CHEMISTRY

BOOKS - IIT-JEE PREVIOUS YEAR (CHEMISTRY)

COORDINATION COMPOUNDS

Jee Main And Advanced

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

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

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

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

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

Answer: A

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2. The number of geometric isomers that can exist for square planar $\left[Pt(C1)(py)(NH_3)(NH_2OH)^+\right]$ is (py = pyridine).

A. 2

B. 3

C. 4

D. 6

Answer: B

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3. Which of the following complex species is not expected to exhibit optical isomerism ?

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

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

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

D. $[Co(en)(NH_3)Cl_2]^+$

Answer: C

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4. As per IUPAC nomenclature, the name of the complex $\left[Co(H_2O)_4(NH_3)_2\right]Cl_3$ is

A. tetraaquadiaminecobalt (III) chloride

B. tetraaquadiaminecobalt (III) chloride

C. Diaminetetraaquacobalt III) chloride

D. Diaminetetraaquacobalt III) chloride

Answer: D

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5. Geometrical shapes of the complex formed by the reaction of Ni^{2+} with Cl^{Θ}, CN^{Θ} and H_2O are :

A. octahedral, tetrahedral and square planar

B. tetrahedral, square planar and octahedral

C. square planar, tetrahedral and octahedral

D. octahedral, square planar and octahedral

Answer: B

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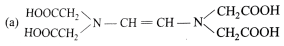
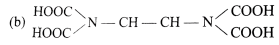
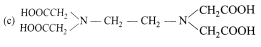
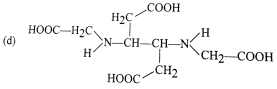
6. The correct structure of ethylenediamineteraacetic acid $(EDTA)$ is .

A. 

B. 

C. 

D. 

Answer: C

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7. The ionisation isomer of $\left[Cr(H_2O)_4Cl(NO_2)\right]Cl$

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

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

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

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

Answer: B

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8. The IUPAC name of $\left[Ni(NH_3)_4\right]\left[NiCl_4\right]$ is

A. Tetrachloronickel (II) -tetraamminenickel (II)

B. Tetraamminenickel (II) -tetrachloronickel (II)

C. Tetraamminenickel (II) -tetrachloronickelate (II)

D. Tetrachloronickel (II) -tetraamminenickelate (0)

Answer: C

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9. Which kind of isomerism is shown by $Co(NH_3)_4Br_2Cl$?

A. Geometrical and ionisation

B. Optical and ionisation

C. Geometrical and optical

D. Geometrical only

Answer: A

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10. The pair of coordination complex exhibiting the same kind of isomerism is .

A. $\left[Cr(NH_3)_5Cl\right]Cl_2$ and $\left[Cr(NH_3)_4Cl_2\right]Cl$

B. $\left[Co(NH_3)_4Cl_2\right]^+$ and $\left[Pt(NH_3)_2(H_2O)Cl\right]^+$

C. $[CoBr_2Cl_2]^{2-}$ and $[PtBr_2Cl_2]^{2-}$

D. $\left[Pt(NH_3)_3(NO_3)\right]Cl$ and $\left[Pt(NH_3)_3Cl\right]Br$

Answer: B::D

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11. The compound(s) that exhibits(s) geometrical isomerism is/are

A. $[Pt(en)Cl_2]$

B. $\left[Pt(en)_2\right]Cl_2$

C. $\left[Pt(en)_2Cl_2\right]Cl_2$

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

Answer: C::D

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12. Statement I The geometrical isomer of the complex $\left[M(NH)_3)_4CI_2\right]$ are optically inactive

Satement II Both geometrical isomers of the complex $\left[M(NH_3)_4CI_2\right]$ possess axis of symmetry .

A. Statement I is ture, Statement II is true, Statement II is the correct explanation of Statement I

B. Statement I is true, Statement II is true, Statement II is not the correct explanation of Statement I.

C. Statement I is true, Statement II is false

D. Statement I is false, Statement II is true .

Answer: B

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13. The coordination number of Ni^{2+} is 4

$NiCI_2 + KCN$ (excess) gives A (cyano complex)

$NiCI_2 + conc.\ HCI$ (excess) gives B (Chloro complex)

The $IUPAC$ name of A and B are .

A. potassium tetracyanonickelate (II), potassium tetrachloronickelate (II)

B. tetracyanopotassiumnickelate (II), tetrachloropotassiumnickelate (II)

C. tetracyanonickel (II), tetrachloronickel (II)

D. potassium tetracyanonickel (II), potassium tetrachloronickel (II)

Answer: A

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14. The type of magnetism exhibited by $\left[Mn(H_2O)_6\right]^{2+}$ ion is _____ .

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15. The number of geometric isomers possible for the complex $[CoL_2Cl_2]^-\left(L = H_2NCH_2CH_2O^-\right)$ is

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16. Among the complex ions,

$\left[Co(NH_2 - CH_2 - CH_2 - NH_2)_2Cl_2\right]^+$, $\left[CrCl_2(C_2O_4)_2\right]^{3-}$

$\left[Fe(H_2O)_4(OH)_2\right]^+$, $\left[Fe(NH_3)_2(CN)_4\right]^-$,

$\left[Co(NH_2 - CH_2 - CH_2 - NH_2)_2(NH_3)Cl\right]^{2+}$ and

that show(s) cis-trans isomerism is

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17. The volume (in mL) of $0.1MAgNO_3$ required for complete precipitation of chloride ions present in $30mL$ of $0.01M$ solution of $\left[Cr(H_2O)_5Cl\right]Cl_2$, as silver chloride is close to:

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18. Total number of geometrical isomers for the complex $[RhCl(CO)(PPh_3)(NH_3)]$ is

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19. Write the formulae of the following complex

(i) Pentamminechlorocobalt (III) ion

(ii) Lithium tetrahydridoaluminate (III)

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20. Write the IUPAC name for $\left[Cr(NH_3)_5CO_3\right]Cl$

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21. Write the $IUPAC$ name for the following compounds

(a) $\left[Co(NH_3)_5ONO\right]CI_2$

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

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

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

B. $\left[Co(H_2O)_3\right].\ 3H_2O$

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

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

Answer: D

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23. The pair having the same magnetic moment is

[at. No. $Cr = 24, Mn = 25, Fe = 26$ and $Co = 27$]

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

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

C. $[CoCl_4]^{2-}$ and $\left[Fe(H_2O)_6\right]^{2+}$

D. $\left[Cr(H_2O)_6\right]^{2+}$ and $[CoCl_4]^{2-}$

Answer: A

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24. Among $\left[Ni(CO)_4\right], [NiCl_4]^{2-}, \left[Co(NH_3)_4Cl_2\right]Cl, Na_3[CoF_6], Na_2O_2$ and CsO_2, the total number of paramagnetic compounds is

A. 2

B. 3

C. 4

D. 5

Answer: B

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25. The colour of $KMnO_4$ is due to

A. $M \rightarrow L$ charge transfer transition

B. $d \rightarrow d$ transition

C. $L \rightarrow M$ charge transfer transition

D. $\sigma \rightarrow \sigma$ transition

Answer: C

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

A. $Li_2O + 2KCl \rightarrow 2LiCl + K_2O$

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

C.

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

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

Answer: B

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

A. $L_4 < L_3, L_2 < L_1$

B. $L_1 < L_3 < L_2 < L_4$

C. $L_3 < L_2 < L_4 < L_1$

D. $L_1 < L_2 < L_4 < L_3$

Answer: B

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

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

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

A. $R < Q < P$

B. $Q < R < P$

C. $R < P < Q$

D. $O < P < R$

Answer: B

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

A. tetrahedral and tetrahedral

B. square planar and square planar

C. tetrahedral and square planar

D. square planar and tetrahedral

Answer: C

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

The diamagnetic are .

A. K, L, M, N

B. K, M, O, P

C. L, M, O, P

D. L, M, N, O

Answer: C

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31. The complex showing a spin -magnetic momnet of $2.82BM$ is .

A. $Ni(CO)_4$

B. $[NiCl_4]^2$

C. $Ni(PPh_3)_4$

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

Answer: B

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32. The spin only magnetic moment value (in Bohr magnetion units) of $Cr(CO)_6$ is

A. 0

B. 2.84

C. 4.9

D. 5.92

Answer: A

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33. Among the following , the coloured compound is

A. $CuCl$

B. $K_3\left[Cu(CN)_4\right]$

C. CuF_2

D. $\left[Cu(CH_3CN)_4\right]BF_4$

Answer: C

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34. Both $\left[Ni(CO)_4\right]$ and $\left[Ni(CN)_4\right]^{2-}$ are diamagnetic. The hybridisations of nickel in these complexes respectively, are

A. sp^3, sp^3

B. sp^3, dsp^2

C. dsp^2, sp^3

D. dsp^2, dsp^2

Answer: B

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35. Among the following metal carbonyls the $C - O$ bond order is lowest in .

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

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

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

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

Answer: B

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36. If the bond length of CO bond in carbon monoxide is 1.128Å, then what is the value of CO bond length in $Fe(CO)_5$?

A. 1.15Å

B. 1.128Å

C. 1.72Å

D. 1.118Å

Answer: A

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37. Spin only magnetic moment of the compound $Hg\left[C0(SCN)_4\right]$ is

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38. The compound having tetrahedral geometry is

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

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

C. $[PdCl_4]^{2-}$

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

Answer: D

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39. A mixture x containing 0.02 mol of $\left[Co(NH_3)_5SO_4\right]Br$ and 0.02 mol of $\left[Co(NH_3)_5Br\right]SO_4$ was prepared in $2L$ of solution.

$1L$ of mixture $X +$ excess $AgNO_3 \rightarrow Y$

$1L$ of mixture $X +$ excess $BaCl_2 \rightarrow Z$

The number of moles of Y and Z are

A. 0.01, 0.01

B. 0.02, 0.01

C. 0.01, 0.02

D. 0.02, 0.02

Answer: A

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40. The complex ion which has no 'd'-electrons in the centre metal atom is

A. $[MnO_4]^-$

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

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

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

Answer: A

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

A. both square planar

B. tetrahedral and square plana, respectively

C. both tetrahedral

D. square planar and tetrahedral, respectively

Answer: C

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42. Which of the following is formed when excess of KCN is added to an aqueous solution of copper sulphate?

A. $Cu(CN)_2$

B. $K_2\left[Cu(CN)_4\right]$

C. $K\left[Cu(CN)_2\right]$

D. $K_3\left[Cu(CN)_4\right]$

Answer: D

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43. Among the following ions, which one has the highest paramgentism ?

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

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

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

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

Answer: B

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44. Among $Ni(CO)_4$, $\left[Ni(CN)_4\right]^{2-}$ and $NiCI_4^{2-}$, dimagnetic complex are: .

A. $Ni(CO)_4$ and $NiCl_4^{2-}$ are diamagnetic and $\left[Ni(CN)_4\right]^{2-}$ is paramagnetic

B. $\left[Ni(CO)_4\right.$ and $\left[Ni(CN)_4\right]^{2-}$ are diamagnetic and $Ni(CO)_4$ is paramagnetic

C. $NI(CO)_4$ and $\left[Ni(CN)_4\right]^{2-}$ are diamagnetic and $[NiCl_4]^{2-}$ is paramagnetic

D. $Ni(CO)_4$ is diamagnetic and $[NiCl_4]^{2-}$ and $\left[Ni(CN)_4\right]^{2-}$ are paramagnetic

Answer: C

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45. Amongst the following, the lowest degree of paramgnetism per mole of the compound at $298K$ will be shown by

A. $MnSO_4.\ 4H_2O$

B. $CuSO_4.\ 5H_2O$

C. $FeSO_4.\ 6H_2O$

D. $NiSO_4.\ 6H_2O$

Answer: B

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46. Statement I $\left[Fe(H_2O)_5NO\right]SO_4$ is paramagnetic

Statement II The Fe in $\left[Fe(H_2O)_5NO\right]SO_4$ has three unpaired electrons

.

A. Statement I is ture, Statement II is true, Statement II is the correct explanation of Statement I

B. Statement I is true, Statement II is true, Statement II is not the correct explanation of Statement I.

C. Statement I is true, Statement II is false

D. Statement I is false, Statement II is true .

Answer: A

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47. The coordination number of Ni^{2+} is 4.

$NiCl_2 + KCN(\text{excess}) \rightarrow A(\text{cyano comples})$

$NiCl_2 + conc.\ HCl(\text{excess}) \rightarrow B(\text{chloro complex})$

Predict the magnetic nature of A and B.

A. Both are diamagnetic

B. A is diamagnetic and B is paramagnetic with one unpaired electron

C. A is diamagnetic and B is paramagnetic with two unpaired electrons

D. Both are paramagnetic

Answer: C

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48. The coordination number of Ni^{2+} is 4.

$NiCl_2 + KCN(\text{excess}) \rightarrow A(\text{cyano comples})$

$NiCl_2 + conc.\ HCl(\text{excess}) \rightarrow B(\text{chloro complex})$

The hybridisation of A and B are

A. dsp^2, sp^3

B. sp^3, sp^3

C. dsp^2, dsp^2

D. sp^3d^2, d^2sp^3

Answer: A

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49. Match each coordination compound in Column I with an appropriate pair of characteristics from Column II and select the correct answer using the codes given below the Column (en $= H_2NCH_2CH_2NH_2$, atomic

number : $Ti = 22, Cr = 24, Co = 27, Pt = 78$)

	Column I		Column II
(A)	$[Cr(NH_3)_4Cl_2]Cl$	1.	Paramagnetic and exhibits ionisation isomerism
(B)	$[Ti(H_2O)_5Cl](NO_3)_2$	2.	Diamagnetic and exhibits *cis-trans* isomerism
(C)	$[Pt(en)(NH_3)Cl]NO_3$	3.	Paramagnetic and exhibits *cis-trans* isomerism
(D)	$[Co(NH_3)_4(NO_3)_2]NO_3$	4.	Diamagnetic and exhibits ionisation isomerism

A.

A	B	C	D
4	2	3	1

B.

A	B	C	D
3	1	4	2

C.

A	B	C	D
2	1	3	4

D.

A	B	C	D
1	3	4	2

Answer: B

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

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51. Both potassium ferrocyanide and potassium ferricyanide are diamagnetic.

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52. The electron density in the xy plane in $3d_{x^2-y^2}$ orbital is zero

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53. For the octahedral complexes of Fe^{3+} in SCN^- (thiocyanato -S) and in CN^- ligand environments, the difference between the spin only magnetic moments in Bohr magnetons (when approximated to the nearest integer) is [atomic number of $Fe = 26$]

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54. In the comples acetylbromidodicarbonylbis (triethylphosphine) iron (II), the number of $Fe - C$ bond (s) is

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55. $EDTA^{4-}$ i9s ethylenediamine tetraacetate ion The total number of $N - CO - O$ bond angles in $[Co(EDTA)]^{-1}$ complex ion is .

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56. $NiCI_2$ in the presence of dimethy1 glyoxime(DMG) gives a complex which precipitates in the presence of NH_4OH giving a bright red colour .

(a) Draw its structure and show H bonding

(b) Give the oxidation state of Ni and its hybridisation

(c) Predict whether it is paramagnetic or dimagnetic .

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57. Write the IUPAC name of the compound $K_2\left[Cr(NO)(CN)_4(NH_3)\right]$. Spin magnetic moment of the complex $\mu = 1.73BM$. Given the structure of anion.

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58. Deduce the structures of $[NiCl_4]^{2-}$ and $\left[Ni(CN)_4\right]^{2-}$ considering the hybridisation of the metal ion. Calculate the magnetic moment (spin only) of the species.

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59. A metal complex having composition $Cr(NH_3)_4CI_2$ Br has been isolated in two forms A and B The A reacts with $AgNO_3$ to give a white precipitate readily soluble in dilute queous ammonia, whereas B gives a pale-yellow precipitate soluble in concentrated ammonia Write the formula of A and B and state the hybridisation of chromium in each. Calculate their magnetic moment (spin only value) .

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60. Draw the structures of $\left[Co(NH_3)_6\right]^{3+}$, $\left[Ni(CN)_4\right]^{2-}$ and $\left[Ni(CO)_4\right]$ Write the hybridisation of atomic orbitals of the transition metal in each case .

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61. Identify the complexes which are expected to be coloured.

a. $\left[Ti(NO_3)_4\right]$, b. $\left[Cu(NCCH_3)_4\right]^{\oplus} BF_4^{\ominus}$

c. $\left[Cr(NH_3)_6\right]^{3+} 3Cl^{\ominus}$, d. $K_3[VF_6]$

A. $\left[Ti(NO_3)_4\right]$

B. $\left[Cu(N\mathbb{C}H_3\right]^{+} BF_4$

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

D. $K_3[VF_6]$

Answer: A

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62. Give reasons in two or three sentences only for the following

"The species $[CuCl_4]^{2-}$ exists, while $[CuI_4]^{2-}$ does not" .

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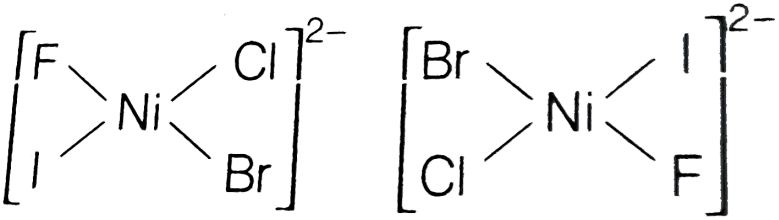
63. What is the relationship between the following two square planar complex ions ? The complex ions are



A. linkage isomers

B. coordination isomers

C. geometric isomers

D. the same

Answer: D

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Physics

1. Addition of excess aqueous ammonia to a pink coloured aqueous solution of $MCl_2.6H_2O(X)$ and NH_4Cl gives an octahedral complex Y in the presence of air. In aqueous solution, complex Y behaves as $1:3$ electrolyte. The reaction of X with excess HCl at room temperature results in the formation of a blue coloured complex Z. The calculated spin only magnetic moment of X and Z is $3.87B.M.$, whersas it is zero for complex Y.

Among the following options, which statement (s) is (are) correct ?

A. The hybridisation of the central metal ion in Y is d^2sp^3

B. Addition of silver nitrate to Y given only two equivalents os silver chloride

C. When X and Y are in equilibrium at $0^{\circ}C$, the colour of the solution is pink

D. Z is a tetrahedral complex

Answer: A::B::D

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2. Match the complexes in Column I with their properties listed in Column II

	Column I		Column II
(A)	$[Co(NH_3)_4(H_2O)_2]Cl_2$	p.	Geometrical isomers
(B)	$[Pt(NH_3)_2Cl_2]$	q.	Paramagnetic
(C)	$[Co(H_2O)_5\ Cl]Cl$	r.	Diamagnetic
(D)	$[Ni(H_2O)_6]Cl_2$	s.	Metal ion with +2 oxidation state

A.

A	B	C	D
4	2	3	1

B.

A	B	C	D
3	1	4	2

C.

A	B	C	D
2	1	3	4

D.

A	B	C	D
1	3	4	2

Answer: A::B::C::D

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3. A, B and C are three complexes of chromium (III) with the empirical formula $H_2O_6Cl_3Cr$. All the three complexes have water and chloride ion as ligands.

Complex A does not react with concentrated H_2SO_4, whereas complexes B and C lose $6.75\,\%$ and $13.5\,\%$ of their original mass, respectively, on treatment with concentrated H_2SO_4. Identify A, B and C

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4. Which of the following are all features of isomers of $\left[Co(en)_3\right]Cl_3$?

Isomers are

A. superimosable mirror images with identical chemical forumulae and the same chemical reactivities with other compounds that are not optical isomers

B. non-superimosable mirror images with identical chemical formulae and the same chemical reactivities with other compounds that are not optical isomers

C. non-superimposable mirror images with dissimilar chemical formulae but similar chemical reactivities with other compounds that are not optical isomers

D. superimposable mirror images with identical chemical formulae and similar physical properties

Answer: B

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5. What is the relationship between the following two complex ions ?

(I) $\left[Co(NH_3)_4Cl\right]^+$

(II) $\left[Co(NH_3)_4(ONO)Cl\right]^+$

The complex ions are

A. coordination isomers

B. optical isomers

C. linkage isomers

D. geometric isomers

Answer: C

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6. Which of the following complexes have doubtful existence ?

A. $[Fe(CO_5)]$

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

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

D. $\left[Ti(CO)_6\right]^{4+}$

Answer: B::D

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7. The paramagnetic complexes is (are)

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

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

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

D. $[CoCl_6]^{3-}$

Answer: A::C::D

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8. Complexes expected to be coloured in solution is/are

A. $K_5[CrF_6]$

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

C. $K_3[FeCl_6]$

D. $K_3[CoCl_6]$

Answer: B::D

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9. In case of octahedral compex, if the e_g orbitals $\left(d_{x^2-y^2} \text{ and } d_{z^2}\right)$ are asymmetricaaly filled, their degeneracy is destroyed and the ligands approaching along $+Z$ and $-Z$ directions experiences different amount of repulsions than the ligands approaching along the $+X, -X, +Y \text{ and } -Y$ directions. As a result, the symmetrical nature of such complexes is lost and either elongation or compression along Z-axis taken place. Answer the following three questions based on

the above situation.

In which of the following case, no such elongation or compressions are expected ?

A. d^4 - weak ligands

B. d^5- weak ligands

C. d^7- strong ligands

D. d^9- strong or weak ligands

Answer: B

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10. In case of octahedral compex, if the e_g orbitals $\left(d_{x^2-y^2} \text{ and } d_{z^2}\right)$ are asymmetricaaly filled, their degeneracy is destroyed and the ligands approaching along $+Z$ and $-Z$ directions experiences different amount of repulsions than the ligands approaching along the $+X, -X, +Y \text{ and } -Y$ directions. As a result, the symmetrical nature of such complexes is lost and either elongation or compression

along Z-axis taken place. Answer the following three questions based on the above situation.

Which of the following is incorrect regarding $K_4[CrF_6]$?

A. It has two long and four short $Cr-F$ bonds

B. It has four long and two short $Cr-F$ bonds

C. spin only magnetic moment of the complex is approximately $4.9Bm$

D. If Cr is replaced by Cu, similar types of deformation in the regular octahedral geometry are observed

Answer: B

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11. In case of octahedral compex, if the e_g orbitals $\left(d_{x^2-y^2} \text{ and } d_{z^2}\right)$ are asymmetricaaly filled, their degeneracy is destroyed and the ligands approaching along $+Z$ and $-Z$ directions experiences different amount of repulsions than the ligands approaching along the $+X, -X, +Y \text{ and } -Y$ directions. As a result, the symmetrical

nature of such complexes is lost and either elongation or compression along Z-axis taken place. Answer the following three questions based on the above situation.

Select the coorect statement.

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

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

C. $\left[Cu(CN)_4\right]^{3-}$ is square planar

D. $\left[Co(CN)_4\right]^{2-}$ is tetrahedral

Answer: B

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12. Assertion $\left[Ti(H_2O)_6\right]Cl_4$ is colourless while $\left[Sc(H_2O)_6\right]Cl_3$ is coloured.

Reason $d-d$ transition is not possible in $\left[Ti(H_2O)_6\right]Cl_4$

A. Both assertion and reason are correct and reason is the correct explanation of the assertion.

B. Both assertion and reason are correct but reason is not the correct explantion

C. Assertion is correct but reason is incorrect

D. Assertion is incorrect but reason is correct

Answer: D

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13. Assertion $\left[Ni(CO)_4\right]$ has longer $C-O$ bond length than the same in $\left[Cr(CO)_5NH_3\right]$

Reason There is greater extent of $d\pi-\rho\pi$ back bonding in $\left[Ni(CO)_4\right]$ than in $\left[Cr(CO)_5NH_3\right]$

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14. Match the quantity of Column I with the quantity of Column II

	Column I		Column II
(A)	Form coloured aqueous solution	p	$K_4[Fe(CN)]_6$
(B)	Paramagnetic	q	$Ca[Ni(CN)]_4$
(C)	Can show both linkage and *cis-trans* isomerism	r	$K_2[Cu(CN)]_4$
(D)	Has effective atomic number of a noble gas	s	$Na_2[CrCl_4]$

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15. How many stereoisomers exist for the complex $\left[Co(en)_2ClNO_2\right]Br$?

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16. The complex $Ca_2[M(CN)]_6$ has spin only magnetic moment $2.83BM$ and the complex $K_2[MCl_4]$ has spin only magnetic moment of 4.9 BM. How many electrons were present in valence shell d-orbital of the neutral gaseous atom on M ?

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