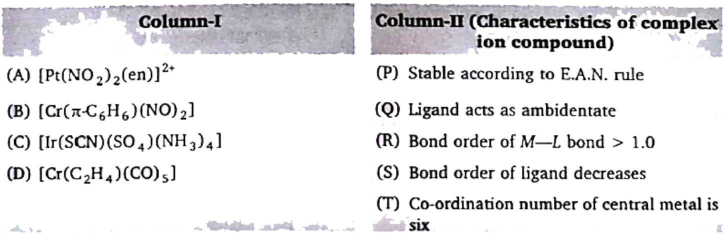
20.



Column-I	Column-II (Characteristics of complex ion compound)
(A) $[Pt(NO_2)_2(en)]^{2+}$	(P) Stable according to E.A.N. rule
(B) $[Cr(\pi\text{-}C_6H_6)(NO)_2]$	(Q) Ligand acts as ambidentate
(C) $[Ir(SCN)(SO_4)(NH_3)_4]$	(R) Bond order of $M—L$ bond > 1.0
(D) $[Cr(C_2H_4)(CO)_5]$	(S) Bond order of ligand decreases
	(T) Co-ordination number of central metal is six

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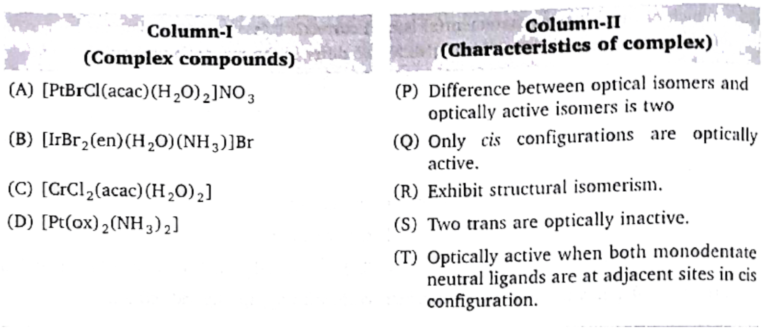

Column-I (Complex compounds)	Column-II (Characteristics of complex)
(A) $[PtBrCl(acac)(H_2O)_2]NO_3$	(P) Difference between optical isomers and optically active isomers is two
(B) $[IrBr_2(en)(H_2O)(NH_3)]Br$	(Q) Only *cis* configurations are optically active.
(C) $[CrCl_2(acac)(H_2O)_2]$	(R) Exhibit structural isomerism.
(D) $[Pt(ox)_2(NH_3)_2]$	(S) Two trans are optically inactive.
	(T) Optically active when both monodentate neutral ligands are at adjacent sites in cis configuration.

21.

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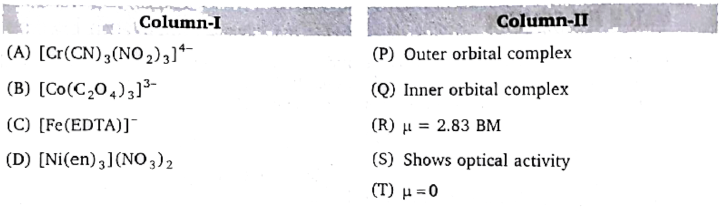
22. Match the following columns



Column-I	Column-II
(A) $[Cr(CN)_3(NO_2)_3]^{4-}$	(P) Outer orbital complex
(B) $[Co(C_2O_4)_3]^{3-}$	(Q) Inner orbital complex
(C) $[Fe(EDTA)]^-$	(R) $\mu = 2.83$ BM
(D) $[Ni(en)_3](NO_3)_2$	(S) Shows optical activity
	(T) $\mu = 0$

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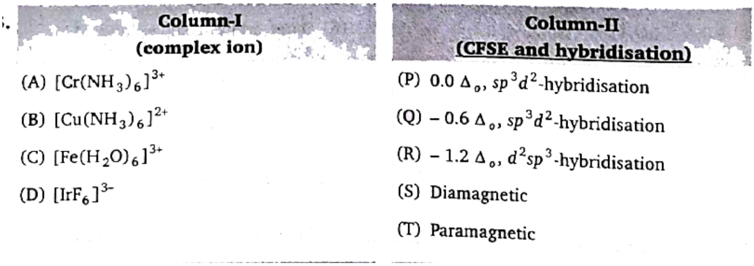

Column-I (complex ion)	Column-II (CFSE and hybridisation)
(A) $[Cr(NH_3)_6]^{3+}$	(P) $0.0\,\Delta_o$, sp^3d^2-hybridisation
(B) $[Cu(NH_3)_6]^{2+}$	(Q) $-0.6\,\Delta_o$, sp^3d^2-hybridisation
(C) $[Fe(H_2O)_6]^{3+}$	(R) $-1.2\,\Delta_o$, d^2sp^3-hybridisation
(D) $[IrF_6]^{3-}$	(S) Diamagnetic
	(T) Paramagnetic

23.

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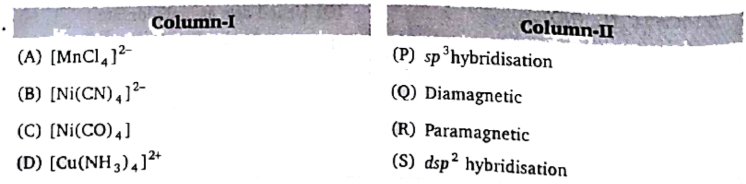

Column-I	Column-II
(A) $[MnCl_4]^{2-}$	(P) sp^3hybridisation
(B) $[Ni(CN)_4]^{2-}$	(Q) Diamagnetic
(C) $[Ni(CO)_4]$	(R) Paramagnetic
(D) $[Cu(NH_3)_4]^{2+}$	(S) dsp^2 hybridisation

24.

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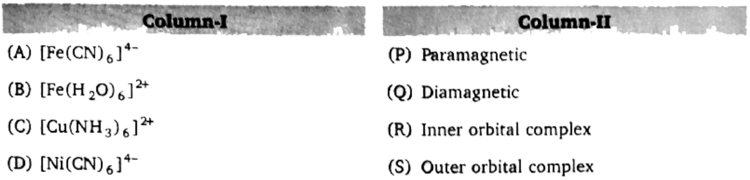
25. Match the Correct Column I and II



Column-I	Column-II
(A) $[Fe(CN)_6]^{4-}$	(P) Paramagnetic
(B) $[Fe(H_2O)_6]^{2+}$	(Q) Diamagnetic
(C) $[Cu(NH_3)_6]^{2+}$	(R) Inner orbital complex
(D) $[Ni(CN)_6]^{4-}$	(S) Outer orbital complex

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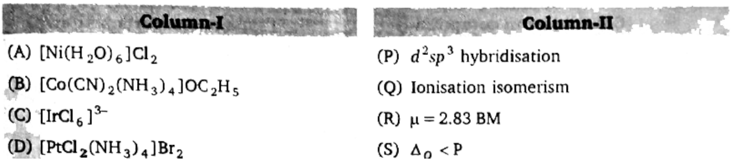
26.



Column-I	Column-II
(A) $[Ni(H_2O)_6]Cl_2$	(P) d^2sp^3 hybridisation
(B) $[Co(CN)_2(NH_3)_4]OC_2H_5$	(Q) Ionisation isomerism
(C) $[IrCl_6]^{3-}$	(R) $\mu = 2.83$ BM
(D) $[PtCl_2(NH_3)_4]Br_2$	(S) $\Delta_o < P$

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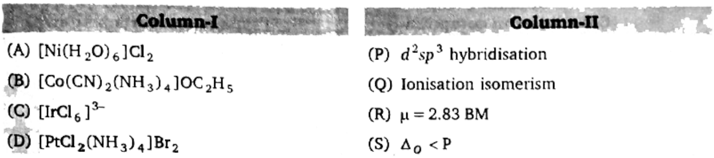
27.



Column-I	Column-II
(A) $[Ni(H_2O)_6]Cl_2$	(P) d^2sp^3 hybridisation
(B) $[Co(CN)_2(NH_3)_4]OC_2H_5$	(Q) Ionisation isomerism
(C) $[IrCl_6]^{3-}$	(R) $\mu = 2.83$ BM
(D) $[PtCl_2(NH_3)_4]Br_2$	(S) $\Delta_o < P$

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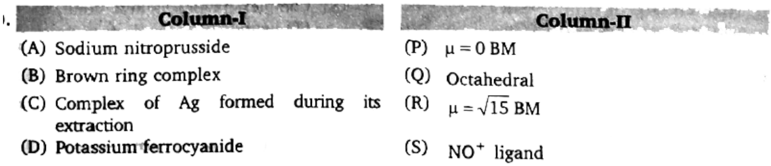
28.



Column-I	Column-II
(A) Sodium nitroprusside	(P) $\mu = 0$ BM
(B) Brown ring complex	(Q) Octahedral
(C) Complex of Ag formed during its extraction	(R) $\mu = \sqrt{15}$ BM
(D) Potassium ferrocyanide	(S) NO^+ ligand

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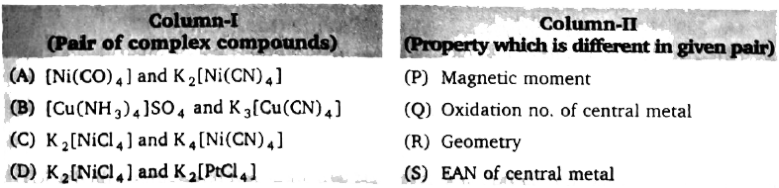

Column-I (Pair of complex compounds)	Column-II (Property which is different in given pair)
(A) $[Ni(CO)_4]$ and $K_2[Ni(CN)_4]$	(P) Magnetic moment
(B) $[Cu(NH_3)_4]SO_4$ and $K_3[Cu(CN)_4]$	(Q) Oxidation no. of central metal
(C) $K_2[NiCl_4]$ and $K_4[Ni(CN)_4]$	(R) Geometry
(D) $K_2[NiCl_4]$ and $K_2[PtCl_4]$	(S) EAN of central metal

29.

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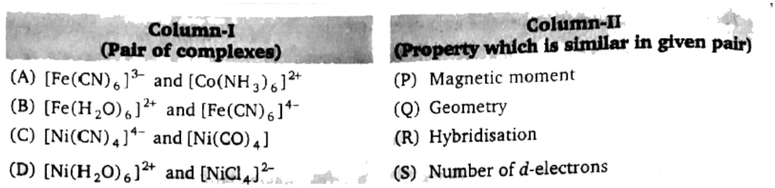

30.

Column-I (Pair of complexes)	Column-II (Property which is similar in given pair)
(A) $[Fe(CN)_6]^{3-}$ and $[Co(NH_3)_6]^{2+}$	(P) Magnetic moment
(B) $[Fe(H_2O)_6]^{2+}$ and $[Fe(CN)_6]^{4-}$	(Q) Geometry
(C) $[Ni(CN)_4]^{4-}$ and $[Ni(CO)_4]$	(R) Hybridisation
(D) $[Ni(H_2O)_6]^{2+}$ and $[NiCl_4]^{2-}$	(S) Number of d-electrons

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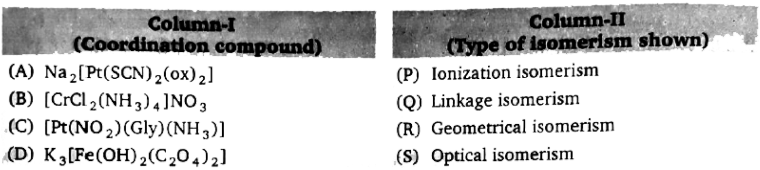
31. Match the following columns



Column-I (Coordination compound)	Column-II (Type of isomerism shown)
(A) $Na_2[Pt(SCN)_2(ox)_2]$	(P) Ionization isomerism
(B) $[CrCl_2(NH_3)_4]NO_3$	(Q) Linkage isomerism
(C) $[Pt(NO_2)(Gly)(NH_3)]$	(R) Geometrical isomerism
(D) $K_3[Fe(OH)_2(C_2O_4)_2]$	(S) Optical isomerism

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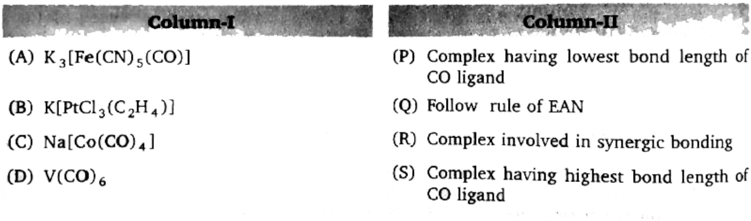
32.



Column-I	Column-II
(A) $K_3[Fe(CN)_5(CO)]$	(P) Complex having lowest bond length of CO ligand
(B) $K[PtCl_3(C_2H_4)]$	(Q) Follow rule of EAN
(C) $Na[Co(CO)_4]$	(R) Complex involved in synergic bonding
(D) $V(CO)_6$	(S) Complex having highest bond length of CO ligand

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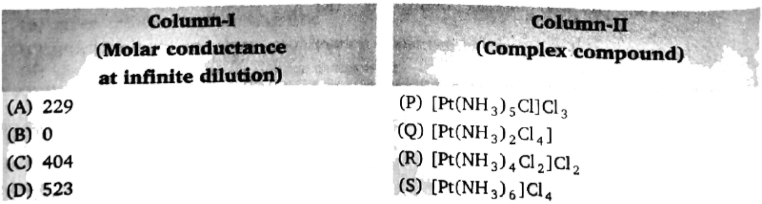
33. Match the following columns



Column-I (Molar conductance at infinite dilution)	Column-II (Complex compound)
(A) 229	(P) $[Pt(NH_3)_5Cl]Cl_3$
(B) 0	(Q) $[Pt(NH_3)_2Cl_4]$
(C) 404	(R) $[Pt(NH_3)_4Cl_2]Cl_2$
(D) 523	(S) $[Pt(NH_3)_6]Cl_4$

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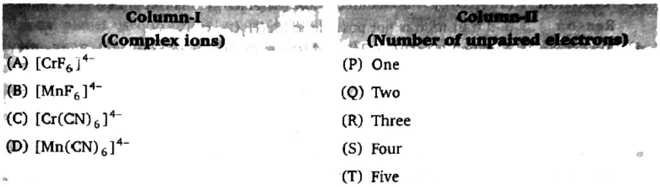
34. Match the following columns



Column-I (Complex ions)	Column-II (Number of unpaired electrons)
(A) $[CrF_6]^{4-}$	(P) One
(B) $[MnF_6]^{4-}$	(Q) Two
(C) $[Cr(CN)_6]^{4-}$	(R) Three
(D) $[Mn(CN)_6]^{4-}$	(S) Four
	(T) Five

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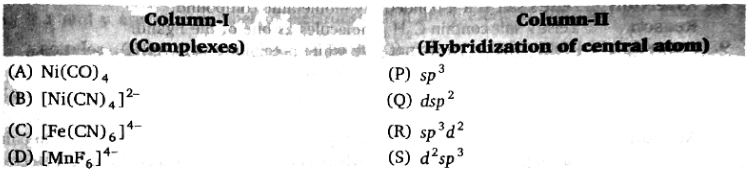
35. Match the following columns



Column-I (Complexes)	Column-II (Hybridization of central atom)
(A) $Ni(CO)_4$	(P) sp^3
(B) $[Ni(CN)_4]^{2-}$	(Q) dsp^2
(C) $[Fe(CN)_6]^{4-}$	(R) sp^3d^2
(D) $[MnF_6]^{4-}$	(S) d^2sp^3

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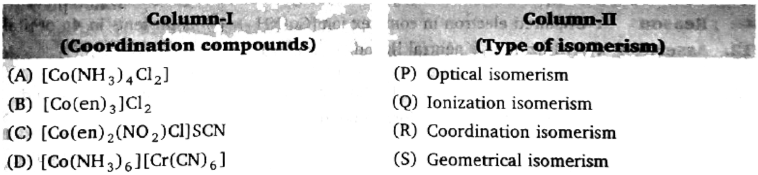
36. Match the following columns



Column-I (Coordination compounds)	Column-II (Type of isomerism)
(A) $[Co(NH_3)_4Cl_2]$	(P) Optical isomerism
(B) $[Co(en)_3]Cl_2$	(Q) Ionization isomerism
(C) $[Co(en)_2(NO_2)Cl]SCN$	(R) Coordination isomerism
(D) $[Co(NH_3)_6][Cr(CN)_6]$	(S) Geometrical isomerism

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ASSERTION-REASON TYPE QUESTIONS

1. Assertion: In N_2 Molecule, any N-atom can coordinate with central atom/ion.

Reason: N_2 molecule can also act as ambidentate ligand.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: A

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2. Assertion: In N_2H_4, any one N-atom can coordination with central metal cation in a coordination compound.

Reason: N_2H_4 can also act as ambidentate ligand.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

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

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

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: B

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4. Assertion: Acidified $\left[Cu\left(NH_3\right)_4\right]^{2+}$ and $\left[Cu\left(H_2O\right)_4\right]^{2+}$ both react with $K_4\left[Fe(CN)_6\right]$ to give brown ppt.

Reason: both complexes are blue in colour of little different shade.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: D

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5. Assertion: $[Fe(EDTA)]^-$ complex is octahedral in shape.

Reason: EDTA is a hexadentate ligand and undergoing sp^3d^2

hybridisation.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: A

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6. STATEMENT-1: Tetrahedral complexes with chiral structure exhibit optical isomerism .

and

STATEMENT-2: They lack plane of symmetry .

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: C

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7. Assertion: Oxidation state of Fe in $Fe(CO)_5$ is zero.

Reason: Synergic bonding takes place in this metal carbonyl complex.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: D

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8. Assertion: Zeise's salt is a π-bonded organometallic compound.

Reason: Zeise's salt contain C_2H_4 molecules as one of the ligand.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: C

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9. Assertion: $\left[CoCl_3(NH_3)_3\right]$ does not give white precipitate with $AgNO_3$ solution.

Reason: $\left[CoCl_3(NH_3)_3\right]$ complex is optically inactive.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: D

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10. Assertion: Transition metal ion forming octahedral complexes undergo sp^3d^2 or d^2sp^3 hybridisation.

Reason: Strong field ligands force the unpaired electrons of central metal ion to pair up causingg d^2sp^3 hybridisation whereas weak field ligands do not affect electronic configuration of the metal ion undergoes in sp^3d^2 hybridisation.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: C

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11. Assertion: Complex ion $\left[Co\left(NH_3\right)_6\right]^{2+}$ is readily oxidized to $\left[Co\left(NH_3\right)_6\right]^{3+}$

Reason: Unpaired electron in complex ion $\left[Co\left(NH_3\right)_6\right]^{2+}$ is present in 4p orbital.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: A

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12. Assertion: Hydrazine is a neutral ligand.

Reason: It has two N as donor atoms and behaves as a chelating ligand.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: A

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13. Assertion: Complex anion $\left[Re_2Cl_8\right]^{2-}$ has one δ-bond, one sigma and two π-bond.

Reason:d_{z^2} orbital can never form δ-bond.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: B

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14. Assertion: In N_2 Molecule, any N-atom can coordinate with central atom/ion.

Reason: N_2 molecule can also act as ambidentate ligand.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: A

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15. Assertion: In N_2H_4, any one N-atom can coordination with central metal cation in a coordination compound.

Reason: N_2H_4 can also act as ambidentate ligand.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: A

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16. Assertion: $\left[Ti\left(H_2O\right)_6\right]^{4+}$ is coloured while $\left[Sc\left(H_2O\right)_6\right]^{3+}$ is colourless.

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

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: B

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17. Assertion: Acidified $\left[Cu\left(NH_3\right)_4\right]^{2+}$ and $\left[Cu\left(H_2O\right)_4\right]^{2+}$ both react with $K_4\left[Fe(CN)_6\right]$ to give brown ppt.

Reason: both complexes are blue in colour of little different shade.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: D

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18. Assertion: $[Fe(EDTA)]^{-}$ complex is octahedral in shape.

Reason: EDTA is a hexadentate ligand and undergoing sp^3d^2 hybridisation.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: A

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19. STATEMENT-1: Tetrahedral complexes with chiral structure exhibit optical isomerism .

and

STATEMENT-2: They lack plane of symmetry .

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: C

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20. Assertion: Oxidation state of Fe in $Fe(CO)_5$ is zero.

Reason: Synergic bonding takes place in this metal carbonyl complex.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: D

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21. Assertion: Zeise's salt is a π-bonded organometallic compound.

Reason: Zeise's salt contain C_2H_4 molecules as one of the ligand.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: C

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22. Assertion: $\left[CoCl_3(NH_3)_3\right]$ does not give white precipitate with $AgNO_3$ solution.

Reason: $\left[CoCl_3(NH_3)_3\right]$ complex is optically inactive.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: D

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23. Assertion: Transition metal ion forming octahedral complexes undergo sp^3d^2 or d^2sp^3 hybridisation.

Reason: Strong field ligands force the unpaired electrons of central metal ion to pair up causingg d^2sp^3 hybridisation whereas weak field ligands do not affect electronic configuration of the metal ion undergoes in sp^3d^2 hybridisation.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: C

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24. Assertion: Complex ion $\left[Co\left(NH_3\right)_6\right]^{2+}$ is readily oxidized to $\left[Co\left(NH_3\right)_6\right]^{3+}$

Reason: Unpaired electron in complex ion $\left[Co\left(NH_3\right)_6\right]^{2+}$ is present in 4p orbital.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: A

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25. Assertion: Hydrazine is a neutral ligand.

Reason: It has two N as donor atoms and behaves as a chelating ligand.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: A

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26. Assertion: Complex anion $\left[Re_2Cl_8\right]^{2-}$ has one δ-bond, one sigma and two π-bond.

Reason:d_{z^2} orbital can never form δ-bond.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. If both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: B

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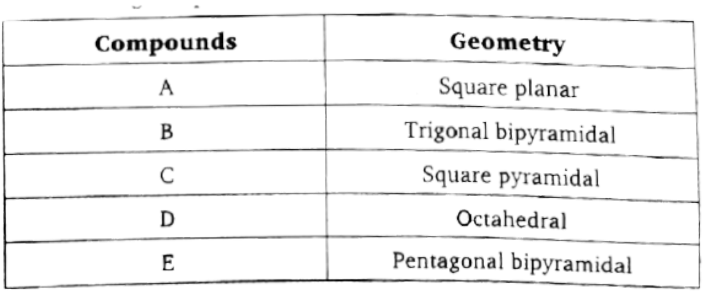
SUBJECTIVE PROBLEMS

1. Consider the following compounds with their regular geometries.



Compounds	Geometry
A	Square planar
B	Trigonal bipyramidal
C	Square pyramidal
D	Octahedral
E	Pentagonal bipyramidal

Calculate value of $(x + y - z)^2$, where x is total number of axial d-orbitals having zero nodal plane, y and z are total no. of non-axial and axial d-orbitals respectively each one having two nodal planes used in hybridisation of central atoms of compounds A to E.

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2. How many π - bonds are present in ferrocene?

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3. Consider the following carbonyl complex compounds.

(i) $Mo(CO)_x$

(ii) $H_y\left[Cr(CO)_5\right]$ and (iii) $Co_2(CO)_z$

Then calculate value of $|x + y - z|$.

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4. If x and y are total number of electrons which are present in non-axial and axial set off d-orbitals respectively in Ni cation of $\left[Ni(DMG)_2\right]$, then calculate the value of $\frac{2x^2}{y}$

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5. Consider the following complex compounds:

(i) $\left[Pt\left(NH_3\right)_2(SCN)_2\right]$

(ii) $\left[Co\left(NH_3\right)_2\left(NO_2\right)_3\right]$

(iii) $\left[Pt(en)Cl_2\right]$

(iv) $\left[Cr(en)_2Br_2\right]^+$

(v) $\left[Rn(en)_3\right]^{3+}$

(vi) $\left[CoCl_2Br_2\right]$

Then calculate sum of total number of geometrical isomers in all above complex compounds.

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6. Consider the following transformation:

$Cr(CO)_x \rightarrow Cr(CO)_y(NO)_x$

If both reactant and product follow EAN rule, then calculate value of $x + z - y$ (where x,y and z are natural numbers).

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7. The oxidation number of Fe in $\left[Fe\left(H_2O\right)_5NO\right]SO_4$ is

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8. Calculate |C.F.S.E| (mod value) is term of Dq. For complex ion $\left[MnF_6\right]^{3-}$.

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9. Total number of geometrical isomers of $\left[CoBrClI(CN)\left(H_2O\right)\left(NH_3\right)\right]^{-}$ complex ion, in which all halides are in cis-position.

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10. What is CFSE of complex ion $\left[FeF_6\right]^{4-}$ in terms of Dq?

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11. How many more co-ordination isomers are possible of the compound $\left[Cu\left(NH_3\right)_4\right]\left[PtCl_4\right]$?

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12. Total number of space (stereo) isomers of complex ion $\left[Cr(gly)(en)_2\right]^{2+}$ are ....

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13. A (Light pink colour complex) $\xrightarrow{Pb_2\frac{0}{d}il.\ \ HNO_2}$ $\Delta HMnO_4 \xrightarrow{H_2S/H^+}$ A (Light pink colour complex).

Calculate CFSE value in light pink colour complex.

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14. How many electrons are present in t_{2g} set of d-orbitals of central metal cation in $\left[Fe\left(H_2O\right)_5(NO)\right]SO_4$ brown ring complex?

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15. A (Light pink colour complex) $\xrightarrow{Pb_2\frac{\varnothing}{d}il.\quad HNO_2} \Delta HMnO_4 \xrightarrow{H_2S/H^+} A$ (Light pink colour complex).

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16. Calculate value of "x+y" if x is the total number of σ bonds and y is total number of π bonds in ligand EDTA and phenanthrolene.

(EDTA Ethylene diamine tetraacetate, Phen=1,10-N,N-phenanthrolene)

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17. Consider the following complex compounds:

(i) $\left[Pt\left(NH_3\right)_2(SCN)_2\right]$

(ii) $\left[Co\left(NH_3\right)_3\left(NO_2\right)_3\right]$

(iii) $\left[Pt(en)Cl_2\right]$

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18. Total number of complexes among the following which are opticaly active?

(i) $\left[Cr(Ox)_3\right]^{3-}$

(ii) cis-$\left[Pt\left(Cl_2\right)(en)\right]$

(iii) cis$\left[Rh\left(Cl_2\right)\left(NH_3\right)_4\right]^+$

(iv) $Ru(dipy)_3]^{3+}$

(v) cis $\left[Co\left(NO_2\right)_3(dien)\right]$

(vi) Trans-$\left[Co\left(NO_2\right)_3(dien)\right]$

(vii) cis $\left[Co\left(NO_2\right)_3\left(NH_3\right)_3\right]$

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19. Consider the following complexes:

(i) $\left[FeIF(CN)\left(H_2O\right)(en)\right]$

(ii) $\left[MoCl_2F_2(gly)\right]^{2-}$

Then, calculate value of $|x-y|$ (where x and y are total number of possible optically active isomers in (i) and (ii) complex respectively).

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20. Consider the following ligands NH_2^-, acac, OH^-, Gly, O_2^-, Phen, DMG, $NO_2^-, CO_3^{2-}, Cl^-, CH_3COO^-, en, SO_4^{2-}$. Then calculate vlaue of "P+Q-R-S" here

P: total number of ligands which act as bridging as well as monodentate only.

Q: Total number of flexidentate ligands.

R: Total number of bidentate ligands only

S: Total number of unsymmetrical bidentate ligands.

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21. $M(CO)_x(NO)_y \xrightarrow{+NO} -COM(NO)_z$

Where EAN of metal (M) in both produce and reactant is samme and it is 54. then calculate value of (x+y=-z). (where x,y and z are netural numbers and M belong to 6th group according to long form of periodic table)

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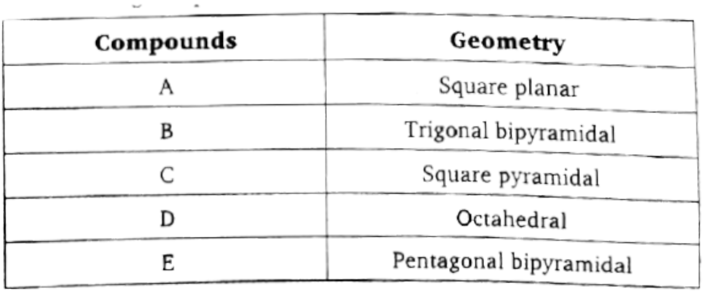

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Then calculate sum of total number of geometrical isomers in all above complex compounds.

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$Cr(CO)_x \rightarrow Cr(CO)_y(NO)_z$

If both reactant and product follow EAN rule, then calculate value of $x + z - y$ (where x,y and z are natural numbers).

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28. Brown colour of the complex $\left[Fe\left(H_2O\right)_5(NO)\right]SO_4$ is due to C. T. spectrum which causes momentary change in oxidation state. Find out oxidation state of Fe in this complex.

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29. Calculate |C.F.S.E| (mod value) is term of Dq. For complex ion $\left[MnF_6\right]^{3-}$.

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30. Total number of geometrical isomers of $\left[CoBrClI(CN)\left(H_2O\right)\left(NH_3\right)\right]^{-}$ complex ion, in which all halides are in cis-position.

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33. Total number of space (stereo) isomers of complex ion $\left[Cr(gly)(en)_2\right]^{2+}$ are ....

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34. Calculate CFSE of light pink compound formed, when $KMnO_4$ is reduced by acidified H_2S.

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35. How many electrons are present in t_{2g} set of d-orbitals of central metal cation in $\left[Fe\left(H_2O\right)_5(NO)\right]SO_4$ brown ring complex?

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36. A (Light pink colour complex) $\xrightarrow{Pb_2\frac{\varnothing}{d}il.\ HNO_2}$ $\Delta HMnO_4$ $\xrightarrow{H_2S/H^+}$ A (Light pink colour complex).

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