



## CHEMISTRY

### BOOKS - G.R. BATHLA & SONS CHEMISTRY (HINGLISH)

### COORDINATION COMPOUNDS

#### STRAIGHT OBJECTIVE TYPE

1. Ethylene diamine is an example of a..... Ligand :

- A. monodentate
- B. bidentate
- C. tridentate
- D. hexdentate

**Answer: B**



2. The donor sites of  $(\text{EDETA})^{4-}$  are?

- A. O atoms only
- B. N atoms only
- C. Two N atoms and four O atoms
- D. Three N atoms and three O atoms

**Answer: C**



[View Text Solution](#)

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

- A. complex salt
- B. double salt



C. normal salt

D. none of these

**Answer: A**

 [View Text Solution](#)

4. All ligands are :

A. Lewis acids

B. Lewis bases

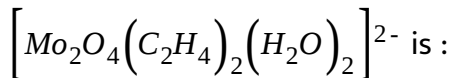
C. Netural

D. none of these

**Answer: B**

 [View Text Solution](#)

5. The oxidation state of Mo in its oxido-complex species



A. +2

B. +3

C. +4

D. +5

**Answer: B**



[View Text Solution](#)

6. Co-ordination number of platinum  $\left[ Pt(NH_3)_4Cl_2 \right]^{2+}$

A. 4

B. 2

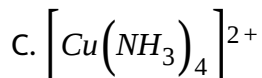
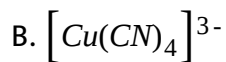
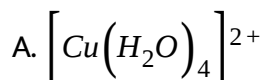
C. 8

D. 6

**Answer: D**

 [View Text Solution](#)

7. Which of the following is copper(I) compound?



D. All of these

**Answer: B**

 [View Text Solution](#)

8. In the complex  $[\text{CoCl}_2(\text{en})_2]$  Br, the co-ordination number and oxidation state of cobalt are :

- A. 6 and +3
- B. 3 and +3
- C. 4 and +2
- D. 6 and +1

**Answer: A**



[View Text Solution](#)

9. What is the charge on the complex  $[\text{Cr}(\text{C}_2\text{O}_4)_2(\text{H}_2\text{O})_2]$  formed by Cr(III)?

- A. +3
- B. +1

C. +2

D. -1

**Answer: A**



[View Text Solution](#)

10. In the coordination compound  $K_4[Ni(CN)_4]$ , the oxidation state of nickel is :

A. -1

B. 0

C. +1

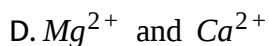
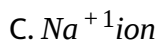
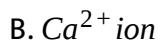
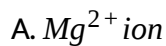
D. +2

**Answer: D**



[View Text Solution](#)

11. The disodium salt of ethylenediaminetetracetic acid can be used to estimate the following ion(s) in the aqueous solution :

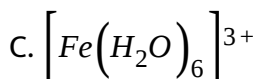
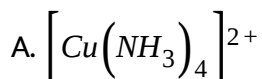


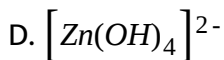
**Answer: B**



[View Text Solution](#)

12. Of the following complex ions, one is a Bronsted-Lowery acid. That one is:





**Answer: D**

 [View Text Solution](#)

13. The co-ordination number of a central metal atom in a complex is determined by :

- A. the number of only anionic ligands bonded to metal ion
- B. the number of ligands around a metal ion bounded by pi bonds
- C. the number of ligands around a metal ion bonded by sigma and pi-bonds
- D. the number of ligands around a metal ion bonded by sigma bonds

**Answer: C**

 [View Text Solution](#)

14. co-ordination compounds have great importance in biological systems. In these context, which statement is incorrect?

- A. Carboxypeptidase-A is an enzyme and contains zinc.
- B. Haemoglobin is the red pigment of blood and contains iron .
- C. Cyanocobalamin is  $B_{12}$  and contains cobalt.
- D. Chlorophylls are green pigments in plants and contain calcium.

**Answer: D**



[View Text Solution](#)

15. The oxidation state of Cr in  $\left[Cr(NH_3)_4Cl_2\right]^+$  is:

- A. 0
- B. +1
- C. +2
- D. +3



**Answer: D**



[View Text Solution](#)

16. How many EDTA (ethylenediaminetetraacetic acid) molecules are required to make an octahedral complex with a  $Ca^{2+}$  ion?

A. six

B. Three

C. One

D. Two

**Answer: D**



[View Text Solution](#)

17. Lead poisoning in the body can be removed by:

A. EDTA in the form of calcium dihydrogen salt

B. cis-platin

C. Zeise's salt

D. DMG

**Answer: C**

 [View Text Solution](#)

**18.** Which of the following are bidentate monoanion ligands?

A. Acetylacetonato

B. Oxalato ion

C. Dimethylglyoximato

D. a) and b) both

**Answer: A**

 [View Text Solution](#)

19. Diethylenetriamine is :

- A. chelating agent
- B. tridentate neutral molecule
- C. tridentate monoanion
- D. (a) and (b) both

**Answer: B**

 [View Text Solution](#)

20.  $Na_2S + Na_2[Fe(CN)_5NO] \rightarrow Na_4[Fe(CN)_5NOS]$ , oxidation number of Fe in reactant (complex) and product (complex) are:

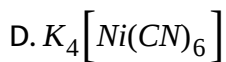
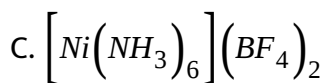
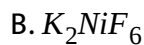
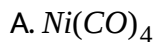
- A. 2, 1
- B. 2, 2
- C. 2, 3

D. 3, 3

**Answer: D**

 [View Text Solution](#)

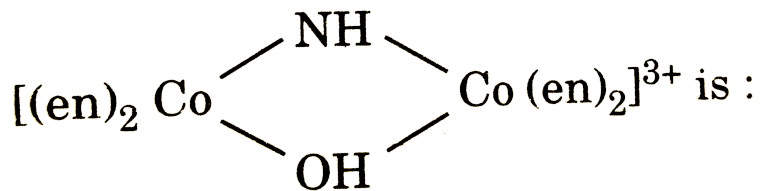
21. In which of the following complexes the nickel metal is in highest oxidation state?



**Answer: B**

 [View Text Solution](#)

22. The oxidation number of Co in the complex ion



A. +2

B. +3

C. +4

D. +6

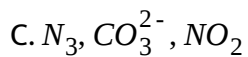
**Answer: B**

 [View Text Solution](#)

23. Which of the following are ambidentate ligands?

A.  $\text{CN}^-$ ,  $\text{NOS}^-$ ,  $\text{P}(\text{C}_6\text{H}_5)_3$

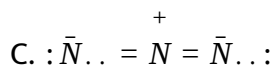
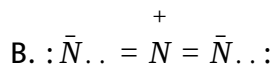
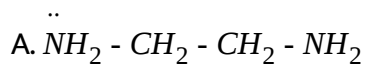
B.  $\text{H}_2\text{N} - \text{NH}_2$ ,  $\text{S}_2\text{O}_3^{2-}$ ,  $\text{CNO}^-$



**Answer: D**

 [View Text Solution](#)

**24.** Which of the following is a bidentate ligand?



D. All of these

**Answer: A**

 [View Text Solution](#)

25. In dimethylglyoximatoligand (dmg) donor atom is/are:

- A. one nitrogen atom
- B. one nitrogen and one oxygen atom
- C. two nitrogen atoms
- D. two oxygen atoms

**Answer: C**



[View Text Solution](#)

26. Which of the following is a bidentate ligand?

- A. bn
- B. dien
- C. trien
- D. EDTA

**Answer: A**



[View Text Solution](#)

**27. Which of the following is not a bidentate ligand?**

A. (en)

B. (Py)

C. (Ox)

D. (gly)

**Answer: B**



[View Text Solution](#)

**28. Which of the following complexes is not a chelate?**

A. bis(dimethylglyoximato)nickle(II)



B. potassium ethylenediaminetetrathiocyanatochromate(III)

C. tetraamminediazidocobalt(III)nitrate

D. trans-diglycinatoplatinum(II)

**Answer: C**

 [View Text Solution](#)

**29. Which pairs contains both ambidentate and flexidentate?**

A.  $CO_3^{2-}$ ,  $CN^-$

B.  $CO_3^{2-}$ ,  $NO_3^-$

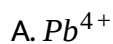
C.  $S_2O_3^{2-}$ ,  $CO_3^{2-}$

D.  $CN^-$ ,  $NO_2^-$

**Answer: A**

 [View Text Solution](#)

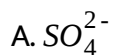
30. The cation which is expected to act as ligand is:



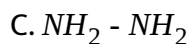
**Answer: D**

 [View Text Solution](#)

31. Which of the following would act as flexidentate ligand?



B. ethylenediamine

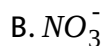
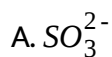


**Answer: A**



[View Text Solution](#)

**32.** Which of the following ligands would act as flexidentate ligand and ambidentate ligand?



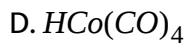
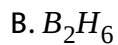
D. None of these

**Answer: A**



[View Text Solution](#)

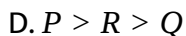
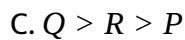
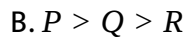
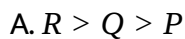
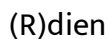
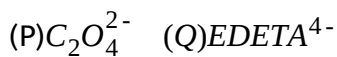
**33.** Which of the following would act as Bronsted acid?



**Answer: D**

 [View Text Solution](#)

**34.** Give the order of chelating effect of following ligands:

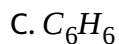
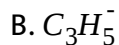
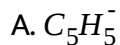


Answer: C



View Text Solution

35. Which of the following ligands can act only  $\pi$ -donor ligand?

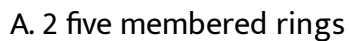


Answer: C



View Text Solution

36. Which a "dien" is bonded with a metal it produces:



B. 2 six membered rings

C. 1 five membered ring

D. 3 five membered rings

**Answer: A**

 [View Text Solution](#)

**37. Which of the following ligands is ambidentate ligand?**

$\ominus$   
A.  $OCN$

B.  $NO_2^\ominus$

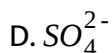
C.  $NOS^\ominus$

D. All of these

**Answer: D**

 [View Text Solution](#)

38. Which of the following ion is not present aq. Sloution of potash alum?

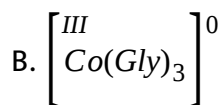


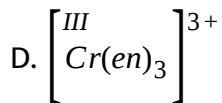
**Answer: C**



[View Text Solution](#)

39. Complex which have minimum number of metal-nitrogen linkage:






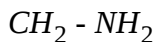
**Answer: A**

 [View Text Solution](#)

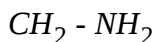
40. Select incorrect about complex  $\left[ Fe(en)_2(bipy) \right] SO_4$ :

(a) contains  ligands

A.



B. |



C. contains total three chelating ligands

D. oxidation number and coordination number of metal are +2 and six respectively

**Answer: A**

 [View Text Solution](#)



41. Which of the following statements is incorrect?

- A. Salt of EDTA is used in the treatment of lead poisoning.
- B. Co-ordination compound of Pt is effectively inhibit growth of tumors.
- C. Haemoglobing is a Co-ordination complex of Co.
- D. The excess of copper and iron are removed by the chelating ligands D-penicillamine and desferrioxime-B.

**Answer: C**



[View Text Solution](#)

42. Which of the following statements is incorrect?

- A. Co-ordination compounds and complexes are synonymous terms.
- B. Complexes must give ions in the solution.

C. Complexes may give ions in the solution or may not give ions in the solution.

D. Generally complex ion does not dissociate into its component parts even in the solution.

**Answer: B**

 [View Text Solution](#)

**43.** Find the correct option in which both ligands form same number of rings with central metal ion:

A.  $Ox^2$ ,  $Cl^-$

B.  $en$ ,  $gly^-$

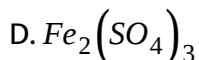
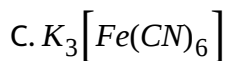
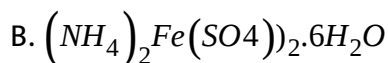
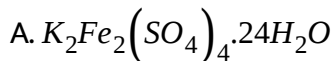
C.  $Py$ ,  $Br^-$

D. none of these

**Answer: B**

 [View Text Solution](#)

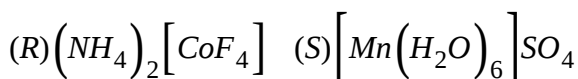
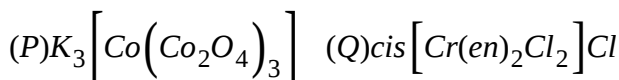
44. Which will not give test of all the ions present in it?



**Answer: C**

 [View Text Solution](#)

45. Give the oxidation state and co-ordination number of central metal ion in the following complexes respectively:



A.  $(P) + 3, 6(Q) + 3, 6(R) + 2, 4(S) + 2, 6$

B.  $(P) + 2, 6(Q) + 3, 6(R) + 2, 4(S) + 2, 6$

C.  $(P) + 3, 6(Q) + 2, 6(R) + 2, 4(S) + 2, 6$

D.  $(P) + 3, 6(Q) + 3, 6(R) + 2, 4(S) + 3, 6$

**Answer: A**

 [View Text Solution](#)

**46.** Diethylene triamine is:

A. Chelating ligand

B. Polydentate ligand

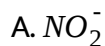
C. Tridentate ligand

D. All of these

**Answer: D**

 [View Text Solution](#)

47. Which amongst the following are ambidentate as well as flexidentate ligand?



D. None of these

**Answer: D**



[View Text Solution](#)

48. Choose the correct statement.

A. Chelating ligands D-penicillamine and desferrioxime B remove toxic proportions of copper and lead (in plant/animal systems) via the formation of co-ordination compounds.

B. EDTA is used in the treatment of lead poisoning.

C. cis-platin is carcinogenic.

D. In black and white photo graphy, the developed film is fixed by washing with hypo solution which dissolves undissolved AgBr to form a complex ion,  $[Ag(S_2O_3)]^-$ .

**Answer: B**

 [View Text Solution](#)

**49.** Choose the only incorrect statement.

A. Articles can be electroplated with silver and gold much more smoothly and evenly from solutions of the complexes,  $[Ag(CN)_2]^-$  and  $[Au(CN)_2]^-$  than from a solution of simple metal ions.

B. Wilkinson's catalyst,  $K[(Ph_3P)_2RhCl_2]$ , is used for the hydrogenation of alkenes.

C. Anti-pernicious anamia factor is a co-ordination compound of cabalt.

D. Chlorophll pigment, resposible for photosynthesis is a coordination compound of magnesium.

**Answer: B**

 [View Text Solution](#)

**50.** A chelating agent has two or more than two donor atoms to bind to a single metal ion. Which of the following is not a chelating agent?

A. thiosulphato

B. oxalate

C. glycinato

D. ethane-1, 2-diamine

**Answer: A**

 [View Text Solution](#)

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

A. NO

B.  $NH_4^+$

C.  $NH_2CH_2CH_2NH_2$

D. CO

**Answer: B**

 [View Text Solution](#)

52. Many protein-based biomaterials such as waste hair and feathers, can absorb heavy metal ions from waste water. It has been observed that metal uptake by these materials increases in alkaline condition. The enhanced uptake in alkaline conditions is due to:



- A. generation of many ligand sites in the protein molecules due to removal of  $H^+$
- B. availability of a high concentration of  $OH^-$  ions as ligands
- C. increased cross-linkages in the protein chains by formation of amide bonds
- D. increase in solubility of the proteins

**Answer: A**



[View Text Solution](#)

53. A person having osteoporosis is suffering from lead poisoning. Ethylene diamine tetraacetic acid (EDTA) is administered for this condition. The best form of EDTA to be used for such administration is:

- A. EDTA
- B. tetrasodium salt
- C. disodium salt

D. calcium dihydrogen salt

**Answer: D**



[View Text Solution](#)

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

A.  $CH_4$

B.  $CN^-$

C. CO

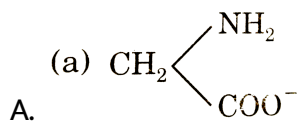
D.  $Br^-$

**Answer: A**



[View Text Solution](#)

55. Glycinato ligand is :



B. Bidentate ligand

C. Two donor sites N and  $\text{O}^-$

D. All of these

**Answer: D**



[View Text Solution](#)

56. One molecule of which of the following ligands form only two rings towards a particular central atom?

A. en

B. bn

C. dien

D. trien

**Answer: C**



[View Text Solution](#)

57. The oxidation number of iron in  $[Fe(CO_3)(\pi - C_4H_4)]$  is:

A. +3

B. +2

C. 0

D. -3

**Answer: B**



[View Text Solution](#)

58. The co-ordination number and oxidation number of X in the compound  $\left[ X(SO_4)(NH_3)_5 \right]$  will be :

A. 10 and +3

B. 1 and +6

C. 6 and +4

D. 6 and +2

**Answer: D**



[View Text Solution](#)

59. Select isoelectronic and isostructural pair:

A.  $CO_2$ ,  $CN_2^{2-}$

B.  $[Cr(CO)_6]^0$ ,  $[Fe(CN)_6]^{4-}$

C.  $NO_2^-$ ,  $O_3$

D. All of the above

**Answer: D**

 [View Text Solution](#)

60. Which of the following ligand does not have any nitrogen donor site?

A. bipy

B.  $acac^{1-}$

C.  $gly^{-1}$

D. dien

**Answer: B**

 [View Text Solution](#)

61. Which of the following ligand can act as chelating agent but does not have chiral centre?

A.  $\text{nta}^{3-}$

B.  $\text{bn}$

C.  $\text{pn}$

D. None of these

**Answer: A**



[View Text Solution](#)

## B. Nomenclature of Coordination Compounds

1. A complex cation is formed by Pt (in some oxidation state) with ligands (in proper number so that coordination number of Pt becomes six).

Which of the following can be correct IUPAC name?

- A. Diammineethylenediaminefthiocyano-S-platinum (II) ion
- B. Diammineethylenediaminefthiocyano-S-platinate (IV) ion
- C. Diammineethylenediaminefthiocyano-S-platinum (IV) ion
- D. Diamminebis (ethylenediamine) dithiocyanate-S-platinum (IV) ion

**Answer: C**

 [View Text Solution](#)

2. Which of the following name is impossible?

- A. Potassium tetrafluoridooxidochromate (VI)
- B. Barium tetrafluoridobromate (III)
- C. Dichlorobis(urea)copper (II)
- D. All are impossible.

**Answer: A**

 [View Text Solution](#)



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

- A.  $[Co(en)_2SO_4]$
- B.  $[Co(en)_3SO_4]$
- C.  $[Co(en)_3]_2SO_4$
- D.  $[Co(en)_3]_2(SO_4)_3$

**Answer: D**



[View Text Solution](#)

4. The correct IUPAC name of the compound  $[Co(NH_3)_4Cl(ONO)]Cl$  is :

- A. Tetraamminechloridonitrito-N-Cobalt(III) chloride
- B. Chloridonitrito-O-tetraamminecobalt(II) chloride

C. Dichloridonitrito-O-tetraamminecobalt(III)

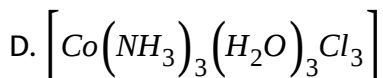
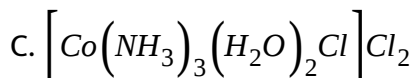
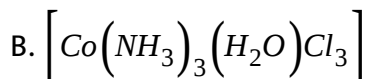
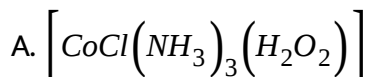
D. Tetraamminechloridonitrito-O-cobalt(III) chloride

**Answer: D**

 [View Text Solution](#)

5. The hypothetical complex

triamminediaquachloridocobalt(III) chloride can be represented as:



**Answer: C**

 [View Text Solution](#)

6. Consider the structure of the complex compound,  $\left[ Cu_4 O Cl_6 (Ph_3P)_4 \right]$ , as given below :

##GRB<sub>O</sub>RG<sub>C</sub>HM<sub>V</sub>01QB<sub>C</sub>05E<sub>01</sub>068 – Q01##

Which of the following is the correct IUPAC name of the complex ?

A.

*hexa - μ - chl or ide - μ<sub>4</sub> - oxidotetrakis (triphenylphosphine) tetracopper (II)*

B.  $\mu_4$  - oxidohexa -  $\mu_2$  - chloridotetra (triphenylphosphine)tetracopper(II)

C.

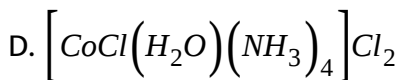
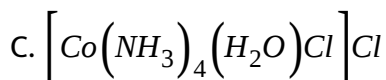
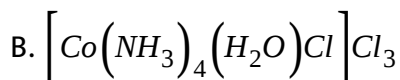
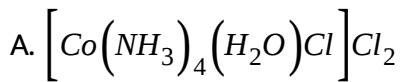
*hexa - μ - chlorido - μ - oxidotetrakis (triphenylphosphine)tetracopper(II)*

D. All of these

**Answer: A**

 [View Text Solution](#)

7. The correct formula for tetraamineaquachloridocobalt (III) chloride is :



**Answer: A**

 [View Text Solution](#)

8. The correct IUPAC name of the complex  $\left[ \text{Pt}(\text{gly})_2\text{I}_2 \right]$  is :

A. bis(glycinato)diiodidoplatinum(IV)

B. diiodidobis(glycinato)platinum(IV)

C. bis(glycinato)diiodidoplatinate(IV)

D. diiodidodiglycinatoplatinum(IV)

**Answer: A**

 [View Text Solution](#)



[View Text Solution](#)

9. A complex anion is formed by Osmium (in some oxidation state) with ligands (in proper number so that coordination number of osmium becomes six). Which of the following can be its correct IUPAC name ?

- A. pentachloridonitridoosmium(VI)
- B. pentachloridonitridoosmate(VI)
- C. azidopentachloridoosmate(VI)
- D. None of these

**Answer: B**



[View Text Solution](#)

10. The IUPAC name of  $K_3Fe(CN)_6$  is :

- A. Potassium hexacyanoferrate(II)

B. Potassium hexacyanoferrate(III)

C. Potassium hexacyanoiron(II)

D. Tripotassium hexacyanoiron(II)

**Answer: B**

 [View Text Solution](#)

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

A. Nitro-N-pentaamminecobalt(III) chloride

B. Nitro-N-pentaamminecobalt(II) chloride

C. Pentaamminenitritocobalt-N-cobalt(II) chloride

D. Pentaamminenitritocobalt-N-cobalt(III) chloride

**Answer: D**

 [View Text Solution](#)

12. Complex ion  $[FeN_3(O_2)(SCN)_4]^{4-}$  is named as :

(coordination number of central metal ion in complex is six)

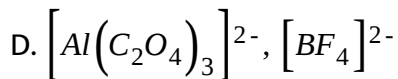
- A. Azidosuperoxidotetrathiocyanato-S-ferrate(II)
- B. Azidoperoxidotetrathiocyanatoferrate(III)
- C. Azidoperoxidotetrathiocyanato-S-ferrate(II)
- D. Azidodioxidotetrathiocyanato-S-ferrate(III)

**Answer: A**

 [View Text Solution](#)

13. Trioxalatoaluminate(III) and tetrafluoro-borate(III) ions are :

- A.  $[Al(C_2O_4)_3]$ ,  $[BF_4]^{3-}$
- B.  $[Al(C_2O_4)_3]^{3+}$ ,  $[BF_4]^{3+}$
- C.  $[Al(C_2O_4)_3]^{3-}$ ,  $[BF_4]^-$



**Answer: C**

 [View Text Solution](#)

14. 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. Tetraamminenickel(II) tetrachloronickelate(0)

**Answer: C**

 [View Text Solution](#)

15. The correct IUPAC name of  $\left[Co(CH_3NH_2)_4(CN)_2\right]Cl$ :



- A. Dicyanidotetramethylaminocobalt(III) chloride
- B. Dicyanidotetrakis(methylamine)cobalt(III) chloride
- C. Dicyanidotetrakis(methylammine)cobalt(III) chloride
- D. Tetramethylaminedicyanidocobalt(III) chloride

**Answer: B**

 [View Text Solution](#)

16. Which option is True (T) and False (F) for IUPAC name of  $K_3[Fe(CN)_6]$ ?

- (i) potassium hexacyanido ferrate(III)
- (ii) tripotassium hexacyanido ferrate
- (iii) potassium haxacyanido ferrate (-3)
- tripotassium hexacyanido ferrate (III)

A. TTTF

B. TTFF

C. TFFF

D. TFTF

**Answer: A**

 [View Text Solution](#)

17. The IUPAC name for the coordination compound  $Ba[BF_4]_2$  is :

- A. Barium tetrafluoroborate (III)
- B. Barium tetrafluoroborate (V)
- C. Barium bis (tetrafluoroborate)(III)
- D. None of these

**Answer: A**

 [View Text Solution](#)

18. The IUPAC name of the complex compound  $[CoCl_2(en)_2]Cl$  is :

- A. Dichloridobis(ethane-1, 2-diamine)cobalt(III) chloride
- B. Dichloridobis(ethane-1, 2-diammine)cobalt(III) chloride
- C. Dichloridobis(ethylenediammine)cobalt(III) chloride
- D. Bis(ethylenediamine)dichlorido cobalt(III) chloride

**Answer: A**

 [View Text Solution](#)

19. The appropriate formula of dichloridobis(ethane-1, 2-diamine)platinum(IV) nitrate is :

- A.  $[PtCl_2(en)_2](NO_3)_2$
- B.  $[Pt(en)_2Cl_2](NO_3)_2$
- C.  $[Pt(en)_2Cl_2]NO_3$
- D.  $[PtCl_2(en)_2]NO_3$

**Answer: A**

 [View Text Solution](#)

20.  $Fe^{II}Cl(CN)_4(O_2)]^{4-}$  is named as :

- A. Chloridotetracyanidodioxidoferrate (II) ion
- B. chloridotetracyanidoperoxidoferrate (II) ion
- C. chloridotetracyanidosuperoxidoferrate (II) ion
- D. None is correct

**Answer: C**

 [View Text Solution](#)

21. select the correct IUPAC name of  $[Co(H_2NCH_2CH_2NH_2)_3]_2(SO_4)_3$  is :

- A. Tris (ethane-1, 2-diamine) cobalt (III) sulphate
- B. Tris (ethane-1, 2-diamine) cobaltate (III) sulphate

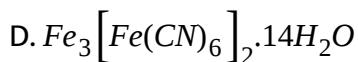
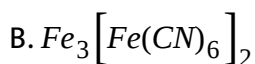
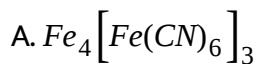
C. Tris (ethane-1, 2-diamine) cobaltate (II) sulphate

D. None of the above

**Answer: A**

 [View Text Solution](#)

22. Write the correct formula of the following complex : [Iron (III)-hexacyanidoferrate(II)-tetradecahydrate]

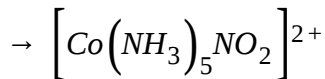


**Answer: D**

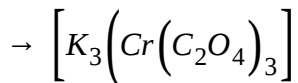
 [View Text Solution](#)

23. Which of the following IUPAC names are incorrectly matched ?

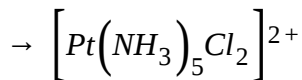
A. Pentaamminenitrito-N-cobalt (III)



B. Potassiumtrioxalato chromate (III)



C. Diamminedichloridoplatinum(II)



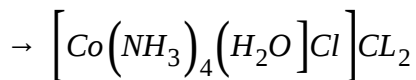
D. None of these

**Answer: C**

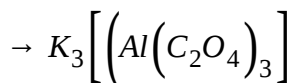
 [View Text Solution](#)

24. Identify the incorrect combination of IUPAC name of the complex and its formula :

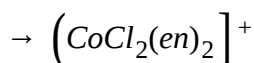
A. Tetraammineaquachloridocobalt(III) chloride



B. Potassium trioxalatoaluminate(III)



C. Dichloridobis (ethane-1, 2-diamine) cobalt(II)



D. Mercury tetrathiocyanatocobaltate(III)



**Answer: C**

 [View Text Solution](#)

25. The correct IUPAC name of  $\left[ \text{Pt}(\text{NH}_3)_2\text{Cl}_2 \right]$  is :

A. Diamminedichloroplatinum (II)

B. Diamminedichloridoplatinum (IV)

C. Diamminechloridoplatinum (0)

D. Dichloridodiammineplatinum (IV)

**Answer: A**

 [View Text Solution](#)

26. IUPAC name of  $\left[Pt(NH_3)_2Cl(NO_2)\right]$  is :

A. Platinum diaminechloronitrite

B. Chloronitrito-N-ammineplatinum (II)

C. Diamminechloridonitrito-N-platinum (II)

D. Diamminechloronitrito-N-platinate (II)

**Answer: C**

 [View Text Solution](#)



27. 1 mole of which complex produces minimum number of  $K^+$  ions on dissociation :

- A. Potassium tris(oxalato)cobaltate(III)
- B. Potassium tetrahydroxidozincate (II)
- C. Potassium tetrachloridoplatinate(II)
- D. Potassium amminepentachloridoplatinate(IV)

**Answer: D**



[View Text Solution](#)

### C. Werners Theory, EAN Rule

1. 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. 4

B. 8

C. 5

D. 6

**Answer: C**

 [View Text Solution](#)

2. The EAN of platinum in potassium hexachloridoplatinate(IV) is :

A. 90

B. 86

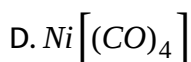
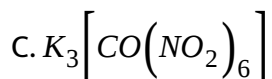
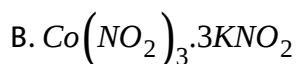
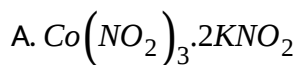
C. 76

D. 88

**Answer: B**

 [View Text Solution](#)

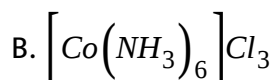
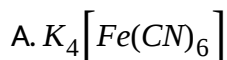
3. A compound is made by mixing cobalt (III) nitrite and potassium nitrite solution in the ratio of 1 : 3. The aqueous solution of the compound showed 4 particles per molecules whereas molar conductivity reveals the presence of six electrical charges. The formula of the compound is :

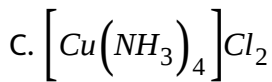


**Answer: C**

 [View Text Solution](#)

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

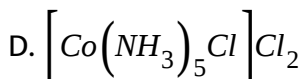
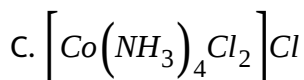
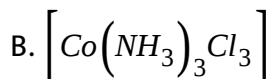
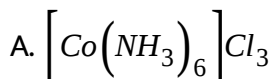




**Answer: A**

 [View Text Solution](#)

5. Which of the following shows maximum molar conductance ?



**Answer: A**

 [View Text Solution](#)

6. A co-ordination complex has the formula  $PtCl_4 \cdot 2KCl$ . Electrical conductance measurement indicate the presence of three ion in one formula unit. Treatment with  $AgNO_3$  produces no precipitate of  $AgCl$ . What is the co-ordination number of Pt in this complex ?

- A. 5
- B. 6
- C. 4
- D. 3

**Answer: B**



[View Text Solution](#)

7. The complex  $[Cr(H_2O)_4Br]Cl$  gives the test for :

- A.  $Br^-$
- B.  $Cl^-$

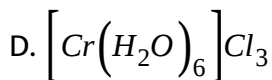
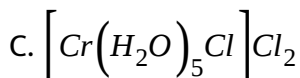
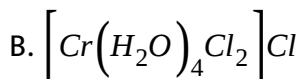
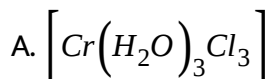


**Answer: B**



[View Text Solution](#)

8. Which of the complexes produces three moles of silver chloride when its one mole is treated with excess of silver nitrate ?



**Answer: D**



[View Text Solution](#)

9. The number of chloride ions which would be precipitated when the complex  $PtCl_4 \cdot 4NH_3$  is treated with silver nitrate is : (here coordination number of platinum is 6).

A. four

B. one

C. three

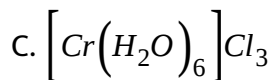
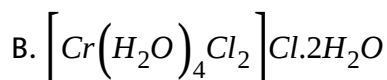
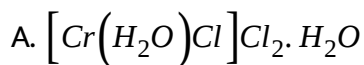
D. two

**Answer: D**



[View Text Solution](#)

10. Concentrated  $H_2SO_4$  will not dehydrate the following complex :



D. All the above complexes will be dehydrated.

**Answer: C**

 [View Text Solution](#)

11. On adding  $AgNO_3$  solution to a solution of  $[Pt(NH_3)_3Cl_3]Cl$ , the percentage of total chloride ion precipitated is :

A. 100

B. 75

C. 50

D. 25

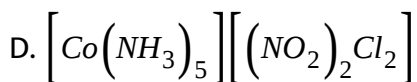
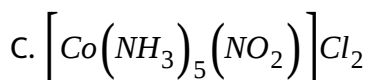
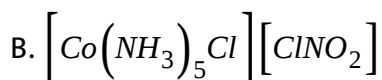
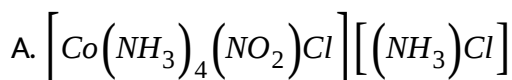
**Answer: D**

 [View Text Solution](#)



12. A coordination compound of cobalt has the molecular formula containing five ammonia molecules, one nitro group and two chlorine atoms for one cobalt atom. One mole of this compound produces three moles of ions in an aqueous solution. The aqueous solution on treatment with an excess of  $AgNO_3$  gives two equivalents of  $AgCl$  as a precipitate.

The formula of this complex would be :



**Answer: C**



[View Text Solution](#)

13. When any solution passes through a cation exchange resin that is in acidic form,  $H^+$  ion of the solution. A solution containing 0.319 g of an isomer with molecular formula  $CrCl_3 \cdot 6H_2O$  is passed through a cation exchange resin in acidic form. The diluted solution requires  $19cm^3$  of 0.125  $NNaOH$ . The isomer is :

- A. triaquatrchlorochromium (III) chloride trihydrate
- B. hexaaquachromium (III) chloride
- C. pentaquamono-chlorochromium (III) chloride monohydrate
- D. tetraquadichlorochromium (III) chloride dihydrate

**Answer: C**



[View Text Solution](#)

14.  $[M(CO)_x(NO)_y]$  in this complex if all NO are replaced by CO can be  $[M(CO)_z]$  complex and EAN value for M is 36 value of x, y, z and M is respectively :

A. 3, 2, 5 and Fe

B. 2, 2, 5 and Fe

C. 3, 2, 6 and Fe

D. 2, 3, 5 and Ru

**Answer: B**

 [View Text Solution](#)

15. If excess of  $AgNO_3$  solution is added to 100mL of a 0.024 M solution of dichlorobis (ethylene diamine) cobalt (III) chloride, how many mol of  $AgCl$  be precipitated?

A. 0.0012

B. 0.0016

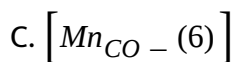
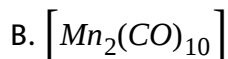
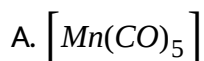
C. 0.0024

D. 0.0048

**Answer: C**

 [View Text Solution](#)

**16.** Which of the following complex acts as reducing agent based on Sidgwick EAN rule?



**Answer: C**

 [View Text Solution](#)

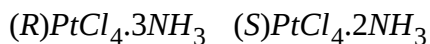
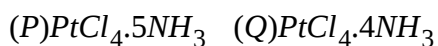
**17.** In the compound  $CoCl_3 \cdot 5NH_3$  :

- A. all the Cl show primary valency (PV) only
- B. two Cl show (PV) and one Cl secondary valency (SV)
- C. two Cl show (PV) and one Cl (PV) as well as (SV)
- D. all the Cl show (SV)

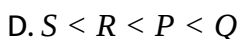
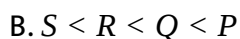
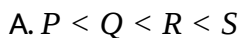
**Answer: C**

 [View Text Solution](#)

**18.** The molar ionic conductance of octahedral complexes is given below :



Correct order is :

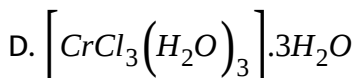
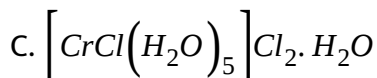
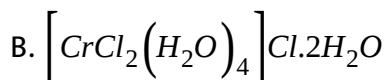
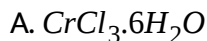


**Answer: B**



**View Text Solution**

19. Which one is the most likely structure of  $CrCl_3 \cdot 6H_2O$  if  $\frac{2}{3}$  of total chlorine of the compound is ppt. by adding  $AgNO_3$  to its aqueous solution :



**Answer: C**



**View Text Solution**

20.  $[Ni(CO)_x]$  and  $[Fe(CO)_y]$  what will be the value of x and y respectively are :

- A. 4 and 4
- B. 4 and 5
- C. 5 and 4
- D. 5 and 5

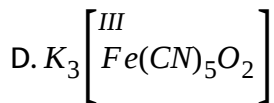
**Answer: B**



[View Text Solution](#)

21. Which of the following will not follow sidgwick's EAN rule ?

- A.  $[Fe(CO)_5]$
- B.  $[Fe(CO)_2(NO)_2]$
- C.  $[Mn_2(CO)_{10}]$



**Answer: D**

 [View Text Solution](#)

22. The molecular formula  $Co(NH_3)_5BrSO_4$  have two isomeric form X and Y which differ in :

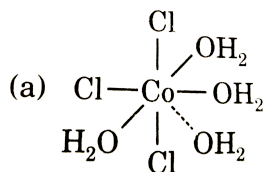
- A. Hybridisation
- B. Magnetic moment
- C. Geometry
- D. Electrical conductivity

**Answer: D**

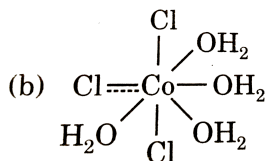
 [View Text Solution](#)



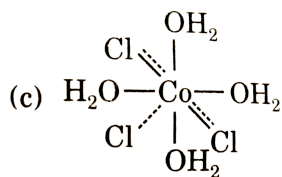
23.  $\text{CoCl}_3 \cdot 4\text{H}_2\text{O}$  is an anhydrous binary solute hence its Werner's representation is :



A.



B.



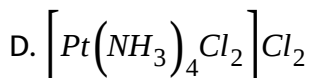
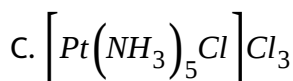
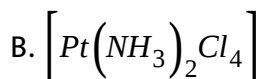
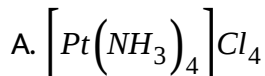
C.

D. none of these

Answer: C

 [View Text Solution](#)

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



**Answer: C**



[View Text Solution](#)

25. How many moles of  $AgCl$  would be obtained, when 100 ml of 0.1 M  $Co(NH_3)_5Cl_3$  is treated with excess of  $AgNO_3$  to give two moles of  $AgNO_3$ ?

A. 0.001

B. 0.02

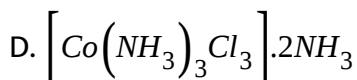
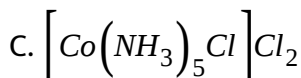
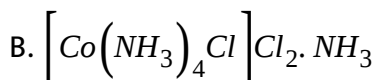
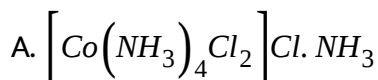
C. 0.03

D. None of these

**Answer: B**

 [View Text Solution](#)

26. One mole of  $Co(NH_3)_5Cl_3$  gives 3 moles of ions on dissolution in water. One mole of this reacts with two moles of  $AgNO_3$  to give two moles of  $AgCl$ . The complex is :



**Answer: C**



[View Text Solution](#)

27. Complexes  $\left[Co(NH_3)_5SO_4\right]Br$  and  $Co(NH_3)_5Br\left]SO_4\right.$  can be distinguished by :

A. conductance measurement

B. using  $BaCl_2$

C. using  $AgNO_3$

D. all of these

**Answer: D**



[View Text Solution](#)

28. Consider the following statements for Werner's theory :

(P) Ligands are connected to the metal ions by ionic bonds

Secondary valencies have directional properties

Secondary valencies are non-ionisable of these statements :

A. P, Q and R are correct

B. Q and R are correct

C. P and R are correct

D. P and Q are correct

**Answer: B**



[View Text Solution](#)

29. Which of the following is correct for both the following coordination compounds ?

(P) $CoCl_3 \cdot 6NH_3$  and (Q) $PtCl_4 \cdot 5NH_3$

A. They give white precipitate with  $AgNO_3$  solution

B. They have different primary valencies for the central metal ions.

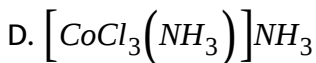
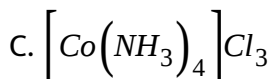
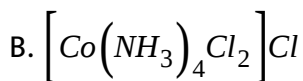
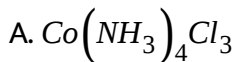
C. Both (a) and (b)

D. None of these

Answer: C

 [View Text Solution](#)

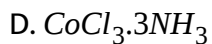
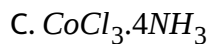
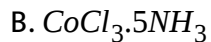
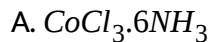
30. 50 ml of 0.2 M solution of a compound with empirical formula  $CoCl_3 \cdot 4NH_3$  on treatment with excess of  $AgNO_3(aq)$  yields 1.435 g of  $AgCl$ . Ammonia is not removed by treatment with concentrated  $H_2SO_4$ . The formula of the compound is :



Answer: B

 [View Text Solution](#)

31. Which of the following is non-conducting ?

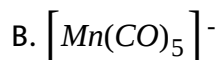
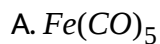


Answer: D



[View Text Solution](#)

32. Choose the complex entity which follow(s) EAN rule :



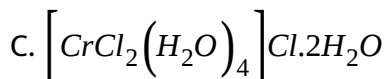
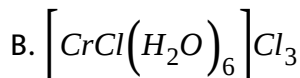
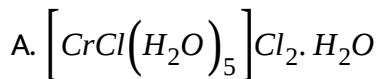
D. all of these

**Answer: D**

 [View Text Solution](#)

33. A solution containing 0.319 gm of complex  $CrCl_3 \cdot 6H_2O$  was passed through cation exchanger and the solution given out was neutralised by 28.5 ml of 0.125 M  $NaOH$ . The correct formula of the complex will be :

[Molecular weight of complex = 266.5]



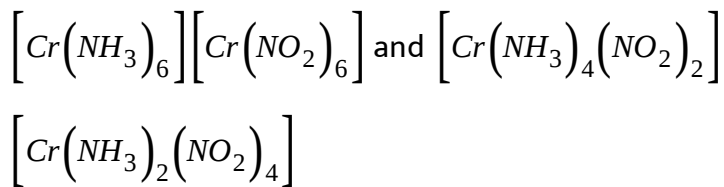
D. all are correct

**Answer: B**

 [View Text Solution](#)



34. Other than the X-ray diffractions, how could be the following pair of isomers be distinguished from one another by ?



- A. cryoscopic method
- B. measurement of molar conductance
- C. measuring magnetic moments
- D. observing their colours

**Answer: B**

 [View Text Solution](#)

35. The EAN of metal atoms in  $\left[Fe(CO)_2(NO^+)_2\right]$  and  $Co_2(CO)_8$  respectively are :

- A. 34, 35

B. 34, 36

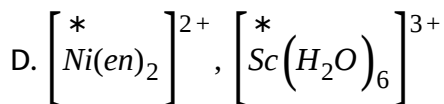
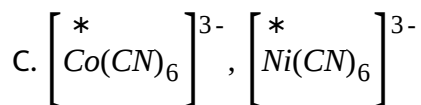
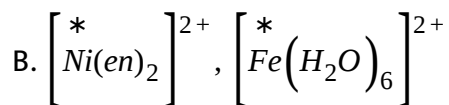
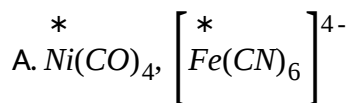
C. 36, 36

D. 36, 35

**Answer: C**

 [View Text Solution](#)

**36.** EAN of the elements (\*) are equal in :



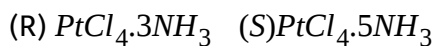
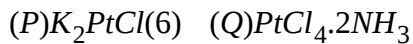
**Answer: A**

 [View Text Solution](#)



[View Text Solution](#)

37. Consider the following complexes :



A. 256, 0, 97, 404

B. 404, 0, 97, 256

C. 256, 97, 0, 404

D. 404, 97, 256, 0

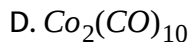
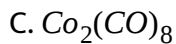
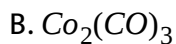
**Answer: A**



[View Text Solution](#)

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

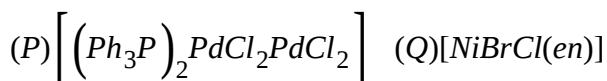
A.  $Co_2(CO)_4$



**Answer: C**

 [View Text Solution](#)

**39.** Choose the correct option regarding the following complex compound which follows (F) and does not follow (NF) the sidgwick EAN rule :



A. (P) (Q) (R) (S)  
NF NF NF NF

B. (P) (Q) (R) (S)  
F F NF F

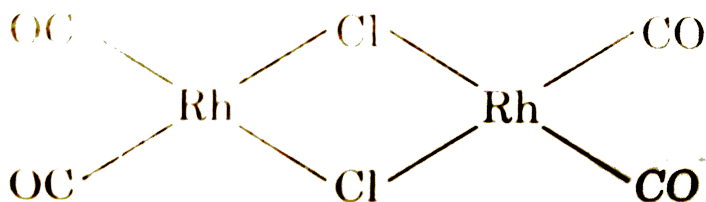
C. (P) (Q) (R) (S)  
NF NF F F

D. (P) (Q) (R) (S)  
NF NF F NF

Answer: C

 [View Text Solution](#)

40. The effective atomic number of Rh (atomic number = 45) in the



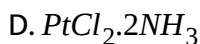
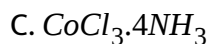
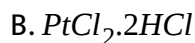
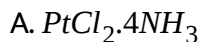
complex is :

- A. 52
- B. 54
- C. 56
- D. 50

Answer: A

 [View Text Solution](#)

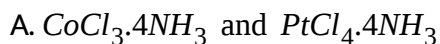
41. Which of the following complex will produce maximum amount of  $AgCl$  (ppt.) on reaction with excess of  $AgNO_3$  ?

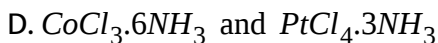
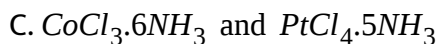
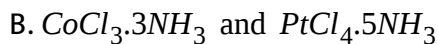


**Answer: A**

 [View Text Solution](#)

42. Both  $Co^{3+}$  and  $Pt^{4+}$  have a co-ordination number of six, which of the following pair of complexes will show approximately the same electrical conductance for their 0.001M aqueous solution ?

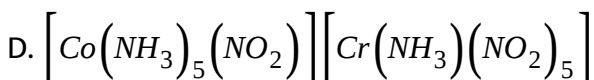
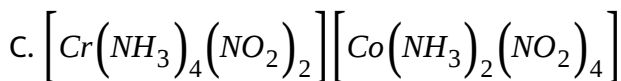
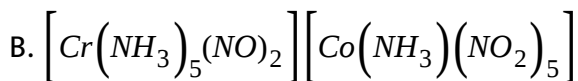
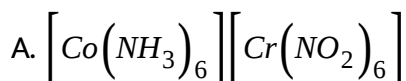




**Answer: C**

 [View Text Solution](#)

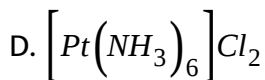
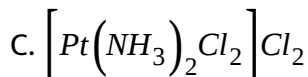
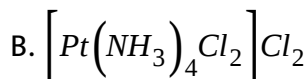
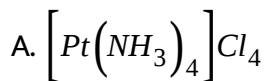
**43.** Which of the following complex has lowest molar conductivity ?



**Answer: C**

 [View Text Solution](#)

44. If two  $Cl^-$  ions are precipitated by  $AgNO_3$  from  $PtCl_4 \cdot 4NH_3$ , find formula of complex :

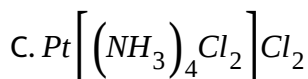
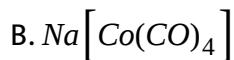
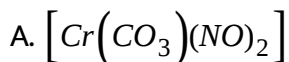


**Answer: B**



[View Text Solution](#)

45. Which of the following complex is heteroleptic type?



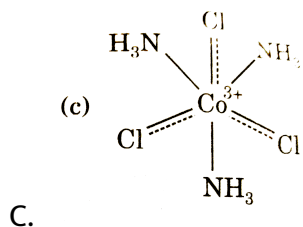
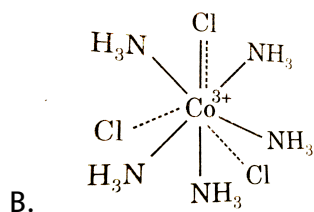
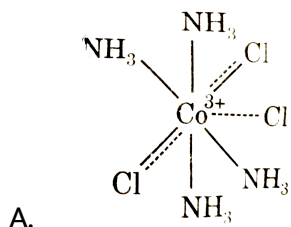


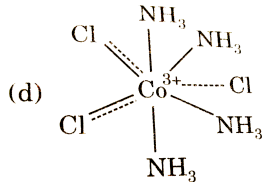
D. (a) and (c) both

Answer: D

 [View Text Solution](#)

46. Which of the following Werner's complex has least electrical conductivity ?





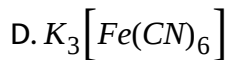
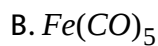
D.

**Answer: C**

 [View Text Solution](#)

47. All of the following obey Sidgwick effective atomic number rule except

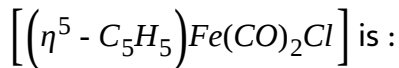
:



**Answer: D**

 [View Text Solution](#)

48. The effective atomic number of iron in complex



A. 34

B. 36

C. 38

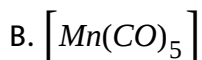
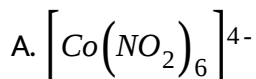
D. 32

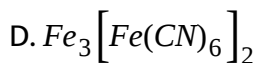
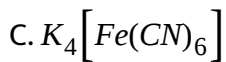
**Answer: B**



[View Text Solution](#)

49. During the race of complex compounds, finish line is fixed achieving EAN value equal to the atomic number of corresponding inert gas. Then which of the following complex is present at the finish line ?





**Answer: C**



[View Text Solution](#)

**50.** Which of the following are not postulates of Werner?

(P) In co-ordination compounds, metals show two types of linkage (valencies) primary and secondary

(Q) The primary valencies are normally ionisable. These are satisfied by neutral molecules or negative ions. The secondary valency is equal to the co-ordination number and is fixed for a metal

The ions/groups bound by the primary and secondary linkages to the metal have characteristic spatial arrangements corresponding to different coordination numbers

(T) Octahedral, Tetrahedral and Square planar geometrical shapes are more common in co-ordination compounds of transition metals

A. (P), (Q), (R ) and (S)

B. (S) and (T)

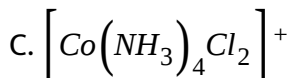
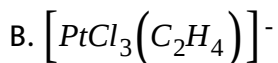
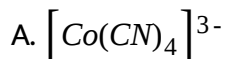
C. (S)

D. (P), (Q), and (R )

**Answer: C**

 [View Text Solution](#)

**51.** Identify heteroleptic complex having oxidation number +1 of the central metal atom :



D. None of these

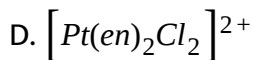
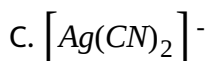
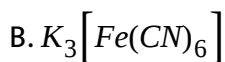
**Answer: D**



[View Text Solution](#)

52. Which of the following complex follow Sidgwick rule of EAN ?

(Pt - 78, Ag - 47, Fe - 26, V - 23)



**Answer: D**



[View Text Solution](#)

53. When 0.1 mol  $CoCl_3(NH_3)_5$  is treated with excess to  $AgNO_3$ , 0.2 mol AgCl are obtained. The conductivity of solution will solutions of following complex entities :

A. 1 : 3 electrolyte

B. 1 : 2 electrolyte

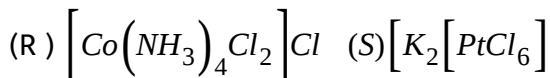
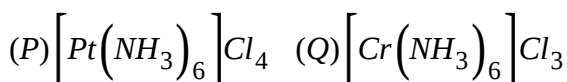
C. 1 : 1 electrolyte

D. 3 : 1 electrolyte

**Answer: B**

 [View Text Solution](#)

**54.** Give the correct increasing order of electrical conductivity of aqueous solution of following complex entities :



A.  $R < S < Q < P$

B.  $S < R < Q < P$

C.  $Q < P < S < R$

$$D. P < Q < S < R$$

**Answer: A**



[View Text Solution](#)

55. When potassium hexachloridoplatinate (IV) is dissolved in water, the solution :

- A. Contains 6 ions per molecule
- B. Reacts with  $AgNO_3$  to give 6 moles of  $AgCl$
- C. Does not contain any  $Cl^-$  ion
- D. Contains  $K^+$ ,  $Pt^{4+}$  and  $Cl^-$  ions

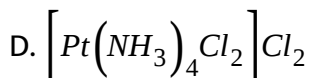
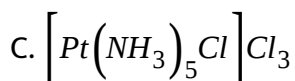
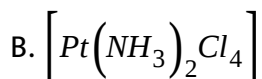
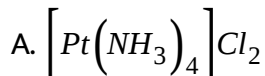
**Answer: C**



[View Text Solution](#)



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



**Answer: C**



[View Text Solution](#)

57. How many atoms are covalently bonded to the chromium atom in  $Cr(NH_3)_4Cl_3$ ?

A. 3

B. 4

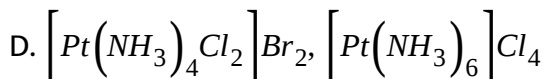
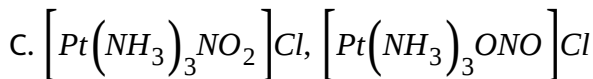
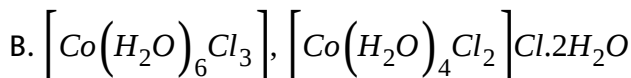
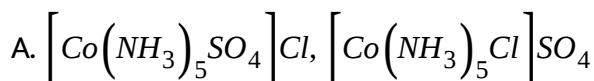
C. 6

D. 7

**Answer: C**

 [View Text Solution](#)

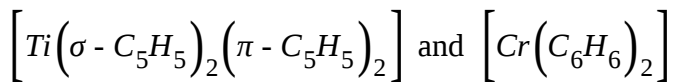
58. Which pair of two isomeric complexes is difficult to differentiate by measuring molar electrical conductivity ?



**Answer: C**

 [View Text Solution](#)

59. Find the difference in EAN of the complexes :



A. 2

B. 4

C. zero

D. 3

**Answer: A**



[View Text Solution](#)

60. Which of the following compound statement is correct for  $[\text{Co}(\text{EDTA})]^-$  complex compound?

A. Number of N - Co - O linkages are '8'

B. Coordination number of central metal atom in complex is '6'

C. EAN value of central metal atom in complex is '36'

D. All of these

**Answer: D**

 [View Text Solution](#)

61. Which of the following compound/ion is  $\pi$ -bonded organometallic compound(s) as well as follow Sidgwick EAN rule?

A. Ferrocene

B. Zeise's salt

C.  $[Fe(CO)_5]^+$

D. Cis-platin

**Answer: A**

 [View Text Solution](#)

62. Find the value of  $x$  in  $H_x[Mn(CO)_5]$ :

A. 2

B. -1

C. 1

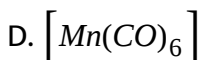
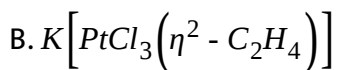
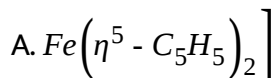
D. -2

**Answer: C**



[View Text Solution](#)

63. Which of the following complexes follow Sidgwick EAN rule?



**Answer: A**



[View Text Solution](#)

## D.VBT, CFT, Hybridisation

1. The complex  $\left[Pt(NH_3)_4\right]^{2+}$  has .....structure :

A. Square planar

B. tetrahedral

C. pyramidal

D. pentagonal

**Answer: C**



[View Text Solution](#)

2. What is the shape of  $Fe(CO)_5$  molecule ? Given that its dipole moment = 0.

- A. Tetrahedral
- B. Octahedral
- C. Trigonal bipyramidal
- D. Square pyramidal

**Answer: D**



[View Text Solution](#)

3. Which of the following complex is not correctly matched with its geometry ?

- A.  $[NiCl_2(Ph_3P)_2]$  - tetrahedral
- B.  $[Co(Py)_4]^{2+}$  - square planar
- C.  $[Cu(CN)_4]^{3-}$  - tetrahedral

D.  $[Fe(CO)_4]^{2-}$  - square planar

**Answer: D**



[View Text Solution](#)

4. The number of unpaired electrons in  $d^6$ , low spin, octahedral complex is :

A. 4

B. 2

C. 1

D. 0

**Answer: B**



[View Text Solution](#)



5. consider the following statements :

Statement-1:  $[MnCl_6]^{3-}$ , and  $[CoF_6]^{3-}$  are paramagnetic having four, five and four unpaired electrons respectively.

Statement-2: Valence bond theory gives a quantitative interpretation of the thermodynamic stabilities of coordination compounds.

Statement-3: The crystal field splitting  $\Delta_0$ , depends upon the field produced by the ligand and charge on the metal ion.

and arrange in the order of true/false.

A. TTT

B. TFT

C. FTF

D. TFF

**Answer: C**



[View Text Solution](#)

6. Low spin complex is formed by :

A.  $sp^3d^2$  hybridization

B.  $sp^3d$  hybridization

C.  $d^2sp^3$  hybridization

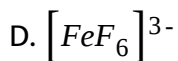
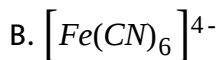
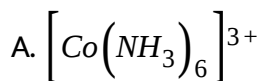
D.  $sp^3$  hybridization

**Answer: D**



[View Text Solution](#)

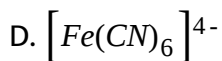
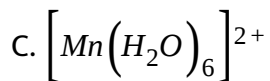
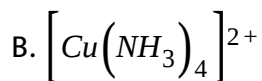
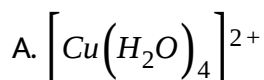
7. Which of the following is a high spin complex?



Answer: C

 [View Text Solution](#)

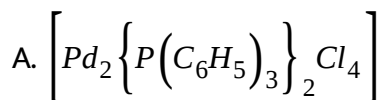
8. Which has maximum paramagnetic nature?

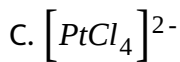


Answer: D

 [View Text Solution](#)

9. Which of the following is non-planar with respect to central atom ?





**Answer: B**



[View Text Solution](#)

10.  $[\text{RhF}_6]^{3-}$  complex ion is :

A. Outer orbital complex

B. Inner orbital complex

C. Neither outer nor inner orbital complex

D. Heteroleptic complex

**Answer: D**



[View Text Solution](#)

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

A.  $d^7$  octahedral low spin

B.  $d^5$  octahedral low spin

C.  $d^9$  tetrahedral

D.  $d^6$  octahedral low spin

**Answer: D**



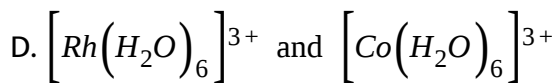
[View Text Solution](#)

12. Among the following pair of complexes, in which case the  $\Delta_0$  value is higher for the first one?

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

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

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



**Answer: D**

 [View Text Solution](#)

13.  $CuSO_4 + NH_4OH \rightarrow$  Deep blue soluble  
excess complex salt

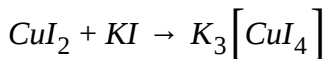
The correct statement regarding the complex is/are :

- A. It has square planar geometry.
- B. It is paramagnetic in nature .
- C. It gives black precipitate of  $CuS$  when treated with  $H_2S$ .
- D. All of these

**Answer: D**

 [View Text Solution](#)

14. Which of the following is incorrect option ?



complex salt

- A. oxidation state of central atom decreases during the formation of complex.
- B. Complex is tetrahedral.
- C. Hybridisation of the complex is  $sp^3$ .
- D. Hybridisation of the complex is  $dsp^2$ .

**Answer: D**



[View Text Solution](#)

15. The number of unpaired electrons present in complex ion  $[\text{FeF}_6]^{3-}$  is:

- A. 5
- B. 4

C. 6

D. 0

**Answer: A**



[View Text Solution](#)

**16.** For cis platin which option is incorrect ?

A. It is used for cancer treatment

B. EAN is 86

C. Hybridisation is  $dsp^2$

D. its dipole moment  $\neq 0$

**Answer: B**



[View Text Solution](#)



17. The crystal field splitting energy for octahedral complex ( $\Delta_0$ ) and that for tetrahedral complex ( $\Delta_t$ ) are related as:

A.  $\Delta_t = \frac{4}{9}\Delta_0$

B.  $\Delta_t = 0.5\Delta_0$

C.  $\Delta_t = 0.33\Delta_0$

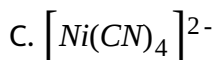
D.  $\Delta_t = \frac{9}{4}\Delta_0$

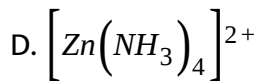
**Answer: A**



[View Text Solution](#)

18. Which of the following complexes has a geometry different from others?





**Answer: C**

 [View Text Solution](#)



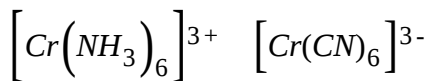
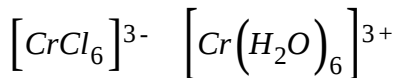
Which of the following option incorrect regarding complex X ?

- A. It has  $d^2sp^3$  hybridisation.
- B. It is an inner orbital complex.
- C. It is an diamagnetic complex.
- D. It is an high spin complex.

**Answer: D**

 [View Text Solution](#)

20. Consider the following complex ions.



The correct order of  $\Delta_0$  is :

A.  $P > Q > R > S$

B.  $P < R < Q < S$

C.  $P < Q < R < S$

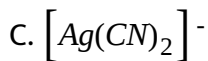
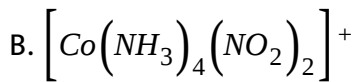
D.  $P < Q < S < R$

**Answer: C**

 [View Text Solution](#)

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

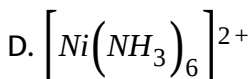
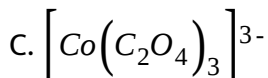
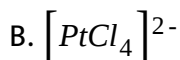
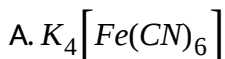




**Answer: D**

 [View Text Solution](#)

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



**Answer: A**

 [View Text Solution](#)

23. The tetrahedral  $[CoI_4]^{2-}$  and square planar  $[PdBr_4]^{2-}$  complex ions are respectively :

- A. low spin, high spin
- B. high spin, low spin
- C. both low spin
- D. both high spin

**Answer: B**



[View Text Solution](#)

24. Which of the following can act as reducing agent ?

- A.  $[Co(NH_3)_6]^{+2}$
- B.  $[Co(NH_3)_6]^{+3}$
- C.  $[Co(NH_3)_4]^{+2}$

D. All of these

**Answer: A**

 [View Text Solution](#)

25. Complex of  $HgC \ominus 4SCN$  has two isomers  $X > Y$  then, which of the following option is incorrect ?

A. X and Y are different in structure

B. Oxidation of  $Hg$  and  $Co$  are same in both the complex

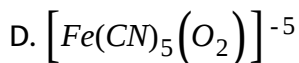
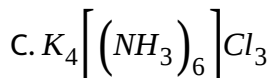
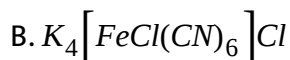
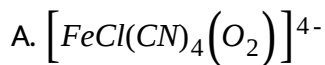
C. X and  $\Delta_0 < P$

D. both have same hybridisation.

**Answer: D**

 [View Text Solution](#)

26. Which of the following complex will be paramagnetic ? (Assume all central atom have  $t_{2g}^6 e_g^0$  configuration).

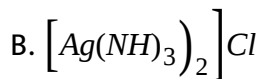
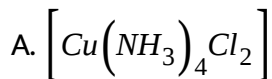


**Answer: A**



[View Text Solution](#)

27. The compound which does not show paramagnetism?



C. NO

D.  $NO_2$

**Answer: B**

 [View Text Solution](#)

**28.** Which of the following statement is correct for the complex

$K_4[Fe(CN)_5O_2]$  ? [Fe having  $t_{2g}^6e_g^0$  configuration ]

A.  $d^2sp^3$  and diamagnetism

B.  $sp^3d^2$  and diamagnetism

C.  $d^2sp^3$  and paramagnetism

D.  $sp^3d^2$  and paramagnetism

**Answer: C**

 [View Text Solution](#)



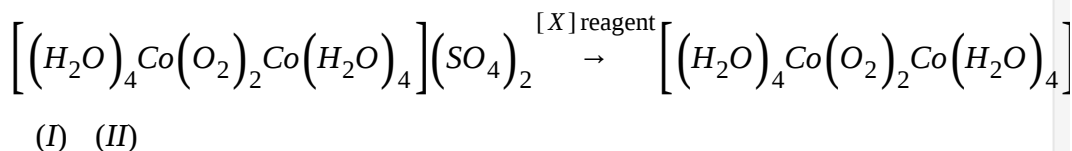
29. In  $\left[ \left( H_2O \right)_4 Co - (O - O) - Co \left( H_2O \right)_4 \right] CL_5$  complex, Co has  $t_{2g}^6 e_g^0$  configuration, this complex is :

- A. diamagnetic
- B. paramagnetic
- C. oxidation state of Co is +2
- D. none of these

**Answer: B**

 [View Text Solution](#)

30.



In both the complex Co has  $t_{2g}^6 e_g^0$  configuration. Which option is incorrect ?

A. Complex (I) is Paramagnetic

B. Complex (II) is Diamagnetic

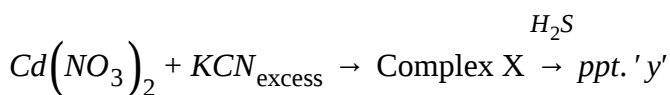
C. (X) is oxidising agent

D. (X) is reducing agent

**Answer: C**

 [View Text Solution](#)

**31.** Correct option regarding the following chemical reaction : (State T for True and F for False)



(P) Complex X is  $sp^3$  hybridised

(Q) ppt. Y is yellow in colour

(R) Complexes X is an example of imperfect complex

(S) Complex X is a diamagnetic complex

A. TTTT

B. TTTF

C. FTTF

D. FFTT

**Answer: A**



[View Text Solution](#)

**32.** Which of the following option is incorrect regarding following process

:



A. X is a high spin complex

B. It is Mond's process

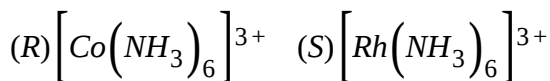
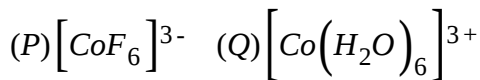
C. X is tetrahedral in shape

D. X is diamagnetic in nature

**Answer: A**

 [View Text Solution](#)

33. The correct order of  $\Delta_0$  for the given complexes, would be :



A.  $P > Q > R > S$

B.  $P > Q > S > R$

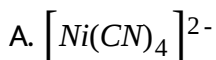
C.  $S > R > Q > P$

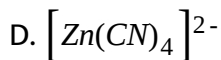
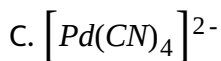
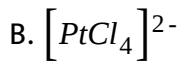
D.  $S > R > P > Q$

**Answer: C**

 [View Text Solution](#)

34. Which of the following is not planar ?





**Answer: D**

 [View Text Solution](#)

**35.** Which of the following statement(s) is/are correct regarding  $Ni(CO)_4$ ?

(P) It has tetrahedral geometry.

It is diamagnetic in nature.

(R) It has all  $Ni - C$  bonds of equal length.

A. P, Q

B. P, R

C. Q, R

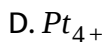
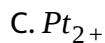
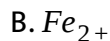
D. P, Q, R

**Answer: D**



[View Text Solution](#)

**36.** Which of the following cation forms inner orbital octahedral complex with  $NH_3$  ?

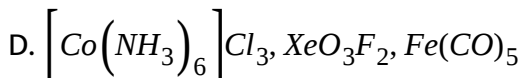
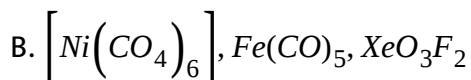
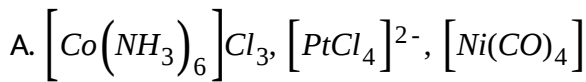


**Answer: D**



[View Text Solution](#)

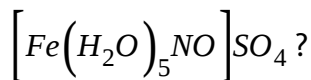
**37.** Which of the following set of species are non-planar as well as  $d_{z^2}$  orbital used in hybridisation ?



**Answer: D**

 [View Text Solution](#)

**38.** Which of the following option is correct regarding



(P) Fe in +2 oxidation state

(Q) It obey's Sidgwick EAN rule

It is an outer orbital complex

(S) NO ligand has +1 oxidation state.

A. FTTT

B. FTFT

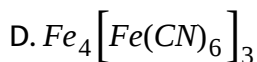
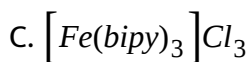
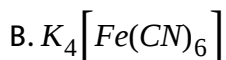
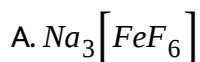
C. FFFF

D. FTFT

**Answer: A**

 [View Text Solution](#)

**39.** The colourless and paramagnetic compound is :

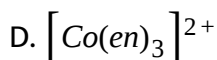
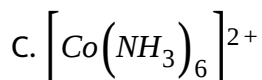
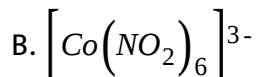
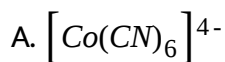


**Answer: A**

 [View Text Solution](#)



40. Which of the following is most easily oxidised ?



Answer: A



[View Text Solution](#)

41. The geometry of  $FeCl_4^{2-}$ ,  $FeCl_2(PPh_3)_2$  and  $AuCl_4^-$  would be respectively.

A. All square planar

B. All tetrahedral

C. Tetrahedral, tetrahedral and square planar

D. Tetrahedral, square planar and tetrahedral

Answer: C

 [View Text Solution](#)

42. It is an experiment fact that  $Cs_2[CuCl_4]$  is orange coloured but  $NH_4_2[CuCl_4]$  is yellow. It is further known that total paramagnetic moment of an unpaired electron is due to spin as well as due to nature of orbital, d orbital contributing more than s or p. Thus the total paramagnetic moment of orange compound is found to be more than that of yellow compound. Then which of the following is correct ?

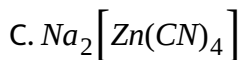
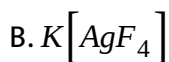
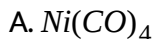
- A. Anion of orange compound is tetrahedral and that of yellow is square planar
- B. Anion of orange compound is square planar and that of yellow is tetrahedral
- C. Both the anions are tetrahedral

D. Both the anions are square planar

**Answer: A**

 [View Text Solution](#)

43. All the following complexes show a decrease in their weights when placed in a magnetic balance. Then Which of these has square planar geometry?



D. None of these

**Answer: B**

 [View Text Solution](#)

44. It is an experimental fact that :



Which of the following is wrong about this red precepitate ?

- A. It is a non-ionic complex
- B. It involves intra molecular H-bonding
- C. Ni(II) is  $sp^2$  hybridized
- D. It is a diamagnetic complexes is :

Answer: C



[View Text Solution](#)

45. The correct order for the CFSE (numerical value) for the following complexes is :

Complex	P	Q	R	S
Formula	$[\text{Co}(\text{CN})_6]^{3-}$	$[\text{Co}(\text{NH}_3)_6]^{3+}$	$[\text{CoF}_6]^{3+}$	$[\text{Co}(\text{H}_2\text{O})_6]^{3+}$

A.  $P > Q > R > S$

B.  $P > Q > S > R$

C.  $S > R > P > Q$

D.  $R > Q > P > S$

**Answer: B**

 [View Text Solution](#)

**46.** A square planar complex is formed by hybridisation of which atomic orbitals ?

A.  $s, p_x, p_y, p_{yz}$

B.  $s, p_x, p_y, p_{x^2-y^2}$

C.  $s, p_x, p_y, d_{z^2}$

D.  $s, p_x, p_y, d_{xy}$

**Answer: B**

 [View Text Solution](#)

47. The CFSE for octahedral  $[CoCl_6]^{4-}$  complex is  $18000\text{cm}^{-1}$ . Then,  $\Delta$  for tetrahedral  $[CoCl_4]^{2-}$  will be :

A.  $18000\text{cm}^{-1}$

B.  $16000\text{cm}^{-1}$

C.  $8000\text{cm}^{-1}$

D.  $2000\text{cm}^{-1}$

Answer: C



[View Text Solution](#)

48. In nitroprusside ion the iron and  $NO$  exist as  $Fe^{II}$  and  $NO^+$  rather than  $Fe^{III}$  and  $NO$ . These forms can be differentiated by :

A. estimating the concentration of iron

B. measuring the concentration of  $CN^-$

C. measuring the solid state magnetic moment

D. thermally decomposing compound

**Answer: C**

 [View Text Solution](#)

49. The complex ions  $[Fe(CN)_6]^{3-}$  and  $[Fe(CN)_6]^{4-}$  :

A. Are both octahedral and paramagnetic

B. Are both octahedral and diamagnetic

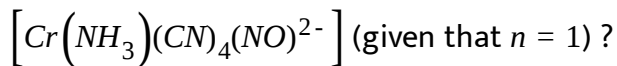
C. Have same structure but opposite magnetic character

D. Have different structure but opposite magnetic character

**Answer: C**

 [View Text Solution](#)

50. Which of the following statement is correct for complex



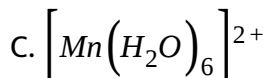
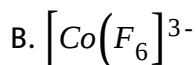
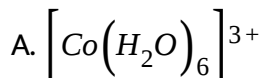
- A. It is  $d^2sp^3$  hybridized.
- B. The chromium is in +1 oxidation state.
- C. It is heteroleptic complex and its aqueous solution is coloured .
- D. All of these

**Answer: D**

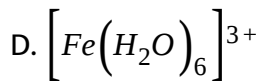


[View Text Solution](#)

51. Which of the following complex involves  $d^2sp^3$  hybridization ?







**Answer: A**

 [View Text Solution](#)

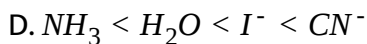
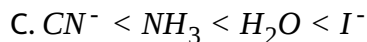
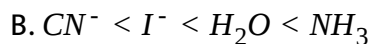
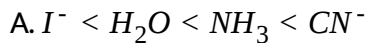
52. Which is true for  $\left[Ni(en)_2\right]^{2+}$  ? (Atomic number of nickel is 28)

- A. Paramagnetism,  $dsp^2$ , square planar, coordination number of  $Ni = 2$
- B. Diamagnetism,  $dsp^2$ , square planar, coordination number of  $Ni = 4$
- C. Diamagnetism,  $sp^3$ , tetrahedral, coordination number of  $Ni = 4$
- D. Paramagnetism,  $sp^3$ , tetrahedral, coordination number of  $Ni = 4$

**Answer: B**

 [View Text Solution](#)

53. The crystal field-splitting for  $Cr^{3+}$  ion in octahedral field changes for ligands  $I^-$ ,  $H_2O$ ,  $NH_3$ ,  $CN^-$  in increasing order is :

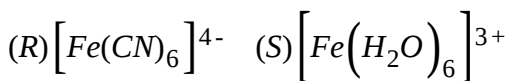
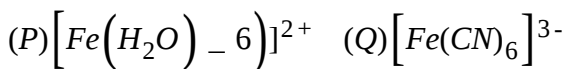


**Answer: A**



[View Text Solution](#)

54. Arrange the following in order of decreasing number of unpaired electrons ?



A. S, P, Q, R

B. P, Q, R, S

C. R, Q, P, S

D. Q, R, P, S

**Answer: A**

 [View Text Solution](#)

55. Which of the following statement is false ?

A. Complex of  $Pt( + II)$  and  $Au( + III)$  are square planar-including with weak field ligands such as halide ions.

B. In tetrahedral complex, the  $t_{2g}$  orbitals are nearer to the direction of the ligands.

C. For  $d^0, d^5, d^{10}$  arrangements the CFSE is zero in both octahedral and tetrahedral complexes with weak field ligands.

D. None of the above

**Answer: D**



[View Text Solution](#)

56. The  $[Fe(CN)_6]^{3-}$  complex ion :

- A. exhibits planar geometry
- B. is diamagnetic
- C. should be very stable
- D. has 2 unpaired electrons

**Answer: C**



[View Text Solution](#)

57. Consider the following statements :

(P)  $[Mn(H_2O)_4]SO_4$  is paramagnetic and square planar

(Q) Crystal field splitting energy (i. e.  $\Delta_0$ ), in  $[Cr(H_2O)_6]^{3+}$  is higher than in  $[Cr(H_2O)_6]^{2+}$

(R ) Wilkinson catalyst  $[RhCl(Ph_3P)_3]$ , a red-violet complex is diamagnetic and square planar.

(S)  $Hg[Co(SCN)_4]$ , a deep blue complex is paramagnetic and tetrahedral.  
and of these select the correct set from the given options.

A. P and S only

B. Q, R and S only

C. P, R and S only

D. P, Q, R and S

**Answer: D**



[View Text Solution](#)

58. Which of the followin statements about  $Fe(CO)_5$  is correct ?

- A. It is paramagnetic and high spin complex
- B. It is diamagnetic and high spin complex
- C. It is diamagnetic and low spin complex
- D. It is paramagnetic and low spin complex

**Answer: C**

 [View Text Solution](#)

**59.** Which of the following statements is not true ?

- A.  $MnCl_4^-$  ion has tetrahedral geometry and is paramagnetic .
- B.  $[Mn(CN)_6]^{2-}$  ion has octahedral geometry and is paramagnetic .
- C.  $[Cu(CN)_4]^{3-}$  has square planar geometry and is diamagnetic.
- D.  $[Ni(Ph_3P)_2Br_3]$  has trigonal bipyramidal geometry and is paramagnetic.

**Answer: C**



[View Text Solution](#)

**60.** For the correct assignment of electronic configuration of a complex, the valence bond theory often requires the measurement of :

- A. molar conductance
- B. optical activity
- C. magnetic moment
- D. dipole moment

**Answer: C**



[View Text Solution](#)

**61.** A complex of certain metal has the magnetic moment of 4.91 BM whereas another complex of the same metal with same oxidation state has zero magnetic moment. The metal ion could be :



**Answer: C**

 [View Text Solution](#)

62. Which of the following is correct for the complex  $\left[ \text{NiBr}_2(\text{PPh}_3)_2 \right]$ ?

A. It is square planar with one unpaired electron.

B. It is tetrahedral with two unpaired electrons.

C. It is square planar and diamagnetic.

D. It is tetrahedral with one unpaired electron.

**Answer: B**

 [View Text Solution](#)



63. Which of the following statement is not correct ?

(P)  $[Ni(H_2O)_6]^{2+}$  and  $[Ni(NH_3)_6]^{2+}$  have same value of CFSE

(Q)  $[Ni(H_2O)_6]^{2+}$  and  $[Ni(NH_3)_6]^{2+}$  have same value of magnetic moment

- A. Only P
- B. Only Q
- C. Both P and Q
- D. None of these

**Answer: A**



[View Text Solution](#)

64. Both  $[Ni(CO)_4]$  and  $[Ni(CN)_4]^{2-}$  are diamagnetic. The hybridization of nickel in these complexes, respectively, are :

A.  $sp^3, sp^3$

B.  $sp^3, dsp^2$

C.  $dsp^2, sp^3$

D.  $dsp^2, sp^2$

**Answer: B**



[View Text Solution](#)

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

A. One, tetrahedral

B. two, tetrahedral

C. one, square planar

D. two, square planar

**Answer: B**



[View Text Solution](#)

66. The complex  $\left[Fe(H_2O)_5NO\right]^{2+}$  is formed in the 'brown ring test' for nitrates. Choose the incorrect statement for the complex.

- A. Its magnetic moment is approximately 3.9 BM
- B. The oxidation state of iron is +1
- C. The hybridization of central metal ion is  $sp^3d^2$
- D. The brown colour of the ring is due to  $d - d$  transition

**Answer: D**



[View Text Solution](#)

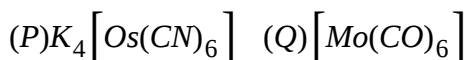
67.  $[Fe(en)_2(H_2O)_2]^{2+} + en \rightarrow \text{complex}(X)$ . The correct statement about complex (X) is :

- A. It is a low spin complex
- B. It is diamagnetic
- C. It shows geometrical isomerism
- D. (a) and (b) both

**Answer: D**

 [View Text Solution](#)

68. Which of the following complexes are low spin diamagnetic ?



select the correct answer using the codes given below :

- A. P, Q and R

B. P and Q only

C. P and R only

D. Q and R only

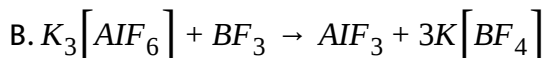
**Answer: B**

 [View Text Solution](#)

69. Which of the following statements is incorrect ?

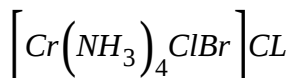
A. Potassium amminetetracyanonitronsoniumchromate(I) having

$\mu = 1.73BM$  has  $d^2sp^3$  hybridization.



C.  $[Cr(NH_3)_6]Cl_3$   $[Cu(NCH_3)_4][BF_4]$  both are coloured

D.  $[Cr(NH_3)_4Cl_2]Br$  can show ionization isomerism with



**Answer: C**

 [View Text Solution](#)

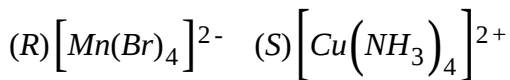
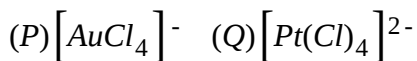
**70.** For Co(II), (Choose incorrect statement):

- A. tetrahedral complexes are generally formed with monodentate anionic ligands like  $N_3^-$ ,  $OH^-$  etc.
- B. planar complexes are formed with bidentate monoanionic like dmg, o-aminophenoxide etc.
- C. planar complexes are also formed with a neutral bidentate ligands like ethylenediamine.
- D. none of these

**Answer: D**

 [View Text Solution](#)

71. Which of the following are square planar complexes ?



select the correct answer using the codes given below :

A. P and Q only

B. Q and R only

C. Q and S only

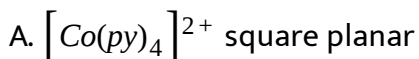
D. P, Q and S only

**Answer: D**



[View Text Solution](#)

72. Which of the following complexes is correctly matched with their geometries ?



B.  $[Cu(CN)_4]^{3-}$  -tetrahedral

C.  $[Fe(CO)_4]^{2-}$  tetrahedral

D. All of these

**Answer: D**

 [View Text Solution](#)

**73.** Which one of the following has a square planar geometry ? [At. no.

Co=27, Ni=28, Fe=26, Pt=78]

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

B.  $[PtCl_4]^{2-}$

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

D.  $[FeCl_4]^{2-}$

**Answer: B**

 [View Text Solution](#)



74. Consider the following statements :

statement-1:  $[Cr(NH_3)_6]^{3+}$  is an inner orbital complex with crystal field stabilization energy equal to  $-1.2 \Delta_0$ .

Statement -2: The complex formed by joining the  $CN^-$  ligands to  $Fe^{3+}$  ion has theoretical value of 'spin only' magnetic moment equal to 1.73 BM.

Statement-3:  $Na_2S + Na_2[Fe(CN)_5NO] \rightarrow Na_4[Fe(CN)_5NOS]$ , In reactant and product the oxidation states of iron are same and arrange in the order of true/false.

A. FTF

B. TTF

C. TTT

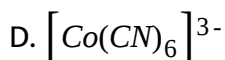
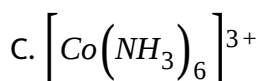
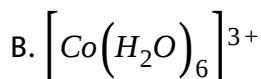
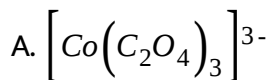
D. FFF

**Answer: C**



[View Text Solution](#)

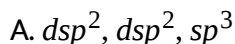
75. In which of the following octahedral complexes of  $Co(at. n \odot 27)$ , will the magnitude of  $\Delta_0$  be the highest ?



Answer: D

 [View Text Solution](#)

76. Among  $[Ni(CN)_4]^{4-}$ ,  $[Ni(PPh_3)_3Br]$  and  $[Ni(dmg)_2]$  species, the hybridisation states of the Ni-atoms are respectively :



B.  $sp^3, sp^3, dsp^2$

C.  $sp^3, dsp^2, dsp^2$

D.  $dsp^2, sp^3, dsp^2$

**Answer: B**

 [View Text Solution](#)

77. The value of 'spin only' magnetic moment for one of the following configuration is 2.84 BM. The correct one is : [Consider octahedral complexes only]

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

B.  $d^4$  (in weak field ligand)

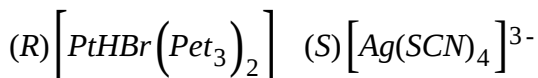
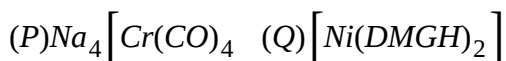
C.  $d^3$  (in weak as well as strong field ligand)

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

**Answer: A**

[View Text Solution](#)

78. Which of the following has  $dsp^2$  hybridization and is diamagnetic in nature ?



A. P, Q, S only

B. P, R, S, T only

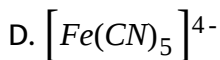
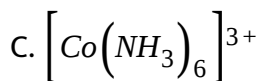
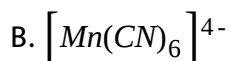
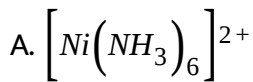
C. Q, R, T only

D. R, T only

**Answer: C**

[View Text Solution](#)

79. Which one is an outer orbital complex ?



**Answer: A**



**View Text Solution**

80. The geometry of  $\left[ NiCl_4 \right]^{2-}$  and  $\left[ NiCl_2(Pme_3)_2 \right]$  are :

A. both square planar

B. tetrahedral and square planar respectively

C. both tetrahedral

D. square planar and tetrahedral respectively

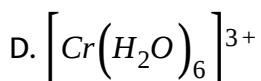
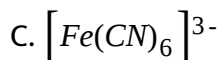
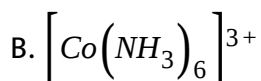
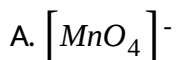
**Answer: B**



[View Text Solution](#)

81. The geometry ion which has no d electrons in the central metal atom is

: [Atomic number  $Cr = 24$ ,  $Mn = 25$ ,  $Fe = 26$ ,  $Co = 27$ ]



**Answer: A**

[View Text Solution](#)

82. The species having tetrahedral shape is :

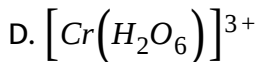
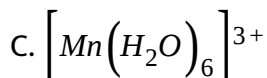
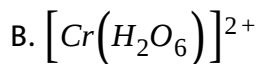
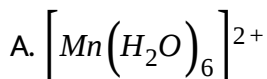




**Answer: D**

 [View Text Solution](#)

**83.** Which one of the following high-spin complexes has the largest CFSE (Crystal field stabilization energy) ?



**Answer: D**

 [View Text Solution](#)

84. The hybridization of  $[CoF_6]^{3-}$  and  $[Co(C_2O_4)]^{3-}$  are :

- A. both  $sp^3d^2$
- B. both  $d^2sp^3$
- C.  $sp^3d^2$  and  $d^2sp^3$  respectively
- D.  $d^2sp^3$  and  $sp^3d^2$  respectively

Answer: C

 [View Text Solution](#)

85. The total crystal field stabilization energy (CFSE) for the complexes

$[Co(H_2O)_6]^{3+}$  and  $[CoF_6]^{3-}$  are respectively : (P is the pairing energy)

- A.  $-24dq + 2P$  and  $-24dq + 2P$
- B.  $-24dq + 2P$  and  $-4.0dq$
- C.  $-4.0dq$  and  $-4.0dq$



D.  $4.0d_q$  and 0

**Answer: B**

 [View Text Solution](#)

86. Wilkinson's catalyst react with  $H_2$  to form an octahedral complex in which  $Rh(Z = 45)$  has the following electronic configuration in the ligand field,  $t_{2g}^{2,2,2}, e_g^{0,0}$

Then which of the following is correct about this new complex ?

- A. It is diamagnetic
- B. Its IUPAC name is chloridotris(triphenylphosphine)rhodium(I)
- C. Hybridization of Rh(I) is  $sp^3d^2$
- D. It is a paramagnetic complex

**Answer: A**

 [View Text Solution](#)

87. The 'spin only' magnetic moment (in units of Bohr magneton,  $\mu_B$ ) of  $Ni^{2+}$  in aqueous solution would be (atomic number  $Ni = 28$ )

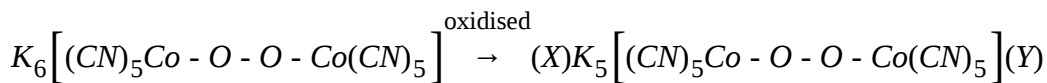
- A. 2.84
- B. 4.80
- C. 0
- D. 1.73

**Answer: A**



[View Text Solution](#)

88.



In both the complexes  $Co$  have  $t_{2g}^6 e_g^0$  configuration. The bond energy of  $(O - O)$  in X and Y is:

- A. bond energy of  $(O - O)$  in Y < bond energy of  $(O - O)$  in X.

B. bond energy of (O - O) in X < bond energy of (O - O) in Y.

C. bond energy of (O - O) in X = bond energy of (O - O) in Y.

D. bond energy of (O - O) in X and bond energy of (O - O) in Y can't be comparable.

**Answer: B**

 [View Text Solution](#)

**89.** The coordination number and the oxidation state of element E in the complex  $[E(en)_2(C_2O_4)]NO_2$  (where en is ethylene diamine) are, respectively :

A. 4 and 2

B. 4 and 3

C. 6 and 3

D. 6 and 2

Answer: C

 [View Text Solution](#)

90. Which of the following is not correctly matched ?

- A.  $[Fe(en)_3]^{3+}$  -  $sp^3d^2$  and paramagnetic
- B.  $[FeCl_4]^{2-}$  -  $sp^3$  and paramagnetic
- C.  $[Fe(CN)_6]^{3-}$  -  $d^2sp^3$  and paramagnetic
- D.  $[Fe(CO)_2(NO^+)_2]$  -  $sp^3$  and diamagnetic

Answer: A

 [View Text Solution](#)

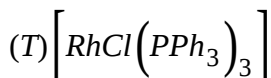
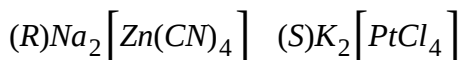
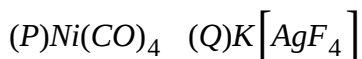
91. The complex  $K_4[Zn(CN)_4(O_2)_2]$  is oxidised into  $K_2[Zn(CN)_4(O_2)_2]$ , then which of the following is correct ?

- A. Zn (II) is oxidised into Zn (IV)
- B. Paramagnetic moment decreases
- C. O - O bond length increases
- D. Paramagnetic moment increases

**Answer: D**

 [View Text Solution](#)

92. All the following complexes show decrease in their weights when placed in a magnetic balance then the group of complexes having tetrahedral geometry is :



A. Q, R, T

B. P, Q, R

C. P, R, S

D. None of these

**Answer: D**

 [View Text Solution](#)

93. The geometry of  $[Co(CO)_4]^-$  and  $[Cd(CN)_4]^{2-}$  are :

A. both square planar

B. both tetrahedral

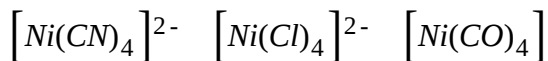
C. tetrahedral and square planar, respectively

D. square planar and tetrahedral, respectively

**Answer: B**

 [View Text Solution](#)

94. In which option ,properties of the given three complexes are correct ?



A. Square planar paramagnetic  $\mu = \sqrt{8B. M.}$

B.  $\mu = 0$  tetrahedral diamagnetic

C. Diamagnetic  $\mu = \sqrt{8B. M.}$  square planar

D. Square planar diamagnetic tetrahedral

**Answer: B**

 [View Text Solution](#)

95. If  $\Delta_0$  is crystal field splitting energy and P is mean pairing energy per pair then stablizing energy of complex  $[FeF_6]^{4-}$  is :

A.  $-2.4\Delta_0 + 3P$

B.  $-2.0\Delta_0 + 3P$

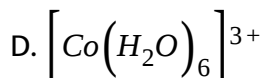
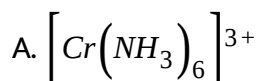
C.  $-1.6\Delta_0 + P$

D.  $-0.4\Delta_0$

**Answer: D**

 [View Text Solution](#)

96. Which of the complex is inner orbital as well as diamagnetic in nature ?

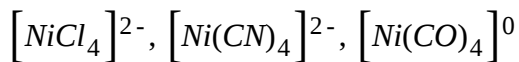


**Answer: D**

 [View Text Solution](#)



97. Consider the following complexes :



What is the similarity in all three complexes ?

- A. Oxidation number and EAN of metal
- B. Geometry and hybridisation
- C. Magnetic nature and number of  $\sigma$  bonds
- D. Coordination number and type of metal

**Answer: D**



[View Text Solution](#)

98.  $[Ni(CN)_4]^{2-}$  and  $[NiCl_4]^{2-}$  have similarity but not in :

- A. magnetic moment
- B. C.N. and O.N.
- C. structure

D. both (a) and (c)

**Answer: D**

 [View Text Solution](#)

99. For which of the following  $d^n$  configuration of octahedral complex(es), cannot exist in both high spin and low spin forms ?

(P) $d^3$  (Q) $d^5$

(R) $d^6$  (S) $d^8$

A. Q and R

B. P and R

C. P and S

D. R and S

**Answer: C**

 [View Text Solution](#)

**100.** 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**

 [View Text Solution](#)

**101.** According to crystal field theory (CFT) :

A. order of increasing field strength of ligands is :  $F^- > H_2O > NH_3$

B. If pairing energy exceeds the magnitude of crystal field splitting  
then pairing occurs

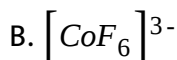
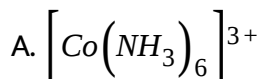
C.  $d^4$  to  $d^7$  co-ordination entities are more stable for strong field as compared to weak field cases

D. Tetrahedral complexes have sufficiently large splitting energy to force pairing and therefore, high spin configuration are rarely observed.

**Answer: C**

 [View Text Solution](#)

**102.** Which amongst following is called spin paired complex ?



D. All complexes with strong field ligands

**Answer: A**



[View Text Solution](#)

103. Which of the following complexes are tetrahedral but spin free ?



D. Both (a) and (b)

**Answer: A**



[View Text Solution](#)

104. Which of the following is not a shortcoming of VBT ?

(P) Quantitative interpretation of magnetic data

(Q) Colour exhibited by coordination compounds

(R ) Quantitative interpretation of the thermodynamic of kinetic stabilities of co-ordination compounds

(S) Exact predictions regarding the octahedral structures of 6 coordination complexes

(U) It does not distinguish between weak and strong ligands.

A. P, Q, R, U

B. T

C. S, T

D. Q, R and S

**Answer: B**



[View Text Solution](#)

**105.** If crystal field theory is completely followed, then which of the following statements must be true ?

A. Anionic ligands such as  $\text{OH}^-$  should exert greater splitting effect than neutral ligands such as  $\text{H}_2\text{O}$

B. Complexes will have partial covalent bonds between ligands and central atom

C. Colour of complexes cannot be explained

D. Complexes will have pure covalent bonds between ligands and central atom

**Answer: A**

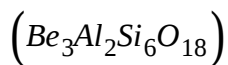
 [View Text Solution](#)

**106.** Ruby is aluminium oxide ( $Al_2O_3$ ) containing about 0.5 - 1 %  $Cr^{3+}$  ions ( $d^3$ ), which are randomly distributed in positions normally occupied by  $Al^{3+}$  choose the only incorrect statement :

A.  $Cr^{3+}$  is incorporated into the alumina lattice as octahedral chromium (III) complexes

B. d-d transitions at these centres give rise to colour

C. In Emerald,  $Cr^{3+}$  ions occupy octahedral sites in the mineral beryl



D. The absorption bands seen in the Emerald, shift to longer wavelength, namely yellow-red and blue, causing Ruby to transmit light in green region.

**Answer: D**

 [View Text Solution](#)

107. For  $[FeF_6]^{3-}$  and  $[CoF_6]^{3-}$ , the statement that is correct is :

A. both are coloured

B. both are colourless

C.  $[FeF_6]^{3-}$  is coloured and  $[CoF_6]^{3-}$  is colourless

D.  $[FeF_6]^{3-}$  is colourless and  $[CoF_6]^{3-}$  is coloured

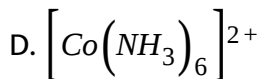
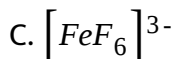
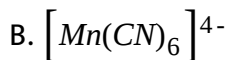
**Answer: D**





[View Text Solution](#)

108. Which of the following complex ions has electrons that are symmetrically filled in both  $t_{2g}$  and  $e_g$  orbitals ?



Answer: C



[View Text Solution](#)

109. Which of the following statement is false ?

A.  $[NiCl_4]^{2-}$  ion is paramagnetic and tetrahedral but  $[PtCl_4]^{2-}$  is diamagnetic and square planar

B.  $[CoF_6]^{3-}$  ion is paramagnetic but  $[NiF_6]^{2-}$  ion is diamagnetic and

low spin

C.  $\Delta_0$  order  $[CrCl_6]^{3-} < [Cr(NH_3)_6]^{3+} < [Cr(CN)_6]^{3-}$

D. bis(dimethylglyoximato)nickel(II) is diamagnetic and tetrahedral

complex

**Answer: D**



[View Text Solution](#)

**110.** The number of unpaired electrons in  $d^6$ , low spin, octahedral complex

is :

A. 4

B. 2

C. 1

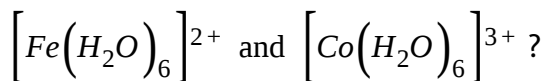
D. 0

**Answer: D**



[View Text Solution](#)

111. Which of the following option is correct for



A. both have same magnetic moment

B. both are high spin complex

C.  $\Delta_0 > P$  for both

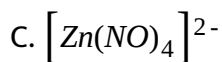
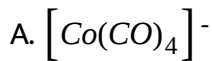
D. Splitting gap is different in both

**Answer: D**



[View Text Solution](#)

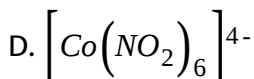
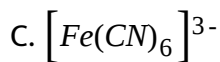
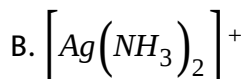
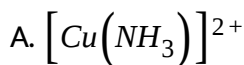
112. Which of the following complex does not have tetrahedral geometry ?



**Answer: B**

 [View Text Solution](#)

**113.** Which of the following complex acts as good reducing agent ?



**Answer: D**

 [View Text Solution](#)

114. Which of the following statement is correct for  $[\text{NiCl}_2(\text{NH}_3)_2]^0$  (spin magnetic moment =0) ?

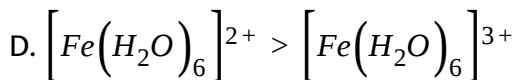
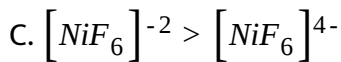
- A. It is optically active complex
- B. It is high spin complex
- C. It is tetrahedral complex
- D. It has two stereo isomers

**Answer: D**

 [View Text Solution](#)

115. Which of the following order is correct for  $\Delta_0/\Delta_t/\Delta_{sp}$  ?

- A.  $[\text{Fe}(\text{SCN})_6]^{3-} > [\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}$
- B.  $[\text{Co}(\text{H}_2\text{O})_3\text{F}_3] > [\text{Co}(\text{H}_2\text{O})_5]^{3+}$



**Answer: C**

 [View Text Solution](#)

**116.** Select the correct statement about  $[CoF_6]^{3-}$  :

A. It is labile complex

B. It is low spin complex

C. Spin only magnetic moment of complex is 3.87 B.M.

D. All of these

**Answer: A**

 [View Text Solution](#)

117. The complex  $\left[Pt(NH_3)_4\right]^{2+}$  has .....structure.

A. Square planar

B. tetrahedral.

C. pyramidal

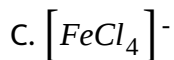
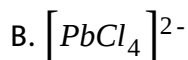
D. pentagonal

**Answer: A**



[View Text Solution](#)

118. Which of the following complex ion has tetrahedral arrangement ?



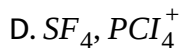
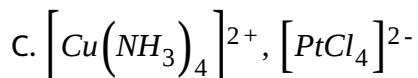
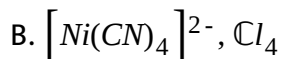
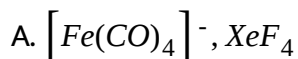
D. All are having tetrahedral structure

Answer: C



View Text Solution

119. The pair of species having square planar shapes for both is :



Answer: C



View Text Solution

120. Select incorrect characteristics about  $[Zn(gly)_2]^0$  :

A. It is diamagnetic in nature



- B. It shows optical isomerism
- C. It shows geometrical isomerism
- D. It has four  $N - Zn - O$  bond angles

**Answer: C**

 [View Text Solution](#)

**121.** Which of the following is not correctly matched (P : Pairing energy)?

- A.  $\left[Co(H_2O)_6\right]^{3+} : \Delta_0 < P : \text{Paramag} \neq \text{tic}$
- B.  $\left[NiF_6\right]^{2-} : \Delta_0 > P : \text{Diamag} \neq \text{tic}$
- C.  $\left[RhF_6\right]^{3-} : \Delta_0 > P : \text{Diamag} \neq \text{tic}$
- D.  $\left[Fe(NH_3)_6\right]^{2+} : \Delta_0 < P : \text{Paramag} \neq \text{tic}$

**Answer: A**

 [View Text Solution](#)

122. Select correct statement :

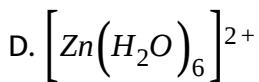
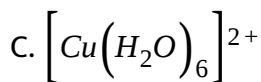
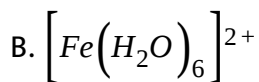
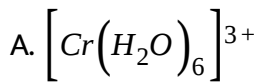
- A. The  $d_{x^2-y^2}$  and  $d_{z^2}$  orbitals are called  $e_g$  orbitals for octahedral splitting
- B. The  $d_{xy}$ ,  $d_{xz}$  and  $d_{yz}$  orbitals lie between the axes and collectively called  $t_{2g}$  orbitals
- C. both are correct
- D. none is correct

Answer: C

 [View Text Solution](#)

## E. Stability, Colour and Magnetic Properties of Complexes

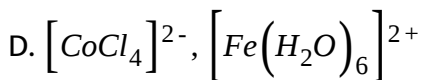
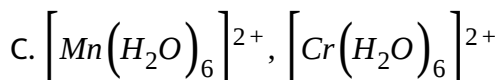
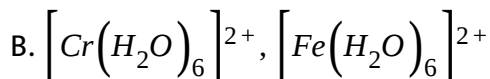
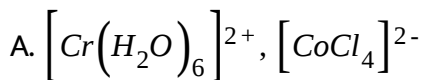
1. Among the following ions, which one has the highest paramagnetism ?



**Answer: B**

 [View Text Solution](#)

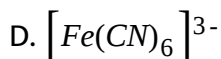
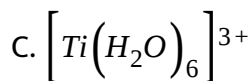
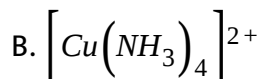
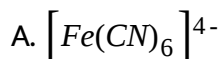
2. The pair in which both species have same magnetic moment (spin only value) is :



**Answer: B**

 [View Text Solution](#)

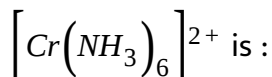
3. Which of the following complexes is diamagnetic ?



**Answer: A**

 [View Text Solution](#)

4. The number of unpaired electrons expected for the complex ion



A. 2

B. 3

C. 4

D. 5

**Answer: A**

 [View Text Solution](#)

5. You are given the following two complexes X and Y which are isomers of each other, X is  $\text{Hg} [\text{Co}(\text{SCN})_4]$ . It is further given that 'spin only' magnetic moment of X is found to be 3.78 BM and that of Y is 1.73 B.M. Then which of the following is correct ?

A. Anion of X will be tetrahedral and that of Y will be square planar

B. Anion of X will be square planar but that of Y will be tetrahedral

C. Both the anions will be tetrahedral

D. Both the anions will be square planar

**Answer: A**



[View Text Solution](#)

6.  $[Ni(CN)_4]^{2-}$  and  $[NiCl_4]^{2-}$  have similarity but not in :

A. magnetic moment

B. C.N. and O.N.

C. geometry

D. both (a) and ©

**Answer: D**



[View Text Solution](#)

7. Select the correct statement .

A. Complex ion  $[MoCl_6]^{3-}$  is paramagnetic

B. Complex ion  $[Co(en)_3]^{3+}$  is diamagnetic

C. Both (a) and (b) are correct

D. None of correct

**Answer: C**

 [View Text Solution](#)

8. Amongst  $Ni(CO)_4$ ,  $[Ni(CN)_4]^{2-}$ ,  $NiCl_4^{2-}$  :

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

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

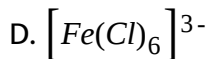
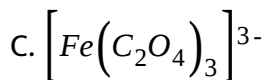
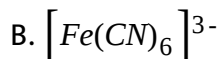
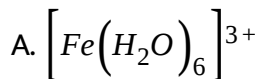
C.  $Ni(CO)_4$  and  $[Ni(CN)_4]^{2-}$  are diamagnetic and  $NiCl_4^{2-}$  is paramagnetic.

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

**Answer: C**

 [View Text Solution](#)

9. In complexes more stability is shown by :

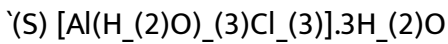
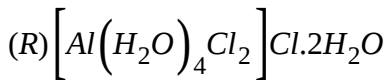
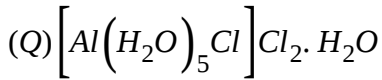
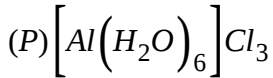


**Answer: C**

 [View Text Solution](#)



10. Give the correct order of stability is shown by :



A.  $P < Q < R < S$

B.  $P > R > Q > S$

C.  $P > Q > R > S$

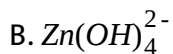
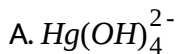
D.  $P > Q > S > R$

Answer: C



View Text Solution

11. Which of the following complexes is least likely to exist ?



**Answer: A**

 [View Text Solution](#)

12. For the reaction  $Ni^{2+} + 4NH_3 \rightarrow [Ni(NH_3)_4]^{2+}$ , at equilibrium is 0.5M. Then the instability constant of the complex will be approximately equal to :

A.  $1.0 \times 10^{-5}$

B.  $1.5 \times 10^{-16}$

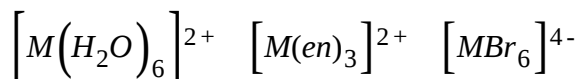
C.  $1.0 \times 10^7$

D.  $1.5 \times 10^{-17}$

**Answer: C**

 [View Text Solution](#)

13. An ion  $M^{2+}$  forms the complexes.



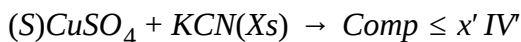
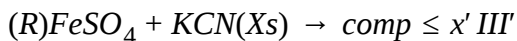
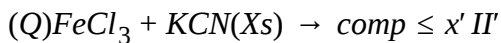
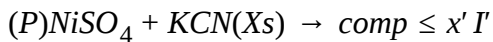
Match the complex with the appropriate colour respectively :

- A. Green, blue and red
- B. Blue, red and green
- C. Green, red and blue
- D. Red, blue and green

**Answer: B**

 [View Text Solution](#)

14. In the following complexes :



Correct order of stability of complexes is :

A.  $P > Q > R > S$

B.  $Q > P > R > S$

C.  $Q > R > P > S$

D.  $R > Q > P > S$

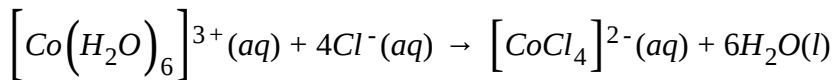
**Answer: A**



[View Text Solution](#)

15. When hydrochloric acid is added to cobalt nitrate solution at room temperature, the following reaction takes place and the solution turns

blue.



pink blue

However when cooled to a temperature below room temperature, the solution turns pink. On the basis of this information mark the appropriate option :

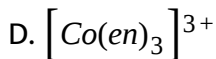
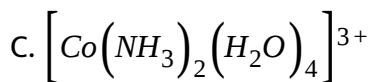
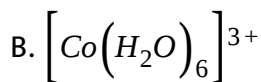
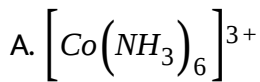
- A.  $\Delta H = 0$  for the reaction
- B.  $\Delta H > 0$  for the reaction
- C.  $\Delta H < 0$  for the reaction
- D.  $\Delta H$  can not be concluded

**Answer: B**



[View Text Solution](#)

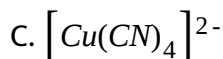
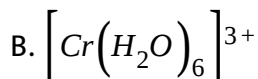
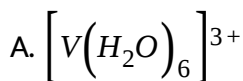
16. Of the following complex ions, the one that probably has the largest overall formation constant,  $K_f$  is :



**Answer: D**

 [View Text Solution](#)

17. The magnetic moment of a complex ion is 2.83 BM. The complex ion is :

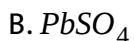
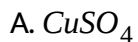


**Answer: A**



[View Text Solution](#)

18. Compound A gives blue colour solution with excess of  $NH_4OH$ , it gives chocolate brown colour with  $K_4[Fe(CN)_6]$ . Complex A is :



**Answer: A**



[View Text Solution](#)

19.  $K_4[Fe(CN)_6]$  is slightly yellow coloured due to :

A. charge transfer

B. more polarization plane

C. unpaired electrons

D. none of these

**Answer: A**



[View Text Solution](#)

20.  $MnO_4^-$  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 + ) temporarily

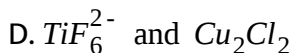
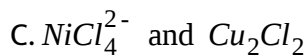
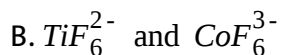
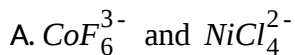
D. none is correct explanation

**Answer: C**



 [View Text Solution](#)

21. Among  $TiF_6^{2-}$ ,  $CoF_6^{3-}$ ,  $Cu_2Cl_2$  and  $NiCl_4^{2-}$  the colourless species are :



**Answer: D**

 [View Text Solution](#)

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

A. It will remain same

- B. It increases from 2.83 B.M.
- C. It decreases from 2.83 B.M.
- D. It cannot be predicted theoretically

**Answer: A**

 [View Text Solution](#)

23. The complex  $\left[Fe(H_2O)_5NO\right]^{2+}$  is formed in the brown ring test for nitrates when freshly prepared  $FeSO_4$  solution is added to aq solution of  $NO_3(-)$  followed by addition of conc.  $H_2SO_4$ . Select correct statement about this complex :

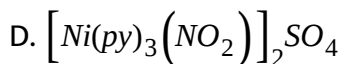
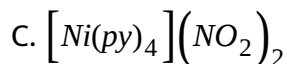
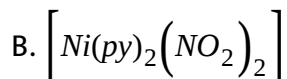
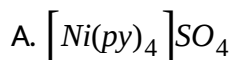
- A. colour changes due to charge transfer
- B. it has iron in +1 oxidation state and nitrosyl as  $NO^+$
- C. it has magnetic moment of 3.87 B.M. confirming three unpaired electrons in Fe

D. all are correct statements

**Answer: D**

 [View Text Solution](#)

24. Aqueous solution of nickel sulphate on treating with pyridine and then adding a solution of sodium nitrite gives dark blue crystals of :



**Answer: C**

 [View Text Solution](#)

25. The spin only magnetic moment value (in Bohr magneton units) of  $Cr(CO)_6$  is :

- A. 0
- B. 2.84
- C. 4.9
- D. 5.92

**Answer: A**



[View Text Solution](#)

26. What will be the theoretical value of 'spin only' magnetic moment when  $Fe(SCN)_3$  reacts with a solution containing  $F^-$  ions to yield a colourless complex ?

- A. 2.83 BM
- B. 3.87 BM

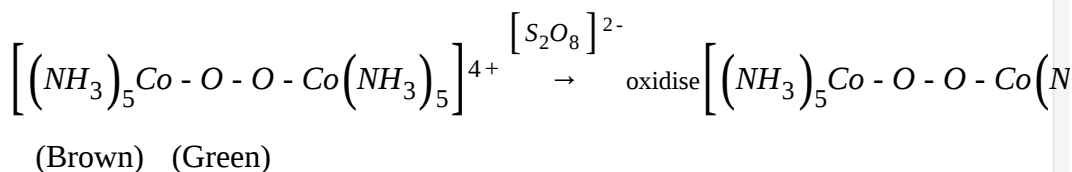
C. 5.92 BM

D. 1.73 BM

**Answer: C**

 [View Text Solution](#)

27.



The magnetic moment of green complex is 1.7 BM and for brown complexes magnetic moment is zero. (O - O) is same in all respect in both the complexes. The oxidation state of Co in brown complex and green complex respectively are :

- A.  $\text{III}$   $\text{III}$  and  $\text{IV}$   $\text{III}$   
*brown green*
- B.  $\text{III}$   $\text{II}$  and  $\text{III}$   $\text{III}$   
*brown green*
- C.  $\text{III}$   $\text{III}$  and  $\text{III}$   $\text{II}$   
*brown green*

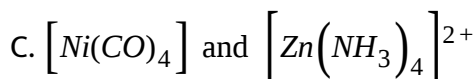
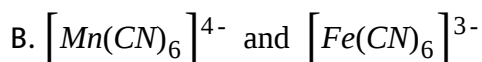
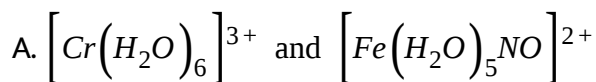
III IV and III III

D. brown green

**Answer: A**

 [View Text Solution](#)

28. Which of the following pairs will show the same magnetic moment ('spin only')?

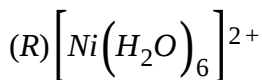
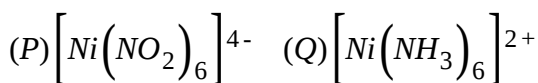


D. All of these

**Answer: D**

 [View Text Solution](#)

29. What will be the correct order for the wave length of light observed for the following ?



A.  $P > Q > R$

B.  $Q > P > R$

C.  $R > Q > P$

D.  $Q > R > P$

**Answer: A**



[View Text Solution](#)

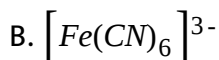
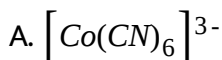
30. Which one of the following statement is false for nickel-dimethylglyoximate complex ?

- A. The stability of complex is only due to the presence of intramolecular hydrogen bonding.
- B. The complex is stable because tridentate dimethyl glyoxime ligand forms a five membered chelate rings.
- C. The complex is stable as it has five membered chelate rings as well as intra molecular hydrogen bonding.
- D. (a) and (b) both.

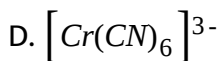
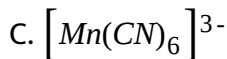
**Answer: A**

 [View Text Solution](#)

31. Which one of the following complexes would exhibit the lowest value of paramagnetic behaviour ?







**Answer: A**



[View Text Solution](#)

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

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

B. copper hydroxide is amphoteric.

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

D. in acidic solution protons coordinates with ammonia molecules are not forming  $NH_4^+$  ions and  $NH_3$  molecules are not available.

**Answer: D**



[View Text Solution](#)

33. The spin magnetic moment of cobalt in the compound,  $Hg[Co(SCN)_4]$

is :

A.  $\sqrt{3}$

B.  $\sqrt{8}$

C.  $\sqrt{15}$

D.  $\sqrt{24}$

**Answer: C**



[View Text Solution](#)

34. Consider the following statements :

Statement-1: The  $[Co(\otimes)_3]^{3-}$  complex is diamagnetic and gains stability through chelation.

Statement 2: The  $\left[Co(NO_2)_6\right]^{4-}$  is inner orbital complex involving  $d^2sp^3$  hybridization and is paramagnetic.

The complex  $\left[PtCl_4\right]^{2-}$  is square planar and diamagnetic.

and arrange in the order of true/false :

A. TTT

B. FFT

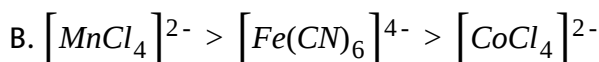
C. TFT

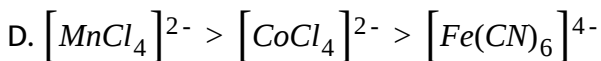
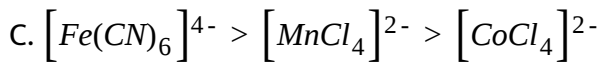
D. TTF

**Answer: A**

 [View Text Solution](#)

35. The correct order of magnetic moments (only spin value in BM) among is :



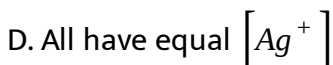
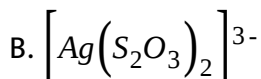
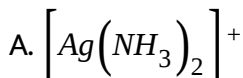


**Answer: D**



[View Text Solution](#)

36. Which of the following complexes would have minimum  $[Ag^+]$  concentration in solution ?

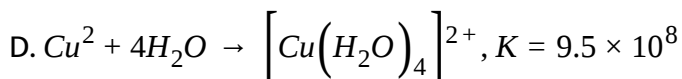
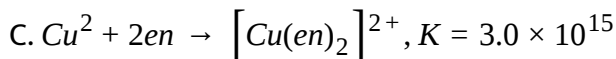
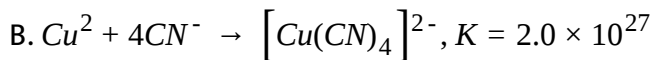
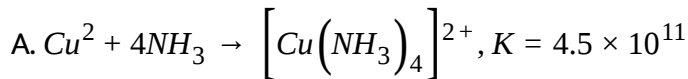


**Answer: C**



[View Text Solution](#)

37. From the stability constant (hypothetical values), given below, predict which is the most stable complex ?

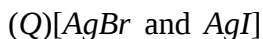
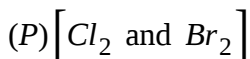


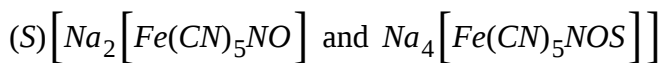
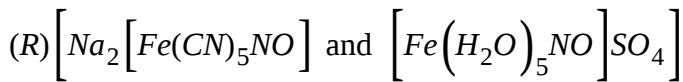
**Answer: B**



[View Text Solution](#)

38. Which of the following set of species are coloured as well as diamagnetic ?





A. P, Q, S

B. P, R, Q

C. P, Q, R, S

D. P, S, Q

**Answer: A**



[View Text Solution](#)

**39.** Which of the following statements is not correct ?

A.  $Ti(NO_3)_4$  is colourless compound.

B.  $\left[Cr(NH_3)_6\right]Cl_3$  is a coloured compound.

C.  $K_3\left[VF_6\right]$  is a colourless compound.

D.  $\left[Cu(NCCH_3)_4\right]\left[BF_4\right]$  is a colourless compound.

**Answer: C**



**View Text Solution**

**40.** What is the ratio of uncomplexed to complexed  $Zn^{2+}$  ion in a solution that is 10 M in  $NH_3$ , if the stability constant of  $[Zn(NH_3)_4]^{2+}$  is  $3 \times 10^9$ ?

A.  $3.3 \times 10^{-9}$

B.  $3.3 \times 10^{-11}$

C.  $3.3 \times 10^{-14}$

D.  $3 \times 10^{-13}$

**Answer: C**



**View Text Solution**

**41.** Which of the following statements is incorrect ?

A.  $N_2$  and  $C_2$  molecules contain both  $\sigma$  and  $\pi$  bonds

B.  $Cu^{2+}$  is more stable than  $Cu^+$  in aqueous medium

C. The electrical conductivity of metals cannot be explained by electron sea model.

D. (a) and (C) both

**Answer: D**

 [View Text Solution](#)

42. What is the magnetic moment of  $K_3[FeF_6]$  ?

A. 3.87 BM

B. 4.98 BM

C. 5.91 BM

D. 6.92 BM

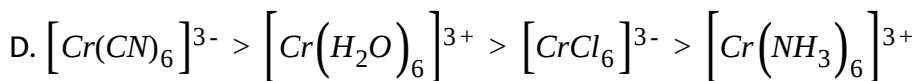
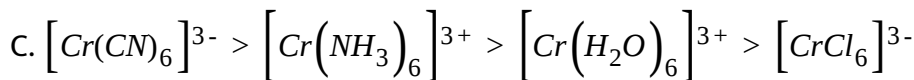
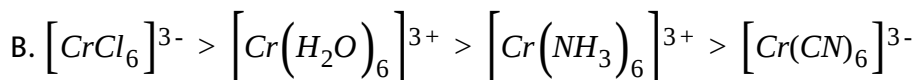
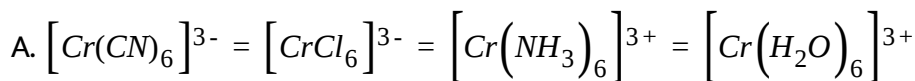
**Answer: C**





[View Text Solution](#)

43. Select the correct order for the wavelength of absorption for the given complexes :

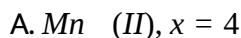


**Answer: B**



[View Text Solution](#)

44. A complex  $K_x[MnF_6]$  has magnetic moment 4.9BM what will be the oxidation state of Mn and value of x :



B.  $Mn(III), x = 3$

C.  $Mn(IV), x = 2$

D.  $Mn(V), x = 1$

**Answer: B**

 [View Text Solution](#)

45. Maximum number of atoms which are in the same plane in  $[Ni(CO)_4]$

:

A. 3

B. 2

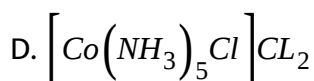
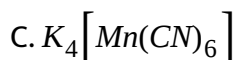
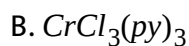
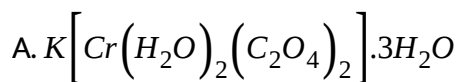
C. 9

D. 5

**Answer: D**

 [View Text Solution](#)

46. Which amongst the following has zero magnetic moment ?

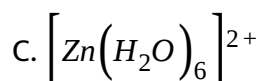
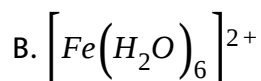
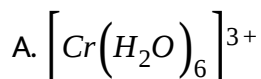


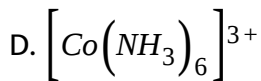
Answer: D



[View Text Solution](#)

47. Which ion has the highest spin magnetic moment value ?





**Answer: B**

 [View Text Solution](#)

**48.** Choose the incorrect statement :

- A.  $FeSO_4$  solution mixed with  $(NH_4)_2SO_4$  solution in 1:1 molar ratio gives test of  $Fe^{2+}$  ion
- B.  $CuSO_4$  solution mixed with aqueous ammonia in 1:1 molar ratio gives test of  $Cu^{2+}$  ion
- C. Aq.  $CuSO_4$  solution (blue in colour) gives a green precipitate with aqueous potassium fluoride
- D. Aq.  $CuSO_4$  solution (blue in colour) gives a bright green solution with aqueous potassium chloride

**Answer: B**



[View Text Solution](#)

49. Find pK if K is the overall complex dissociation equilibrium constant

for  $\left[ \text{Cu}(\text{NH}_3)_4 \right]^{2+}$  ion, given that  $\beta_4$  for this complex is  $2.0 \times 10^{13}$  :

A. 13.3

B. 12.7

C. 13.7

D. 12.3

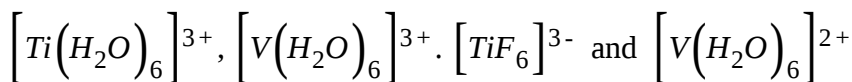
**Answer: A**



[View Text Solution](#)

50. Choose the correct statement for the complex  $\left[ \text{Al}(\text{H}_2\text{O})_6 \right]^{3+}$  :

A. It has the same hybridisation as



B. It has different magnetic property as compared to  $\left[ \text{Cr}(\text{NH}_3)_6 \right]^{3+}$

C. It has same magnetic property as compared to  $\left[ \text{MnF}_6 \right]^{2-}$  but different hybridisation

D. Both (a) and (b)

**Answer: D**

 [View Text Solution](#)

51. For the complex  $ML_2$ , Stepwise formation constants



$ML + L \rightarrow ML_2$  are 4 and 3 respectively. Hence, overall stability constant

for  $M + 2L \rightarrow ML_2$  is :

A. 12

B. 7

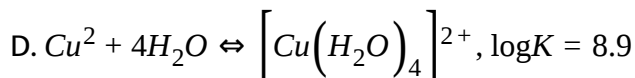
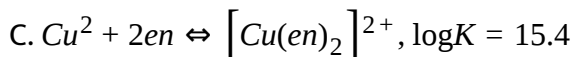
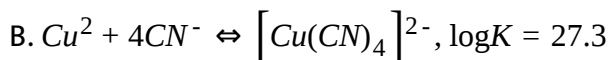
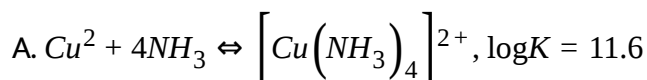
C. 1.33

D. 0.75

**Answer: A**

 [View Text Solution](#)

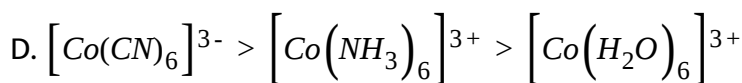
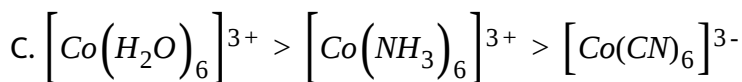
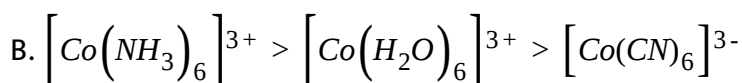
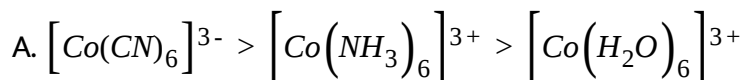
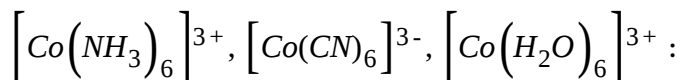
52. Which of the following complexes formed by  $\text{Cu}^{2+}$  ions most stable ?



**Answer: B**

 [View Text Solution](#)

53. The colour of the coordination compounds depends on the crystal field splitting. What will be the correct order of absorption of wavelength of light in the visible region, for the complexes,



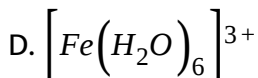
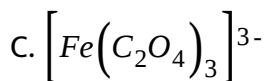
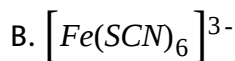
**Answer: C**



[View Text Solution](#)

54. The stabilisation of coordination compounds due to chelation is called the chelate effect. Which of the following is the most stable complex species ?





**Answer: C**



**View Text Solution**

**55.** The nature of  $CsAuCl_3$  is (this compound contains  $Au$  in two oxidation states and there is no  $Au - Au$  bond) :

A. diamagnetic

B. paramagnetic

C. ferromagnetic

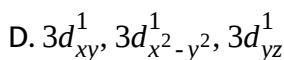
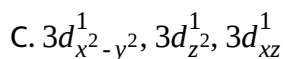
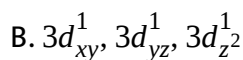
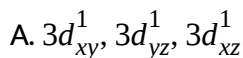
D. antiferromagnetic

**Answer: A**



[View Text Solution](#)

56.  $\left[ Cr(H_2O)_6 \right] Cl_3$  (atomic number of Cr=24) has a magnetic moment of 3.83 B.M. The correct present in the complex is :



**Answer: A**



[View Text Solution](#)

57. Which of the following chemical species is tetrahedral, diamagnetic as well as coloured ?





**Answer: A**

 [View Text Solution](#)

58. The colour of  $Co(H_2O)_6^{2+}$  is best attributed to electronic transitions :

A. between different n levels in the metal.

B. between the metal's d orbitals.

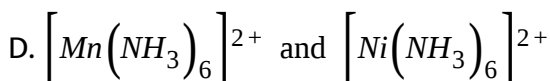
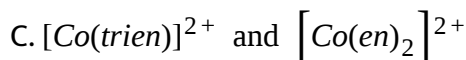
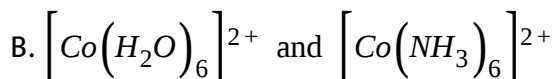
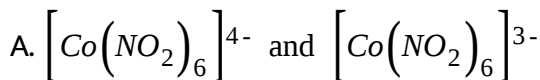
C. from the  $Co^{2+}$  ion to water molecules.

D. during ionization.

**Answer: B**

 [View Text Solution](#)

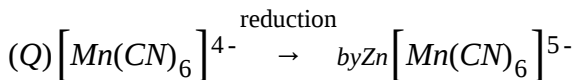
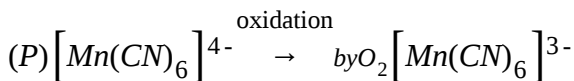
59. Out of the following pairs (of complexes), in which option, first complex is more stable than second complex :



**Answer: C**

 [View Text Solution](#)

60. Which change in  $[Mn(CN)_6]^{4-}$  results in symmetrical distribution of electrons in non-degenerate d- orbitals of metal ion ?



A. P only

- B. Q only
- C. P and Q both
- D. None of these

**Answer: B**

 [View Text Solution](#)

## F. Isomerism in Coordination Compounds

1. The complexes  $[Pt(NH_3)_4][PtCl_6]$  and  $[Pt(NH_3)_4Cl_2][PtCl_4]$  are :

- A. linkage isomers
- B. optical isomers
- C. Co-ordination isomers
- D. ionization isomers

**Answer: C**



[View Text Solution](#)

2.  $[Co(NH_3)_5NO_2]Cl_2$  and  $[Co(NH_3)_5ONO]Cl_2$  are related to each other as :

- A. Geometrical isomers
- B. linkage isomers
- C. coordination isomers
- D. ionization isomers

**Answer: B**



[View Text Solution](#)

3. The number of geometrical isomers of  $[Co(NH_3)_3(NO_3)_3]$  are :

- A. 0

B. 2

C. 3

D. 4

**Answer: B**

 [View Text Solution](#)

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

A. 2

B. 3

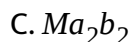
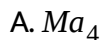
C. 4 (tetrahedral)

D. 6

**Answer: D**

 [View Text Solution](#)

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



**Answer: C**

 [View Text Solution](#)

6.  $\left[CoCl_2(NH_3)_4\right]^+ + Cl^- \rightarrow \left[CoCl_3(NH_3)_3\right] + NH_3$  If in the above reaction only one isomer of the product is obtained, which is true for the initial (reactant) complex :

A. compound is in cis form



B. compound is in trans form

C. compound is in both (cis and trans) forms

D. can't be predicted

**Answer: B**

 [View Text Solution](#)

7. Geometrical isomerism in coordination compounds is exhibited by :

A. Square planar and tetrahedral complexes

B. Square planar and octahedral complexes

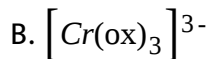
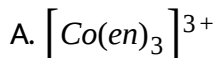
C. Tetrahedral and octahedral complexes

D. Square planar, tetrahedral and octahedral complexes

**Answer: B**

 [View Text Solution](#)

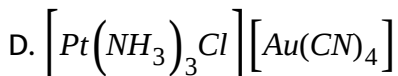
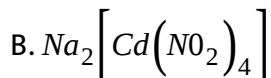
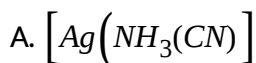
8. Which of the following is not optically active ?



**Answer: D**

 [View Text Solution](#)

9. Geometrical isomerism can be shown by :



**Answer: C**

 [View Text Solution](#)

10.  $[Pt(NH_3)(NH_2OH)(NO_2)(py)]^+$  will form how many geometrical isomers ?

A. 2

B. 3

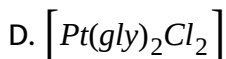
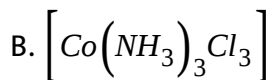
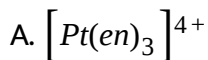
C. 4

D. 5

**Answer: B**

 [View Text Solution](#)

11. Which of the following would exhibit geometrical as well as optical isomerism ?



**Answer: D**

 [View Text Solution](#)

12. The number of geometrical isomers and optical isomers of

$[Pt(NH_3)(Br)(Cl)(Py)]$  are respectively.

A. 2, 0

B. 3, 2

C. 3, 0

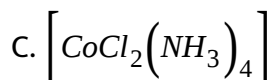
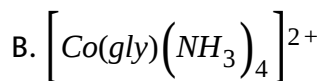
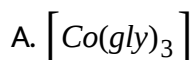
D. 2, 2

**Answer: C**



[View Text Solution](#)

13. The complex entity which shows geometrical as well as optical isomerism, is :



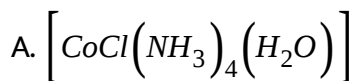
D. All of these

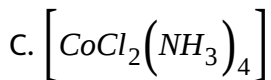
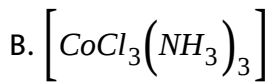
**Answer: A**



[View Text Solution](#)

14. Which of the following complex compound exhibits geometrical isomerism ?



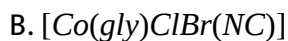
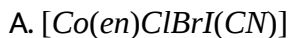


D. All of these

**Answer: D**

 [View Text Solution](#)

15. Which of the following will exhibit more than ten isomers ?



D. All of the above

**Answer: D**

 [View Text Solution](#)

16. How many total possible isomers are present for  $\left[Pt(CN)_2(NO_2)_2\right]^{2-}$  ?

A. 2

B. 4

C. 10

D. 19

**Answer: D**



[View Text Solution](#)

17. Coordination number, oxidation state and number of isomers in

$K_3\left[Cr(C_2O_4)_3\right]$  are respectively :

A. 6, +3, 2

B. 4, +2 and 2

C. 3, +3, 3

D. 3, 0 and 3

**Answer: A**

 [View Text Solution](#)

18. The total number of optically active isomers of  $[Pt(en)_2Cl_2]^{2+}$  is :

A. 2

B. 3

C. 4

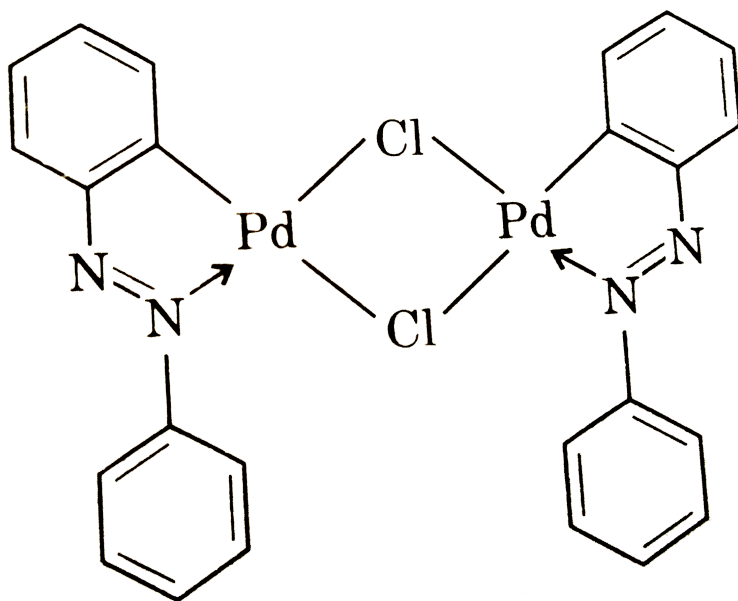
D. 6

**Answer: A**

 [View Text Solution](#)



19. Select the correct statement regarding the complex given below :

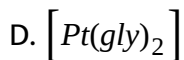
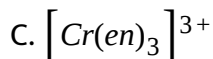
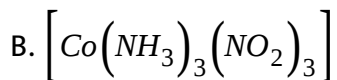
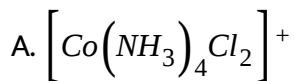


- A. It exhibits geometrical isomerism
- B. It is optically active
- C. The central metal ion  $Pd^{2+}$  is  $sp^3$  hybridised
- D. It exhibits coordination position isomerism

Answer: A

 [View Text Solution](#)

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



Answer: C



[View Text Solution](#)

21. Which of the following is correct IUPAC name of any complex compound ?

A. Tris (acetyl acetonato) iron (III) chloride

B. Hexachloridoplatinum (IV) tetraamine dicynidoplatinate (IV)

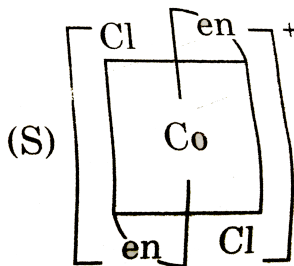
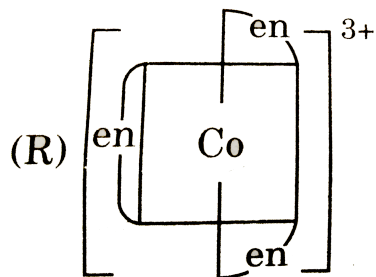
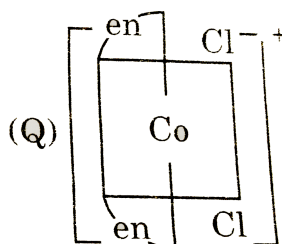
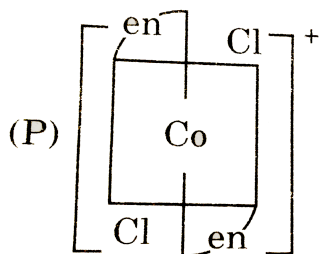
C. Amminebromidochoridomethylamineplatinum (II)

D. Cis-dichlorido (ethylenediamine) platinum (II)

Answer: C

 [View Text Solution](#)

22. Which of the following ions are optically active ?



A. P only

B. Q only

C. Q and R

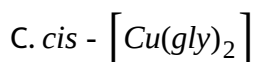
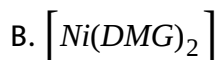
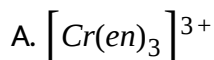
D. S only

**Answer: C**



[View Text Solution](#)

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



D. In all of these

**Answer: A**



[View Text Solution](#)

24. Isomerisation exhibited by  $\left[Cr(NH_3)_2(H_2O)_2Cl_2\right]^+$  are :

- A. ionisation, optical
- B. hydrate, optical
- C. geometrical, optical
- D. Coordination, geometrical

**Answer: C**



[View Text Solution](#)

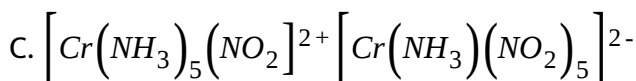
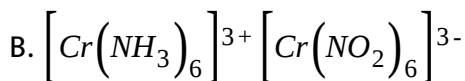
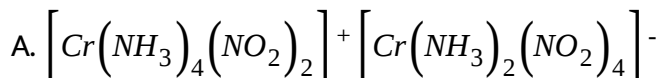
25. Which of the following complexes exhibit chirality ?

- A.  $\left[Cr(ox)_3\right]^{3-}$
- B. *cis* -  $\left[PtCl_2(en)\right]$
- C. *cis* -  $\left[RhCl_2(NH_3)_4\right]^+$
- D. *mer* -  $\left[Co(NO_2)_3(dien)\right]$

Answer: A

 [View Text Solution](#)

26. Which of the following polymerisation isomers of the compound having empirical formula  $\left[Cr(NH_3)_3(NO_2)_3\right]^+$  has the lowest molecular mass ?

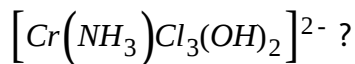


D. All of the above

Answer: D

 [View Text Solution](#)

27. How many isomers are possible for the complex ion



A. 2

B. 3

C. 4

D. 5

**Answer: B**



[View Text Solution](#)

28. On treatment of  $[Pt(NH_3)_4]^{2+}$  with concentrated HCl, two compounds (P) and (Q) having the same formula,  $[Pt(NH_3)_2Cl_2]$  are obtained, (P) can be converted into (Q) by boiling with dilute HCl. A solution of (P) reacts with oxalic acid to form  $[Pt(NH_3)_2(C_2O_4)]$

whereas (Q) does not react. Point out the correct statement of the following :

- A. (P) cis, (Q) trans, both tetrahedral
- B. (P) cis, (Q) trans, both square planar
- C. (P) trans, (Q) cis, both tetrahedral
- D. (P) trans, (Q) cis, both square planar

**Answer: B**

 [View Text Solution](#)

29. Which of the following complexes shows ionization isomerism ?

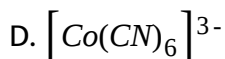
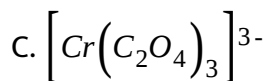
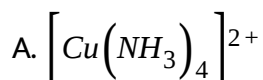
- A.  $\left[ Cr(NH_3)_6 \right] Cl_3$
- B.  $\left[ Cr(en)_2 \right] Cl_2$
- C.  $\left[ Cr(en)_3 \right] Cl_3$
- D.  $\left[ Co(NH_3)_5 Br \right] SO_4$



**Answer: D**

 [View Text Solution](#)

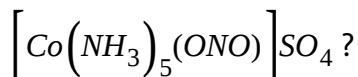
**30.** Which of the following will show optical isomerism ?



**Answer: C**

 [View Text Solution](#)

**31.** Which kind of isomerism is shown by the complex



(P) Ionisation isomerism

(Q) Linkage isomerism

(R) Geometrical isomerism

(S) Optical isomerism

A. P, Q, R and S are correct

B. P, R and S are correct only

C. P and Q are correct only

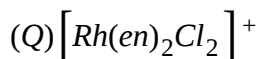
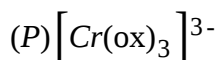
D. Q, R and S are correct only

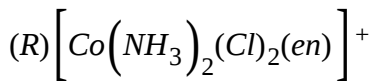
**Answer: C**



[View Text Solution](#)

**32.** Which of the following complexes show geometrical as well as optical isomerism ?





Select the correct answer using the codes given below :

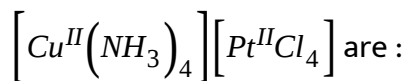
- A. P only
- B. P and Q only
- C. Q and R only
- D. All P, Q, R

**Answer: C**



[View Text Solution](#)

33. The total number of possible isomers of the compound

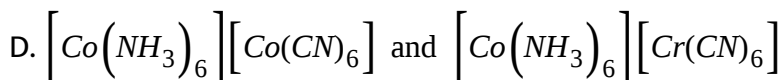
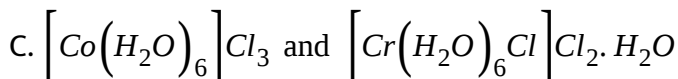
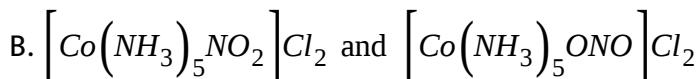
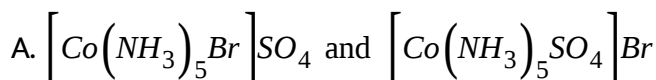


- A. 3
- B. 5
- C. 4

Answer: C

 [View Text Solution](#)

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



Answer: D

 [View Text Solution](#)

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

(P) IUPAC name of the compound is pentaamminentrito-N-chromium (III)

tetrachloridozincate (II)

(Q) It shows geometrical isomerism

(R) It shows linkage isomerism

(S) It shows co-ordination isomerism

A. R, S only

B. P, R and S only

C. Q, R, S only

D. P, Q, R and S

**Answer: B**



[View Text Solution](#)

36. Which of the following statement is correct ?

- A. Geometrical isomerism is not observed in complexes of coordination number 4 having tetrahedral geometry
- B. Square planar complexes generally do not show geometrical isomerism
- C. The square planar complexes of general formula  $Ma_3b$  or  $Mab_3$  exhibits cis-trans isomerism
- D. The platinum glycinato complex,  $[Pt(gly)_2]$  does not show geometrical isomerism

**Answer: A**

 [View Text Solution](#)

37.  $[Co(en)_3]^{3+}$  ion is expected to show :

- A. two optically active isomers : d and l forms
- B. d, l and meso forms

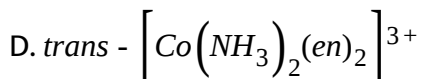
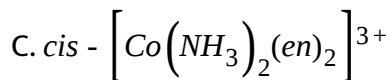
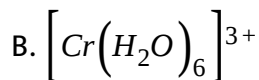
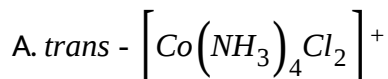
C. four optically active isomers : cis, d and l isomers and trans d and l isomers

D. None of these

**Answer: A**

 [View Text Solution](#)

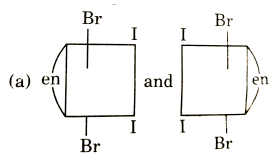
**38. Which of the following complex will show optical activity ?**



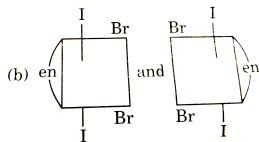
**Answer: C**

 [View Text Solution](#)

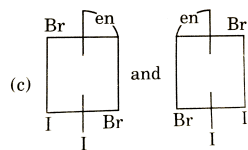
39. The complex ion has two optical isomers. Their correct configuration are :



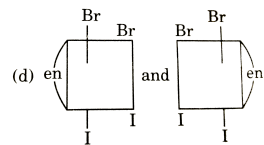
A.



B.



C.



D.

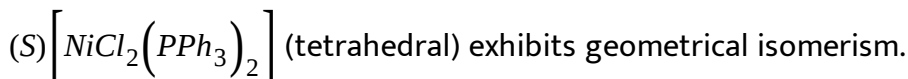
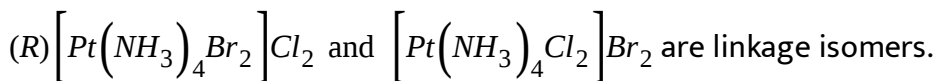
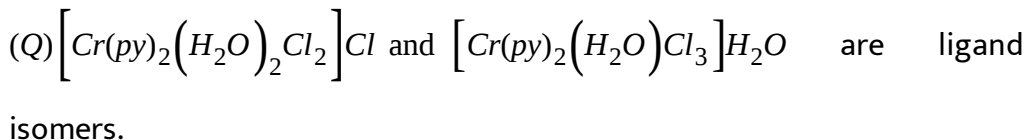
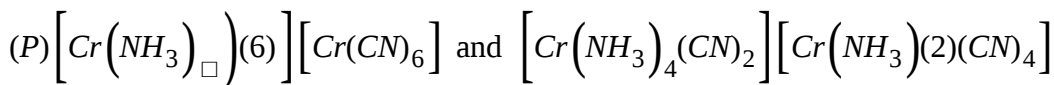
Answer: D



View Text Solution



40. Consider the following statements and select the correct option using the codes given :



A. (P) only

B. (P) and (R) only

C. (Q) and (R) only

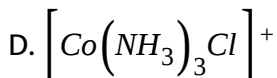
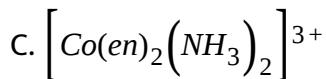
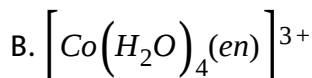
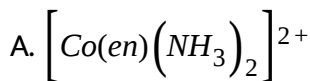
D. (R) and (S) only

**Answer: A**



**View Text Solution**

41. Which of the following has an optical isomer ?

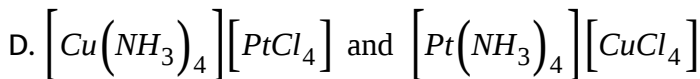
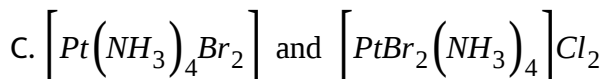
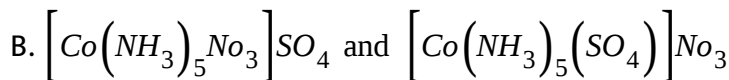
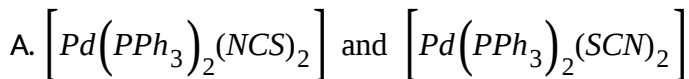


Answer: C



[View Text Solution](#)

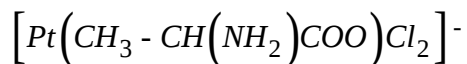
42. Which of the following pairs represents linkage isomers ?



**Answer: A**

 [View Text Solution](#)

43. Select the correct statement regarding

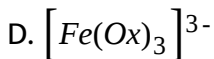
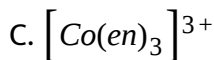
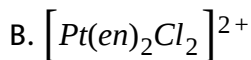


- A. It exhibits both geometrical and optical isomerism
- B. It exhibits only optical isomerism
- C. It exhibits only geometrical isomerism
- D. It has 3 stereo isomers

**Answer: B**

 [View Text Solution](#)

44. The diamagnetic complex which has two geometrical and 4 optically active isomers is :

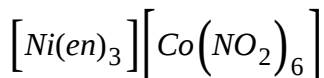
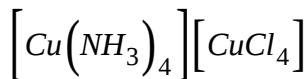
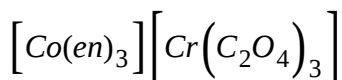


**Answer: A**



**View Text Solution**

**45.** The total possible co-ordination isomers for the following compounds respectively are :



A. 4, 4, 4

B. 2, 2, 2

C. 2, 2, 4

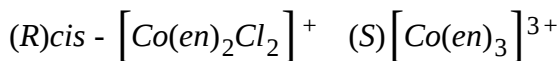
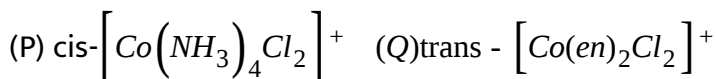
D. 4, 2, 4

**Answer: D**



[View Text Solution](#)

**46.** Which of the following compounds show optical isomerism ?



select the correct answer using the codes given below :

A. P and Q

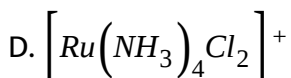
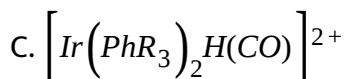
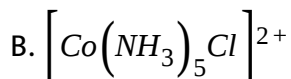
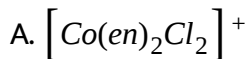
B. Q and R

C. R and S

D. P, R and S

**Answer: C**

47. Which one has largest number of isomers ?



Answer: A

48. Which of the following statement is incorrect ?

A.  $[NiBr_2(Pet_3)_2]$  and  $[Cu(NH_3)_5Cl]^{2+}$  have same geometrical but different magnetic properties.

B.  $\left[Co(NH_3)_3Cl\right]Cl_2$  and  $K_4\left[Cr(CN)_6\right].3H_2O$  both are inner orbital complexes but the former is diamagnetic and later one is paramagnetic with two unpaired electrons.

C.  $\left[Co(NH_3)_2Cl_2(en)\right]^+$  can have total five stereo isomeric forms.

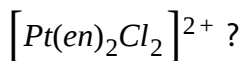
D. Complex  $\left[Pt(NH_3)_4\right]\left[PtCl_6\right]$  can show coordination isomerism.

**Answer: C**



[View Text Solution](#)

49. Which of the following statement is incorrect about the complex ion



A. It has two geometrical isomers-cis and trans.

B. Both the cis and trans isomers display optical activity.

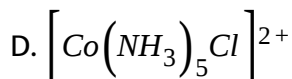
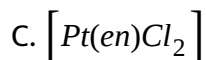
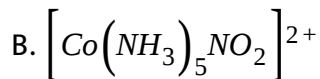
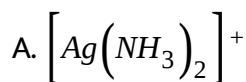
C. Only the cis isomer displays optical activity.

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

**Answer: B**

 [View Text Solution](#)

50. Of the following complex ions, one exhibits isomerism. That is :



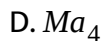
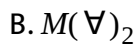
**Answer: B**

 [View Text Solution](#)

51. Which of the following will be able to show geometrical isomerism ?







**Answer: C**

 [View Text Solution](#)

52. The number of geometrical isomers for octahedral  $[Co(NH_3)_2Cl_4]^-$  and square planar  $[AuCl_2Br_2]^-$  respectively are :

A. 1, 2

B. 2, 2

C. 3, 2

D. 2, 3

**Answer: B**

 [View Text Solution](#)

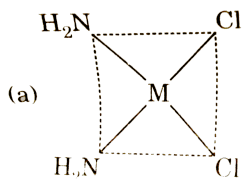
53. Select the correct statement from the following :

- A.  $\left[Sc(H_2O)_6\right]^{3+}$  and  $\left[Ti(H_2O)_6\right]^{3+}$  both are colourless.
- B.  $Co(NH_3)_4Br_2Cl$  has ionization isomers and geometrical isomers.
- C.  $\left[Pd(NO_2)_2(NH_3)_2\right]$  is square planar and show geometrical as well as linkage isomerism.
- D. Both (b) and (C) are correct.

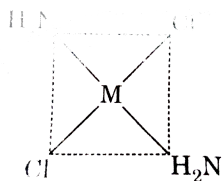
Answer: D

 [View Text Solution](#)

54. Which of the following isomers of  $\left[M(NH_3)_2Cl_2\right]$  would react with silver oxalate  $(Ag_2C_2O_4)$  ?



A.



B.

C. Both (a) and (b)

D. None of these

**Answer: A**

 [View Text Solution](#)

55. Which of the following is correct regarding  $\left[Pt(NH_3)_2(CN)_2\right]$ ?

A. It exhibits linkage isomerism as well as geometrical isomerism.

B. It exhibits optical isomerism.

C. It exhibits ionisation isomerism.

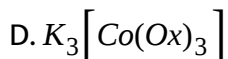
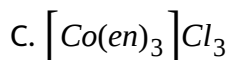
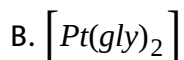
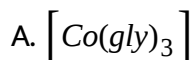
D. It exhibits only linkage isomerism.

**Answer: A**

 [View Text Solution](#)

56. The complex which exhibits geometrical as well as optical isomerism is

:



**Answer: A**

 [View Text Solution](#)

57. How many isomers possible for  $[Co(gly)(dmg)(en)]^{+1}$ ?

A. 2

B. 3

C. 4

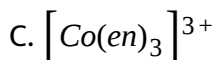
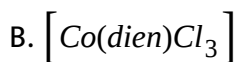
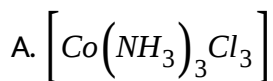
D. None of these

**Answer: C**



[View Text Solution](#)

58. Which of the following does not show fac-mer isomerism ?



D. All of these

Answer: C



View Text Solution

59. Which of the following statements are true ?

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

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

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

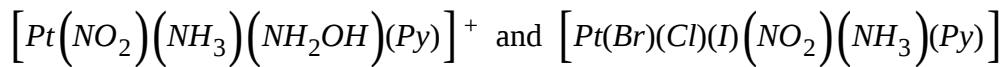
D. In  $Mabcd$  tetrahedral complex, optical isomerism can not be observed

Answer: B



View Text Solution

60. How many geometrical isomers and stereoisomers are possible for



respectively :

A. 3 and 15

B. 3 and 30

C. 4 and 15

D. 4 and 30

**Answer: B**



[View Text Solution](#)

61. The two compounds pentaamminesulphatocobalt (III) bromide and pentamminesulphatocobalt (III) chloride represent :

A. Linkage isomerism

B. ionization isomerism

C. Coordination isomerism

D. No isomerism

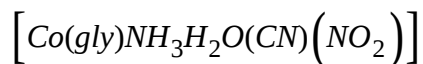
**Answer: D**



[View Text Solution](#)

62. How many total possible isomers are present in the following complex

?



A. 24

B. 48

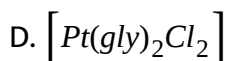
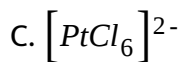
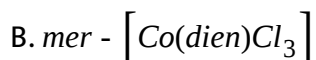
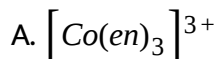
C. 96

D. 12

**Answer: C**

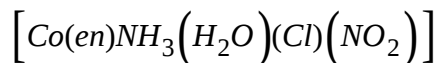


63. Which of the following will exhibit geometrical as well as optical isomerism ?



**Answer: D**

64. How many total possible isomers are present in the following complex ?



A. 24

B. 48

C. 96

D. 12

**Answer: A**



[View Text Solution](#)

65. Total possible linkage isomers of  $K_4[Fe(CN)_5(NO_2)]$  is :

A. 12

B. 10

C. 6

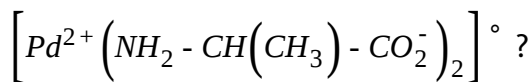
D. 4

**Answer: A**



[View Text Solution](#)

66. How many geometrical isomers are possible for



A. 2

B. 3

C. 4

D. 6

**Answer: C**



[View Text Solution](#)

67.  $\left[ Cr(NH_3)_5Br \right]Cl$  and  $\left[ Cr(NH_3)_5Cl \right]Br$  can be distinguished by/and isomerism shown is :

A.  $BaCl_2$ , ionisation

B.  $AgNO_3$ , ionisation

C.  $AgNO_3$ , coordinate

D.  $BaCl_2$ , linkage

**Answer: B**

 [View Text Solution](#)

68. Which kind of isomerism is exhibited by  $[Co(EDTA)]^-$ :

A. Optical and geometrical isomerism

B. Geometrical isomerism

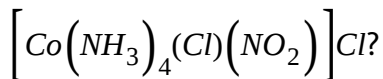
C. Optical isomerism

D. No isomerism

**Answer: C**

 [View Text Solution](#)

69. Which one of the following statements are correct for the complex



(P) Cobalt is in +III oxidation state involving  $d^2sp^3$  hybridization.

(Q) Cobalt is in +III oxidation state involving  $sp^3d^2$  hybridization.

(R) It shows ionisation as well as linkage isomerism.

(S) It also shows geometrical isomerism.

A. P, R and S only

B. Q, R and S only

C. P and S only

D. Q and S only

**Answer: A**



[View Text Solution](#)

70. Which of the following statements are true ?

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

B. In  $\left[Fe(C_2O_4)_3\right]^{3-}$ , 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 complex, optical isomerism can not be observed

**Answer: B**



[View Text Solution](#)

71. If a complex,  $Ma_4b_2$  (where M is a central atom and a and b are monodentate ligands) has trigonal prismatic geometry, the total number of possible geometrical isomers would be :

A. 4

B. 2

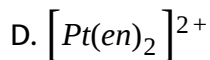
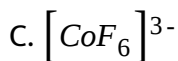
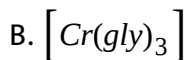
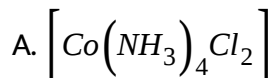
C. 3

D. 5

**Answer: C**

 [View Text Solution](#)

**72.** Which of the following complexes would exhibit only geometrical isomerism ?



**Answer: A**



[View Text Solution](#)

73. The total possible number of optically inactive isomers of the complex

$\left[Pt(NH_3)_2FClBrI\right]$  would be :

- A. 6
- B. 12
- C. 3
- D. 15

**Answer: C**



[View Text Solution](#)

74. Which kind of isomerism is exhibited by octahedral  $\left[Co(NH_3)_4Br_2Cl\right]$

?

- A. Geometrical and ionization



B. Geometrical and optical

C. Optical and ionization

D. Geometrical only

**Answer: A**

 [View Text Solution](#)

75.  $\left[Co(NH_3)_4(SCN)_2\right]^+$  and  $\left[Co(NH_3)_4(NCS)_2\right]^+$  are :

A. ionisation isomers

B. linkage isomers

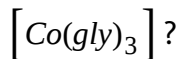
C. coordination isomers

D. geometrical isomers

**Answer: B**

 [View Text Solution](#)

76. Which of the following isomerism is exhibited by the complexes,



- A. Geometrical
- B. Optical
- C. Linkage
- D. Both (a) and (b)

**Answer: D**



[View Text Solution](#)

77. Select the correct statement :

- A. Potassium ferrocyanide and potassium ferricyanide can be differentiated by measuring the solid state magnetic moment.

B. The complex  $\left[Co(NH_3)_5Br\right]SO_4$  and  $\left[Co(NH_3)_5SO_4\right]Br$  can be differentiated by adding aqueous solution of barium chloride .

C. The complex  $\left[Co(NH_3)Cl\right]Br$  and  $\left[Co(NH_3)_5Br\right]Cl$  can be differentiated by adding aqueous solution of silver nitrate.

D. All of these

**Answer: D**



[View Text Solution](#)

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

A. Colourless and diamagnetic

B. Green coloured and diamagnetic

C. Green coloured and shows coordination isomerism

D. Diamagnetic and shows linkage isomerism

Answer: C



View Text Solution

79. Which of the following is true about the complex  $[PtCl_2(NH_3)OH_2]$  ?

[Atomic number of  $Pt = 78$ ]

(P) It will have two geometrical isomeric forms, cis and trans

(Q) The hybridisation state of  $Pt(II)$  is  $sp^2$

(R) It is a square planar complex

(S) It is a diamagnetic complex

(T) It can show hydrate isomerism

(U) It is tetrahedral complex

A. P, R, S

B. Q, S, T

C. Q, T, U

D. P, T, U

**Answer: A**

 [View Text Solution](#)

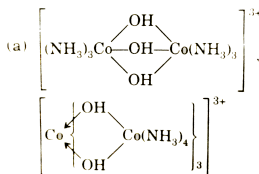
**80.** Which of the following complex is optically inactive but its other geometrical isomer is optically active ?

- A. trans-tetraaquadichloridocobalt(III) nitrate
- B. Mer-triaquatrifluoridocobalt(III)
- C. Trans-diamminebise(ethane 1, 2 diamine) cobalt(III)chloride
- D. Trans-diamminedichloridoplatinum(II)

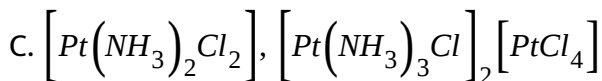
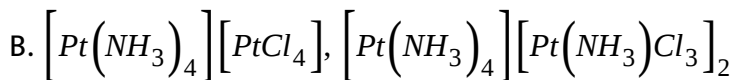
**Answer: C**

 [View Text Solution](#)

**81.** Which of the following complexes are polymerisation isomers ?



A.



D. All of these

**Answer: D**

 [View Text Solution](#)

82. Type of isomerism which may be possible for the six coordinated complex of metal M having formula of  $\text{Cr}(\text{NO}_2)_2 \cdot 6\text{H}_2\text{O}$ :

A. Hydrate isomerism

B. Linkage isomerism

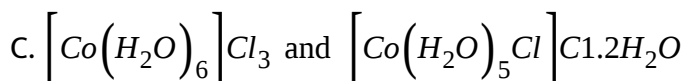
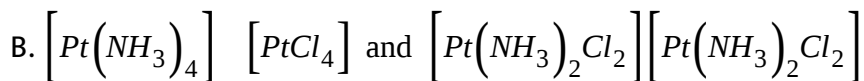
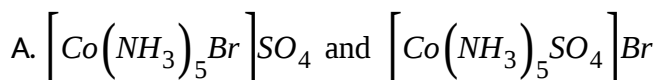
C. Geometrical isomerism

D. All are possible

Answer: D

 [View Text Solution](#)

83. Which of the following pair of complexes are co-ordination isomers ?

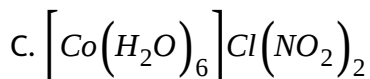
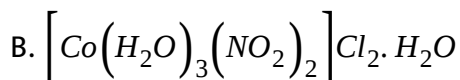
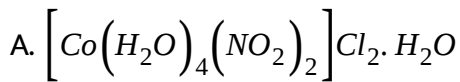


D. None of these

Answer: D

 [View Text Solution](#)

84. Which of the following complex among the given options is not the hydrate isomer of others ?



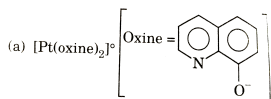
D. None of these

**Answer: B**

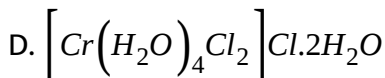
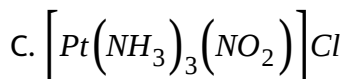
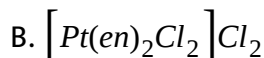
 [View Text Solution](#)

**85.** Select which complex have structural and stereo both type of isomers

:



A.

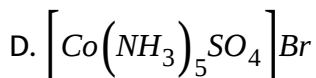
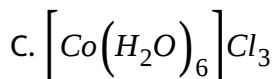
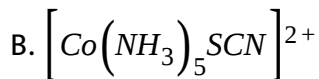
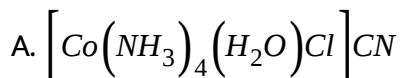




**Answer: D**

 [View Text Solution](#)

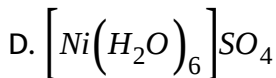
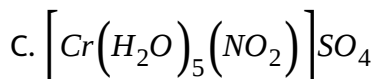
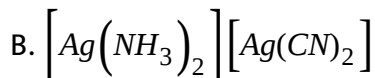
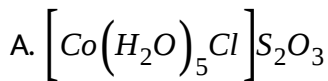
**86.** Which of the following complex/ion only show linkage isomerism ?



**Answer: B**

 [View Text Solution](#)

**87.** Which of the following complexes may show atleast three type of isomerism, namely ionisation, hydrate and linkage ?



**Answer: C**



**View Text Solution**

88. What kind of isomerism exists between  $\left[Cr(H_2O)_6\right]Cl_3$  (violet) and  $\left[Cr(H_2O)_5Cl\right]Cl_2 \cdot H_2O$  (greyish green) ?

A. linkage isomerism

B. solvate isomerism (hydrate)

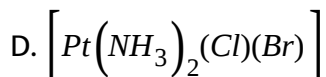
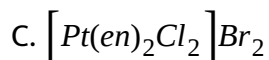
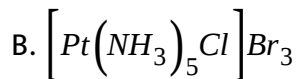
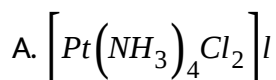
C. Polymerisation isomerism

D. co-ordination isomerism

**Answer: B**

 [View Text Solution](#)

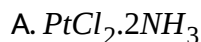
**89.** Select the complex which show both structural and stereo isomerism :

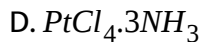
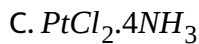
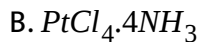


**Answer: C**

 [View Text Solution](#)

**90.** Select which is heteroleptic complex and show fac-mer isomerism :

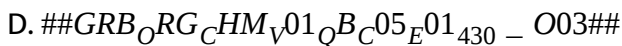
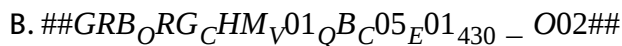
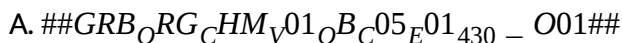




**Answer: D**

 [View Text Solution](#)

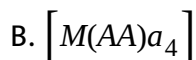
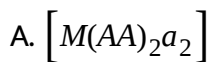
**91. Which of the following complex exists as dextro and laevo form ?**



**Answer: B**

 [View Text Solution](#)

92. Which complex does not show geometrical isomerism but show optical isomerism ?



C.  $[Mabcd]$  tetrahedral

D.  $[Mabcd]$  square planar

**Answer: C**



[View Text Solution](#)

93. The complex  $[Pt(py)(H_2O)(NH_3)(NO_2)ClBr]$  has :

A. 10 geometrical isomers, each one is optically active

B. 10 geometrical isomers, five of them are optically active

C. 15 geometrical isomers, each one is optically active

D. 15 geometrical isomers, each one is optically inactive

Answer: C

 [View Text Solution](#)

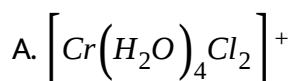
94. Which of the following statement is correct ?

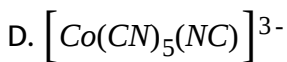
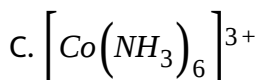
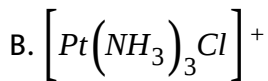
- A. Tetrahedral complex does not show optical isomerism
- B. cis and trans isomers of  $[M(AA)_3]^{n\pm}$  are optically active
- C.  $[Mabcdef]^{n\pm}$  has 15 optically active isomers
- D.  $[Ma_3b_3]^{n\pm}$  has two stereo isomers

Answer: D

 [View Text Solution](#)

95. Indicate the complex ion which shows geometrical isomerism :

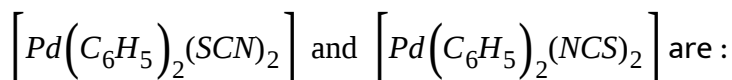




**Answer: A**

 [View Text Solution](#)

96. Due to the presence of ambidentate ligands coordination compounds show isomerism. Palladium complexes of the type



A. linkage isomers

B. coordination isomers

C. ionisation isomers

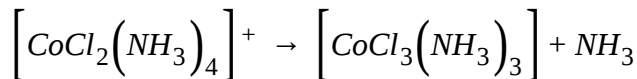
D. geometrical isomers

**Answer: A**



[View Text Solution](#)

97. Four statements for the following reaction given below



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

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

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

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

The correct statements are :

A. P and Q

B. R and S

C. P and S

D. Q and R

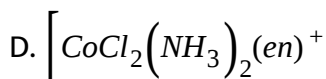
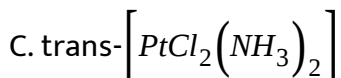
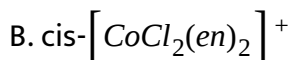
**Answer: C**



[View Text Solution](#)



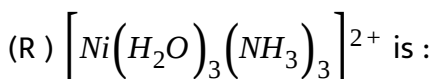
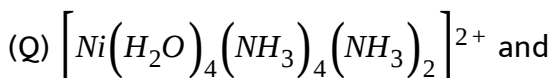
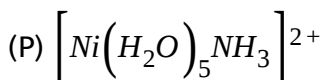
98. The complex that shows optical activity is :



**Answer: B**

 [View Text Solution](#)

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



A. (P) and (Q) show geometrical and optical isomerism

B. (Q) and (R) show geometrical and optical isomerism

C. (P) and (Q) show only geometrical isomerism

D. (Q) and (R) show only geometrical isomerism

**Answer: D**

 [View Text Solution](#)

**100.** In coordination compounds, the hydrate isomers differ in :

A. the number of water molecule of hydration only

B. the number of water molecules present as ligands

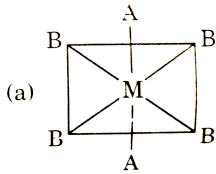
C. Both (a) and (b)

D. their coordination number of the metal atom

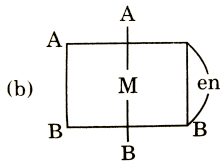
**Answer: C**

 [View Text Solution](#)

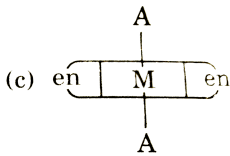
101. The phenomenon of optical activity will be shown by :



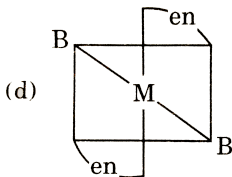
A.



B.



C.



D.

**Answer: B**



**View Text Solution**

102. Find the pair of compounds in which both show geometrical as well as optical isomerism :

- A.  $M(AA)_3$  and  $M(AB)_3$
- B.  $[M(AA)_2a_2]$  and  $[M(AA)ab]$
- C.  $[Zn(gly)_2]$  and  $[NiCl_4]^{2-}$
- D. None of these

Answer: D



[View Text Solution](#)

103. Two complex compounds with same representation

$[CoCl_2(NH_3)_4]Cl$  have different colours then select the correct statement :

- A. Both are structural isomers of each other
- B. Both are stereoisomers of each other

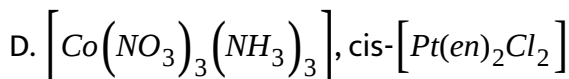
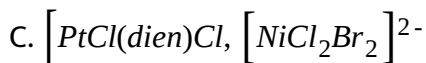
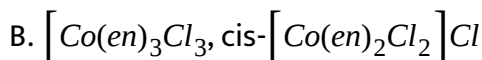
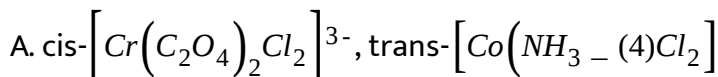
C. Both have same conductivity relative to one mole of electrolyte

D. Both (b) and (c) are correct.

**Answer: D**

 [View Text Solution](#)

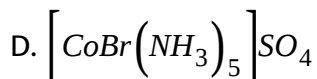
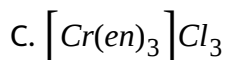
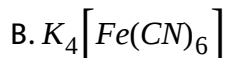
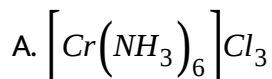
**104.** In which of the following pairs both the complexes show optical isomerism ?



**Answer: B**

 [View Text Solution](#)

105. which of the following complexes show ionization isomerism ?



Answer: D



[View Text Solution](#)

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

A. 0

B. 2

C. 3

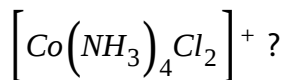
D. 4

**Answer: B**



[View Text Solution](#)

**107.** How many different isomers exist for the octahedral complex



A. 1

B. 2

C. 3

D. 4

**Answer: B**



[View Text Solution](#)

**108.** How many isomers exist for the octahedral compound,  $\text{Pt}(\text{NH}_3)_2\text{Cl}_4$ ?

A. 1

B. 2

C. 3

D. 4

**Answer: B**



[View Text Solution](#)

**109.** How many isomers exist for a square planar platinum compound which has four different groups attached to the platinum atom ?

A. one

B. two

C. three

D. four

**Answer: C**



 [View Text Solution](#)

110. How many isomers of octahedral  $Co(NH_3)_3Cl_3$  are there ?

A. 2

B. 3

C. 4

D. 5

**Answer: A**

 [View Text Solution](#)

111. How many isomers exist for the

$[Co(NH_3)_4Cl_2]^+$  and  $[Co(en)_2Cl_2]^+$  ions, respectively ?

$[en = H_2NC_2H_4NH_2]$

A. 2 and 2

B. 2 and 3

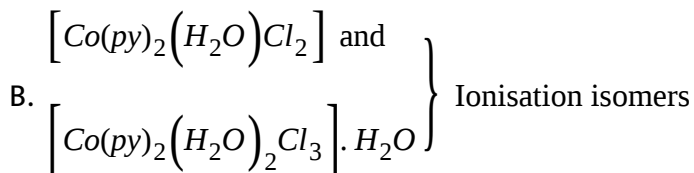
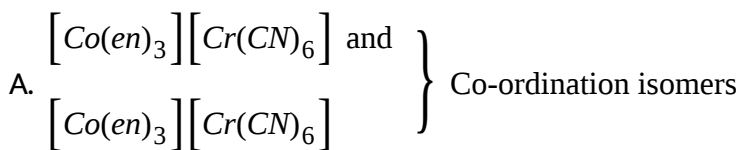
C. 3 and 2

D. 3 and 3

**Answer: B**

 [View Text Solution](#)

**112.** Which of the following complex is incorrectly matched against their indicated properties ?



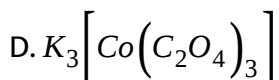
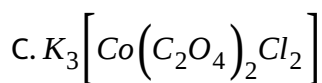
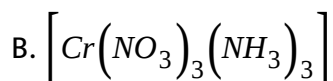
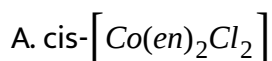
C.  $\text{CrCl}_3(\text{H}_2\text{O})_6$  - Do not show G.I and O.I.

D.  $\text{Co}(\text{en})_2\text{Cl}_2\text{NO}_2$  - Can show Ionisation isomerism

Answer: B

 [View Text Solution](#)

113. Which of the following complex will have three isomeric forms ?



Answer: C

 [View Text Solution](#)

114. Total number of geometrical isomers of  $[\text{M}(\text{AB})_2\text{C}_2\text{D}_2]$ :

A. 4

B. 7

C. 6

D. 8

**Answer: A**



[View Text Solution](#)

115. Number of geometrical isomer(s) of square planar complex

$[RhCl(PPh_3)(H_2O)(CO)]$  is :

A. 0

B. 2

C. 3

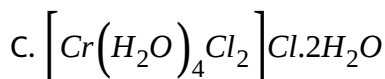
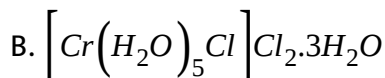
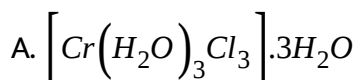
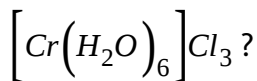
D. 4

**Answer: C**



[View Text Solution](#)

116. Which of the following complex is not hydrate isomer of



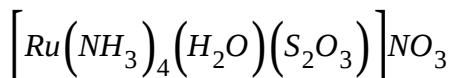
D. None of these

Answer: A



View Text Solution

117. Which type of isomerism may be shown by this complex



A. Ionisation isomerism

- B. Linkage isomerism
- C. Geometrical isomerism
- D. All of these

**Answer: D**

 [View Text Solution](#)

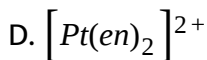
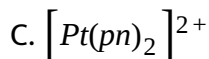
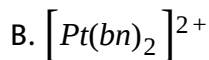
118.  $[Pt(Ox)(py)_2(O_2)(H_2O)]$  Select correct statement about this complex :

- A. Oxidation state of  $O_2$  is -1
- B. EAN of pt is 86
- C. Complex will show geometrical as well as optical isomerism
- D. Both (b) and (C)

**Answer: D**

 [View Text Solution](#)

119. Which of the following does not show optical activity ?

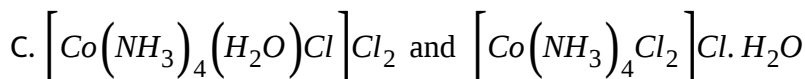
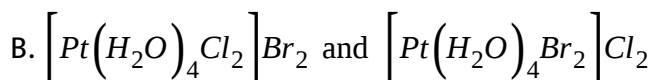
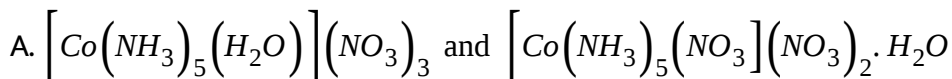


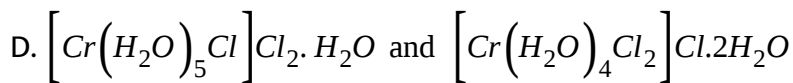
Answer: D



[View Text Solution](#)

120. Select the pair of hydrate isomers in which both hydrate isomers have two stereoisomeric form :



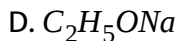
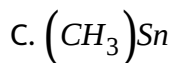
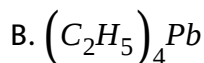


Answer: C

 [View Text Solution](#)

## G. Organometallic Compounds, Synergic Bonding

1. Which one is not an organometallic compound?



Answer: D

 [View Text Solution](#)



2. In Ziese's salt C=C bond length is :

Note:  $\left\{ \begin{array}{l} \text{C - C bond length in ethane is } 1.54\text{\AA} \\ \text{C = C bond length in ethane is } 1.34\text{\AA} \\ \text{C} \equiv \text{C bond length in ethane is } 1.20\text{\AA} \end{array} \right\}$

A. 1.37Å

B. 1.19Å

C. 1.87Å

D. 1.34Å

**Answer: A**



[View Text Solution](#)

3. Which is not a  $\pi$  - bonded complex ?

A. Ziese's salt

B. Ferrocene

C. bis(benzene) chromium

D. Tetraethyl lead

**Answer: D**

 [View Text Solution](#)

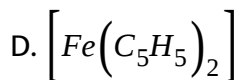
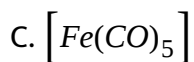
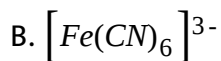
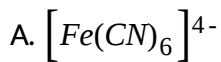
4. What is wrong about the compound  $K\left[Pt\left(\eta^2 - C_2H_4\right)Cl_3\right]$ ?

- A. It is called Ziese's salt
- B. It is a  $\pi$  - *bonded* complex
- C. Oxidation number of Pt is +4
- D. Four ligands surround the platinum atom

**Answer: C**

 [View Text Solution](#)

5. Formula of ferrocene is:

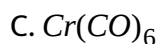
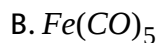


**Answer: D**



**View Text Solution**

6. Which of the following has  $d_{C-O}$  (Carbon-oxygen bond length) longer than that of free CO molecule ?



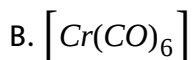
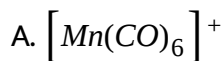
D. All of these

**Answer: D**



[View Text Solution](#)

7. Among the following metal carbonyl carbonyl C-O bond is strongest in :

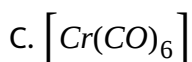
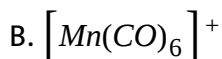


**Answer: A**



[View Text Solution](#)

8. Which of the following metal carbonyl C-O bond length is minimum ?

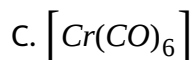
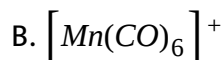




**Answer: B**

 [View Text Solution](#)

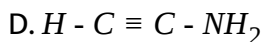
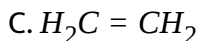
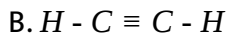
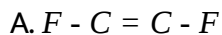
9. In which of the following metal carbonyls, the C-O bond length is minimum ?



**Answer: B**

 [View Text Solution](#)

10. Which of the following is the strongest  $\pi$  - acid for  $\pi$  -  $\text{æp} \rightarrow r$ ?

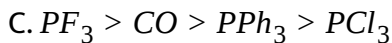
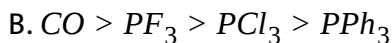
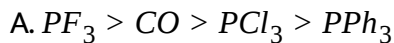


**Answer: A**



[View Text Solution](#)

11. The correct order of  $\pi$  - acid nature is :

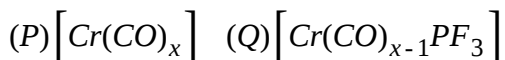


**Answer: A**



[View Text Solution](#)

**12.** Consider the following complexes



If  $PF_3$  is better  $\pi$  acceptor than  $CO$ , what will be the order of bond length of  $CO$  in complexes (P) and (Q) :

A.  $P > Q$

B.  $Q > P$

C.  $P = Q$

D. can not be compared

**Answer: A**



[View Text Solution](#)

13. Which of the following statements is correct for  $Ni(CO)_4$  and  $[Co(CO)_4]^-$  ?

- A. Both are paramagnetic
- B. Both are isostructural and isoelectronic
- C. Both involve  $d^3s$  hybridisation
- D. Synergic bonding is not involved

**Answer: B**

 [View Text Solution](#)

14. Which of the following has highest C - C bond length among the following ?

- A.  $[PtCl_3(C_2H_4)]^-$
- B.  $[PtCl_3(C_2F_4)]^-$
- C.  $C_2H_4$



D.  $C_2F_4$

**Answer: B**



[View Text Solution](#)

**15.** Wilkinson's catalyst contains :

A. rhodium

B. iron

C. aluminium

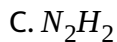
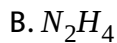
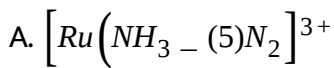
D. cobalt

**Answer: A**



[View Text Solution](#)

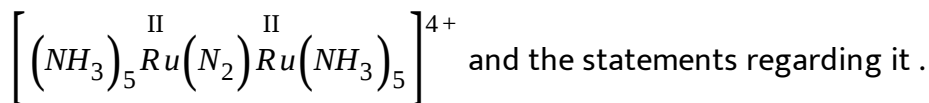
**16.** Which of the following has the shortest  $N - N$  bond length ?



**Answer: D**

 [View Text Solution](#)

17. Consider the complex given below



- (i) N-N bond length is longer than that in free  $N_2$  molecule.
- (ii) It is diamagnetic having  $t_{2g}^4 e_g^2$  configuration of each  $Ru^{2+}$  ion .
- (iii) Back bonding is involved in this

The correct statement(s) is/are :

A. Only (i)

B. Only(i) and (ii)

C. Only (ii) and (iii)

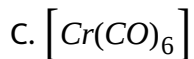
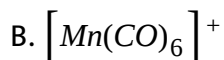
D. all of these.

**Answer: B**

 [View Text Solution](#)

18. In which of the following metal carbonyls the C-O bond order is lowest

?



**Answer: D**

 [View Text Solution](#)

19. Which of the following has maximum C-O bond length ?

A. CO

B.  $CO_2$

C.  $[Cr(CO)_6]$

D.  $CO_3^{2-}$

Answer: D



[View Text Solution](#)

20. The bond length in CO is  $1.128\text{\AA}$ . What will be the bond length of CO in  $Fe(CO)_5$  ?

A.  $1.158\text{\AA}$

B.  $1.128\text{\AA}$

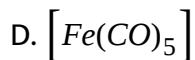
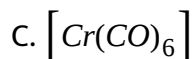
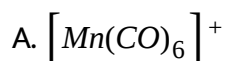
C.  $1.72\text{\AA}$

D.  $1.118\text{\AA}$

**Answer: A**

 [View Text Solution](#)

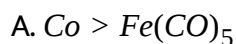
**21.** Among the following metal carbonyl, the C-O bond order is lowest in :

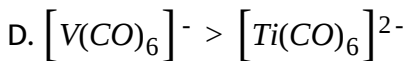
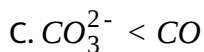
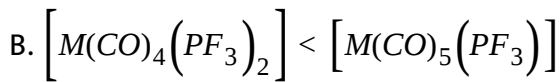


**Answer: B**

 [View Text Solution](#)

**22.** Select the correct order of C-O bond length :

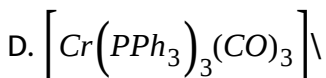
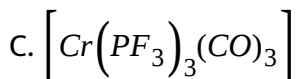
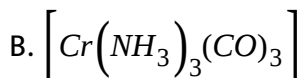
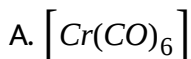




**Answer: B**

 [View Text Solution](#)

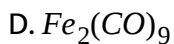
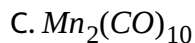
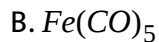
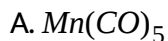
**23.** Which of the following has the shortest Cr-C bond length ?



**Answer: B**

 [View Text Solution](#)

24. Which of the following is an oxidizing agent ?



**Answer: A**



[View Text Solution](#)

25. Which of the following statements is correct ?

A. A Werner postulated the use of two types of linkage (primary and secondary ) by a metal atom/ion in a coordination compound .

B. Wilkinson catalyst is used for the hydrogenation of alkenes.

C. Metal carbonyl possess both  $\pi$  and  $\sigma$  bonds.

D. All of these.

**Answer: D**

 [View Text Solution](#)

26. Which options is incorrect for  $K_4[Fe(CN)_6]$ :

A.  $CN^-$  is ambidentate ligand

B. it has ionic and 5 coordinate bonds

C. its effective atomic number is 36

D. total number of  $\Pi$  - bonds in this complexes is 12

**Answer: B**

 [View Text Solution](#)

27. Which of the following is correct for the Zeise's salt ?



- A. The complex ion is square planar
- B. The central metal ion, platinum, is in  $+II$  oxidation state
- C.  $H_2C = CH_2$  molecule is perpendicular to the  $PtCl_3$  plane
- D. All of these

**Answer: D**

 [View Text Solution](#)

**28.** In  $Fe(CO)_5$ , the F-C bond possesses :

- A.  $\pi$  - character only
- B. both  $\sigma$  and  $\pi$  characters
- C. ionic character only
- D.  $\sigma$  - character only

**Answer: B**

 [View Text Solution](#)

29.  $\pi$  - bond  $\in g$  is not involved in :

- A. ferrocene
- B. Dibenzenechromium
- C. Zeise's salt
- D. Grignard's reagent

**Answer: D**



[View Text Solution](#)

30. Which of the following statement is correct with respect to the metal carbonyl of 1st transition series ?

- A. As  $M - C\pi$  bonding increases, the C-O bond length increases .
- B. As positive charge on the central metal atom increases, the C-O bond length increases.

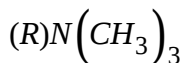
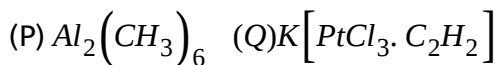
C. As electron density on the central metal atom increases, the C-O bond length increases.

D. (a) and (c ) both

**Answer: D**

 [View Text Solution](#)

**31. Which amongst the following are organometallic compounds ?**



A. P only

B. R only

C. P and Q only

D. P, Q and R

**Answer: C**



[View Text Solution](#)

32. The number of  $\sigma$  bonds in Zeise's salt is :

- A. 4
- B. 6
- C. 7
- D. none of these

**Answer: D**



[View Text Solution](#)

33. Which has aromatic ring in complex ?

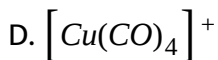
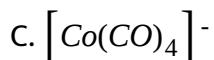
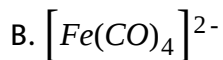
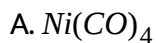
- A. DMG in dimethylglyoximate
- B. Cyclopentadienyl anion in ferrocene
- C. Both (a) and (b)

D. None of these

**Answer: B**

 [View Text Solution](#)

**34.** Which has largest C-O bond length in the given, complexes ?



**Answer: B**

 [View Text Solution](#)

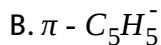
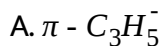
**35.** In metal carbonyls, metal ligand  $\sigma$  bond is formed by :

- A. Vacant orbital of metal and lone pair of carbon
- B. Vacant d-orbital and occupied  $\pi^*$  orbital of ligand
- C. Occupied d-orbital and vacant  $\pi^*$  orbital of ligand
- D. Vacant orbital of metal and lone pair of oxygen

**Answer: A**

 [View Text Solution](#)

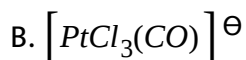
**36.** Which of the following ligand is not  $\pi - aep \rightarrow r$  ligand ?



**Answer: C**

 [View Text Solution](#)

37. Which of the following molecule has lower  $\nu_{C-O}$  (stretching vibration frequency of C-O bond) ?



C. Both have equal  $\nu_{C-O}$

D. None of these

**Answer: B**



[View Text Solution](#)

38. Select the correct statement for Zeise's salt :

A. The C=C bond is present in same plane to the  $PtCl_3$  group

B. C-C bond length of ethylene is higher in complex than C-C bond length of ethylene in isolated condition

C. The formula of Zeise's salt is  $\left[Fe(\pi - C_5H_5)_2\right]$

D. The formula of Zeise's salt is  $K\left[PtCl_3(C_2(CN)_4)\right]$

**Answer: B**

 [View Text Solution](#)

**39.** Which of the following has lower stretching frequency for C-O bond ?

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

B.  $[V(CO)_6]^-$

C. Both have equal stretching frequency

D. None of these

**Answer: B**

 [View Text Solution](#)



40. Select the correct statement :

A.  $[V(CO)_6]$  can act as oxidizing agent

B. The  $d_{C-O}$  in bridging carbonyl group is longer than that of terminal carbonyl group

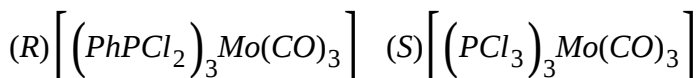
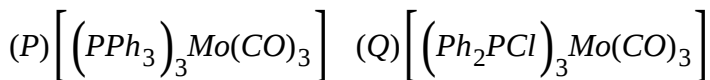
C. Ligands such as  $CO$ ,  $CN^\ominus$  and  $NO^+$  are  $\pi$ -acceptor ligand

D. All are correct

Answer: D

 [View Text Solution](#)

41. Arrange the following complex in increasing order of stretching vibrational frequency of C-O bond :



A.  $P > Q > R > S$

B.  $P = S > R > Q$

C.  $S = P > Q > R$

D.  $P < Q < R < S$

**Answer: D**

 [View Text Solution](#)

42. The V-C distance in  $V(CO)_6$  and  $[V(CO)_6]^-$  are respectively (in pm) :

A. 200, 200

B. 193, 200

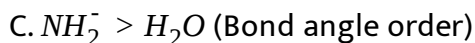
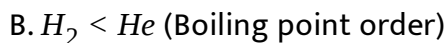
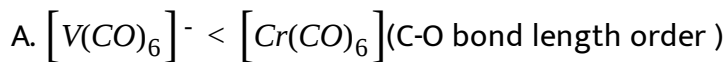
C. 200, 193

D. 193, 193

**Answer: C**

 [View Text Solution](#)

43. Identify the correct order :



D. All are correct

Answer: C



[View Text Solution](#)

44. Tetracyanoethylene has a formal  $C = C$  double bond length of X in the free ligand but in the complex  $[Pt\{C_2(CN)_4\}Cl_3]^-$  the C-C bond length will be :

A. Greater than X

B. Less than X

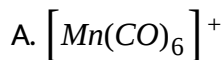
C. Equal to X

D. None of these

**Answer: A**

 [View Text Solution](#)

**45.** Which of the following has lower stretching frequency for C-O bond ?



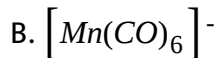
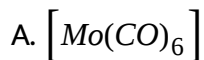
C. Both have equal stretching frequency

D. None of these

**Answer: B**

 [View Text Solution](#)

46. Which of the following species show(s) synergic bonding ?



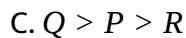
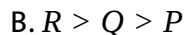
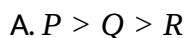
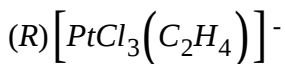
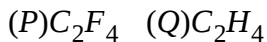
D. All of the above species have synergic bonding

Answer: D



[View Text Solution](#)

47. Arrange the following compound according to  $d_C$  order :



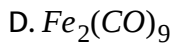
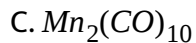
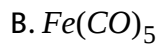
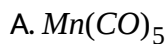
$$D. Q > R > P$$

**Answer: B**



[View Text Solution](#)

**48.** Which of the following is an oxidizing agent ?

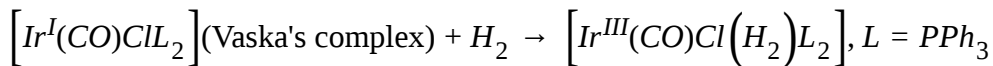


**Answer: A**



[View Text Solution](#)

49. If  $H_2$  molecule is acting as ligand via oxidative addition :



then, choose the correct statement about the  $H_2$  molecule fate before and after reaction .

- |    |            |  |             |
|----|------------|--|-------------|
|    | Before     | Transition State                                       | After       |
| A. | $B. O = 1$ | $1\sigma\text{-donor}, \sigma(\ast) \text{- acceptor}$ | $B. O. = 0$ |
|    | Before     | Transition State                                       | After       |
| B. | $B. O = 1$ | $1\sigma\text{-donor}, \sigma(\ast) \text{- acceptor}$ | $B. O. = 1$ |
|    | Before     | Transition State                                       | After       |
| C. | $B. O = 1$ | $1\sigma\text{-donor}, \pi(\ast) \text{- acceptor}$    | $B. O. = 0$ |
|    | Before     | Transition State                                       | After       |
| D. | $B. O = 1$ | $1\sigma^*\text{-donor}, \sigma \text{- acceptor}$     | $B. O. = 0$ |

**Answer: A**

 [View Text Solution](#)

50. Which of the following factor is responsible for the  $\Pi$  character in metal carbon bond (M-C) in carbonyl complexes ?

- A. Overlap and donation from the lone pair of C into a vacant (hybrid) metal orbital to form a  $M \leftarrow C$  bond,
- B. Overlap and the donation from a filled  $d_{xz}$  or  $d_{yz}$  orbital on M into a vacant antibonding  $\pi_p^*$  orbital on CO to form a  $M \rightarrow C$  bond
- C. Overlap and the donation from the lone pair on vacant (hybrid) metal orbital into C to form a  $M \rightarrow C$  bond
- D. Overlap and the donation from a filled vacant antibonding  $\pi_p^*$  orbital on C into  $d_{xz}$  or  $d_{yz}$  orbital on M to form  $M \leftarrow C$  bond

**Answer: B**



[View Text Solution](#)

51. Select the incorrect statement about metal carbonyl complex compounds :



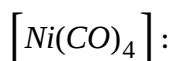
- A. Metal carbon bond in metal carbonyls possess both  $\sigma$  and  $\Pi$  characters
- B. Due to synergic bonding metal carbon bond becomes weak
- C. Due to synergic bonding carbon oxygen bond strength decreases
- D. In metal carbonyls, extent of synergic bonding will increase with increase in negative charge on central metal ion

**Answer: B**



[View Text Solution](#)

52. Identify the type of bond character between *Ni* and *CO* ligand in



- A.  $\sigma$  character only
- B.  $\pi$  - bond character only
- C. both  $\sigma$  and  $\pi$  bond character

D. none of these

**Answer: C**



[View Text Solution](#)

## REASONING TYPE

1. Statement-1: In  $[Co(en)_3]Cl_3$ , the coordination number of  $Co^{3+}$  ion is 3.

Statement-2: 'en' is a bidentate ligand.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: D**



**View Text Solution**

2. Statement-1: The geometrical isomers of the complex  $\left[ M(NH_3)_4Cl_2 \right]$  are optically inactive.

Statement-2: Both geometrical isomers of the complex  $\left[ M(NH_3)_4Cl_2 \right]$  possess axis of symmetry.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: B**

3. Statement-1:  $[Co^{II}(NH_3)_6]^{2+}$  is not readily oxidised to  $[Co^{III}(NH_3)_6]^{3+}$  When air is bubbled through it.

Statement-2: Crystal field stabilization energy of  $Co(+III)$  with a  $d^6$  configuration is higher than for  $Co(+II)$  with a  $d^7$  arrangement.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: D**

4. Statement-1: In the coordination complex  $\left[Pt(NH_3)_4Cl_2\right]Br_2$ , a yellow precipitate of  $AgBr$  is obtained on treating it with  $AgNO_3$ .

Statement-2: Bromide ions are present as counter ions in the ionization sphere.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: A**



[View Text Solution](#)

5. Statement-1: Coordination number of cobalt in the complex  $[Co(en)_3]^{3+}$  is six.

Statement-2: Ethylenediamine acts as a bidentate ligand.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: A**



[View Text Solution](#)

6. Statement-1: Charge on the complex of ferric ion with EDTA is minus one.

Statement-2: EDTA is a hexadentate ligand.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: B**

 [View Text Solution](#)

7. Statement-1: In the complex  $\left[Co(NH_3)_3Cl_3\right]$ , chloride ions satisfy the primary valencies as well as the secondary valencies of cobalt metal.

Statement-2:  $\left[Co(NH_3)_3Cl_3\right]$  shows geometrical as well as the optical isomerism.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: C**

 [View Text Solution](#)

8. Statement-1: The complex  $\left[Cr(SCN)(NH_3)_5\right]Cl_2$  is linkage isomeric with  $\left[Cr(NCS)(NH_3)_5\right]Cl_2$ .

Statement-2:  $SCN^-$  is an ambident ligand in which there are two possible coordination sites.



A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: A**

 [View Text Solution](#)

9. Statement-1:  $[Ni(CN)_4]^{2-}$  is a paramagnetic complex.

Statement-2: The complex is inner orbital complex.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: D**

 [View Text Solution](#)

10. Statement-1: The  $[Ni(en)_3]Cl_2$  has higher stability than  $[Ni(NH_3)_6]Cl_2$ .

Statement-2: In  $[Ni(en)_3]Cl_2$ , the geometry Ni is octahedral.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: B**

 [View Text Solution](#)

11. Statement-1: Potassium ferrocyanide is diamagnetic where as potassium ferricyanide is paramagnetic .

Statement-2: Crystal field spletting in ferrocyanide ion is greater than that of ferricyanide ion.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: C**



[View Text Solution](#)

12. Statement-1:  $NF_3$  is a weaker ligand than  $N(CH_3)_3$ .

Statement-2:  $NF_3$  ionises to give  $F^-$  ions in aqueous solution.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: C**



[View Text Solution](#)

13. Statement-1:  $[NiF_6]^{4-}$  and  $[NiF_6]^{2-}$  both are high spin complexes.

Statement-2:  $F^-$  is weak field ligand.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: D**

 [View Text Solution](#)

14. Statement-1: The species  $[CuCl_4]^{2-}$  exists but  $[CuI_4]^{2-}$  does not.

Statement-2:  $[NiCl_2(PPh_3)_2]$  have tetrahedral geometry.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: B**

 [View Text Solution](#)

15. Statement-1:  $\left[ Fe(H_2O)_5NO \right] SO_4$  is paramagnetic.

Statement-2: The Fe in  $\left[ Fe(H_2O)_5NO \right] SO_4$  has three unpaired electrons.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: A**

 [View Text Solution](#)

**16.** Statement-1: Triethylenetraamine is bidentate monoanion.

Statement-2: Complex containing propylenediamine ligand shows ligand isomerism.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

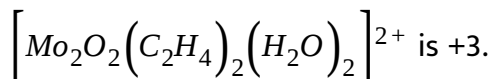
C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: D

 [View Text Solution](#)

17. Statement-1: The oxidation state of Mo in the oxido complex species



Statement-2: The  $\text{C}_2\text{H}_4$  and  $\text{H}_2\text{O}$  are neutral ligands whereas O is an anionic ligand.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.



**Answer: B**



[View Text Solution](#)

18. Statement-1:  $[Co^{II}(gly)_3]$  is called inner-metallic complex or inner complex.

Statement-2: Both the coordination number and charge of the Both the coordination number and charge of the cation are satisfied simultaneously by ligands.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: A**



[View Text Solution](#)

19. Statement-1: All tetrahedral complexes are mainly high spin and the low spin configurations are rarely observed.

Statement-2:  $\Delta_t$  is always much smaller even with stronger field ligands and it is never energetically favourable to pair up the electrons.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: A**



[View Text Solution](#)

20. Statement-1:  $CO$ ,  $CN^-$ ,  $NO^+$  and phosphines ligands act as  $\pi$  acceptor.

Statement-2: In  $[Mn^{VII}O_4]^-$  and  $[Cr^{VI}O_4]^{2-}$ , the ligands act as  $\pi$  donor and transfer charge from ligands to metal in  $\pi$  interactions as well as  $\sigma$  interactions.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

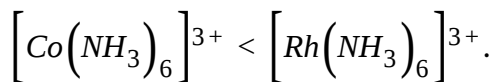
D. Statement-1 is False, Statement-2 is True.

**Answer: B**

 [View Text Solution](#)

21. Statement-1: The value of  $\Delta_0$  for  $M^{3+}$  complexes are always much higher than value for  $M^{2+}$  complexes (for the same set of ligands)

Statement-2: The crystal field stabilization energy of



- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: B**

 [View Text Solution](#)

22. All the complexes of  $\text{Pt}(+II)$  and  $\text{Au}(+III)$  with strong field as well as with weak field ligands are square planar.

Statement-2: The crystal field splitting  $\Delta_0$  is larger for second and third row transition elements, and for more highly charged species. This larger

value of  $\Delta_0$  energetically favours the pairing of electron for square planar geometry.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: A**

 [View Text Solution](#)

23. Statement-1:  $\left[Co(NH_3)_5SO_4\right]Br$  and  $\left[Co(NH_3)_5Br\right]SO_4$  are ionization isomers.

Statement-2: They can distinguished by adding  $AgNO_3$  solution and  $BaCl_2$  solution respectively.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: B**



[View Text Solution](#)

**24.** Statement-1: In  $OC-M-CO$  if one CO is replaced by better  $\pi$ -*ae*p  $\rightarrow r$  ligand than CO, then stretching frequency of C-O bond increases.

Statement-2: If replaced ligand is better  $\pi$ -*ae*p  $\rightarrow r$ , it will reduce the flow of electron in the  $\pi^*$  orbital of CO.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: A**

 [View Text Solution](#)

25. Statement-1:  $[Co(en)_3]^{3+}$  show stereoisomerism.

Statement-2: EAN value of  $[Co(en)_3]^{3+}$  is 36.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: B**

 [View Text Solution](#)

**26.** Statement-1: In Zeise's salt C-C bond order regarding ethylene molecule is less than two.

Statement-2: Ethylene accepts electron pair from filled d-orbital of  $Pt^{2+}$  into its vacant bonding M.O.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.



**Answer: C**

 [View Text Solution](#)

27. Statement-1:  $[V(CO)_6]$  cannot act as oxidising agent.

Statement-2: It cannot be reduced by reducing agent.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: D**

 [View Text Solution](#)

28. Statement-2: Hund's rule violates in  $[Co(CN)_6]^{3-}$  complex ion.

Statement-2: Degeneracy of d orbitals is lost under any field ligand.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: D**

 [View Text Solution](#)

29. Statement-1: Complex ion  $[Co(NH_3)_6]^{2+}$  is readily oxidized to  $[Co(NH_3)_6]^{3+}$ .

Statement-2: Unpaired electron in complex ion  $\left[Co(NH_3)_6\right]^{2+}$  is present in 4d orbital.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: B**

 [View Text Solution](#)

30. Statement-1: Aqueous  $CuSO_4$  solution on reaction with excess of aqueous KCN forms  $K_3[Cu(CN)_4]$ .

Statement-2:  $CuS$  is obtained when  $H_2S(g)$  is passed through  $K_3[Cu(CN)_4]$

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: C**

 [View Text Solution](#)

31. Statement-1:  $[Ti(H_2O)_6]^{3+}$  is violet in colour while  $Ti^{3+}$  is colourless.

Statement-2: Light correspondign to dnergy of blue-green region is absorbed by the complex to excite the electron from  $t_{2g}$  level to  $e_g$  level.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: A**

 [View Text Solution](#)

**32.** Statement-1: Toxic metal ions are removed by the chelating ligands.

Statement-2: Chelate complexes tend to be more stable.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: A**

 [View Text Solution](#)

33. Statement-1:  $[Cr(H_2O)_6]Cl_2$  and  $[Fe(H_2O)_6]Cl_2$  are reducing in nature.

Statement-2: Unpaired electrons are present in their d-orbitals.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: B**



[View Text Solution](#)

**34.** Statements-1: Linkage isomerism arises in coordination compounds containing ambidentate ligand.

Statement-2: Ambidentate ligand has two different donor atoms.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: A**



[View Text Solution](#)

35. Statement-1: Complexes of  $MX_6$  and  $MX_5L$  type (X and L are unidentate) do not show geometrical isomerism.

Statement-2: Geometrical isomerism is not shown by complexes of coordination number 6.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: C**



[View Text Solution](#)



36. Statement-1:  $[Fe(CN)_6]^{3-}$  ion shows magnetic moment corresponding to two unpaired electrons.

Statement-2: It has  $d^2sp^3$  type hybridisation.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: D

 [View Text Solution](#)

37. Statement-1:  $[Cu(NH_3)_4]^{2+}$  and  $[Cu(CN_4)]^{3-}$  ions are coloured.

Statement-2:  $[Cu(NH_3)_4]^{2+}$  involves  $dsp^2$  hybridization with one

unpaired electron.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: D**



[View Text Solution](#)

**38.** Statement-1:  $NH_2NH_2$  although possesses two electron pairs for donation but cannot act as a chelating agent .

Statement-2: The coordination by  $NH_2NH_2$  leads to a three member highly unstable strained ring.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: A**

 [View Text Solution](#)

39. Statement-1: In the reaction

$$\left[CoCl_2(NH_3)_4\right]^+ + Cl^- \rightarrow \left[CoCl_3(NH_3)_3\right]^+ + NH_3,$$
 when reactant is in cis-form two isomers of the product are obtained.

Statement-2: Third chloride ions replaces an ammonia cis to both chloride ion or trans to one of the chloride ion.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: A**

 [View Text Solution](#)

40. Statement-1: The complex  $CoBr_3 \cdot 4NH_3 \cdot 2H_2O$  has molar conductivity corresponding to 1:3 electrolyte.

Statement-2: The formula of the compound is  $[Co(H_2O)_2(NH_3)_4]Br_3$ .

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: B**

 [View Text Solution](#)

**41.** Statement-1: The correct distribution of 3d electrons of chromium in the complex  $\left[Cr(H_2O)_6\right]Cl_3$  is  $3d_{xy}^2, 3d_{zy}^1, 3d_{zx}^0$ .

Statement-2: The complex has a magnetic moment of 3.83 BM.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: D**

 [View Text Solution](#)

**42.** Statement-1: The correct order for the wave length of absorption in

the visible region is :  $\left[ Ni(NO_2)_6 \right]^{4-} < \left[ Ni(NH_3)_6 \right]^{2+} < \left[ Ni(H_2O)_6 \right]^{2+}$

Statement-2: The stability of different complexes depends on the strength of the ligands field of the various ligands.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: B**

 [View Text Solution](#)

43. Statement-1: The *cis* -  $[CoCl_2(en)_2]^+$  has two enantiomers.

Statement-2: en in a bidentate mono anion.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: C**

 [View Text Solution](#)

44. Statement-1: All known mononuclear complexes of chromium with +3 oxidation state, irrespective of the strength of the ligand must have three unpaired electrons.

Statement-2: In complex  $[Cr(NH_3)_4BrCl]Cl$ , the 'spin only' magnetic is close to 3.87 BM.

- A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: B**



[View Text Solution](#)



45. Statement-2: The 'spin only' magnetic moment of green complex, potassium amminetetraacyanonitrososoniam chromate(I) is 1.73 BM.

Statement-2: To have two d-orbital empty for  $d^2sp^3$  hybridization, the pairing of electrons take place having behind one unpaired electron as  $CN^-$  is a stronger field ligand.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: A**



[View Text Solution](#)

**46.** Statement-1: The mineral corundum,  $Al_2O_3$  is colourless when pure. However, when various  $M^{3+}$  transition metal ion are present in trace amounts, various coloured gemstones metal ion.

Statement-2: The colours are produced due to electronic transitions within d-orbitals (called d-d transitions) of a transition metal ion.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: A**

 [View Text Solution](#)

47. Statement-2: All pseudohalide ions are not stronger coordinating ligands than the halide ion and hence the complex formed by pseudohalide ions are of high spin.

Statement-2: The halide ions have higher values of electronegativity in their corresponding periods.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: D**

 [View Text Solution](#)

**48.** Statement-1: Pentaamminethiocyanato-N-chromium(III) tetrachloridozincate(II) is a coloured compound and is an example of ionisation isomerism.

Statement-2: The compound is paramagnetic and therefore, d-d transition is possible.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: D**

 [View Text Solution](#)

49. Statement-1:  $K_3[VF_6]$  and  $KMnO_4$  are coloured compounds.

Statement-2: The colour of the compound is attributed to d-d transition in both the compounds.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: C

 [View Text Solution](#)

50. Statement-1:  $[FeCl_2(SCN)_2]^{2-}$ , (high spin complex) can exist as diastereoisomers.

Statement-2: In tetrahedral geometry, all positions are identical to each other.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: D**

 [View Text Solution](#)

51. Statement-1: When the ligands are stronger, the distribution of six electrons of  $Co^{3+}$  ions is  $d_{xy}^2$ ,  $d_{yz}^2$  and  $d_{zx}^2$

Statement-2:  $t_{2g}$  orbitals corresponds to  $d_{xy}$ ,  $d_{yz}$  and  $d_{z^2}$ .

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: B**

 [View Text Solution](#)

52. Statement-1:  $[Co(NO_2)_6]^{4-}$  and  $[Co(NO_2)_6]^{3-}$  both complex involve  $d^2sp^3$  hybridization but former is paramagnetic and later one diamagnetic.

Statement-2: In  $[Co(NO_2)_6]^{4-}$  one of the 3d electrons jumps to 4d orbital making the two d-orbitals empty for  $d^2sp^3$  hybridization.  $NO_2$  is a

stronger ligand which favours the pairing of electrons and therefore,  $d^2sp^3$  hybridization.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: A**

 [View Text Solution](#)

**53.** Statement-1: Acetylacetonate complexes of the metal ions are more stable than the corresponding ethylenediamine complexes.

Statement-2: Acetylacetonate complexes of the metal ions contain a six



membered conjugate chelate rings and the resonance in its chelate ion is an additional factor contributing to the stability.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: A**

 [View Text Solution](#)

**54.** Statement-1: Among the complexes  $[Fe(CN)_6]^{4-}$  and  $[Fe(NH_3)_6]^{2+}$ , former complex absorbs the light of shorter wavelength.

Statement-2: The crystal field splitting depends upon the strength of the ligands and charge on the metal ion.

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: B**

 [View Text Solution](#)

55. Statement-1:  $\left[Co(en)(NO_2)_2(pn)\right]^+$  ion exists in four geometrical forms : two are cis and two are trans.

Statement-2: en (symmetrical ligand) and pn (unsymmetrical ligand) are ethylene diamine and 1, 2-diamino propane respectively forming complex of the type  $M(AA)(AB)_2$ .

- A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: A**



[View Text Solution](#)

**56.** Statement-1: In Zeise's salt relative to free ethylene, the C-C bond is lengthened slightly from 133.7 pm to 137.5 pm.

Statement-2: The bond between the ethylene molecule and the metal ion may be considered as a dative  $\sigma$  - bond to an available orbital on the metal in Zeise's salt.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: B**



[View Text Solution](#)

57. Statement-1:  $Cs_2[CoF_6]$  is an inner orbital complex with one unpaired electron.

Statement-2: According to the spectrochemical series  $F^-$  is weak field ligands.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: B**

 [View Text Solution](#)

58. Statement-1:  $[Co(NH_3)_6]^{2+}$  when exposed to air, is more easily oxidised into  $[Co(NH_3)_6]^{3+}$  as compared to oxidation of  $Co^{2+}$  into  $Co^{3+}$  in gaseous state.

Statement-2: In  $[Co(NH_3)_6]^{2+}$  electron is to be removed from 4d, and in  $Co^{2+}(g)$ , electron is removed from 3d.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: A**

 [View Text Solution](#)

**59.** Statement-1: In  $Mn_2(CO)_{10}$  molecule, there are total 70 electrons in both Mn atoms.

Statement-2:  $Mn_2(CO)_{10}$  molecule acts as a strong oxidising agent.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

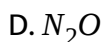
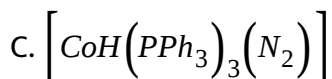
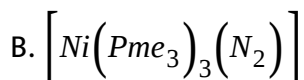
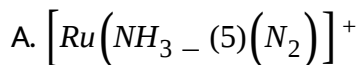
D. Statement-1 is False, Statement-2 is True.

Answer: C

 [View Text Solution](#)

## MULTIPLE OBJECTIVE TYPE QUESTION

1. Which of the following complexes or molecules has/ have N-N bond length greater than that in free  $N_2$  molecule?



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

 [View Text Solution](#)

2. Select the correct statement(s) about the complex,  $\left[Pt(S_5)_3\right]^{2-}$ .

A. It contains  $S_5^{2-}$  anion which is a chelating ligand.

B. Its geometry is octahedral.

C. Hybridisation of pt is  $d^2sp^3$ .

D. The complex ion is chiral.

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



[View Text Solution](#)

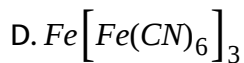
3. Which of the following are coloured due to the charge transfer ?

A.  $KMnO_4$

B.  $K_2Cr_2O_7$

C.  $\left[Fe(H_2O)_5NO\right]SO_4$

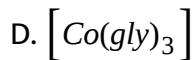
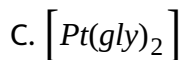
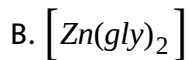
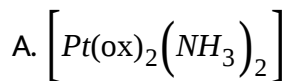




Answer: A::B::C::D

 [View Text Solution](#)

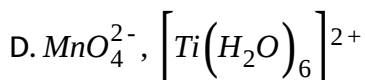
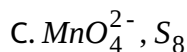
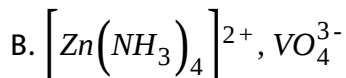
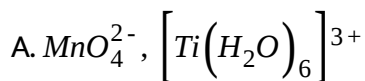
4. Which of the following complexes would exhibit both geometrical as well as optical isomerism?



Answer: A::D

 [View Text Solution](#)

5. Which of the following pair of species are paramagnetic and coloured ?

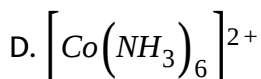
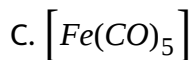


Answer: A:D



[View Text Solution](#)

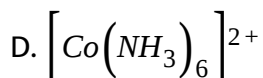
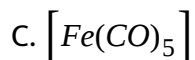
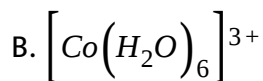
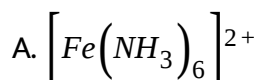
6. Which of the following complexes follow EAN rule ?



Answer: A::C::D

 [View Text Solution](#)

7. Which of the following is/are paramagnetic complex(es)?



Answer: A::D

 [View Text Solution](#)

8. Consider the complex  $\left[CoH(N_2)(PPh_3)_3\right]$  having trigonal bipyramidal geometry in which cobalt is  $dsp^3$  hybridised. Select the correct

statements regarding the given complex.

A. IUPAC name of the complex is hydridodinitroentris (triphenylphospine) cobalt (I).

B. It is diamagnetic in nature.

C.  $N^2$  occupies axial position.

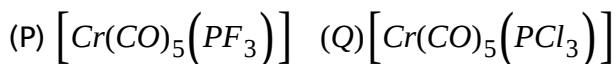
D. N-N bond length is longer than free  $N_2$  molecule.

**Answer: B::C::D**



[View Text Solution](#)

9. Consider the following complexes.



Select the correct options.

A. Both P and Q have longer CO bond length than free CO molecule.

B. P has shorter CO bond length than Q.

C. P has longer Cr-C bond length than Q.

D.  $PF_3$  is a better  $\pi$  - aep  $\rightarrow r$  than  $PCl_3$ .

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

 [View Text Solution](#)

**10.** The complexes having different CO bond length is/are :

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

B.  $Co_2(CO)_8$

C.  $Fe_2(CO)_9$

D.  $Fe(CO)_5$

**Answer: B::C::D**

 [View Text Solution](#)

11. Which of the following statements are correct regarding :



- A. It exhibits optical isomerism
- B. It has two optically inactive isomers.
- C. It has two optically active isomers.
- D. It has three diastereomers.

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



[View Text Solution](#)

12. Potassium hexachloroplatinate,  $K_2[PtCl_6]$  adopts anti-fluorite crystal structure. The correct informations about ideal  $K_2[PtCl_6]$  crystal is/ are:

- A.  $K^+$  ions occupy all the tetrahedral voids.
- B. The unit cell is FCC with respect to  $PtCl_6^{2-}$  ions.
- C. The coordination number of  $PtCl_6^{2-}$  ions is 4.

D. The coordination number of  $PtCl_6^{2-}$  ions is 8.

**Answer: A::B::D**

 [View Text Solution](#)

13. Select the correct statements regarding  $[Pt(en)(pn)Cl_2]^{2+}$  ion.

A. It exhibits optical isomerism

B. It exhibits geometrical isomerism.

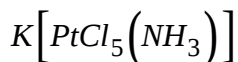
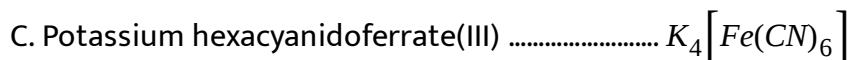
C. All isomers are optically active

D. It is diamagnetic in nature

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

 [View Text Solution](#)

14. Which of the following pairs of name and formula of complexes, is correct ?



Answer: A::B::D

 [View Text Solution](#)

15. 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



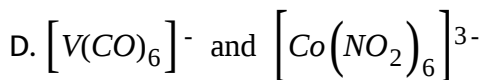
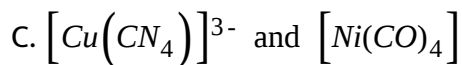
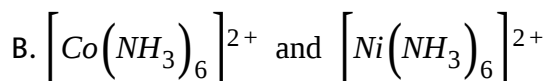
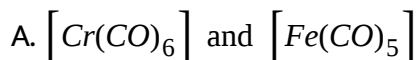
C. dimerization

D. none

**Answer: B::C**

 [View Text Solution](#)

**16.** In which of the following pairs of complexes the central metal/ions do have same effective atomic number?



**Answer: A::C::D**

 [View Text Solution](#)

17. Which of the following statement is/are correct ?

- A.  $Ni(CO)_4$ - Tetrahedral, paramagnetic
- B.  $[Ni(CN)_4]^{2-}$  - Square planar, diamagnetic
- C.  $Ni(dmg)_2$  - Square planar, diamagnetic
- D.  $[NiCl_4]^{2-}$  - Tetrahedral, paramagnetic

Answer: B::C::D



[View Text Solution](#)

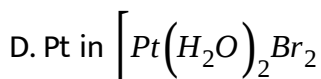
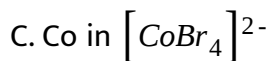
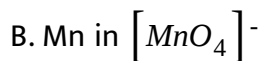
18. Which of the following is/are correctly matched ?

- A.  $[Co(Pme_3)_4]$  -  $sp^3$  and one unpaired electron.
- B.  $[Ni(en)_3](NO_2)_2$  -  $sp^3d^2$  and two unpaired electrons.
- C.  $[V(NH_3)_6]Cl_3$  -  $sp^3d^2$  and two unpaired electrons.
- D.  $[Mn(NO^+)_3(CO)]$  -  $sp^3$  and diamagnetic.

Answer: A::B::D

 [View Text Solution](#)

19. Spin only' magnetic moment of Ni in  $[Ni(dmg)_2]$  is same as that found in :

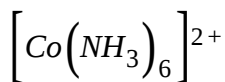


Answer: B::D

 [View Text Solution](#)

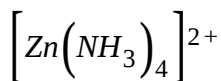
20. Which of the following statements is/are correct ?

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



B. Among  $F^-$ ,  $Cl^-$ ,  $Br^-$  and  $I^-$ ,  $F^-$  forms more stable complexes due to small size.

C.  $\left[Cu(NH_3)_4\right]^{2+}$  is thermodynamically more stable than



D. Among

$\left[Fe(CN)_6\right]^{3-}$ ,  $\left[Fe(H_2O)_6\right]^{2+}$  and  $\left[Fe(en)_3\right]^{3+}$ ,  $\left[Fe(CN)_6\right]^{3-}$  is

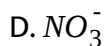
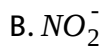
most stable.

**Answer: A:C**

 [View Text Solution](#)

21. Which of the following ligands can show linkage isomerism ?

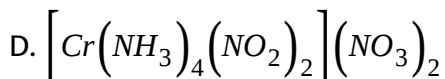
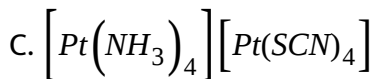
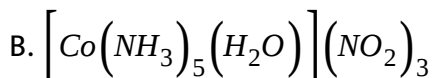
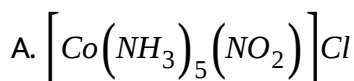
A.  $CNS^-$



**Answer: A::B::C**

 [View Text Solution](#)

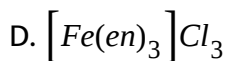
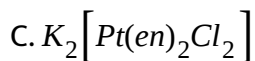
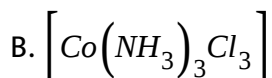
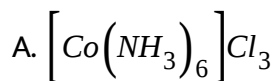
**22.** In which of the following complexes more than one type of structural isomerism is possible ?



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

 [View Text Solution](#)

23. Which of the following will produce a white precipitate upon reacting with  $AgNO_3$ ?

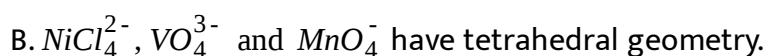
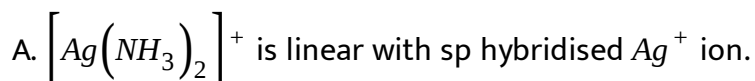


Answer: A::D



[View Text Solution](#)

24. Which of the following statement is/are correct?



c.  $[Cu(NH_3)_4]^{2+}$ ,  $[Pt(NH_3)_4]^{2+}$  and  $[Ni(CN)_4]^{2-}$  have  $dsp^2$

hybridisation of the metal ions.

D.  $Fe(CO)_5$  have trigonal bipyramidal structure with  $dsp^3$  hybridised iron.

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

 [View Text Solution](#)

25. Which of the following exhibit geometrical isomerism (M stands for a metal, and a and b are achiral ligands)?

A.  $Ma_2b_2$

B.  $Ma_2b_4$

C.  $Ma_5b$

D.  $Ma_6$

**Answer: A::B**



[View Text Solution](#)

26. Which of the following are  $\pi$  - *bonded* organometallic compounds ?

- A. Ferrocene
- B. Diethyl zinc
- C. Ethylmagnesium iodide
- D. Dibenzene chromium

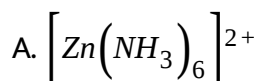
**Answer: A::D**



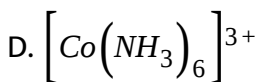
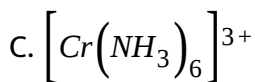
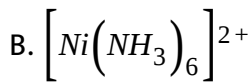
[View Text Solution](#)

27. Which of the following in/are inner orbital complex(es) as well as diamagnetic in nature?

[ Atomic Number : Cr=24, Mn=25, Fe=26, Co=27]





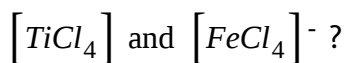


**Answer: D**



[View Text Solution](#)

28. Which of the following statement is/are false for



A. Both tetrahedral and diamagnetic.

B. Both tetrahedral but former is diamagnetic and later is paramagnetic.

C. Square planar and tetrahedral respectively and both are paramagnetic.

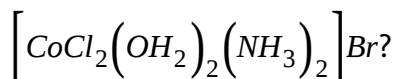
D. Solutions of both complexes are coloured.

**Answer: A::C::D**



**View Text Solution**

29. Which of the following isomerism is/are shown by the complex



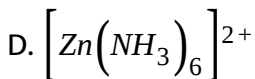
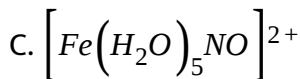
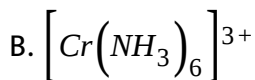
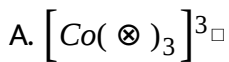
- A. Ionization
- B. Linkage
- C. Geometrical
- D. Optical

**Answer: A::C::D**



**View Text Solution**

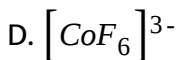
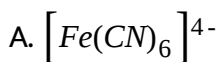
30. Which of the following is/are inner orbital complexes as well as paramagnetic with magnetic moment equal to 3.78 (approximate)?



**Answer: B::C**

 [View Text Solution](#)

**31. Which of the following is/are paramagnetic ?**



**Answer: D**

 [View Text Solution](#)

32. Co-ordination number of Cr in  $\text{CrCl}_3 \cdot 5\text{H}_2\text{O}$  is six. The maximum volume of 0.1 N  $\text{AgNO}_3$  needed to precipitate the chlorine in outer sphere in 200ml of 0.01M solution of the complex is/are :

A. 140 ml

B. 40 ml

C. 80ml

D. 20ml

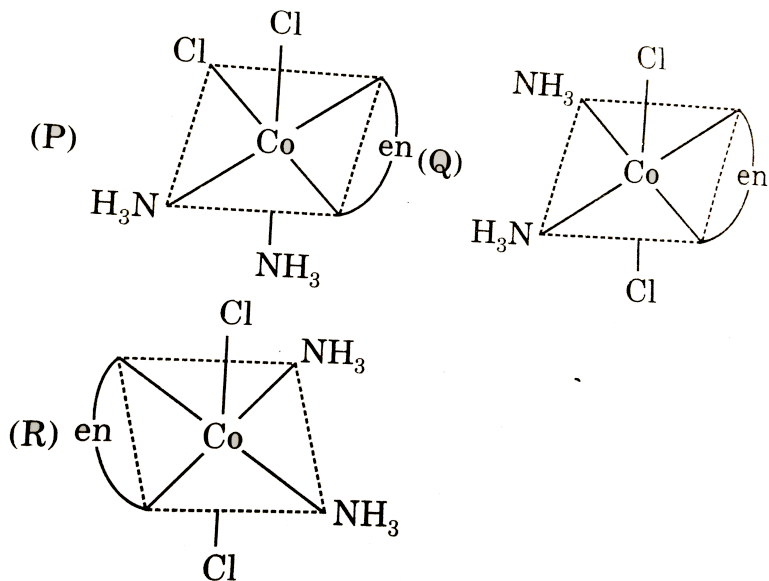
**Answer: B**



[View Text Solution](#)

33. Three arrangements are shown for the complex  $[\text{Co}(\text{en})(\text{NH}_3)_2\text{Cl}_2]^+$

. Pick up the wrong statement.



A. P and Q are geometrical isomers

B. Q and R optical isomers

C. P and R optical isomers

D. Q and R are geometrical isomers

**Answer: B::C::D**



**View Text Solution**

34. Consider the following statements.

(P) Blue salt  $K_4[Mn(CN)_6] \cdot 3H_2O$  is isostructural with the hexacyanoferrate (II) and the former complex is paramagnetic but later one is diamagnetic.

(Q) In the series of isoelectronic species  $[V(CO)_6]^-$ ,  $[Cr(CO)_6]$  and  $[Mn(CO)_6]^+$ , from the vanadium to manganese complexes there is reduction in the strength of the bonding between metal and carbon and an increase in that in the carbonyl group (i.e.CO).

(R) Chlorotritriphenylphosphinerhodium (I) is a square planar diamagnetic complex which is used as a homogeneous catalyst in hydrogenation of alkenes.

(S) Like  $[Co(NH_3)_4Cl_2]^+$  ion,  $[Co(en)_2Cl_2]^+$  ion can exist in cis and trans forms and neither can display optical activity.

(T)  $Ni(CO)_4$  and  $NiCl_2(PPh_3)_2$  have same hybridization but different, magnetic moment and effective atomic number.

A. P, R and T

B. Q, R and S

C. Q, R and T

D. R, S and T

**Answer: A::C**

 [View Text Solution](#)

35. The compound  $Na_2IrCl_6$  reacts with triphenylphosphine in diethyleneglycol in an atmosphere of CO to give  $[IrCl(CO)(PPh_3)_2]$ .

(Atomic number of Ir=77)

Which of the following statements is/are correct ?

A. The IUPAC name of the complex is carbonylchloridobis (triphenylphosphine) iridium(I).

B. The hybridization of the metal ion is  $sp^3$ .

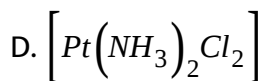
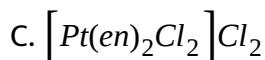
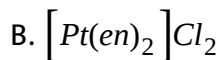
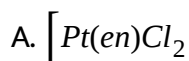
C. The magnetic moment (spin only) of the complex is zero.

D. The complex shows geometrical as well as ionization isomerism.

**Answer: A::C**

 [View Text Solution](#)

**36.** The compounds that exhibit(s) geometrical isomerism is (are):



**Answer: C::D**

 [View Text Solution](#)



37. The type of isomerism present in nitropentaamminechromium(III) chloride is :

- A. optical
- B. linkage
- C. ionization
- D. polymerization

**Answer: B::C**

 [View Text Solution](#)

38. Which statement(s) about coordination of cation is/are true ?

- A. Most metal ions exhibit only a single characteristic coordination number
- B. The coordination number is equal to the number of ligands bonded to the metal atom

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

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

**Answer: B::D**

 [View Text Solution](#)

**39.** Which of the following statement(s) is/are correct ?

A.  $[Co(NH_3)_6]^{3+}$ ,  $[Co(CN)_6]^{3-}$  and  $[Co(NO_2)_6]^{3-}$  are diamagnetic involving  $d^2sp^3$  hybridization.

B.  $[Zn(NH_3)_4]^{2+}$ ,  $[FeCl_4]^-$  and  $[Ni(CO)_4]$  are diamagnetic involving  $sp^3$  hybridisation.

- C. The magnetic moment of  $\left[Fe(H_2O)_6\right]^{3+}$  is 5.92 BM. and that of  $\left[Fe(CN)_6\right]^{3-}$  is 1.73 B.M.
- D. The magnetic moment of  $K_4\left[MnF_6\right]$  and  $K_3\left[FeF_6\right]$  are same.

**Answer: A::C::D**

 [View Text Solution](#)

**40.** Which of the following statement(s) is/are correct with respect to the crystal field theory ?

- A. It considers only the metal ion d-orbital and gives no consideration at all to other metal orbitals.
- B. It cannot account for the  $\pi$  - bond  $\in g$  in complexes.
- C. The ligands are point charges which are either ions or neutral molecules.

D. The magnetic properties can be explained in term of splitting of d-orbital enetgies in different crystal field.

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



[View Text Solution](#)

**41.** Consider the following statements :

Statement-1: Generally, square planar complexes show geometrical isomerism but do not exhibit optical isomerism because they do not possess plane of symmetry.

Statement-2:  $\Delta_t = \frac{4}{9}\Delta_0$

Statement-3: In octahedral complexes each electron entering the  $t_{2g}$  orbitals stabilizes the complex ion by  $0.4 \Delta_0$  and each electron entering the  $e_g$  orbital destabilizes the complex by an amount of  $0.6 \Delta_0$ .

Select the correct statement from the codes given below.

A. Statement-1 and statement-3 are correct

B. Statement-1 and statement-3 are correct

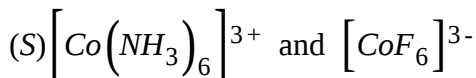
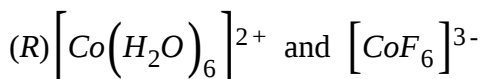
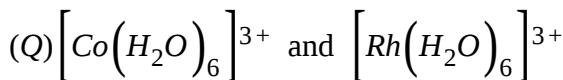
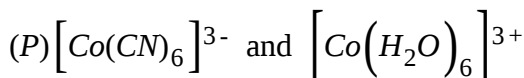
C. Statement-1 is incorrect

D. Statement-2 and statement-3 are incorrect

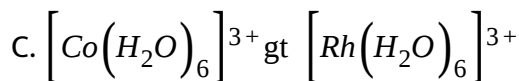
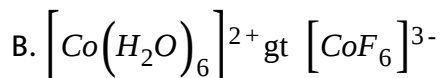
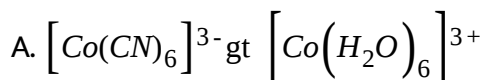
**Answer: B::C**

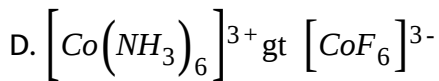
 [View Text Solution](#)

**42.** For the given set of complexes :



Select the correct order for  $\Delta_0$ :





**Answer: A::B**

 [View Text Solution](#)

**43.** Tetrahedral complexes are generally favoured :

A. where the ligands are bulky

B. when the ligands are stronger

C. where the electronic configuration of the central metal is

$d^0d^5$  or  $d^{10}$  (with weak field ligands) as there is no CFSE.

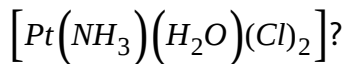
D. when the central metal ion has pseudo noble gas electron

configuration, i.e.  $(n-1)d^{10}ns^0np^0$ .

**Answer: A::C**

 [View Text Solution](#)

44. Which of the following statements is/are true for



- A. It has diamagnetic character
- B. It has square planar geometry
- C. It shows geometrical and optical isomerism
- D. It shows only geometrical isomerism

Answer: A::B::D



[View Text Solution](#)

45. Which of the following statement is/are correct ?

- A. In  $K_3[Fe(CN)_6]$ , the ligand satisfies only the secondary valencies of ferric ion.
- B. In  $K_3[Fe(CN)_6]$ , the ligand satisfies both primary and secondary valencies of ferric ion.

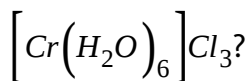
C. In  $K_3[Fe(CN)_6]$ , the ligand satisfies only the secondary valencies of ferrous ion.

D. In  $[Cu(NH_3)_4]SO_4$ , the ligand satisfies only the secondary valencies of copper.

**Answer: B::D**

 [View Text Solution](#)

46. Which of the following statements is/are incorrect for the complex



A. It has a magnetic moment of 3.83 BM.

B. The distribution of 3d electrons is  $3d_{xy}^1, 3d_{yz}^1, 3d_{zx}^1$ .

C. The ligand satisfies both primary and secondary valencies of chromium

D. It shows co-ordination as well as hydrate isomerism.



Answer: C::D

 [View Text Solution](#)

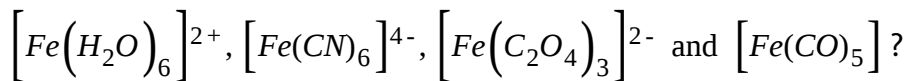
47. Which statement is/are incorrect ?

- A.  $[Ni(PPh_3)_2Br_2]^-$  tetrahedral and paramagnetic.
- B.  $[Ni(CO)_4]$  tetrahedral and diamagnetic.
- C.  $[Ni(CN)_4]^{2-}$  square planar and diamagnetic.
- D.  $[Ni(Cl)_4]^{2-}$  square planar and diamagnetic.

Answer: A::B::C

 [View Text Solution](#)

48. Which of the following statements is/are true for the complexes,



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

B.  $\left[Fe(C_2O_4)_3\right]^{3-}$  is less stable than  $\left[Fe(CN)_6\right]^{4-}$ .

C. All complexes have same effective atomic number.

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

**Answer: A::D**



[View Text Solution](#)

49.  $\left[CoCl_2(en)_2\right]Br$  will show :

A. coordination position isomerism

B. ionization isomerism

C. geometrical isomerism

D. optical isomerism.

**Answer: B::C::D**



[View Text Solution](#)

50. Select the correct statement(s).

A.  $[Co(EDTA)]^-$  has two optical isomers.

B.  $[Co(NH_3)_5(NO_2)]^{2+}$  show linkage isomerism.

C. For  $[Pt(NH_3)BrCl(NO_2)py]$ , theoretically fifteen different geometrical isomers are possible.

D.  $[Cr(H_2O)_4Cl_2 \cdot 2H_2O]$  is an example of hydrate as well as linkage isomerism.

Answer: A::B::C



View Text Solution

51. A complex compound of one cobalt (III) ion, two 'en' molecules, two chloride ions and one nitrate ion will show:

A. linkage isomerism

B. ionisation isomerism

C. geometrical isomerism

D. optical isomerism

**Answer: B::C::D**

 [View Text Solution](#)

52. A complex containing cobalt(III) ion is associated with two diaminopropane molecules and two chloride ion forming an octahedral geometry. The complex ion will show :

A. ligand isomerism

B. geometrical isomerism

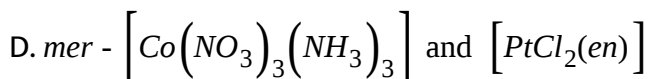
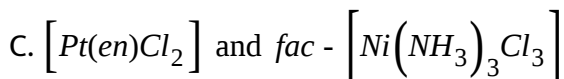
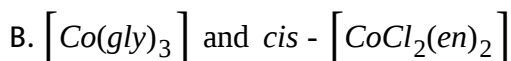
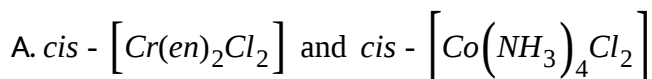
C. optical isomerism

D. ionization isomerism

Answer: A::B::C

 [View Text Solution](#)

53. In which of the following pairs both the complexes do not show optical isomerism ?



Answer: A::C

 [View Text Solution](#)

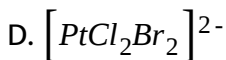
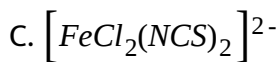
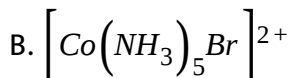
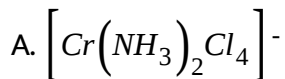
54. Which of the following is true for the complex  $Co(NO_2)(Cl)_2 \cdot 5NH_3$  (Co is in +III oxidation state)?

- A. It shows linkage isomerism
- B. It show ionisation isomerism
- C. If is inner orbital complex
- D. It is diamagnetic.

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

 [View Text Solution](#)

**55.** Which of the following complexes can exist as diastereoisomers ?



**Answer: A::D**

 [View Text Solution](#)

56. Which of the following statement(s) is/are correct ?

A. *Cis* -  $\left[Pt(NH_3)_2Cl_2\right]$  is used as an anticancer species.

B. Carboxypeptidase-A is an enzyme and contains zinc.

C. In the silver electroplating of copper,  $K[Ag(CN)_2]$  is used in place of  $AgNO_3$ .

D.  $CN^-$  ions show the reducing as well as complexing properties towards metal species.

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



[View Text Solution](#)

57. Select the correct statement.

A. Chelating 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  $[CoF_6]^{3-}$ ,  $F^-$  is a weak field ligand, so that

$\Delta_{oct} < P$  ( Pairing energy ) and it is low spin complex.

D.  $[CoCl_2(NH_3)_2(en)]^\ominus$  complex ion will have four different isomers.

**Answer: A::B::D**



[View Text Solution](#)

**58.** Which of the following statements is/are true?

A. In ferrocyanide ion, the effective atomic number is 36

B. Chelating ligands are atleast bidentate ligands

C.  $[CrCl_2(CN)_2(NH_3)_2]^{2+}$  and  $[CrCl_3(NH_3)_3]$  both have  $d^2sp^3$

hybridisation



D. As the number of rings in complex increases, stability of complex (chelate) also increases

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

 [View Text Solution](#)

59. Which one of the following statement(s) is/are false ?

A. Weak ligands like  $F^-$ ,  $Cl^-$  and  $OH^-$  usually form low spin complexes.

B. Strong ligand like  $CN^-$  and  $NO_2^-$ , generally form high spin complexes.

C.  $[FeF_6]^{3-}$  is high spin complex

D.  $[Ni(CO)_4]$  is high spin complex

**Answer: A::B::D**

 [View Text Solution](#)

60. Choose the correct statement(s).

A.  $[Ag(NH_3)_2]^{2+}$ , is linear with  $sp$  hybridised  $Ag^+$  ion

B.  $NiCl_4^{2-}$ ,  $VO_4^{3-}$  and  $MnO_4^-$  have tetrahedral geometry

C.  $[Cu(NH_3)_4]^{2+}$ ,  $[Pt(NH_3)_4]^{2+}$  and  $[Ni(CN)_4]^{2-}$  have  $dsp^2$  hybridisation of the metal ions.

D.  $Fe(CO)_5$  has trigonal bipyramidal structure with  $d_2sp^3$  hybridised iron.

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

 [View Text Solution](#)

61. Which of the following statements 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 exists
- C.  $[Mabcd]^{n\pm}$  square planar complexes exhibit both optical as well as geometrical isomerism
- D. In  $[Mabcd]^{n\pm}$  tetrahedral complexes, optical isomerism cannot be observed

**Answer: A::C::D**

 [View Text Solution](#)

62. Which of the following statements are correct ?

- A.  $\pi-C_5H_5$  lig and will be named as  $\eta^6$ -cyclopentadienyl
- B.  $\pi-C_3H_5$  lig and will be named as  $\eta^3$ -allyl

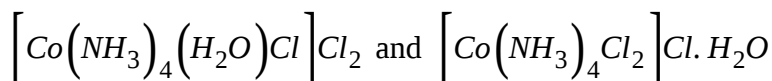
C. The correct order of boiling point for  $CH_4$  and  $CCl_4$  is  $CCl_4 > CH_4$

D. The boiling point order for  $H_2$  and He is just reverse order of its molecular weight

**Answer: B::C::D**

 [View Text Solution](#)

63. Select similarity between :



A. Oxidation number and coordination number of metal

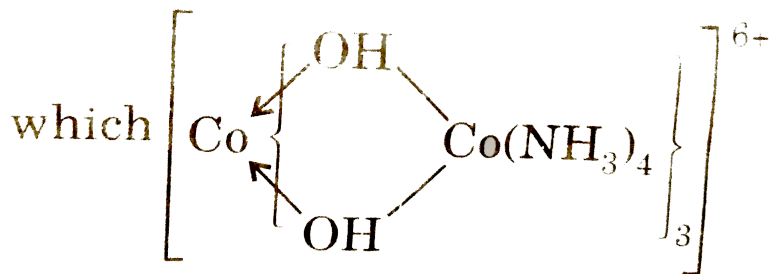
B.  $Cl^-$  and  $H_2O$  are the ligands

C. Amount of precipitate with  $AgNO_3$  solution (by equimolar 1 litre solution both)

D. Number of Co-N linkages

**Answer: A::D**

64. Select the correct statement(s) about complex in which

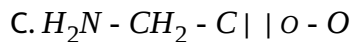
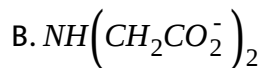
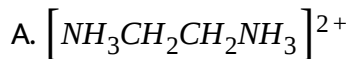


All the cobalts are in same oxidation state.

- A. Oxidation number of each cobalt is +3
- B. It is a bridging complex
- C. It has total 18, O-Co-N bond angle
- D. It has an ambidentate ligand

Answer: A::D

65. Which of the following is/are bidentate chelating ligand ?

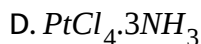
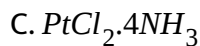
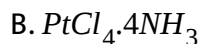
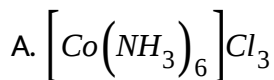


Answer: C::D



[View Text Solution](#)

66. Which of the following complex is heteroleptic ?



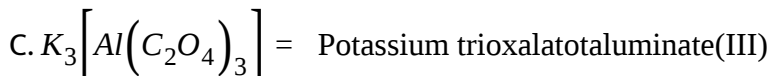
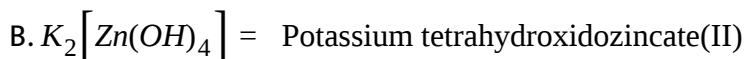
Answer: B::C::D



View Text Solution

67. Find the correct match out of following :

A.



D.



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



View Text Solution

68. Select the correct IUPAC name from the following.

A.  $H[AuCl_4]$  : Hydrogen tetrachloridoaurate(III)

B.  $[PtCl_6]^{2-}$  : Hexachloridopaltinate(IV) ion

C.  $[Cu(NH_3)_4]SO_4$  : Tetraaminecopper(II) sulphate

D.  $[Cr(en)_3]Cl_3$  : Tris (ethylenediamine)Chromium(III) chloride

Answer: B::C::D

 [View Text Solution](#)

69. If  $(\eta^5 - C_5H_5) M(C_2H_4)_2$  follows EAN rule, the central metal atom/ion would be :

A.  $Co(Z = 27)$

B.  $Fe(Z = 26)$

C.  $Ni(Z = 28)$

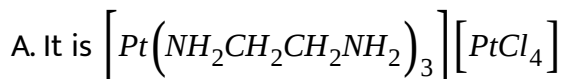


D.  $Rh(Z = 45)$

Answer: A::D

 [View Text Solution](#)

70. Select correct about the complex salt formed by the combination of cation of tris(ethylenediamine)platinum(IV)chloride and Anion of sodium tetrachloridoplatinate(II).



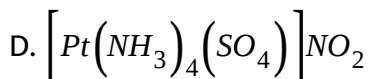
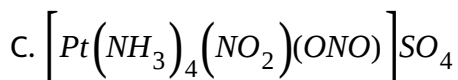
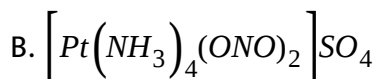
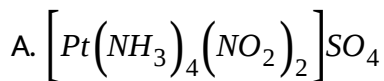
C. Coordination number of metal is six in cation and four in anion

D. IUPAC name of salt = tris(ethylenediamine)platinum(IV) tetrachloridoplatinate(II)

Answer: C::D

 [View Text Solution](#)

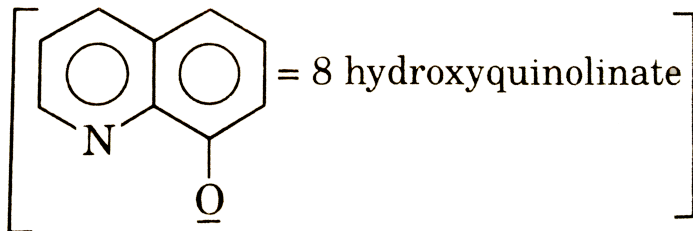
71. Select which is/are isomer of each other :



Answer: A::B::C

 [View Text Solution](#)

72. Select correct about : Bis(8-hydroxyquinolato)zinc(II) compound :



- A. It is diamagnetic in nature
- B. It shows optical isomerism
- C. It shows geometrical isomerism
- D. It has four N-Zn-O bond angles

**Answer: A::B::D**

 [View Text Solution](#)

**73.** Which of the following statement is incorrect ?

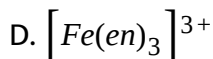
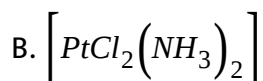
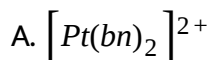
- A. IUPAC name of  $[Co(en)_3]_2 (SO_4)_3$  is tris(ethane-1, 2-diamine)cobalt(III) trisulphate
- B. Iron(III) hexacyanoferrate(III) has formula  $Fe[Fe(CN)_6]$
- C. Geometrical isomerism is possible in tetrahedral complex having formula  $[Mabcd]^{n\pm}$

D. Optical isomers are mirror images that are superimposable on one another

**Answer: A::C::D**

 [View Text Solution](#)

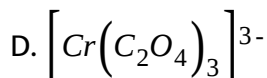
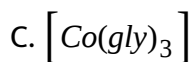
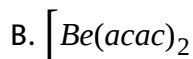
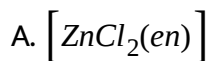
74. Which of the following molecule(s)/ion(s) can show optical isomerism ?



**Answer: A::C::D**

 [View Text Solution](#)

75. Which of the following compounds are resolvable into d or l-forms ?



Answer: C::D

 [View Text Solution](#)

76. Select incorrect statement about the complex :



A. It is a chiral complex

B. It is a polar complex

C. Its trans form is chiral

D. Its trans form in non-polar

**Answer: A::C::D**

 [View Text Solution](#)

77. Select the correct statements about  $Ma_2bcde$

A. It has 6 cis geometrical isomers with respect to two a

B. It has 3 trans isomers with respect to two a

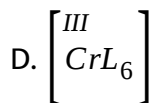
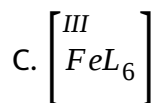
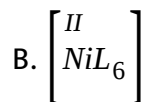
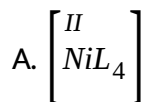
C. It has 15 stereoisomers

D. It has 12 optically active and 3 optically inactive isomers

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

 [View Text Solution](#)

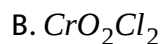
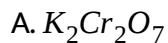
78. In which of the following complex(s) spin only magnetic moment is independent, from the nature of ligand. (L=monodentate ligand) :

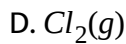
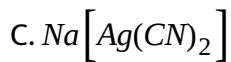


Answer: B::D

 [View Text Solution](#)

79. Which of the following species is/are coloured ?

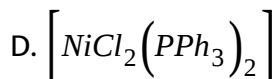




**Answer: A::B::D**

 [View Text Solution](#)

**80.** Which of the following complexes is/are tetrahedral ?

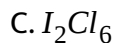


**Answer: C::D**

 [View Text Solution](#)



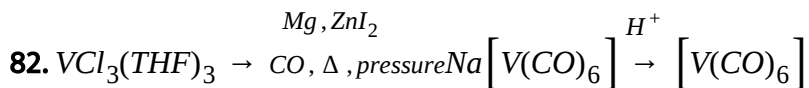
81. Which of the following molecules is/are planar ?



Answer: B::C::D



View Text Solution



Select the correct statement about  $[V(CO)_6]$

A. It acts as reducing agent

B. It acts as oxidising agent

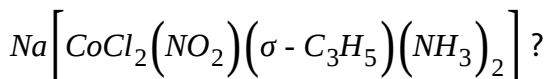
C. E.A.N value of V is 35

D. E.A.N value of V is 36

Answer: B::C

 [View Text Solution](#)

83. Which of the following names is/are correct for the compound

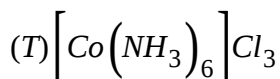
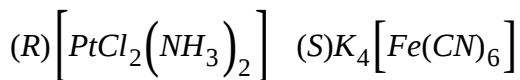
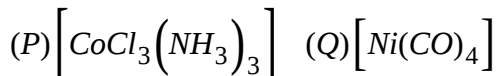


- A. Sodium allyldiamminedichloridonitrito-N\_cobaltate (III)
- B. Sodium diamminedichloridoallylnitrito-N-cobaltate (III)
- C. Sodium diamminedichloridocyclopropylnitrito-N\_cobaltate (III)
- D. Sodium diamminecyclopropylnitrito-N-dichloridocobaltate (III)

Answer: A::C

 [View Text Solution](#)

84. Identify pair of neutral co-ordination entity amongst the following



A. P and T

B. P and Q

C. Q and R

D. S and T

**Answer: B::C**



[View Text Solution](#)

85.  $EDTA^{4-}$  is an important ligand. Which statement about this ligand is/are true ?

- A. It is a hexadentate ligand
- B. It can bind through two oxygen and four nitrogen atoms to a central metal ion
- C. It is a flexidentate ligand
- D. IUPAC name of the ligand is ethylenediaminetriacetato

**Answer: A:C**

 [View Text Solution](#)

**86.** Choose the correct statement about Metal Carbonyls :

- A. Decacarbonyl-dimanganese(0) is made up of two square pyramidal  $Mn(CO)_5$  units joined by a Mn-Mn bond
- B. Octahedral-dicobalt(0) has a Co-Co bond bridged by two CO groups
- C.  $M - C\pi - bond$  is formed by the donation of a pair of electrons from a filled d-orbital of metal into the vacant antibonding  $\pi^*$  orbital of

carbon monoxide

D. A total of ten M-C  $\sigma$ bonds are present in  $[\text{Co}_2(\text{CO})_8]$  complex

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

 [View Text Solution](#)

**87. Choose the correct statement(s) :**

A. Chlorophyll is a co-ordination compound of magnesium

B. Haemoglobin is a co-ordination compound of iron

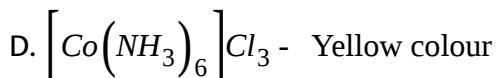
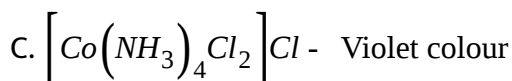
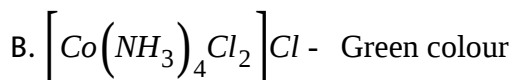
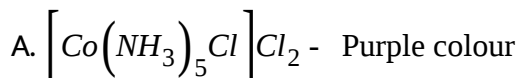
C. Vitamin  $B_{12}$  is a co-ordination compound of cobalt

D. Zeise's salt is used in chemotherapy for cancer patients

**Answer: A::B::C**

 [View Text Solution](#)

88.  $\text{CoCl}_3 \cdot 6\text{NH}_3$  can form 4 different types of complexes (According to Werner). Which of the following cannot exhibit optical isomerism as well as geometrical isomerism ?

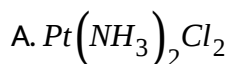


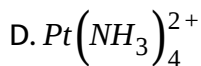
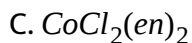
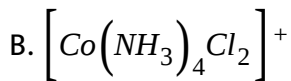
Answer: A::B::C



[View Text Solution](#)

89. Which of the following complexes are capable of showing geometrical isomerism ?





**Answer: A::B::D**

 [View Text Solution](#)

**90.** Choose the correct statement(s).

A. Tetrahedral complexes do not show geometrical isomerism because the relative positions of the unidentate ligands attached to the central metal atom are the same with respect to each other

B.  $[Co(en)_3]^{3+}$  has two stereoisomers both of which are optically active

C.  $[Co(en)_3]^{2+}$  has three stereoisomers out of which only two are optical isomers

D. *trans* -  $[\text{CrCl}_2(\text{ox})_2]^{3-}$  is an optical isomer of *cis* -  $[\text{CrCl}_2(\text{ox})_2]^{3-}$

Answer: A::B

 [View Text Solution](#)

91. Choose the incorrect statement(s).

A.  $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$  is obtained as the yellow form, in which the nitrate ligand is bound through oxygen (-ONO) and as the red form in which the nitrate ligand is bound through nitrogen (-NO<sub>2</sub>)

B.  $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2][\text{Pt}(\text{NH}_3)_2\text{Br}_2]$  is a co-ordination isomer of  $[\text{Pt}(\text{NH}_3)_4][\text{PtCl}_2\text{Br}_2]$

C. A complex with molecular formula  $\text{CoSO}_4\text{Br}\cdot 5\text{NH}_3$  on treatment with  $\text{AgNO}_3$  can give either white ppt or yellow precipitate

D.  $\text{CrCl}_3\cdot 6\text{NH}_3$  can exhibit solvate isomerism, very similar to ionisation isomerism



**Answer: A::B**



**View Text Solution**

**92.** Werner's theory could not explain :

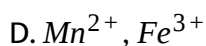
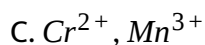
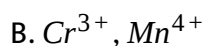
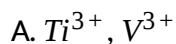
- A. Directional properties of bonds in co-ordination compounds
- B. Characteristic magnetic and optical properties of co-ordination compounds
- C. Why only certain elements possess the remarkable property of forming co-ordination compounds
- D. Why co-ordination number 6 gives octahedral complexes only\

**Answer: A::B::C**



**View Text Solution**

93. In which of the ion pairs, magnetic property depends on the strength of ligand present in the complex ?

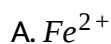


Answer: C::D



[View Text Solution](#)

94. Which of the following ions can form paramagnetic as well as diamagnetic complexes (without considering magnetic property of ligands)?



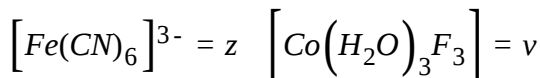
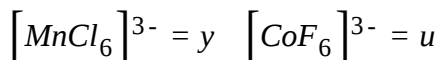
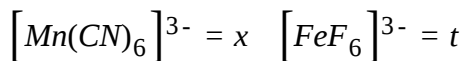
C. Ni

D.  $Fe^{3+}$

**Answer: A::C::D**

 [View Text Solution](#)

**95.** Find the number of unpaired electrons in each case



Hence, find the correct relationship between  $x, y, z, t, u, v$

A.  $y - u = v$

B.  $y^2 + (x + z)^2 = t^2 + v^2$

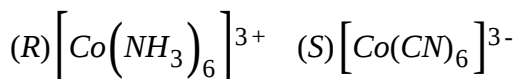
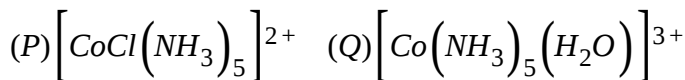
C.  $x^2 + z - t = y^2 - u^2 + v^2$

D.  $x + y + z + t + u > u^2$

Answer: A::B::C

 [View Text Solution](#)

96. Four complexes are given :



All of them exhibit at least one of the following 4 colours viz, violet, red, yellow orange, pale yellow. One of them absorbs light in the U.V. region.

Choose the correct statement(s).

A. Order of wavelength of light absorbed :  $P > Q > R > S$

B. S must be violet in colour

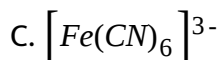
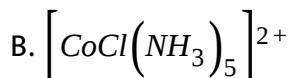
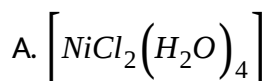
C. R must have absorbed wavelength of blue colour light

D. Q must be pale yellow in colour

Answer: A::C

 [View Text Solution](#)

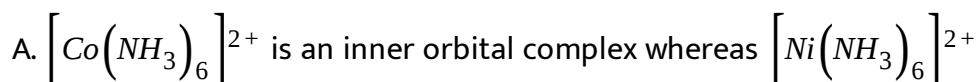
97. In which of the following, the central metal atom is behaving as a Lewis acid ?



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

 [View Text Solution](#)

98. Choose the correct statement(s) :



is an outer orbital complex

- B.  $[Fe(H_2O)_6]^{3+}$  is strongly paramagnetic whereas  $[Fe(CN)_6]^{3-}$  is weakly paramagnetic.
- C.  $[Ni(CO)_4]$  is tetrahedral and paramagnetic
- D.  $[NiCl_4]^{2-}$  is tetrahedral and diamagnetic

**Answer: A::B**

 [View Text Solution](#)

99. In  $Pt(C_2H_4)_2(C_2F_4)$  molecule, in which the platinum and all six carbon atoms are almost coplanar, choose the correct statement(s).

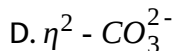
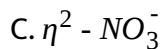
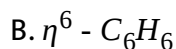
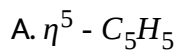
- A. C-C distance is greater in  $C_2F_4$  than  $C_2H_4$
- B.  $Pt - C(\text{of } C_2H_4)$  distance is greater than  $Pt - C(\text{of } C_2F_4)$
- C. If  $C_2H_4$  is replaced by  $C_2(CN)_4$  in the complex, then C-C distance is greater in  $C_2(CN)_4$  than  $C_2F_4$ . (double bond length)

D. In case of  $\underline{C}(CN)_4$  in the complex, above, the underlined C-  
hybridisation is  $\lim_{n \rightarrow \infty} sp^n$ .

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

 [View Text Solution](#)

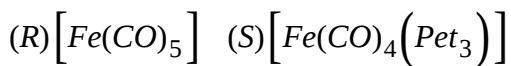
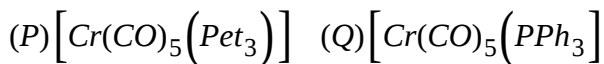
**100.** Which of the chelating ligands maintain hapticity equal to denticity ?



**Answer: C::D**

 [View Text Solution](#)

101. Consider following 4 complexes :



Choose the correct statement.

A. P will have lower C-O stretching frequency and a longer metal carbon bond than Q.

B. P will have lower C-O stretching frequency and a shorter metal carbon bond than Q.

C. R has higher C-O stretching frequency and a longer metal carbon bond than S.

D. S has higher C-O stretching frequency and a longer metal carbon bond than R.

**Answer: B::C**



[View Text Solution](#)



102. VBT model for  $[MnCo(CO)_9]$  suggests :

- A. It is a heteronuclear carbonyl
- B. It has  $d^2sp^3$  hybridisation of Mn
- C. It has  $dsp^3$  hybridisation of Co
- D. The Mn-Co bond is formed by overlapping of Mn and Co hybrid orbital, each orbital bearing an unpaired electron.

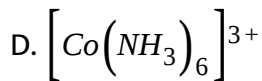
Answer: A::B::C::D



[View Text Solution](#)

103. Which of the following are paramagnetic ?

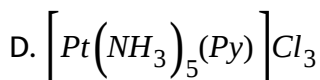
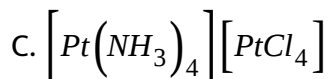
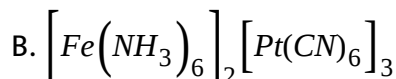
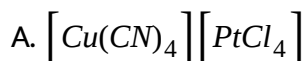
- A.  $[Ni(CN)_4]^{2-}$
- B.  $[NiCl_4]^{2-}$
- C.  $[CoF_6]^{3-}$



Answer: B::C

 [View Text Solution](#)

104. Which of the following can show coordination isomerism ?



Answer: A::B::C

 [View Text Solution](#)

105. Which is/are correct statement(s)?

- A.  $[Co(en)_3][Cr(CN)_6]$  will show coordination isomerism
- B.  $[Mn(CO)_5(SCN)]$  will show linkage isomerism
- C.  $[Co(NH_3)_5(NO_3)] SO_4$  will show ionisation isomerism
- D. None is correct

**Answer: A::B::C**

 [View Text Solution](#)

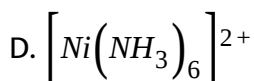
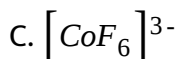
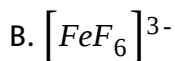
**106.** Atomic number of Mn, Fe, and Co are 25, 26, 27 and 28 respectively. Which of the following inner orbital octahedral complexes ions are diamagnetic ?

- A.  $[Co(NH_3)_6]^{3+}$
- B.  $[Mn(CN)_6]^{4-}$
- C.  $[Fe(CN)_6]^{4-}$
- D.  $[Fe(CN)_6]^{3-}$

**Answer: A::C**

 [View Text Solution](#)

**107.** Atomic number of Mn, Fe, Co and Ni are 25, 26, 27 and 28 respectively. Which of the following outer orbital octahedral complexes have same number of unpaired electrons ?



**Answer: A::C**

 [View Text Solution](#)

108. Which of the following options are correct for  $[Fe(CN)_6]^{3-}$  complex ?

A.  $d^2sp^3$  hybridisation

B.  $sp^3d^2$  hybridisation

C. paramagnetic

D. diamagnetic

**Answer: A:C**



[View Text Solution](#)

109. An aqueous pink solution of cobalt(II) chloride changes to deep blue on addition of excess of HCl. This is because .....

A.  $[Co(H_2O)_6]^{2+}$  is transformed into  $[CoCl_6]^{4-}$

B.  $[Co(H_2O)_6]^{2+}$  is transformed into  $[CoCl_4]^{2-}$

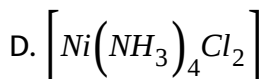
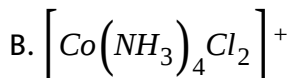
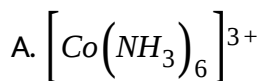
C. tetrahedral complexes have smaller crystal field splitting than octahedral complexes

D. tetrahedral complexes have larger crystal field splitting than octahedral complex.

**Answer: B::C**

 [View Text Solution](#)

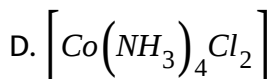
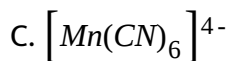
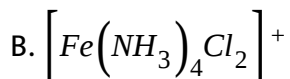
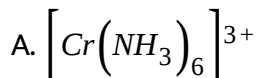
**110.** Which of the following complexes are homoleptic ?



**Answer: A::C**

 [View Text Solution](#)

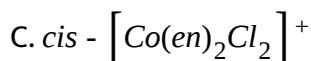
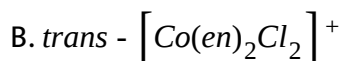
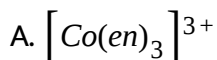
111. Which of the following complexes are heteroleptic ?

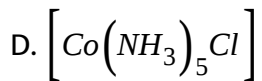


Answer: B::D

 [View Text Solution](#)

112. Identify the optically active compounds from the following :





**Answer: A::C**

 [View Text Solution](#)

**113.** Identify the correct statements for the behaviour of ethane-1, 2-diamine as a ligand :

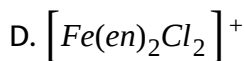
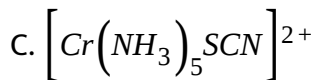
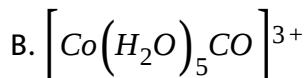
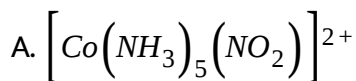
- A. It is a neutral ligand
- B. It is a didentate ligand
- C. It is a chelating ligand
- D. It is a unidentate ligand

**Answer: A::B::C**

 [View Text Solution](#)



114. Which of the following complexes show linkage isomerism ?

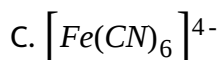
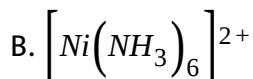
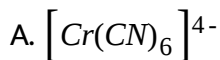


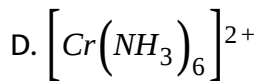
Answer: A:C



[View Text Solution](#)

115. Which of the following complex(es) is paramagnetic as well as low spin ?

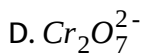
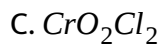




**Answer: A**

 [View Text Solution](#)

**116.** In which of the following geometry around metal is tetrahedral and colour is due to charge transfer spectra (LMCT) ?



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

 [View Text Solution](#)

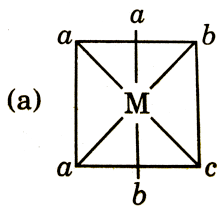
117. Which of the following complex ion of Ag cation have correct indicated properties, where L is a weak monodentate neutral ligand?

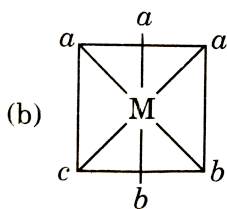
- A.  $[AgL_2]^+$  : linear and diamagnetic
- B.  $[AgL_4]^+$  : tetrahedral and paramagnetic
- C.  $[AgL_6]^{2+}$  : octahedral and paramagnetic
- D.  $[AgL_4]^{3+}$  : square planar and diamagnetic

Answer: A::C::D

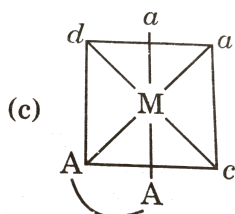
 [View Text Solution](#)

118. Which of the following type of complex(s) is/are optically inactive ?

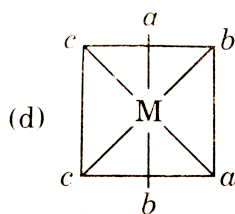




B.



C.



D.

**Answer: A::B**



[View Text Solution](#)

**119.** Select the correct statements :

A. The smaller the ligand, the closer it comes to the metal ion and thus the greater the repulsion between ligand and the electrons

present in the d-orbital of central atom that is why

$I^- < Br^- < Cl^- < F^-$  are present in spectrochemical series as order.

B. Aminoethanethiolate complex of  $Pt(II)$ ,  $\left[Pt(NH_2CH_2CH_2S)_2\right]$  has

no enantiomers but has geometrical isomers while

aminoethanethiolate complex of  $Co(II)$ ,  $\left[Co(NH_2CH_2CH_2S)_2\right]$

has no enantiomers and no geometrical isomers.

C.  $\left[Ni(H_2O)_6\right]^{2+}$  is green,  $\left[Ni(NH_3)_6\right]^{2+}$  is deep blue and

$\left[Ni(CN)_4\right]^{2-}$  is yellow because  $\left[Ni(H_2O)_6\right]^{2+}$  has absorbed red

colour,  $\left[Ni(NH_3)_6\right]^{2+}$  has absorbed orange colour and

$\left[Ni(CN)_4\right]^{2-}$  has absorbed violet indigo colour.

D.  $\left[Fe(C_2O_4)_3\right]^{3-}$  complex ion has  $d^2sp^3$  hybridisation, is inner

orbital complex and low spin.

**Answer: A::C**



**View Text Solution**

120. (Co-ordination entity, Wave length of light), ( $\lambda$ , absorbed(nm)), (  
 $[\text{CoCl}(\text{NH}_3)_5]^{2+}$ , "P), ( $[\text{CoCl}(\text{NH}_3)_5(\text{H}_2\text{O})]^{3+}$ , "Q), (  
 $[\text{Co}(\text{NH}_3)_6]^{3+}$ , "R), ( $[\text{Co}(\text{CN})_6]^{3+}$ , "S), ( $[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$ , "T) :}

A.  $P > R > Q$

B.  $T > P > Q > R > S$

C.  $P > Q > R$

D.  $T > Q > P > R > S$

Answer: B::C

 [View Text Solution](#)

121. Which of the following orders are correct ?

A.  $[\text{Fe}(\text{CO})_4]^{2-} < [\text{Co}(\text{CO})_4]^- < [\text{Ni}(\text{CO})_4] \Rightarrow$  Stretching vibrational  
frequency of C-O bond

B.  $[Mn(Co)_5]^- < [Mn(CO)_6]^+ imp \leq s$  EAN of central metal ion

C.  $Trien = imda^{2-} \Rightarrow$  Denticity of ligand

D.  $[Ni(en)_3]^{2+} < [Ni(NH_3)_2(en)_2]^{2+} \Rightarrow$  Number of stereo isomers

**Answer: A::D**

 [View Text Solution](#)

**122.** Which of the following chemical species act as ambidentate ligand ?

A.  $C_2S_2O_2^{2-}$

B.  $NO_2^-$

C.  $CN^-$

D.  $SCN^-$

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

 [View Text Solution](#)

123. Which of the following chemical can act as non-classical ligand(s) ?

A. CO

B.  $C_2H_4$

C.  $NO^+$

D.  $PR_3$

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



[View Text Solution](#)

124. Which of the following is/are the characteristics of ferrocene ?

A. Cyclopentadienyl act as a  $\pi$  - *don* or ligand

B. Fe is in ( + 2) oxidation state

C. It is an organometallic compound

D. It has metal-carbon bond



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

 [View Text Solution](#)

**125.** In case of  $\left[ Mn(NH_3)_6 \right]^{2+}$ :

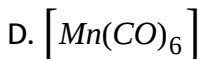
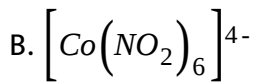
- A. Relation in between  $\Delta_0$  and  $P$  is  $\Delta_0 < P$
- B. Two unpaired electrons are present in axial d-orbital of  $Mn^{2+}$
- C. Hybridisation of central metal atom of complex is  $d^2sp^3$
- D. d-orbitals involved in hybridisation of central atom are  $d_{x^2}$  and  $d_{xy}$

**Answer: A::B**

 [View Text Solution](#)

**126.** Which of the following species(s) act as reducing agent.

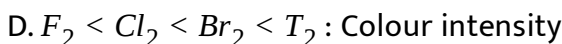
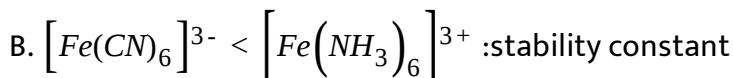
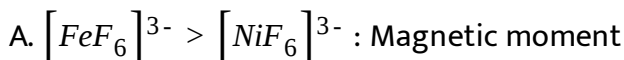
A.  $[Co(CN)_6]^{4-}$



**Answer: A::B::D**

 [View Text Solution](#)

127. Which of the following does not represent the correct sequence of indicated properties ?



**Answer: B::C**

 [View Text Solution](#)

128. Which of the following statement(s) is/are correct ?

A.  $Ni(CO)_4$  is diamagnetic and  $sp^3$  hybridised

B. Complex ion  $[Cu(CN)_4]^{3-}$  is paramagnetic and  $Cu^+$  ion is  $dsp^2$  hybridised

C.  $[MnBr_4]^{2-}$  ion is paramagnetic and  $sp^3$  hybridised

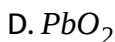
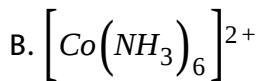
D. Vaska's Catalyst i.e.  $[IrCl(CO)(PPh_3)_2]$  is diamagnetic and  $Ir^+$  ion is  $dsp^2$  hybridised .

Answer: A::C::D

 [View Text Solution](#)

129. Which of the following is/are act as reducing agent ?

A.  $Na_2S_2O_3$



**Answer: A::B::C**

 [View Text Solution](#)

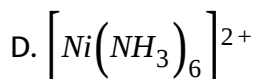
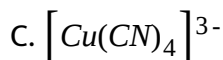
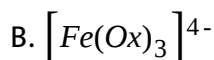
## COMPREHENSION 1

1. 180 electron rule: Valence shell of a transition metal consists of nine valence orbitals of (n-1) d, ns and np sub-shells, which can accommodate 18 electrons. When a metal complex has 18 valence electrons, it is said to have achieved the same electronic configuration as the noble gas at the end of the period. The rule and its exception are similar to the application of the octet rule of main group elements. The rule is not helpful for complexes of the s-block metals, the lanthanides or actinides. Effective atomic number is the total number of electrons possessed by the central

possessed by the central metal atom/ion including the electrons contributed by the ligands. It is obvious that if a central transition metal atom/ion achieves 18 electrons in its valence shell, it attains the nearest noble gas configuration, which is known as effective atomic number (EAN) rule.

[Atomic number :Cr=24, Fe=26, Cu=29, Ni=28, Rh=45]

Which of the following does not obey EAN rule or 18 electron rule ?



**Answer: D**



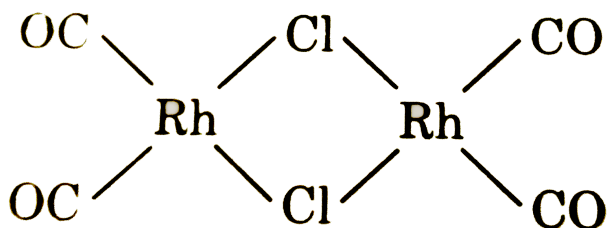
[View Text Solution](#)

2. 180 electron rule: Valence shell of a transition metal consists of nine valence orbitals of (n-1) d, ns and np sub-shells, which can accommodate

18 electrons. When a metal complex has 18 valence electrons, it is said to have achieved the same electronic configuration as the noble gas at the end of the period. The rule and its exception are similar to the application of the octet rule of main group elements. The rule is not helpful for complexes of the s-block metals, the lanthanides or actinides. Effective atomic number is the total number of electrons possessed by the central metal atom/ion including the electrons contributed by the ligands. It is obvious that if a central transition metal atom/ion achieves 18 electrons in its valence shell, it attains the nearest noble gas configuration, which is known as effective atomic number (EAN) rule.

[Atomic number :Cr=24, Fe=26, Cu=29, Ni=28, Rh=45]

The effective atomic number of Rhodium in



is :

B. 52

C. 56

D. 53

**Answer: B**



[View Text Solution](#)

**3. 180 electron rule:** Valence shell of a transition metal consists of nine valence orbitals of  $(n-1) d$ ,  $ns$  and  $np$  sub-shells, which can accommodate 18 electrons. When a metal complex has 18 valence electrons, it is said to have achieved the same electronic configuration as the noble gas at the end of the period. The rule and its exception are similar to the application of the octet rule of main group elements. The rule is not helpful for complexes of the  $s$ -block metals, the lanthanides or actinides. Effective atomic number is the total number of electrons possessed by the central metal atom/ion including the electrons contributed by the ligands. It is obvious that if a central transition metal

atom/ion achieves 18 electrons in its valence shell, it attains the nearest noble gas configuration, which is known as effective atomic number (EAN) rule.

[Atomic number :Cr=24, Fe=26, Cu=29, Ni=28, Rh=45]

18 electron rule is applicable to :

- A. s-block elements
- B. p-block elements
- C. d-block elements
- D. f-block elements

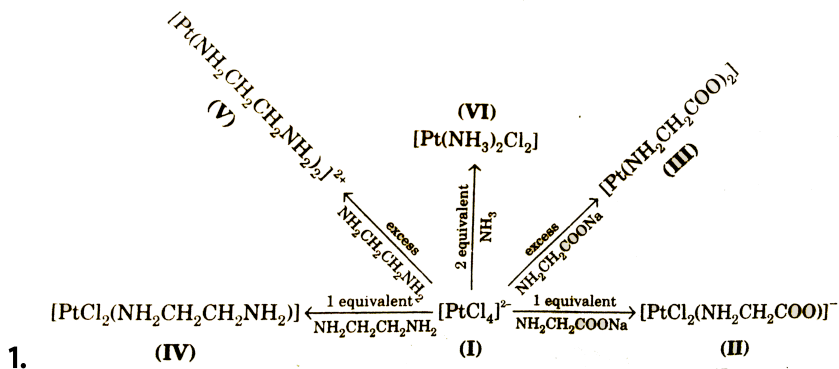
**Answer: C,**



[View Text Solution](#)

**COMPREHENSION 2**





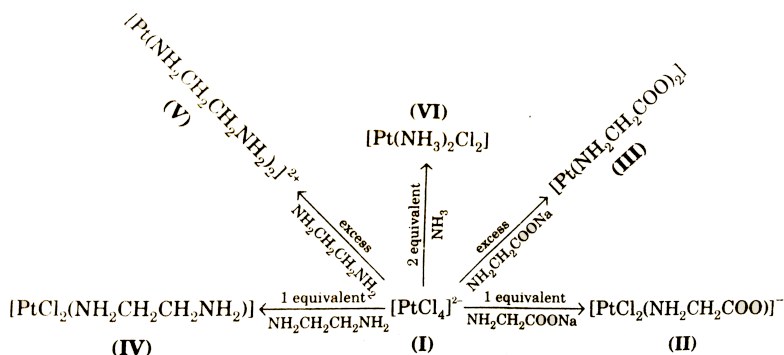
All these complexes are square planar about  $\text{Pt}^{II}$ . Square planar complexes show geometrical isomerism provided ligands are proper. A bidentate ligand (like ethylenediamine, glycinate) does not attach itself in anti-position. If the ligands present in square planar complexes do not contain chiral or asymmetric center, such complexes do not show optical isomerism due to presence of plane of symmetry.

Optical isomerism is shown by :

- A. IV
- B. V
- C. III
- D. none of these

Answer: D

 View Text Solution



All these complexes are square planar about  $Pt^{II}$ . Square planar complexes show geometrical isomerism provided ligands are proper. A bidentate ligand (like ethylenediamine, glycinato) does not attach itself in anti-position. If the ligands present in square planar complexes do not contain chiral or asymmetric center, such complexes do not show optical isomerism due to presence of plane of symmetry.

Geometrical isomerism is exhibited by

A. II, III, VI

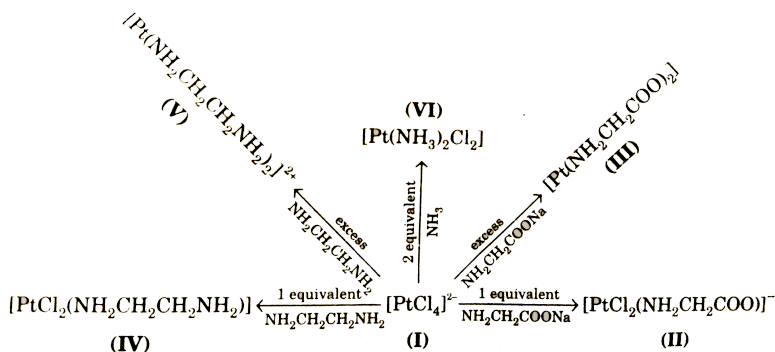
B. III, IV, V

C. III, IV, VI

D. II, IV, VI

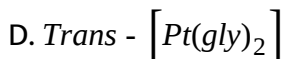
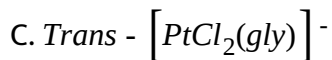
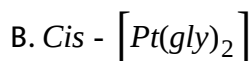
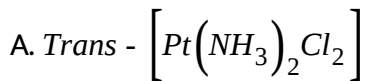
Answer: A

 View Text Solution



All these complexes are square planar about  $\text{Pt}^{\text{II}}$ . Square planar complexes show geometrical isomerism provided ligands are proper. A bidentate ligand (like ethylenediamine, glycinato) does not attach itself in anti-position. If the ligands present in square planar complexes do not contain chiral or asymmetric center, such complexes do not show optical isomerism due to presence of plane of symmetry.

Which of the following is not possible ?



**Answer: C,**

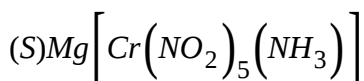
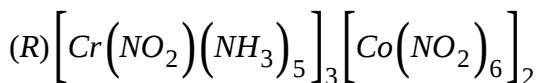
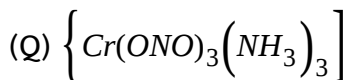
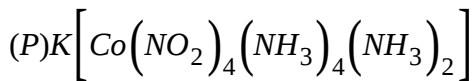
 [View Text Solution](#)

## COMPREHENSION 4

1. Complex compound 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 with complicated structures. 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.

Arrange the following compounds in order of their Molar conductance :



A.  $Q < P < S < R$

B.  $P < Q < R < S$

C.  $Q < P < R < S$

D.  $S < R < Q < P$

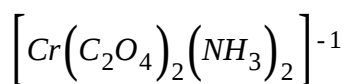
**Answer: A**



**View Text Solution**

2. 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 with complicated structures. 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.

The oxidation number and coordination number and EAN of chromium in the following complex is :



A. *O. N.* = + 4, *C. N.* = 4 and *EAN* = 36

B. *O. N.* = + 3, *C. N.* = 4 and *EAN* = 36

C. *O. N.* = - 1, *C. N.* = 4 and *EAN* = 33

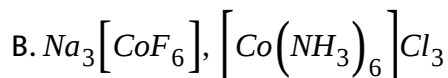
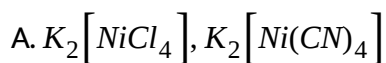
D. *O. N.* = + 3, *C. N.* = 6 and *EAN* = 33

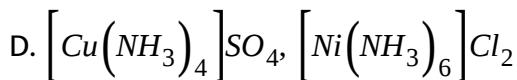
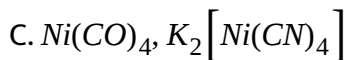
Answer: D

 [View Text Solution](#)

3. 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 with complicated structures. 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.

In which of the following pairs, both the complexes have the same geometry but different hybridisation ?





**Answer: B**

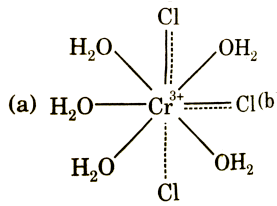
 [View Text Solution](#)

## COMPREHENSION 5

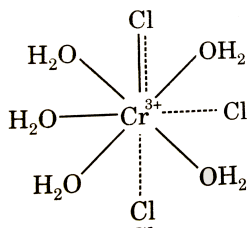
1. A, B and C are three complexes of chromium (III) with the empirical formula  $H_{12}O_6Cl_3Cr$ . All the three complexes have water and chloride ion as ligands. Complex A does not react with concentrated  $H_2SO_4$ , whereas complexes B and C lose 6.75% and 13.5% of their original weight, respectively, on treatment with concentrated  $H_2SO_4$ .

According to the Werner theory, the structure of complex A is represented by :

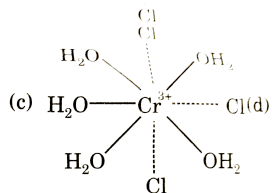




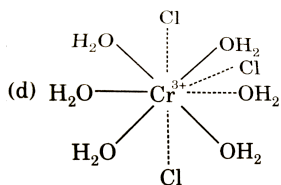
A.



B.



C.



D.

Answer: D



View Text Solution

2. A, B and C are three complexes of chromium (III) with the empirical formula  $H_{12}O_6Cl_3Cr$ . 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 weight, respectively, on treatment with concentrated  $H_2SO_4$ .

Complexes A, B and C are not distinguished by:

- A. molar conductivity data
- B. by using  $P_4O_{10}$
- C. qualitative test by  $AgNO_3$
- D. quantitative test by  $AgNO_3$

**Answer: C**

 [View Text Solution](#)

3. A, B and C are three complexes of chromium (III) with the empirical formula  $H_{12}O_6Cl_3Cr$ . 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 weight, respectively, on treatment with concentrated  $H_2SO_4$ .

Which type of isomerism is possible in complex C?

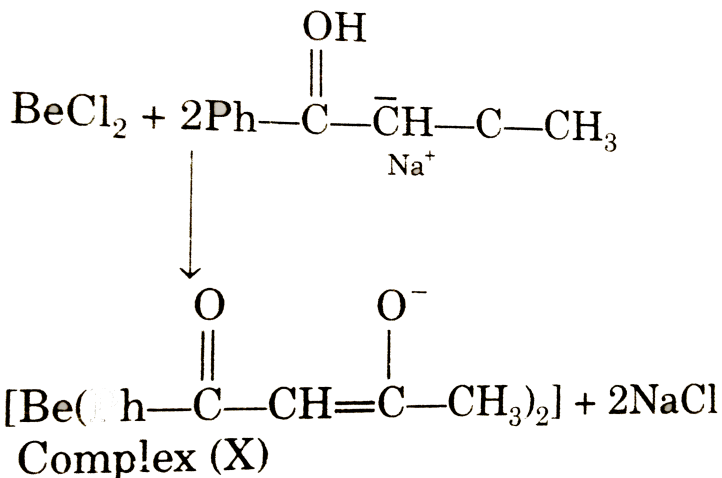
- A. Geometrical
- B. Hydration
- C. Co-ordination
- D. Both (a) and (b)

**Answer: D**



[View Text Solution](#)

**COMPREHENSION 6**



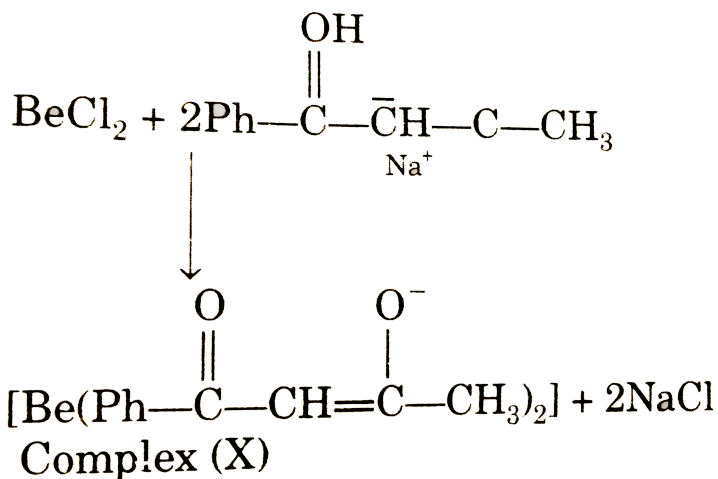
1.

The complex (X) has tetrahedral geometry. The correct name of the complex (X) is :

- A. bis(benzoylacetonoato)beryllium (II)
- B. dibenzoylacetonoatoberyllium (II)
- C. bis(benzoylacetonoato)beryllate (II)
- D. bis(acetylacetonoato)beryllium (II)

**Answer: A**

 [View Text Solution](#)



2.

Which of the following statement is correct fo(X).

- A. It is optically inactive
- B. It is optically active
- C. It does not follow EAN or octet rule
- D. It has  $S_4$  axis of symmetry

Answer: B

 [View Text Solution](#)

1. According to crystal field theory, interaction between central metal atom/ion and ligand is electrostatic in nature. In free metal ions, the five d-orbitals are degenerate. However, in a ligand field e.g., tetrahedral, octahedral, square planar, square pyramidal, trigonal bipyramidal, the degeneracy of 5d-orbitals is lost.

If lobes of d-orbitals of central metal atom/ion are along the axes through which ligands are approaching, the energy of corresponding d-orbital is raised more than the d-orbitals having lobes between the axes. e.g., octahedral complexes, square planar complexes, square pyramidal complexes.

Which of the following orbitals has the highest energy in square pyramidal ligand field ?

A.  $d_{xy}$

B.  $d_{z^2}$

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

D.  $d_{yz}, d_{zx}$

Answer: C

 [View Text Solution](#)

2. According to crystal field theory, interaction between central metal atom/ion and ligand is electrostatic in nature. In free metal ions, the five d-orbitals are degenerate. However, in a ligand field e.g., tetrahedral, octahedral, square planar, square pyramidal, trigonal bipyramidal, the degeneracy of 5d-orbitals is lost.

If lobes of d-orbitals of central metal atom/ion are along the axes through which ligands are approaching, the energy of corresponding d-orbital is raised more than the d-orbitals having lobes between the axes. e.g., octahedral complexes, square planar complexes, square pyramidal complexes.

The correct order  $\Delta_o$ ,  $\Delta_t$  and  $\Delta_{sp}$  (where o, t and sp stand for octahedral, tetrahedral and square planar fields respectively) is :

A.  $\Delta_o > \Delta_{sp} > \Delta_t$

B.  $\Delta_{sp} > \Delta_o > \Delta_t$

C.  $\Delta_{sp} > \Delta_t > \Delta_o$

D.  $\Delta_o > \Delta_t > \Delta_{sp}$

**Answer: B**



[View Text Solution](#)

## COMPREHENSION 8

1. Ligands are electron pair donor groups. Ambidentate ligands are those ligands where two different atoms can donate electron pair. The complex where ambidentate ligands are present shows linkage isomerism.

Total number of linkage isomers that are present in  $Na_4[Fe(CN)_5NOS]$  is

:

A. 18

B. 6

C. 8



**Answer: A**

 [View Text Solution](#)

2. Ligands are electron pair donor groups. Ambidentate ligands are those ligands where two different atoms can donate electron pair. The complex where ambidentate ligands are present shows linkage isomerism.

The correct name of linkage isomer of  $\left[Co(NH_3)_5(SCN)\right]SO_4$

- A. Pentaamminethiocyanato-S-cobalt (III) sulphate
- B. Pentaamminethiocyanato-N-Cobalt (II) sulphate
- C. Pentaamminethiocyanato-N-Cobalt (III) sulphate
- D. Pentaamminecyanato-N-Cobalt (III) sulphate

**Answer: C**

 [View Text Solution](#)

3. Ligands are electron pair donor groups. Ambidentate ligands are those ligands where two different atoms can donate electron pair. The complex where ambidentate ligands are present shows linkage isomerism.

Total possible linkage isomers of  $K_4[Fe(CN)_5(NO_2)]$  is :

A. 12

B. 10

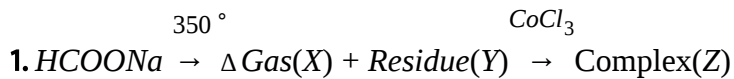
C. 6

D. 4

**Answer: A**



[View Text Solution](#)

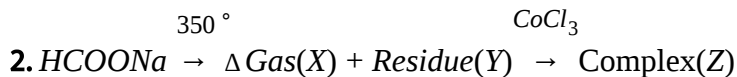


Choose the correct statement regarding (X).

- A. It is paramagnetic
- B. Its bond order is one
- C. It can't act as  $\pi$  - acid
- D. It is a powerful oxidising agent.

**Answer: D**

 [View Text Solution](#)



Complex (Z) is:

- A. an outer orbital complex
- B. optically active

C. oxidised when exposed to air

D. paramagnetic

**Answer: D**



[View Text Solution](#)

## COMPREHENSION 10

1. Double salts are addition compounds which lose their identify in aqueous solution whereas complexes which are also addition compounds do not lose their identify in aqueous solution. The coordination compounds show isomerism and find application in photography , qualitative analysis, metallurgy, water purification and in the treatment of various diseases.

Which of the following statement is incorrect ?

A. Alum is a double salt

B. EDTA salt of calcium is used in the treatment of lead poisoning.

C. Effective atomic number of the metals in complexes

$[Ni(CO)_4]$  and  $[Fe(CN)_6]^{4-}$  is same .

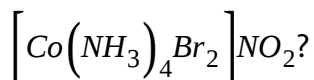
D. Chloridotris (triphenyl phosphine) rhodium(I) is effective heterogeneous catalyst for hydrogenation of alkenes.

**Answer: C**

 [View Text Solution](#)

2. Double salts are addition compounds which lose their identity in aqueous solution whereas complexes which are also addition compounds do not lose their identity in aqueous solution. The coordination compounds show isomerism and find application in photography , qualitative analysis, metallurgy, water purification and in the treatment of various diseases.

Which of the following statement is true for the complex,



- A. It shows ionisation, linkage and geometrical isomerism.
- B. It does not show optical isomerism because its cis and trans forms each have at least one plane of symmetry.
- C. Its ionisation isomers cannot be differentiated by silver nitrate solution.
- D. (a) and (b) both.

**Answer: D**



[View Text Solution](#)

3. Double salts are addition compounds which lose their identity in aqueous solution whereas complexes which are also addition compounds do not lose their identity in aqueous solution. The coordination compounds show isomerism and find application in photography, qualitative analysis, metallurgy, water purification and in the treatment of various diseases.

Choose the correct option for the complex  $[PtCl_2(en)_2]^{2+}$ .

- A. Platinum is in +2 oxidation state
- B. Racemic mixture is obtained on mixing mirror images of its trans form in 1:1 molar ratio
- C. It has two five membered chelating rings
- D. (b) and (c) both

**Answer: C**

 [View Text Solution](#)

## COMPREHENSION 11

1. In coordination chemistry there are a variety of methods applied to find out the structure of complexes. One method involves treating the complex with known reagents and from the nature of reaction, the formula of the complex can be predicted. An isomer of the complex  $\text{Co(en)}_2(\text{H}_2\text{O})\text{Cl}_2\text{Br}$ , on reaction with concentrated  $\text{H}_2\text{SO}_4$  (dehydrating agent), suffers loss in weight and on reaction with  $\text{AgNO}_3$  solution it

gives a white precipitate which is soluble in  $NH_3(aq)$ .

The correct formula of the complex is :

- A.  $[CoClBr(en)_2]H_2O$
- B.  $[CoCl(en)_2(H_2O)]BrCl$
- C.  $[CoBr(en)_2(H_2O)]Cl_2$
- D.  $[CoBrCl(en)_2]Cl \cdot H_2O$

**Answer: D**



[View Text Solution](#)

2. In coordination chemistry there are a variety of methods applied to find out the structure of complexes. One method involves treating the complex with known reagents and from the nature of reaction, the formula of the complex can be predicted. An isomer of the complex  $Co(en)_2(H_2O)Cl_2Br$ , on reaction with concentrated  $H_2SO_4$  (dehydrating agent), suffers loss in weight and on reaction with  $AgNO_3$  solution it gives a white precipitate which is soluble in  $NH_3(aq)$ .



If all the ligands in the coordination sphere of the above complex be replaced by  $F^-$ , then the magnetic moment of the complex ion (due to spin only) will be :

A. 2.8 BM

B. 5.9 BM

C. 4.9 BM

D. 1.73 BM

**Answer: C**



[View Text Solution](#)

**3.** In coordination chemistry there are a variety of methods applied to find out the structure of complexes. One method involves treating the complex with known reagents and from the nature of reaction, the formula of the complex can be predicted. An isomer of the complex  $Co(en)_2(H_2O)Cl_2Br$ , on reaction with concentrated  $H_2SO_4$  (dehydrating agent), suffers loss in weight and on reaction with  $AgNO_3$  solution it

gives a white precipitate which is soluble in  $NH_3(aq)$ .

Similarly if all the ligands in the coordination sphere are replaced by  $NO_2^-$ , then the magnetic moment of the complex ion (due to spin only) will be :

A. 1.73 BM

B. 0.0 BM

C. 4.9 BM

D. 5.9 BM

**Answer: B**



[View Text Solution](#)

4. In coordination chemistry there are a variety of methods applied to find out the structure of complexes. One method involves treating the complex with known reagents and from the nature of reaction, the formula of the complex can be predicted. An isomer of the complex  $Co(en)_2(H_2O)Cl_2Br$ , on reaction with concentrated  $H_2SO_4$  (dehydrating agent), suffers loss in weight and on reaction with  $AgNO_3$  solution it

gives a white precipitate which is soluble in  $NH_3(aq)$ .

If one mole of original complex is treated with excess  $Pb(NO_3)_2$  solution, then the number of moles of white precipitate (of  $PbCl_2$ ) formed will be

:

A. 0.5

B. 1.0

C. 0.0

D. 3.0

**Answer: A**



[View Text Solution](#)

5. In coordination chemistry there are a variety of methods applied to find out the structure of complexes. One method involves treating the complex with known reagents and from the nature of reaction, the formula of the complex can be predicted. An isomer of the complex  $Co(en)_2(H_2O)Cl_2Br$ , on reaction with concentrated  $H_2SO_4$  (dehydrating

agent), suffers loss in weight and on reaction with  $AgNO_3$  solution it gives a white precipitate which is soluble in  $NH_3(aq)$ .

The number of geometrical isomers of the formula fo the above original complex are (including the complex) :

A. 2

B. 3

C. 4

D. 1

**Answer: A**



[View Text Solution](#)

## COMPREHENSION 12

1. Valence bond theory for bonding in transition metal complexes was developed by Pauling. From the valence bond point of view, formation of a complex involves reaction between Lewis bases (ligands) and a Lewis

acid (metal atom or metal ion) with the formation of coordination covalent (or dative) bonds between them. The model utilizes hybridization of metal s, p and d valence orbitals to account for the observed structures and magnetic properties of complexes.

Valence bond theory is able to deal satisfactorily with many stereochemical and magnetic properties but it has nothing to say about electronic spectra or the reason for the kinetic inertness of chromium (III) and low spin cobalt (III) octahedral complexes. To understand this and more other features of transition metal we must turn to other theories like crystal field theory etc.

Pure crystal field theory assumes that the only interaction between the metal ion and the ligands is an electrostatic or ionic one with the ligands being regarded as negative point charges. This theory is quite successful in interpreting many important properties of complexes.

Select the correct statement about the crystal field theory.

- A. Metal-ligand bond in coordination compounds arises purely from electrostatic interaction between the metal ion and the ligand.

- B. Metal-ligand bond in coordination compound is purely a covalent bond.
- C. The pattern of splitting of the d-orbitals depends upon the nature of the crystal field.
- D. Both (a) and (c).

**Answer: D**

 [View Text Solution](#)

2. Valence bond theory for bonding in transition metal complexes was developed by Pauling. From the valence bond point of view, formation of a complex involves reaction between Lewis bases (ligands) and a Lewis acid (metal atom or metal ion) with the formation of coordination covalent (or dative) bonds between them. The model utilizes hybridization of metal s, p and d valence orbitals to account for the observed structures and magnetic properties of complexes.

Valence bond theory is able to deal satisfactorily with many stereo

chemical and magnetic properties but it has nothing to say about electronic spectra or the reason for the kinetic inertness of chromium (III) and low spin cobalt (III) octahedral complexes. To understand this and more other features of transition metal we must turn to other theories like crystal field theory etc.

Pure crystal field theory assumes that the only interaction between the metal ion and the ligands is an electrostatic or ionic one with the ligands being regarded as negative point charges. This theory is quite successful in interpreting many important properties of complexes.

Which of the following is correct for the complex  $\left[ \text{Ti}(\text{H}_2\text{O})_6 \right]^{3+}$  ?

- A. Hybridization of central metal ion of the complex is  $sp^3d^2$ .
- B. The complex is paramagnetic containing one unpaired electron.
- C. Hybridization of central metal ion of the complex is  $d^2sp^3$ .
- D. Both (b) and (c).

**Answer: D**



[View Text Solution](#)

**3.** Valence bond theory for bonding in transition metal complexes was developed by Pauling. From the valence bond point of view, formation of a complex involves reaction between Lewis bases (ligands) and a Lewis acid (metal atom or metal ion) with the formation of coordination covalent (or dative) bonds between them. The model utilizes hybridization of metal s, p and d valence orbitals to account for the observed structures and magnetic properties of complexes.

Valence bond theory is able to deal satisfactorily with many stereochemical and magnetic properties but it has nothing to say about electronic spectra or the reason for the kinetic inertness of chromium (III) and low spin cobalt (III) octahedral complexes. To understand this and more other features of transition metal we must turn to other theories like crystal field theory etc.

Pure crystal field theory assumes that the only interaction between the metal ion and the ligands is an electrostatic or ionic one with the ligands being regarded as negative point charges. This theory is quite successful in interpreting many important properties of complexes.



The hybridization of  $\left[ \text{NiCl}_2(\text{PPh}_3)_2 \right]$  and  $\left[ \text{NiCl}_2(\text{Pme}_3)_2 \right]$  are respectively (consider  $\text{PPh}_3$  a bulkier ligand than  $\text{Pme}_3$ ):

A.  $sp^3$  and  $dsp^2$

B.  $sp^3$  and  $sp^3$

C.  $dsp^2$  and  $dsp^2$

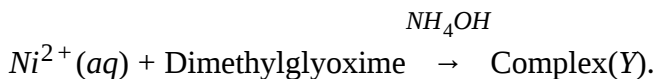
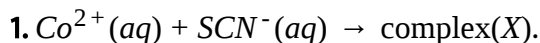
D.  $dsp^2$  and  $sp^3$

**Answer: A**



[View Text Solution](#)

## COMPREHENSION 13



The coordination number of cobalt and nickel in complexes X and Y are

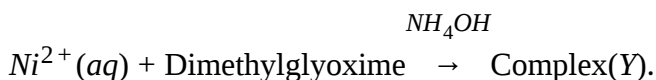
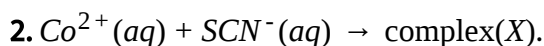
four.

The IUPAC names of the complexes (X) and (Y) are respectively.

- A. tetrahiocyanato-S-cobalt (II) and bis(dimethylglyoximate) nickel(II).
- B. tetrathiocyanato-S-cobaltate (II) and bis(dimethylglyoximato) nickel (II).
- C. tetrathiocyanato-S-cobaltate (II) and bis(dimethylglyoximato) nickelate(II).
- D. tetrathiocyanato-S-cobaltate (II) and bis(dimethylglyoximato) nickel(II).

**Answer: B**

 [View Text Solution](#)



The coordination number of cobalt and nickel in complexes X and Y are

four.

The geometry of complexes (X) and (Y) are respectively :

A. tetrahedral and square planar

B. both tetrahedral

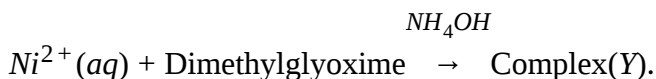
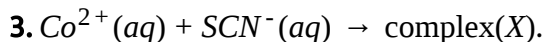
C. square planar and tetrahedral

D. both square planar

**Answer: A**



[View Text Solution](#)



The coordination number of cobalt and nickel in complexes X and Y are four.

Select the correct statement for the complexes (X) and (Y).

A. (X) is paramagnetic with two unpaired electrons.

B. (Y) is diamagnetic and shows intermolecular H-bonding

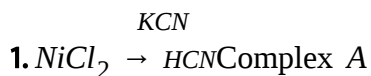
C. (X) is paramagnetic with three unpaired electrons and (Y) is diamagnetic.

D. (X) and (Y) both are diamagnetic

**Answer: C**

 [View Text Solution](#)

## COMPREHENSION 14



A and B complexes have the co-ordination number 4.

The IUPAC name of complexes A and B are respectively :

- A. Potassium tetracyanonickelate(II) and Potassium tetrachloronickelate(II)

B. Potassium tetracyanonickel (II) and Potassium tetrachloronickel(II)

C. Potassium cyanonickelate(II) and Potassium chloronickel(II)

D. Potassium cyanonickel(II) and Potassium chloronickel(II)

**Answer: A**

 [View Text Solution](#)

2.  $NiCl_2 \xrightarrow{KCN} HCN \text{Complex } A$

$NiCl_2 \xrightarrow{KCN} excess \text{Complex } B$

A and B complexes have the co-ordination number 4.

The hybridization of both complexes are :

A.  $dsp^2$

B.  $sp^2$  and  $dsp^2$

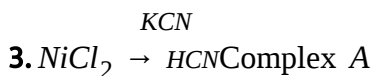
C.  $dsp^2$  and  $sp^3$

D. both  $sp^3$

Answer: C



View Text Solution



A and B complexes have the co-ordination number 4.

What are the magnetic nature of A and B ?

A. Both diamagnetic.

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

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

D. Both are paramagnetic.

Answer: C



View Text Solution

## COMPREHENSION 15

1. A metal complex  $Cr(NH_3)_4Cl_2$  having molar conductivity corresponding to 1:1 electrolyte have been isolated in two Forms (X) and (Y), (X) reacts with  $AgNO_3$  giving white precipitate which turns yellow on reaction with sodium arsenite whereas (Y) gives a yellow precipitate soluble in concentrate  $NH_4OH$

The correct formula and the IUPAC name of the complex (X) is :

- A.  $[Cr(NH_3)_4Cl_2]Br$  and tetraaminedichloridochromate(II) bromide.
- B.  $[Cr(NH_3)_4ClBr]Cl$  and tetraamminebromidochloridochromate(II) chloride.
- C.  $[Cr(NH_3)_4ClBr]Cl$  and tetramminebromidochloridochromium(III) chloride.

D.  $\left[ Cr(NH_3)_4ClBr \right]Cl$  and tetraamminebromidochloridochromium(III) chloride.

**Answer: D**

 [View Text Solution](#)

2. A metal complex  $Cr(NH_3)_4Cl_2$  having molar conductivity corresponding to 1:1 electrolyte have been isolated in two Forms (X) and (Y), (X) reacts with  $AgNO_3$  giving white precipitate which turns yellow on reaction with sodium arsenite whereas (Y) gives a yellow precipitate soluble in concentrate  $NH_4OH$

The hybridization of chromium in complexes (X) and (Y) are :

- A. both  $sp^3d^2$
- B. both  $d^2sp^3$
- C.  $d^2sp^3$  and  $sp^3d^2$  respectively
- D.  $sp^3d^2$



**Answer: B**



[View Text Solution](#)

3. A metal complex  $Cr(NH_3)_4Cl_2$  having molar conductivity corresponding to 1 : 1 electrolyte have been isolated in two Forms (X) and (Y), (X) reacts with  $AgNO_3$  giving white precipitate which turns yellow on reaction with sodium arsenite whereas (Y) gives a yellow precipitate soluble in concentrate  $NH_4OH$

Which of the following statements is true for the complex (X) and (Y) ?

- A. The effective atomic number of chromium in both the complexes is 33.
- B. Both can exist as diastereomers.
- C. Both cis and trans forms of (X) have same dipole moment.
- D. All of these

**Answer: D**

4. A metal complex  $Cr(NH_3)_4Cl_2$  having molar conductivity corresponding to 1:1 electrolyte have been isolated in two Forms (X) and (Y), (X) reacts with  $AgNO_3$  giving white precipitate which turns yellow on reaction with sodium arsenite whereas (Y) gives a yellow precipitate soluble in concentrate  $NH_4OH$

The forms (X) and (Y) are example of :

- A. linkage isomers
- B. ligand isomers
- C. ionisation isomers
- D. coordination position isomers

**Answer: C**

5. A metal complex  $Cr(NH_3)_4Cl_2$  having molar conductivity corresponding to 1:1 electrolyte have been isolated in two Forms (X) and (Y), (X) reacts with  $AgNO_3$  giving white precipitate which turns yellow on reaction with sodium arsenite whereas (Y) gives a yellow precipitate soluble in concentrate  $NH_4OH$

Which of the following statements is true for the complex (Y) ?

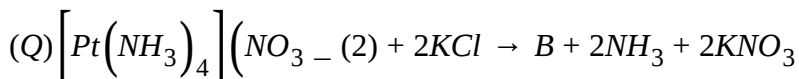
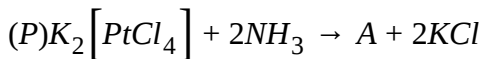
- A. Its trans form is non-planar
- B. Its IUPAC name is tetraaminedichloridochromate(III) bromide.
- C. Its 'spin only' magnetic moment is 3.83 BM.
- D. All of these

**Answer: C**



[View Text Solution](#)

1. A chemical performs the following reactions :



He finds that both A and B are white, crystalline compounds that give elemental analysis for empirical formula  $PtCl_2(NH_3)_2$ . However, A is most soluble in polar solvents, such as ethanol, while B is soluble in petroleum ether and carbon tetrachloride.

The correct IUPAC name of complex A is :

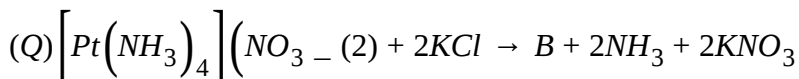
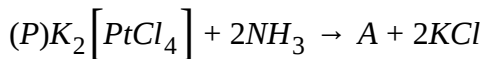
- A. cis-dichloridodiammineplatinate(II)
- B. cis-diamminedichloridoplatinum(II)
- C. trans-diamminedichloridoplatinum(II)
- D. trans-diamminedichloridoplatinate(II).

**Answer: B**



[View Text Solution](#)

2. A chemical performs the following reactions :



He finds that both A and B are white, crystalline compounds that give elemental analysis for empirical formula  $PtCl_2(NH_3)_2$ . However, A is most soluble in polar solvents, such as ethanol, while B is soluble in petroleum ether and carbon tetrachloride.

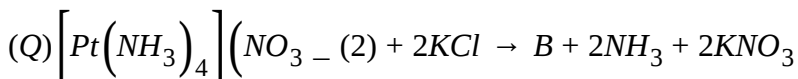
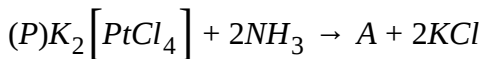
Which of the following statements is true for the complex A and B ?

- A. Both the compounds react with silver oxalate to give white precipitate.
- B. Only A reacts with silver oxalate to give white precipitate.
- C. Only B reacts with silver oxalate to give white precipitate.
- D. None of these react with silver oxalate.

**Answer: B**

 [View Text Solution](#)

3. A chemical performs the following reactions :



He finds that both A and B are white, crystalline compounds that give elemental analysis for empirical formula  $PtCl_2(NH_3)_2$ . However, A is most soluble in polar solvents, such as ethanol, while B is soluble in petroleum ether and carbon tetrachloride.

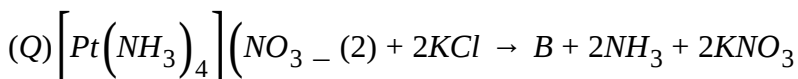
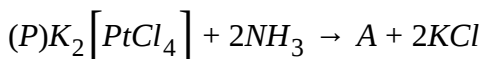
Which of the following statement is true ?

- A. Both A and B forms are diamagnetic involving square planar geometry.
- B. Both A and B forms are a paramagnetic involving square planar geometry.
- C. Both A and B form are diamagnetic involving tetrahedral geometry.
- D. Both A and B forms are paramagnetic involving tetrahedral geometry.

Answer: A

 [View Text Solution](#)

4. A chemical performs the following reactions :



He finds that both A and B are white, crystalline compounds that give elemental analysis for empirical formula  $PtCl_2(NH_3)_2$ . However, A is most soluble in polar solvents, such as ethanol, while B is soluble in petroleum ether and carbon tetrachloride.

Select the correct statement from the following statements.

- A. A form is used as anti-cancer
- B. B form has some dipole moment
- C. (a) and (b) both
- D. None

Answer: A



View Text Solution

## COMPREHENSION 17

1. Square planar complexes are generally formed by  $d^8$  ions with strong field ligands. The crystal field splitting is larger for second and third row transition elements and for more highly charged species. All the complexes having  $4d^8$  and  $5d^8$  configuration are mostly square including those with weak field ligands such halide ions. Square planar complexes with coordination number four can show diastereoisomerism.

Which of the ions do not form the square planar complexes amongst the following ions ?

A.  $Ni(+II)$  and  $Rh(+I)$  with strong field ligands

B.  $Rh(+I)$  and  $Au(+III)$  with strong as well as weak field ligands.



C.  $Pd(+II)$ ,  $Pt(+II)$  and  $Au(+III)$  with strong as well as weak field ligands.

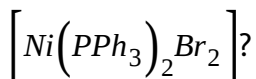
D. None of the above

**Answer: D**

 [View Text Solution](#)

2. Square planar complexes are generally formed by  $d^8$  ions with strong field ligands. The crystal field splitting is larger for second and third row transition elements and for more highly charged species. All the complexes having  $4d^8$  and  $5d^8$  configuration are mostly square including those with weak field ligands such halide ions. Square planar complexes with coordination number four can show diastereoisomerism.

Which of the following statements is true for the complex



- A. Hybridisation is the same as found in nickel (+ 2) complex with strong field ligands like CN.
- B. Hybridisation is the same as found in nickel (0) complex with strong field ligands like CO.
- C. Hybridisation is the same as found in nickel (+ 2) complex with weak field ligands like halide ions.
- D. (b) and (c ) both

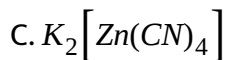
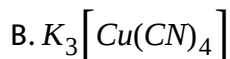
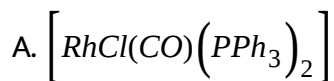
**Answer: D**

 [View Text Solution](#)

3. Square planar complexes are generally formed by  $d^8$  ions with strong field ligands. The crystal field splitting is larger for second and third row transition elements and for more highly charged species. All the complexes having  $4d^8$  and  $5d^8$  configuration are mostly square including those with weak field ligands such halide ions. Square planar complexes

with coordination number four can show diastereoisomerism.

Amongst the following complexes which has square planar geometry ?



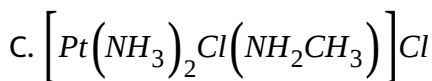
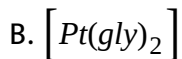
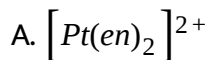
**Answer: A**



[View Text Solution](#)

4. Square planar complexes are generally formed by  $d^8$  ions with strong field ligands. The crystal field splitting is larger for second and third row transition elements and for more highly charged species. All the complexes having  $4d^8$  and  $5d^8$  configuration are mostly square including those with weak field ligands such halide ions. Square planar complexes with coordination number four can show diastereoisomerism.

Which one of the following square planar complexes will show geometrical isomerism ?



D. (b) and (c) both

**Answer: D**



[View Text Solution](#)

## COMPREHENSION 18

1. Geometrical isomerism arises in heteroleptic complexes due to different possible geometrical arrangement of the ligands. Important examples of this behaviour are found with coordination number 4 and 6. Such isomerism is not possible for a tetrahedral geometry but it is

possible for square planar as well as octahedral complexes. Optical square planar as well as octahedral complexes. Optical square planar as well as octahedral complexes. Optical isomers are mirror images that cannot be superimposed on one another. These are called enantiomers. Optical isomerism is common in octahedral complexes involving bidentate ligands.

The total number of isomers possible for the complex  $[Co(en)_2Cl_2]^+$  is :

A. 3

B. 4

C. 5

D. 2

**Answer: A**

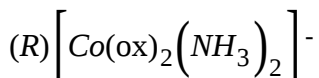
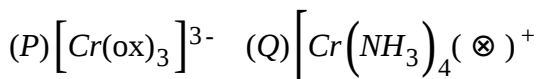


[View Text Solution](#)

2. Geometrical isomerism arises in heteroleptic complexes due to different possible geometrical arrangement of the ligands. Important

examples of this behaviour are found with coordination number 4 and 6. Such isomerism is not possible for a tetrahedral geometry but it is possible for square planar as well as octahedral complexes. Optical square planar as well as octahedral complexes. Optical square planar as well as octahedral complexes. Optical isomers are mirror images that cannot be superimposed on one another. These are called enantiomers. Optical isomerism is common in octahedral complexes involving bidentate ligands.

For which of the following complexes, are optical isomers possible ?



Select the correct answer using the codes given below :

- A. P only
- B. P and Q only
- C. P and R only
- D. P, Q and R

**Answer: C**



3. Geometrical isomerism arises in heteroleptic complexes due to different possible geometrical arrangement of the ligands. Important examples of this behaviour are found with coordination number 4 and 6. Such isomerism is not possible for a tetrahedral geometry but it is possible for square planar as well as octahedral complexes. Optical square planar as well as octahedral complexes. Optical square planar as well as octahedral complexes. Optical isomers are mirror images that cannot be superimposed on one another. These are called enantiomers. Optical isomerism is common in octahedral complexes involving bidentate ligands.

Which one of the following statements is false ?

- A.  $\left[ \text{cis} - \text{Pt}(\text{NH}_3)_2\text{Cl}_2 \right]$  will have some dipole moment
- B.  $\left[ \text{cis} - \text{Pt}(\text{NH}_3)_2\text{Cl}_2 \right]$  will show geometrical as well as optical isomerism.
- C.  $\text{cis} - \left[ \text{CrCl}_2(\text{ox})_2 \right]$  is a chiral molecules.

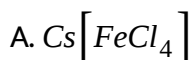
D. (a) and (b) both

**Answer: B**

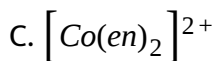
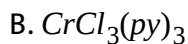
 [View Text Solution](#)

4. Geometrical isomerism arises in heteroleptic complexes due to different possible geometrical arrangement of the ligands. Important examples of this behaviour are found with coordination number 4 and 6. Such isomerism is not possible for a tetrahedral geometry but it is possible for square planar as well as octahedral complexes. Optical square planar as well as octahedral complexes. Optical square planar as well as octahedral complexes. Optical isomers are mirror images that cannot be superimposed on one another. These are called enantiomers. Optical isomerism is common in octahedral complexes involving bidentate ligands.

Which of the following complexes will show geometrical isomerism ?







**Answer: B**



[View Text Solution](#)

5. Geometrical isomerism arises in heteroleptic complexes due to different possible geometrical arrangement of the ligands. Important examples of this behaviour are found with coordination number 4 and 6. Such isomerism is not possible for a tetrahedral geometry but it is possible for square planar as well as octahedral complexes. Optical square planar as well as octahedral complexes. Optical square planar as well as octahedral complexes. Optical isomers are mirror images that cannot be superimposed on one another. These are called enantiomers. Optical isomerism is common in octahedral complexes involving

bedentate ligands.

Select the correct statement.

A. Both  $\left[ \text{NiCl}_2(\text{PPh}_3)_2 \right]$  and its analogous Pd(II) show geometrical isomerism.

B.  $\left[ \text{CoBrCl}(\text{en})_2 \right]$  will show geometrical isomerism but is chiral compound.

C. *cis* -  $\left[ \text{Co}(\text{NH}_3)_4\text{Br}_2 \right]^+$  can exist as enantiomer

D. A complex of palladium (II) with two chloride ions and two thiocyanate ions will show linkage as well as geometrical isomerism.

**Answer: D**

 [View Text Solution](#)

1. Splitting energy ( $\Delta_0$ ) can usually be measured from the absorption spectra of the complex ions. In simple cases when light is absorbed by a complex ion, an electron in one of the lower energy orbitals is excited to one of the higher energy orbital. The energy corresponding to the frequency of absorbed light is equal to  $\Delta_0$ . If value of  $\Delta_0$  for the complex is in visible region, the complex is coloured and the value of  $\Delta_0$  lies in ultraviolet or infrared region, the complex is colourless. For octahedral complexes, the crystal field stabilisation energy is given by  $CFSE = + \left[ -0.4t_{2g}N + 0.6e_gN_1 \right] \Delta_0$  Where N and  $N_1$  are number of electrons in  $t_{2g}$  and  $e_g$  orbitals respectively.

The value of CFSE can be used for the correction of the experimental values of heats of hydration of divalent can be obtained by subtracting the calculated CFSE values from the experimental values.

The value of crystal field splitting ( $\Delta_0$ ) for  $\left[ Ti(H_2O)_6 \right]^{3+}$  is  $243 \text{ kJ mol}^{-1}$ .

The crystal field stabilisation energy (CFSE) in this complex is : (in  $\text{kJ mol}^{-1}$ )

A.  $-\frac{3}{5} \times 243$

B.  $-\frac{2}{5} \times 243$

C.  $-3 \times \frac{2}{5} \times 243$

D. -243

**Answer: B**

 [View Text Solution](#)

2. Splitting energy ( $\Delta_0$ ) can usually be measured from the absorption spectra of the complex ions. In simple cases when light is absorbed by a complex ion, an electron in one of the lower energy orbitals is excited to one of the higher energy orbital. The energy corresponding to the frequency of absorbed light is equal to  $\Delta_0$ . If value of  $\Delta_0$  for the complex is in visible region, the complex is coloured and the value of  $\Delta_0$  lies in ultraviolet or infrared region, the complex is colourless. For octahedral complexes, the crystal field stabilisation energy is given by  $CFSE = + \left[ -0.4t_{2g}N + 0.6e_gN_1 \right] \Delta_0$  Where N and  $N_1$  are number of electrons in  $t_{2g}$  and  $e_g$  orbitals respectively.

The value of CFSE can be used for the correction of the experimental values of heats of hydration of divalent can be obtained by subtracting the calculated CFSE values from the experimental values.

Which of the following statements is correct ?

A. Zinc (II) ion has a zero CFSE for any geometry.

B. A solution of  $\left[Ti(H_2O)_6\right]^{3+}$  is purple as the value of  $\Delta$  for the  $H_2O$  complex is in the visible region.

C. Solution of  $[Fe(CN)_6]^{4-}$  and  $[Fe(H_2O)_6]^{2+}$  appear colourless in dilute solutions.

D. All of these

**Answer: D**

 [View Text Solution](#)

3. Splitting energy ( $\Delta_0$ ) can usually be measured from the absorption spectra of the complex ions. In simple cases when light is absorbed by a

complex ion, an electron in one of the lower energy orbitals is excited to one of the higher energy orbital. The energy corresponding to the frequency of absorbed light is equal to  $\Delta_0$ . If value of  $\Delta_0$  for the complex is in visible region, the complex is coloured and the value of  $\Delta_0$  lies in ultraviolet or infrared region, the complex is colourless. For octahedral complexes, the crystal field stabilisation energy is given by  $CFSE = + \left[ -0.4t_{2g}N + 0.6e_gN_1 \right] \Delta_0$  Where N and  $N_1$  are number of electrons in  $t_{2g}$  and  $e_g$  orbitals respectively.

The value of CFSE can be used for the correction of the experimental values of heats of hydration of divalent can be obtained by subtracting the calculated CFSE values from the experimental values.

The heat of hydration of  $Cr^{2+}$  ion is  $-450k \text{ cal/mol}$ . For  $\left[ Cr(H_2O)_6 \right]^{2+}$ ,  $\Delta_0 = 13,900 \text{ cm}^{-1}$ . What heat of hydration would be, if there were no crystal field stabilisation energy ?

- A.  $-426k \text{ cal/mole}$
- B.  $-245k \text{ cal/mole}$
- C.  $-4.84k \text{ cal/mole}$
- D. none of these

**Answer: A**



[View Text Solution](#)

## COMPREHENSION 20

1. In metal carbonyls, there is synergic bonding interaction between metal and carbon monoxide. This leads to increase in strength of metal ligands bond and decrease in bond order of CO in carbonyl complex as compared to bond order in carbon monoxide.

Simple carbonyls are invariably spin-paired complexes except for vanadium metal.

The increase in bond length in CO as compared to carbon monoxide is due to :

A. the donation of lone pair of electrons on the carbon into a vacant orbital of the metal atom.

- B. the donation of a pair of electrons form a filled d-orbital of metal into the vacant antibonding  $\pi^*$  orbital of carbon monoxide.
- C. (a) and (b) both
- D. none.

**Answer: B**

 [View Text Solution](#)

2. In metal carbonyls, there is synergic bonding interaction between metal and carbon monoxide. This leads to increase in strength of metal ligands bond and decrease in bond order of CO in carbonyl complex as compared to bond order in carbon monoxide.

Simple carbonyls are invariably spin-paired complexes except for vanadium metal.

Which of the following statement is false for nickel carbonyl  $[Ni(CO)_4]$ ?

- A. It is a colourless compound.



B. The Ni-C-O group is linear.

C. The four carbonyl group are lying at the corners of a regular tetrahedron.

D. The metal-carbon bond length (for  $\sigma$  bond) does not alter.

**Answer: D**

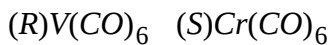
 [View Text Solution](#)

3. In metal carbonyls, there is synergic bonding interaction between metal and carbon monoxide. This leads to increase in strength of metal ligands bond and decrease in bond order of CO in carbonyl complex as compared to bond order in carbon monoxide.

Simple carbonyls are invariably spin-paired complexes except for vanadium metal.

Which one of the following metal carbonyls are inner orbital complexes with diamagnetic property ?

(P)  $Ni(CO)_4$  (Q)  $Fe(CO)_5$



Select the correct answer from the codes given below :

A. P and Q only

B. Q, R and S only

C. Q and S only

D. P, Q and S only

**Answer: C**



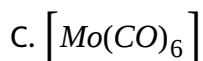
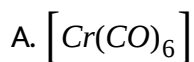
[View Text Solution](#)

4. In metal carbonyls, there is synergic bonding interaction between metal and carbon monoxide. This leads to increase in strength of metal ligands bond and decrease in bond order of CO in carbonyl complex as compared to bond order in carbon monoxide.

Simple carbonyls are invariably spin-paired complexes except for vanadium metal.

Which one of the following metal carbonyl involves the  $d^2sp^3$

hybridization for the formation of metal-carbon  $\sigma$  bonds and is paramagnetic ?



**Answer: B**



[View Text Solution](#)

5. In metal carbonyls, there is synergic bonding interaction between metal and carbon monoxide. This leads to increase in strength of metal ligands bond and decrease in bond order of CO in carbonyl complex as compared to bond order in carbon monoxide.

Simple carbonyls are invariably spin-paired complexes except for vanadium metal.

Which of the following statement is correct for metal carbonyls ?

- A. In general, the effective atomic number for a stable monomeric of the next inert gas except  $[V(CO)_6]$ .
- B. The metal-carbon bond in metal carbonyls posses both s and p character.
- C. The C-O bond length in  $[Cr(CO)_6]$  is greater than that in  $[W(CO)_6]$
- D. All of these

**Answer: D**

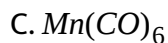
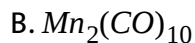
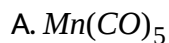
 [View Text Solution](#)

## COMPREHENSION 21

1. Sidgwick EAN rule says that complex compound has the tendency to achieve the EAN of 36, 54 and 86 for first, second and third transition series elements.

Which of the following complex acts as reducing agent based on Sidgwick

EAN rule ?



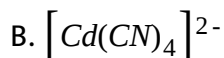
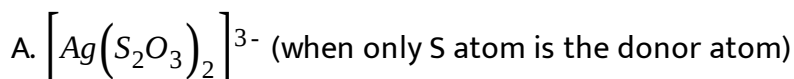
**Answer: C**

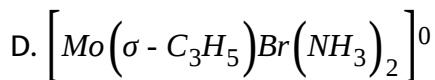
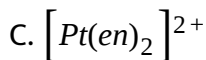


[View Text Solution](#)

2. Sidgwick EAN rule says that complex compound has the tendency to achieve the EAN of 36, 54 and 86 for first, second and third transition series elements.

Which of the following complex follows sidgwick EAN rule ?





**Answer: B**

 [View Text Solution](#)

3. Sidgwick EAN rule says that complex compound has the tendency to achieve the EAN of 36, 54 and 86 for first, second and third transition series elements.

Which of following statement is not correct regarding complex "Ferrocene".

A. EAN of central atom in ferrocene is not equal to its nearest noble

gas

B. Molecule is having aromatic character

C. It has sandwich like structure

D. Two rings act as  $\pi$  - donor ligand

Answer: A

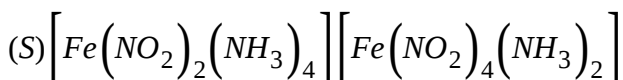
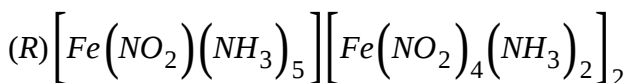
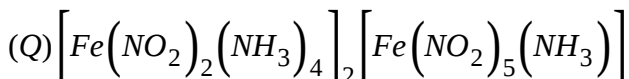
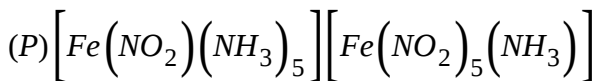
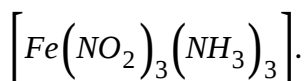


View Text Solution

## COMPREHENSION 22

1. Complex compounds which have same molecular formula but have different structural arrangements of ligands around central metal atom or ion are called structural isomers and phenomenon is named as structural isomerism.

Which of the following compounds is/are polymerisation isomer of



Choose the correct code :

A. Q, R

B. Q, R, S

C. P, S

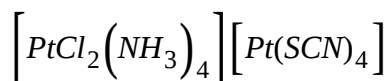
D. P, Q, R, S

**Answer: D**

 [View Text Solution](#)

2. Complex compounds which have same molecular formula but have different structural arrangements of ligands around central metal atom or ion are called structural isomers and phenomenon is named as structural isomerism.

How many more coordination isomers are possible of the following complex compound.



A. 5



B. 6

C. 8

D. 9

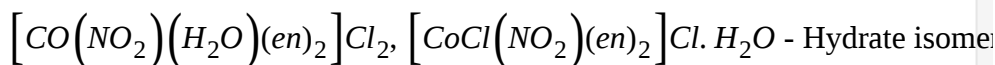
**Answer: C**

 [View Text Solution](#)

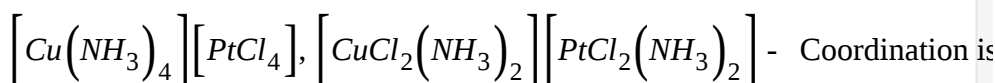
3. Complex compounds which have same molecular formula but have different structural arrangements of ligands around central metal atom or ion are called structural isomers and phenomenon is named as structural isomerism.

Select incorrect match :

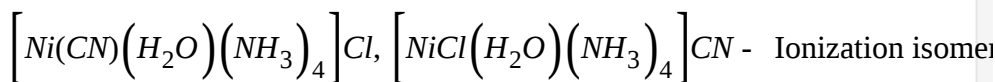
A.



B.



C.



D.



**Answer: B**



[View Text Solution](#)

## COMPREHENSION 23

1. When a transition metal ion (usually) is involved in octahedral complex formation, the five degenerate d-orbitals split into two set of degenerate orbitals (3 + 2). Three degenerate orbitals of lower energy ( $d_{xy}, d_{yz}, d_{zx}$ ) and a set of degenerate orbitals of higher energy ( $d_{x^2-y^2}$  and  $d_{z^2}$ ). The orbitals with lower energy are called  $t_{2g}$  orbitals and those with higher energy are called  $e_g$  orbitals.

In octahedral complexes, positive metal ion may be considered to be present at the centre and negative ligands at the corner of a regular octahedron. As lobes of  $d_{x^2-y^2}$  and  $d_{z^2}$  lie along the axis, i.e., along the ligands, the repulsions are more and so, high is the energy. The lobes of the remaining three d-orbitals lie between the Axis i.e., between the ligands. The repulsions between them are less, so lesser the energy. In the octahedral complexes, if metal ion has electrons more than 3, then for pairing them, the options are

- (i) Pairing may start with 4th electron in  $t_{2g}$  orbitals.
- (ii) Pairing may start normally with 6th electron when  $t_{2g}$  and  $e_g$  orbitals are singly filled.

In which of the following configurations, hybridisation and magnetic moment of octahedral complexes are independent of nature of ligands.

- (P)  $d^3$  configuration of any metal cation
- (Q)  $d^6$  configuration of IIIrd transition series metal cation
- (R)  $d^8$  configuration of Ist transition series metal cation
- (S)  $d^7$  configuration of any metal cation

Select the correct code:

A. R, S

B. P, R, S

C. P, Q, S

D. P, Q, R

**Answer: D**



[View Text Solution](#)

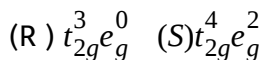
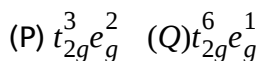
2. When a transition metal ion (usually) is involved in octahedral complex formation, the five degenerate d-orbitals split into two set of degenerate orbitals (3 + 2). Three degenerate orbitals of lower energy ( $d_{xy}$ ,  $d_{yz}$ ,  $d_{zx}$ ) and a set of degenerate orbitals of higher energy ( $d_{x^2-y^2}$  and  $d_{z^2}$ ). The orbitals with lower energy are called  $t_{2g}$  orbitals and those with higher energy are called  $e_g$  orbitals.

In octahedral complexes, positive metal ion may be considered to be present at the centre and negative ligands at the corner of a regular octahedron. As lobes of  $d_{x^2-y^2}$  and  $d_{z^2}$  lie along the axis, i.e., along the ligands, the repulsions are more and so, high is the energy. The lobes of

the remaining three d-orbitals lie between the Axis i.e., between the ligands. The repulsions between them are less, so lesser the energy. In the octahedral complexes, if metal ion has electrons more than 3, then for pairing them, the options are

- (i) Pairing may start with 4th electron in  $t_{2g}$  orbitals.
- (ii) Pairing may start normally with 6th electron when  $t_{2g}$  and  $e_g$  orbitals are singly filled.

Which of the following electronic arrangement is/are possible for inner orbital octahedral complex.



Select the correct code :

A. P, S

B. Q, R

C. R only

D. R, S

**Answer: C**

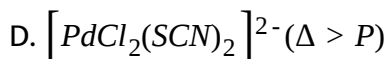
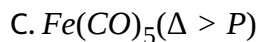
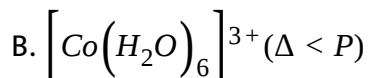
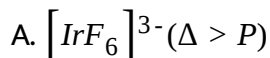
3. When a transition metal ion (usually) is involved in octahedral complex formation, the five degenerate d-orbitals split into two set of degenerate orbitals (3 + 2). Three degenerate orbitals of lower energy ( $d_{xy}$ ,  $d_{yz}$ ,  $d_{zx}$ ) and a set of degenerate orbitals of higher energy ( $d_{x^2-y^2}$  and  $d_{z^2}$ ). The orbitals with lower energy are called  $t_{2g}$  orbitals and those with higher energy are called  $e_g$  orbitals.

In octahedral complexes, positive metal ion may be considered to be present at the centre and negative ligands at the corner of a regular octahedron. As lobes of  $d_{x^2-y^2}$  and  $d_{z^2}$  lie along the axis, i.e., along the ligands, the repulsions are more and so, high is the energy. The lobes of the remaining three d-orbitals lie between the Axis i.e., between the ligands. The repulsions between them are less, so lesser the energy. In the octahedral complexes, if metal ion has electrons more than 3, then for pairing them, the options are

- (i) Pairing may start with 4th electron in  $t_{2g}$  orbitals.
- (ii) Pairing may start normally with 6th electron when  $t_{2g}$  and  $e_g$  orbitals

are singly filled.

Select incorrect match for the following complexes.



**Answer: B**



[View Text Solution](#)

## COMPREHENSION 24

1. 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.

$$\bar{\nu} = \frac{1}{2\pi c} \sqrt{\frac{K}{\mu}} \text{ cm}^{-1}$$
 Where,  $K$  = force constant of the bond which is directly

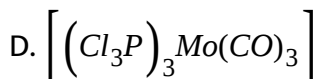
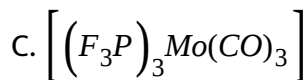
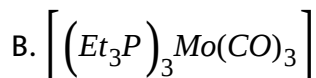
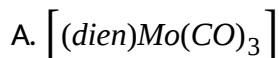
proportional to bond strength

$\mu$  = reduced mass of ligand

$\bar{\nu}$  = stretching frequency of the CO bond

$c$  = velocity of light

In which of the following complex, stretching frequency for C-O bond is least as well as bond energy of M-C bond is highest ?



**Answer: A**



[View Text Solution](#)



2. 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.

$$\nu = \frac{1}{2\pi c} \sqrt{\frac{K}{\mu}} \text{ cm}^{-1}$$

Where, K=force constant of the bond which is directly

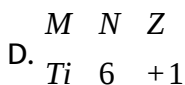
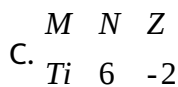
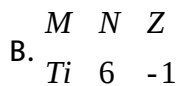
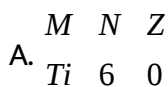
proportional to bond strength

$\mu$  = reduced mass of ligand

$\nu$  = stretching frequency of the CO bond

C = velocity of light

In compound  $[M(CO)_N]^Z$  the correct match for highest M-C bond length for given M, N and Z respectively



Answer: D

 [View Text Solution](#)

3. 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.

$$\bar{\nu} = \frac{1}{2\pi c} \sqrt{\frac{K}{\mu}} \text{ cm}^{-1}$$
 Where, K=force constant of the bond which is directly

proportional to bond strength

$\mu$  = reduced mass of ligand

$\bar{\nu}$  = stretching frequency of the CO bond

C = velocity of light

In which of the following, ligand bond order does not change (within ligand) during synergic bonding in their respective complexes ?

A. CO

B. NO

C.  $CH_2 = CH_2$

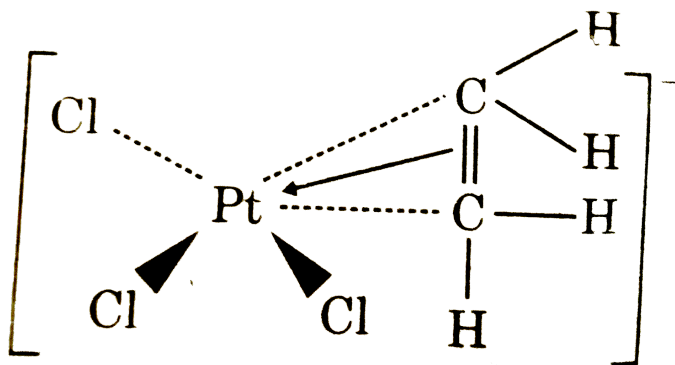
D.  $PtCl_3$

Answer: D

 View Text Solution

## COMPREHENSION 25

1. Anionic part of Zeise's salt is an organometallic compound :



The H-C-H bond angles in Zeise's salt are about :

- A.  $115^\circ$ , intermediate between the ideal values for  $sp^2$  and  $sp^3$  hybridisation
- B.  $135^\circ$ , intermediate between the ideal values for  $sp$  and  $sp^2$  hybridisation
- C.  $120^\circ$  exactly
- D.  $97^\circ$  intermediate between the ideal values for  $sp^3$  and  $sp^2$  hybridisation.

**Answer: A**

 [View Text Solution](#)

## COMPREHENSION 26

1. Nickelocene,  $\left[ Ni(\eta^5-C_5H_5)_2 \right]$  is a bright green reactive solid conveniently prepared by adding a solution of  $NiCl_2$  in dimethyl

sulphoxide to a solution to a of  $KC_5H_5$  in 1, 2 dimethoxyethane.

What is the E.A.N of Ni in above complex ?

A. 35

B. 36

C. 38

D. None of these

**Answer: C**



[View Text Solution](#)

2. Nickelocene,  $\left[ Ni(\eta^5 - C_5H_5)_2 \right]$  is a bright green reactive solid conveniently prepared by adding a solution of  $NiCl_2$  in dimethyl sulphoxide to a solution to a of  $KC_5H_5$  in 1, 2 dimethoxyethane.

What is the oxidation state of nickel in the above complex ?

A. 0

B. +3

C. +2

D. None of these

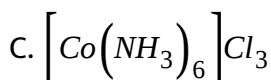
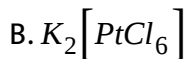
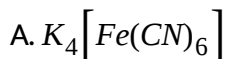
**Answer: C**

 [View Text Solution](#)

## COMPREHENSION 27

1. Werner proposed coordination theory to explain the properties and structures of various metal ammines of cobalt, chromium, platinum, etc. It was first successful attempt which satisfactorily described the formation of coordination compounds from stable molecules.

Which of the following has four number of ions in aqueous solution ?



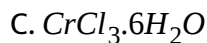
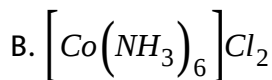
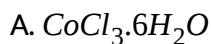


**Answer: C**

 [View Text Solution](#)

2. Werner proposed coordination theory to explain the properties and structures of various metal ammines of cobalt, chromium, platinum, etc. It was first successful attempt which satisfactorily described the formation of coordination compounds from stable molecules.

Which of the following compound has 2 primary valencies ?



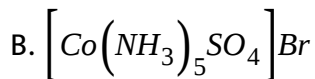
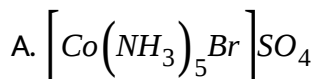
D. None of these

**Answer: B**

 [View Text Solution](#)

3. Werner proposed coordination theory to explain the properties and structures of various metal ammines of cobalt, chromium, platinum, etc. It was first successful attempt which satisfactorily described the formation of coordination compounds from stable molecules.

Which of the following has higher molar conductance ?



C. Both (a) and (b)

D. None of these

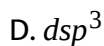
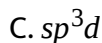
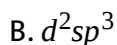
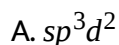
**Answer: A**

 [View Text Solution](#)



1. Crystal field theory was proposed by H. beths (1929) and Van Vleck (1932) and as originally applied to ionic crystals to explain their optical properties and is, therefore, called crystal field theory, however, this theory was applied to the study of coordination compounds in 1950 and this theory accounts for more satisfactory explanation for the properties of complexes especially colour and magnetism.

What is the hybridisation of  $\left[ Ni(H_2O)_6 \right]^{2+}$ ?



**Answer: A**



[View Text Solution](#)

2. Crystal field theory was proposed by H. Bethe (1929) and Van Vleck (1932) and as originally applied to ionic crystals to explain their optical properties and is, therefore, called crystal field theory, however, this theory was applied to the study of coordination compounds in 1950 and this theory accounts for more satisfactory explanation for the properties of complexes especially colour and magnetism.

What is the geometry of  $\left[Co(NH_3)_6\right]^{2+}$ ?

- A. Octahedral
- B. Tetrahedral
- C. Square planar
- D. Square pyramidal

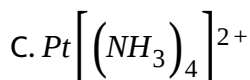
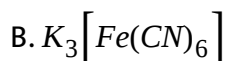
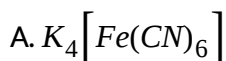
**Answer: A**



[View Text Solution](#)

3. Crystal field theory was proposed by H. beths (1929) and Van Vleck (1932) and as originally applied to ionic crystals to explain their optical properties and is, therefore, called crystal field theory, however, this theory was applied to the study of coordination compounds in 1950 and this theory accounts for more satisfactory explanation for the properties of complexes especially colour and magnetism.

Which of the following complex is paramagnetic in nature ?



D. None of these

**Answer: B**

 [View Text Solution](#)

1. Ligands can be classified by various ways, based upon charges, denticity and interaction between ligand and central atom.

Which of the following ligand is unsymmetrical bidentate ligand as well as having chiral centre which cannot be made symmetrical at all giving rotation around any single bond ?

A.  $pn$

B.  $bn$

C.  $gly^-$

D.  $dmg^-$

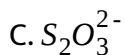
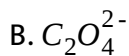
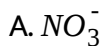
**Answer: A**



[View Text Solution](#)

2. Ligands can be classified by various ways, based upon charges, denticity and interaction between ligand and central atom.

Which of the following ligand is of ambidentate type ?



D. None of these

**Answer: C**

 [View Text Solution](#)

## COMPREHENSION 30

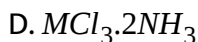
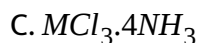
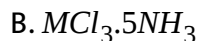
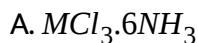
1. Inspired by Alfred Werner (1866-1919), a KOTA student decided to reconduct a similar experiment on unknown salt samples of  $\text{MCl}_3 \cdot x\text{NH}_3$ . The student found that some of the chloride ions could be precipitated as  $\text{AgCl}$  on adding silver nitrate solution. He found that this salt was of 4 years (based on colour). He labelled these complexes as A (yellow complex) B (purple complex), C (Green complex), D (violet complex). He found that moles of  $\text{AgCl}$  precipitated (per mole of salt) in one case

was 3, one case it was 2, and in two cases it was one.

He then measured the electrical conductivity of various salt solutions and found that D had the lowest value.

He then measured the boiling point of solutions of A, B, C, D and found that B had the 2nd highest boiling point, Based on the above information, answer the following questions.

If all the complexes taken by the student were crystalline, then, what is the possible molecular formula of the complex having least boiling point?



**Answer: C**



[View Text Solution](#)

2. Inspired by Alfred Werner (1866-1919), a KOTA student decided to reconduct a similar experiment on unknown salt samples of  $MCl_3 \cdot xNH_3$ .

The student found that some of the chloride ions could be precipitated as AgCl on adding silver nitrate solution. He found that this salt was of 4 years (based on colour). He labelled these complexes as A (yellow complex) B (purple complex), C (Green complex), D (violet complex).

He found that moles of AgCl precipitated (per mole of salt) in one case was 3, one case it was 2, and in two cases it was one.

He then measured the electrical conductivity of various salt solutions and found that D had the lowest value.

He then measured the boiling point of solutions of A, B, C, D and found that B had the 2nd highest boiling point, Based on the above information, answer the following questions.

What is the relationship between C and D (if C, had the lowest boiling point )?

A. Ammoniated isomers

B. Structural isomers

C. Both (a) and (b)

D. Geometrical isomers

**Answer: D**



[View Text Solution](#)

3. Inspired by Alfred Werner (1866-1919), a KOTA student decided to reconduct a similar experiment on unknown salt samples of  $MCl_3 \cdot xNH_3$ .

The student found that some of the chloride ions could be precipitated as AgCl on adding silver nitrate solution. He found that this salt was of 4 years (based on colour). He labelled these complexes as A (yellow complex) B (purple complex), C (Green complex), D (violet complex).

He found that moles of AgCl precipitated (per mole of salt) in one case was 3, one case it was 2, and in two cases it was one.

He then measured the electrical conductivity of various salt solutions and found that D had the lowest value.

He then measured the boiling point of solutions of A, B, C, D and found that B had the 2nd highest boiling point, Based on the above



information, answer the following questions.

If atomic number of M is 27, then number of N-M-N bond angles in A will be :

A. 21

B. 15

C. 10

D. 6

**Answer: B**



[View Text Solution](#)

4. Inspired by Alfred Werner (1866-1919), a KOTA student decided to reconduct a similar experiment on unknown salt samples of  $MCl_3 \cdot xNH_3$ . The student found that some of the chloride ions could be precipitated as AgCl on adding silver nitrate solution. He found that this salt was of 4 years (based on colour). He labelled these complexes as A (yellow complex) B (purple complex), C (Green complex), D (violet complex).

He found that moles of AgCl precipitated (per mole of salt) in one case was 3, one case it was 2, and in two cases it was one.

He then measured the electrical conductivity of various salt solutions and found that D had the lowest value.

He then measured the boiling point of solutions of A, B, C, D and found that B had the 2nd highest boiling point, Based on the above information, answer the following questions.

The order of electrical conductivity for the 4 complexes will be :

A.  $B > A > C > D$

B.  $C = B > D > A$

C.  $C > D > B = A$

D.  $A > B > C = D$

**Answer: D**



[View Text Solution](#)

5. Inspired by Alfred Werner (1866-1919), a KOTA student decided to reconduct a similar experiment on unknown salt samples of  $MCl_3 \cdot xNH_3$ .

The student found that some of the chloride ions could be precipitated as AgCl on adding silver nitrate solution. He found that this salt was of 4 years (based on colour). He labelled these complexes as A (yellow complex) B (purple complex), C (Green complex), D (violet complex).

He found that moles of AgCl precipitated (per mole of salt) in one case was 3, one case it was 2, and in two cases it was one.

He then measured the electrical conductivity of various salt solutions and found that D had the lowest value.

He then measured the boiling point of solutions of A, B, C, D and found that B had the 2nd highest boiling point, Based on the above information, answer the following questions.

The student took 2.675 g sample of A (Atomic weight of central atom=59) and dissolved it in water to form 1 L solution whose molar conductance was found to be  $200 \Omega^{-1}cm^2mol^{-1}$  What is the specific conductance of the solution ?

A.  $2 \times 10^{-3} \Omega^{-1}cm^{-1}$

B.  $2 \times 10^{-4} \Omega^{-1} \text{cm}^{-1}$

C.  $0.2 \Omega^{-1} \text{cm}^{-1}$

D.  $0.4 \Omega^{-1} \text{cm}^{-1}$

**Answer: A**

 [View Text Solution](#)

## COMPREHENSION 31

1. The coordination compounds are of great importance. These compounds are widely present in the mineral, plant and animal worlds and are known to play many important functions in the area of analytical chemistry, metallurgy, biological systems, industry and medicine.

Which of the following reagents can be used for qualitative and quantitative analysis (based on colour reactions) as well as for estimation of hardness of water ?

A. EDTA

B. DMG

C.  $\alpha$  - nitroso -  $\beta$  - naphthol

D. Cupron

**Answer: A**



[View Text Solution](#)

2. The coordination compounds are of great importance. These compounds are widely present in the mineral, plant and animal worlds and are known to play many important functions in the area of analytical chemistry, metallurgy, biological systems, industry and medicine.

In which of the following processes, co-ordination complex formation/usage is done for extraction of metals ?

A. Mc Artur Forrest cyanide process

B. Mond's process

C. Both (a) and (b)

D. None of these

Answer: C



View Text Solution

## COMPREHENSION 32

1. In the complex, basic beryllium acetate  $\left[Be_4O(CH_3COO)_6\right]$  it is known that 'O' is acting as bridge for all 4 beryllium and  $(CH_3COO^-)$  as a bridging ligand for any two berylliums, in pairs. Now, answer the following questions :

Number of Be-O-Be bond angles in the complex = x

Number of O-Be-O bond angles in the complex = y

Find the value of  $\frac{y}{x}$

A. 5

B. 4

C. 6

D. 3

**Answer: B**

 [View Text Solution](#)

2. In the complex, basic beryllium acetate  $\left[Be_4O(CH_3COO)_6\right]$  it is known that ' $O$ '<sup>\*</sup> is acting as bridge for all 4 beryllium and  $(CH_3COO^-)$  as a bridging ligand for any two berylliums, in pairs. Now, answer the following questions :

Choose the correct set of hybridisation for  $Be$  and  $O$ <sup>\*</sup> in the complex :

A.  $sp, sp^3$

B.  $sp^3, sp^3$

C.  $sp^2, sp^2$

D.  $sp, sp$

**Answer: B**



[View Text Solution](#)

3. In the complex, basic beryllium acetate  $\left[ Be_4O(CH_3COO)_6 \right]$  it is known that 'O' is acting as bridge for all 4 beryllium and  $(CH_3COO^-)$  as a bridging ligand for any two berylliums, in pairs. Now, answer the following questions :

Identify the ligand which is ambidentate and has three different donor sites available :

A.  $NCS^-$

B.  $NOS^-$

C.  $CNO^-$

D. all of these

**Answer: B**



[View Text Solution](#)



## COMPREHENSION 33

1. According to Werner, the arrangement of 6 groups around the metal centre within the co-ordination sphere can lead to three possible geometries (For Q. 1 and Q. 2) : planar hexagon, trigonal prism and octahedral. For a particular geometry, if the groups (i.e. ligands) are arranged in different ways then the possibility of geometrical isomerism will arise.

A complex  $\left[PtCl_2(NH_3)_4\right]^{2+}$  in RENREW'S universe has a total 3 stereoisomers possible. If Werner was present, then, according to him, what can be the probable shape of the complex ?

- A. planar hexagon
- B. trigonal prism
- C. octahedron
- D. both (a) and (b)

Answer: D



View Text Solution

2. According to Werner, the arrangement of 6 groups around the metal centre within the co-ordination sphere can lead to three possible geometries (For Q. 1 and Q. 2) : planar hexagon, trigonal prism and octahedral. For a particular geometry, if the groups (i.e. ligands) are arranged in different ways then the possibility of geometrical isomerism will arise.

If in RENREW'S universe,  $[PtBrCl(NH_3)Py]$  complex was found to have two stereo-isomers, then according to Werner, which inference can be correct ?

(P) Complex must be square planar

(Q) Complex may be tetrahedral

(R) Complex may show geometrical isomerism

(S) Complex must exhibit optical isomerism

A. P, Q

B. Q, R

C. Q, S

D. P, S

**Answer: B**



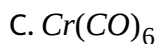
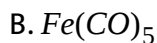
[View Text Solution](#)

## COMPREHENSION 34

1. The relative stabilities of metal carbonyls and their ions can be explained on the basis of a rule which is known as  $18e^-$  rule. If number of valence shell electrons of the metal + number of electrons donated by bonded CO groups comes to be 18 electrons, then carbonyl is said to be stable.

Which of the following complexes are following  $18e^-$  rule?

A.  $Ni(CO)_4$



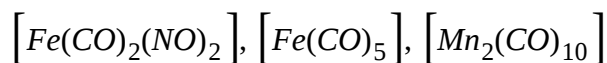
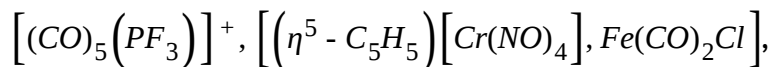
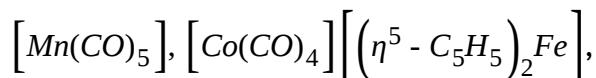
**Answer: A,B,C**

 [View Text Solution](#)

2. The relative stabilities of metal carbonyls and their ions can be explained on the basis of a rule which is known as  $18e^-$  rule. If number of valence shell electrons of the metal + number of electrons donated by bonded CO groups comes to be 18 electrons, then carbonyl is said to be stable.

Some heteroleptic/noncarbonyl complexes also follow 18 electron rule.

Identify the number of complexes following the rule.



A. 7

B. 8

C. 9

D. 6

**Answer: A**



[View Text Solution](#)

## COMPREHENSION 35

1. Both double salt as well as complexes are formed by combination of two or more stable compounds in stoichiometric ratio. However, they differ in the fact that double salt dissociate into simple ions completely when dissolved in water but in complex salt, complex ions doesn't dissociate into ions.

Which of the following statements is correct for complex formed by combination of one mole of  $PtCl_4$  and four mole  $NH_3$ ?

- A. It can show geometrical isomerism
- B. It does not follow sidgwick rule
- C. It does not show ionization isomerism
- D. It gives white ppt with  $AgNO_3$

**Answer: A,C,D**

 [View Text Solution](#)

2. Both double salt as well as complexes are formed by combination of two or more stable compounds in stoichiometric ratio. However, they differ in the fact that double salt dissociate into simple ions completely when dissolved in water but in complex salt, complex ions doesn't dissociate into ions.

Which of the following correct about alums ?

- A. Alums are double salt.
- B.  $Li^+$  cation does not form alums

C. Aq. Solution of alums are always colourless

D. In alums two type of cations are present

**Answer: A,B,D**

 [View Text Solution](#)

## COMPREHENSION 36

1. Crystal field theory considers purely ionic bond between metal and ligand. The five d-orbitals in an isolated gaseous metal are degenerate. The degeneracy of the d-orbitals is lost in presence of ligand which is known as splitting of d-orbitals.

Calculate crystal field stabilization energy in  $\left[Co(C_2O_4)_3\right]^{3-}$  in terms of

$\Delta_0$

A.  $-2.4\Delta_0$

B.  $+2.4\Delta_0$

C.  $-3.6\Delta_0$

D.  $-1.8\Delta_0$

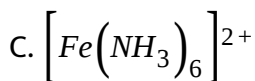
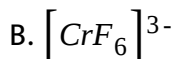
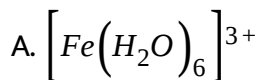
**Answer: A**



[View Text Solution](#)

2. Crystal field theory considers purely ionic bond between metal and ligand. The five d-orbitals in an isolated gaseous metal are degenerate. The degeneracy of the d-orbitals is lost in presence of ligand which is known as splitting of d-orbitals.

Complex in which  $t(2g)^3$  electronic configuration is not observed.



D.



Answer: C



View Text Solution

## COMPREHENSION 37

1. As originally developed, crystal field theory was used to describe the electronic structure of metal ion crystals, where they are surrounded by oxide ions or other anions that create an electrostatic field with symmetry dependent on the crystal structure.

If for the complex  $K_4[FeL_6]$  the value of  $\Delta_0 = 22000 \text{ cm}^{-1}$ . Find out the value of crystal pairing energy. Where L is uninegative monodentate ligand.

A.  $-46200 \text{ cm}^{-1}$

B.  $-52800 \text{ cm}^{-1}$

C.  $+2200 \text{ cm}^{-1}$

D.  $-22200 \text{ cm}^{-1}$

**Answer: B**

 [View Text Solution](#)

2. As originally developed, crystal field theory was used to describe the electronic structure of metal ion crystals, where they are surrounded by oxide ions or other anions that create an electrostatic field with symmetry dependent on the crystal structure.

Total number of nodal planes of the orbitals involved in hybridisation of central metal ion in complex  $[MnO_4]^-$  is :

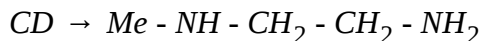
- A. 6
- B. 4
- C. 2
- D. 3

**Answer: A**

 [View Text Solution](#)

## COMPREHENSION 38

1. In certain cases, achiral ligands can become chiral on coordination to a metal, leading to a complex that is chiral. Usually the non-chiral ligand contains a donor that rapidly inverts as a free ligand, but that becomes locked in one configuration on co-ordination. An example is  $MeNHCH_2CH_2NHMe$ , where two N atoms become chiral centres on co-ordination to a metal atom. Consider two bidentate ligands for square planar complexes only :



Total number of chiral and achiral complexes obtained from  $M(AA)_2$  Will be respectively :

A. 2, 1

B. 4, 2

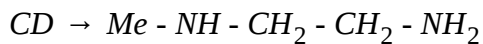
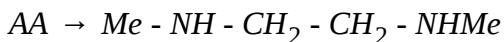
C. 4, 3

D. 2, 2

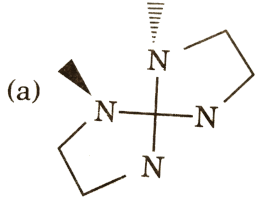
Answer: C

 [View Text Solution](#)

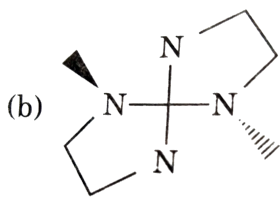
2. In certain cases, achiral ligands can become chiral on coordination to a metal, leading to a complex that is chiral. Usually the non-chiral ligand contains a donor that rapidly inverts as a free ligand, but that becomes locked in one configuration on co-ordination. An example is  $MeNHCH_2CH_2NHMe$ , where two N atoms become chiral centres on coordination to a metal atom. Consider two bidentate ligands for square planar complexes only :



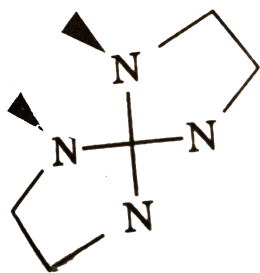
In the complex solution  $[M(CD)_2]$ , identify the complex isomer which does not have any mirror planes but is not chiral.



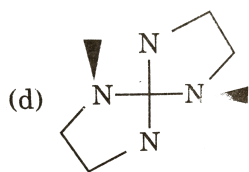
A.



B.



C.



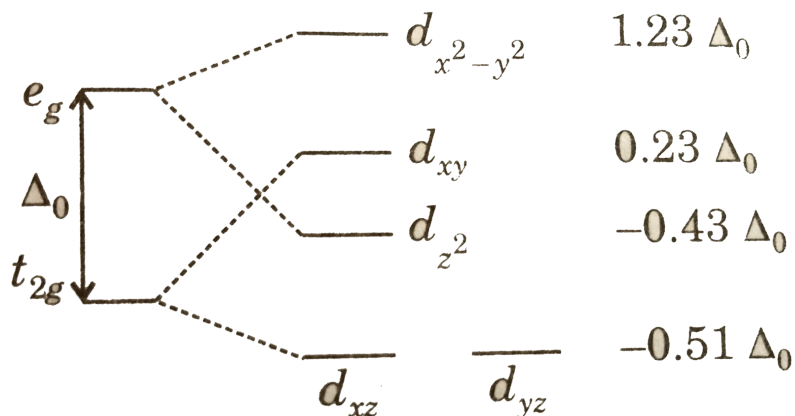
D.

**Answer: B**



**View Text Solution**

1. The splitting diagram for square planar complexes is more complex than for octahedral and tetrahedral complexes and is shown below with the relative energies of each orbital.



Calculate crystal field stabilisation energy for a diamagnetic square planar  $d^8$  metal complex with the help of above diagram neglecting pairing energy (P)

A.  $-2.88\Delta_0$

B.  $-2.44\Delta_0$

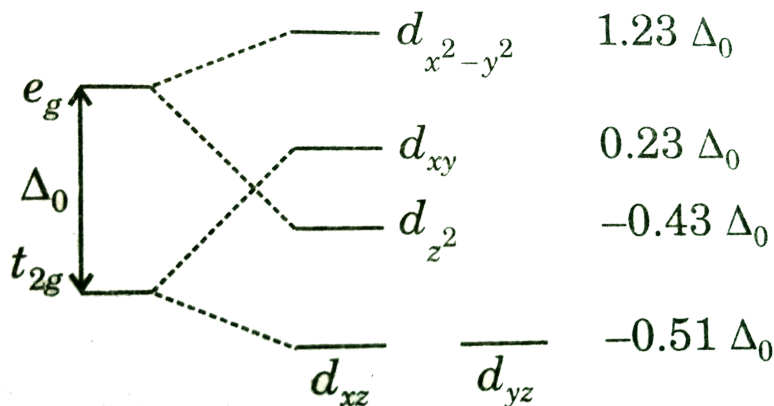
C.  $-1.65\Delta_0$

D.  $-4.84\Delta_0$

Answer: B

 View Text Solution

2. The splitting diagram for square planar complexes is more complex than for octahedral and tetrahedral complexes and is shown below with the relative energies of each orbital.



Which of the following set of  $d e^-$  have same crystal field stabilisation energy value for tetrahedral complex neglecting pairing energy (P) :

(P)  $d^1, d^6$  (Q)  $d^2, d^7$

(R)  $d^3, d^8$  (S)  $d^4, d^9$

(T)  $d^5, d^{10}$

A. Only T

B. Q, R and T

C. P, Q and S

D. P, Q, R, S and T

**Answer: D**

 [View Text Solution](#)

## COMPREHENSION 40

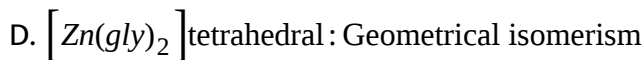
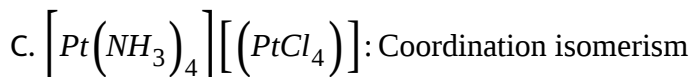
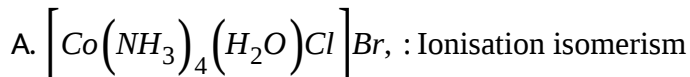
1. Isomers in coordination chemistry include many types. In structural isomers hydrate or solvent isomers, ionisation isomers and coordination isomers have same overall formula but have different ligands attached to the central atom or ion.

The term linkage isomerism or ambidentate isomerism are used for cases of bonding through different through different atoms of the same ligand. Stereoisomers have the same ligands, but differ in the geometric



arrangement of the ligands.

Which of the following is not correctly matched against indicated isomerism ?



**Answer: D**



[View Text Solution](#)

2. Isomers in coordination chemistry include many types. In structural isomers hydrate or solvent isomers, ionisation isomers and coordination isomers have same overall formula but have different ligands attached to the central atom or ion.

The term linkage isomerism or ambidentate isomerism are used for cases

of bonding through different through different atoms of the same ligand. Stereoisomers have the same ligands, but differ in the geometric arrangement of the ligands.

$Ma_3, b_3$  complex has two geometrical forms(I) Facial (II) Meridional then which of the following statement is incorrect ?

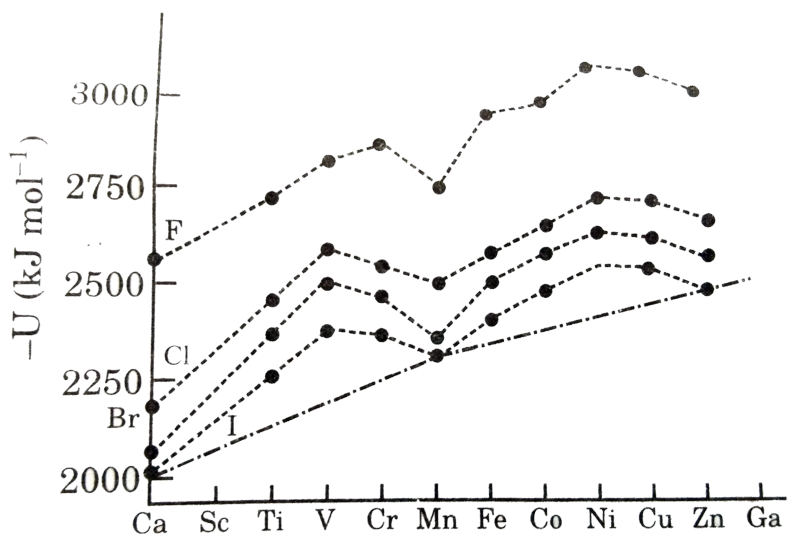
- A. In facial isomer three same ligands occupy adjacent positions on octahedron face
- B. In meridional isomers same ligands are present at  $90^\circ$  and  $180^\circ$  angles
- C. In facial isomer same ligands are present only at  $90^\circ$  angle
- D. Both isomers (facial and meridional) are optically active

**Answer: D**



[View Text Solution](#)

1. Though CFT is used for explaining transition metal complexes yet it can also be used for explaining the variation of lattice energies of transition metal compounds. For example halides of bivalent metal ions of 3d-series ( $MX_2$ ). It is found that in the crystal of such metal halides each metal ion is octahedrally surrounded by halides ions and vice-versa, hence these compounds can be treated at par with octahedral complexes. In the following figure, variation of lattice energy of  $MX_2$  is given with atomic number of metal ions.



If a graph is plotted for the hydration of  $M^{3+}$  ions with the atomic number of metal of 4th period metals from Ca to Ga then the species which are lying at minima of curve will be :

A. Ca, Mn, Zn

B. Sc, Mn, Ga

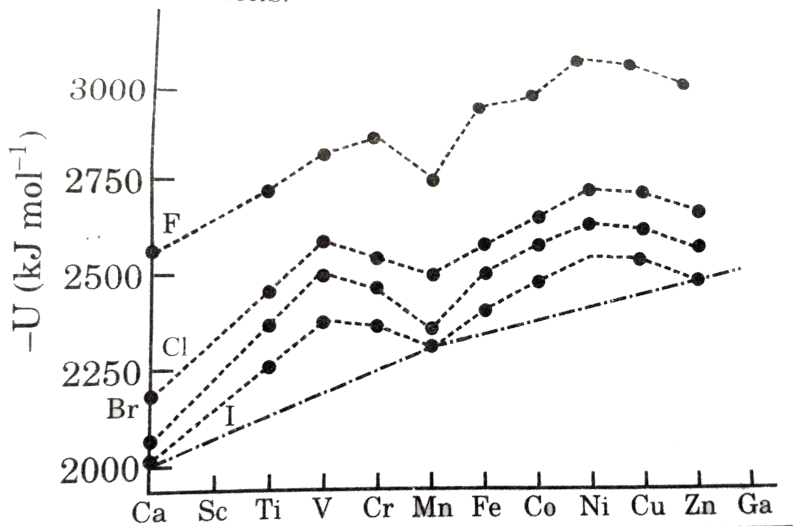
C. Sc, Fe, Ga

D. Ca, Fe, Zn

**Answer: C**

 [View Text Solution](#)

2. Though CFT is used for explaining transition metal complexes yet it can also be used for explaining the variation of lattice energies of transition metal compounds. For example halides of bivalent metal ions of 3d-series ( $MX_2$ ). It is found that in the crystal of such metal halides each metal ion is octahedrally surrounded by halides ions and vice-versa, hence these compounds can be treated at par with octahedral complexes. In the following figure, variation of lattice energy of  $MX_2$  is given with atomic number of metal ions.



In which of the following complexes, the metal ion has lowest ionic radius?

- A.  $[Ti(H_2O)_6]^{2+}$
- B.  $[V(H_2O)_6]^{2+}$
- C.  $[Cr(H_2O)_6]^{2+}$
- D.  $[Mn(H_2O)_6]^{2+}$

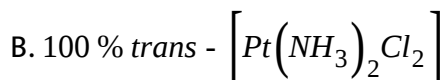
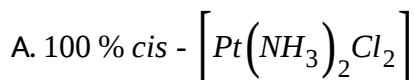
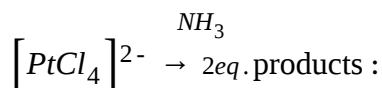
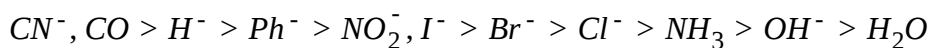
**Answer: B**



[View Text Solution](#)

1. Trans-effect (a kinetic phenomenon) indicates the labilisation at the trans-position during the nucleophilic substitution.

The ligand which can weaken its trans bond more is considered to have its more trans influence. Trans-effect series :



C. Mixture of diastereomers with % *trans* > % *cis*

D. Mixture of diastereomers with % *cis* > % *trans*

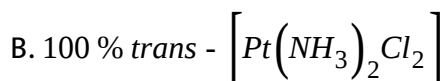
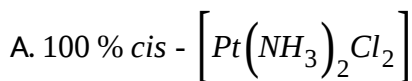
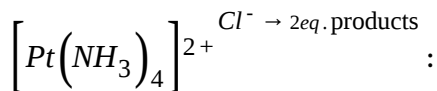
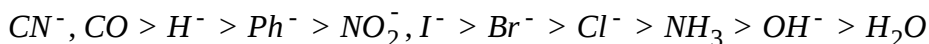
**Answer: A**



**View Text Solution**

2. Trans-effect (a kinetic phenomenon) indicates the labilisation at the trans-position during the nucleophilic substitution.

The ligand which can weaken its trans bond more is considered to have its more trans influence. Trans-effect series :



C. Mixture of diastereomers with % *trans* > % *cis*

D. Mixture of diastereomers with % *cis* > % *trans*

**Answer: B**



[View Text Solution](#)

**MATCH THE COLUMN TYPE**

Column I

Column II

- (a)  $[Pt(NH_3)ClBrI]^-$  (p) Square planar
1. (b)  $[Pt(NH_3)ClBrNO_2]^-$  (q) EAN = 84
- (c)  $[Pt(NH_3)Cl(CN)_2]^-$  (r) Linkage isomers are 3
- (t) Linkage isomers are 4

 [View Text Solution](#)

Column-I (Complex)		Column-II (Properties)	
(a)	$[Cr(H_2O)_3(NO_2)_3]$	(p)	$sp^3d^2$
(b)	$[Ni(H_2O)_2Cl_2(en)]$	(q)	$d^2sp^3$
(c)	$[Co(en)_2(NO_2)py]$	(r)	Paramagnetic
(d)	$[Fe(NH_3)_6]Cl_2$	(s)	Geometrical isomerism
		(t)	Linkage isomerism

2.

 [View Text Solution](#)



Column-I		Column-II	
(a)	$[\text{Co}(\text{en})_3]^{3+}$	(p)	$sp^3d^2$ hybridisation
(b)	$[\text{Co}(\text{ox})_3]^{3-}$	(q)	Diamagnetic
(c)	$[\text{Co}(\text{H}_2\text{O})_6]^{2+}$	(r)	$d^2sp^3$ hybridisation
(d)	$[\text{Co}(\text{NO}_2)_6]^{3-}$	(s)	Paramagnetic
		(t)	Chelate ligand

3.

 [View Text Solution](#)

Column-I		Column-II (CFSE Magnitude)	
(a)	$[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$	(p)	$0.6 \Delta_0$
(b)	$[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$	(q)	$0.4 \Delta_0$
(c)	$[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$	(r)	0
(d)	$[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$	(s)	$1.2 \Delta_0$

4.

 [View Text Solution](#)

Column-I (Complexes)		Column-II (Characteristics)	
(a)	$[\text{Ni}(\text{CO})_4]$	(p)	Tetrahedral
(b)	$[\text{Fe}(\text{NO})_2(\text{CO})_2]$	(q)	$\pi$ back bonding
(c)	$[\text{Ni}(\text{PF}_3)_4]$	(r)	Diamagnetic
(d)	$[\text{NiBr}_2(\text{PPh}_3)_2]$	(s)	One of the ligand is three electron donor.

5.



[View Text Solution](#)

Column-I (Pair of complex compounds)		Column-II (Property which is different in given pair)	
(a)	$[\text{Ni}(\text{CO})_4]$ and $\text{K}_2[\text{Ni}(\text{CN})_4]$	(p)	Magnetic moment
(b)	$[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$ and $\text{K}_3[\text{Cu}(\text{CN})_4]$	(q)	Oxidation number of central metal

6.



[View Text Solution](#)

7.

Column-I		Column-II (Incorrect characteristics for complexes in column I)	
(a)	$[\text{CoF}_3(\text{H}_2\text{O})_3]$	(p)	Homoleptic
(b)	$[\text{IrCl}_6]^{3-}$	(q)	Ambidentate ligand
(c)	$[\text{Cr}(\text{H}_2\text{O})_3(\text{Me}_2\text{S})_2\text{Br}](\text{NO}_3)_2$	(r)	Co-ordination number of central atom is 6


[View Text Solution](#)

8.

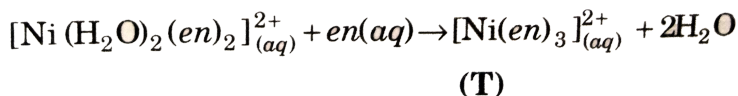
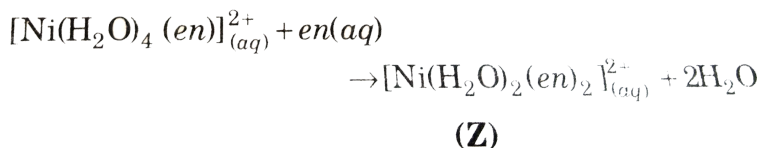
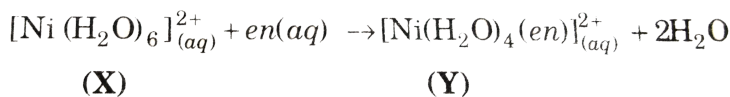
Column-I		Column-II	
(a)	$[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$	(p)	Follows Sidgwick rule
(b)	$[\text{Co}(\text{H}_2\text{O})_3\text{F}_3]$	(q)	EAN value is 36
(c)	$[\text{Co Cl} \cdot \text{CN} \cdot \text{NO}_2(\text{NH}_3)_3]$	(r)	Have two geometrical isomers
(d)	$[\text{Fe}(\text{gly})_3]$	(s)	Shows optical isomerism
		(t)	Shows linkage isomerism


[View Text Solution](#)

Column-I		Column-II	
(a)	$\mu = \sqrt{15}$ B.M.	(p)	Switzer's Salt
(b)	O.N. of metal = +2	(q)	Potassium ferrocyanide
(c)	Octahedral complex	(r)	Potassium ferricyanide
(d)	$d^2sp^3$ hybridised metal ion	(s)	Brown ring complex
		(t)	Sodium nitroprusside

9.

 [View Text Solution](#)



10. Match the colours of X, Y, Z, T from the list given



 [View Text Solution](#)

Column-I		Column-II	
(a)	$[\text{PtCl}(\text{NO}_2)(\text{NH}_3)_4]\text{SO}_4$	(p)	Shows linkage isomerism
(b)	$[\text{Mn}(\text{NH}_3)_5(\sigma\text{-C}_3\text{H}_5)]$	(q)	Shows co-ordination position isomerism
(c)	$[\text{Pt}(\text{NH}_3)_4][\text{Cr}(\text{NCS})(\text{NO}_2)_2(\text{NH}_3)_2\text{I}]$	(r)	Shows ionization isomerism
(d)	$\left[ \begin{array}{ccc} & \text{NH}_2 & \\ & / \quad \backslash & \\ \text{Cl}(\text{NH}_3)_3\text{Co} & & \text{Co}(\text{NH}_3)_3\text{Cl} \\ & \backslash \quad / & \\ & \text{O}_2 & \end{array} \right]^{2+}$	(s)	Shows co-ordination isomerism
		(t)	Shows ligand isomerism

11.



[View Text Solution](#)

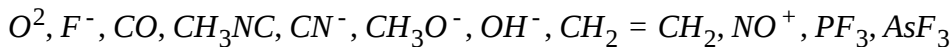
## SUBJECTIVE TYPE

1. Find the total number of optically active compounds in  $[\text{Zn}(\text{bm})(\text{en})]\text{Cl}_2$ .



[View Text Solution](#)

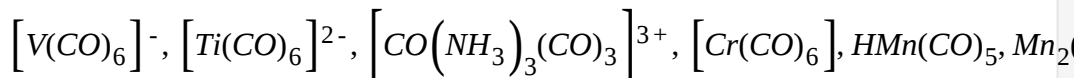
2. Find the total number of ligands which act as  $\pi$ -acceptor  $\rightarrow r$ .



[If your answer is 2, write your answer as 2, write it as 0002.]

 [View Text Solution](#)

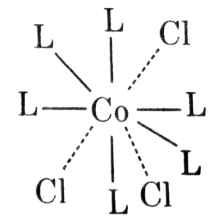
3. How many of the following species would have C-O bond length longer than that of free CO molecule.

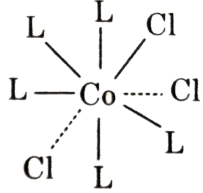
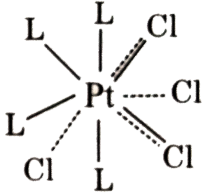
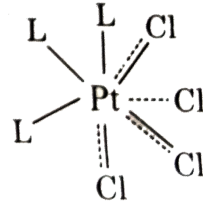
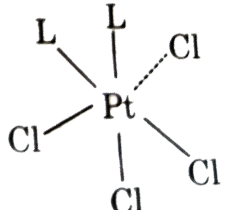


[Write your answer as 0003, if it is 3.]

 [View Text Solution](#)

4. How many of the modern formula are correctly matched with the structures predicted by Werner's coordination theory?

Modern Formula	Werner's structure
(P) $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$	 <p>'L' stands for <math>\text{NH}_3</math></p>

(Q) $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$	
(R) $[\text{Pt}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}_2$	
(S) $[\text{Pt}(\text{NH}_3)_3\text{Cl}_3]\text{Cl}$	
(T) $[\text{Pt}(\text{NH}_3)_2\text{Cl}_4]$	

Write your answer as 0004 if your answer is 4.

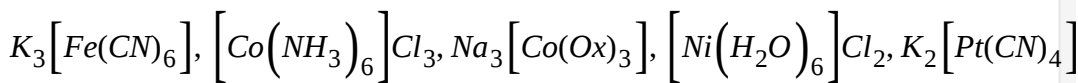


[View Text Solution](#)

5. Find the sum of optically active isomers of both  $[Pt(gly)_2Cl_2]$  and  $[Co(en)_2Cl_2]$ .

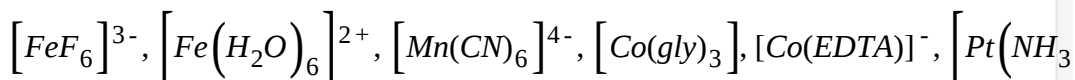
 [View Text Solution](#)

6. Find the total number of diamagnetic complexes.



 [View Text Solution](#)

7. Consider the following complex entities.

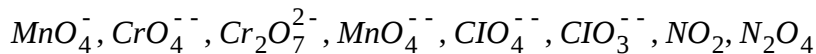


If W, X, Y and Z are the total number of diamagnetic, paramagnetic, capable of exhibiting stereoisomerism and coloured complex entities respectively, find WXYZ. If W, X, Y and Z are 2, 4, 3, 6 respectively, write your answer as 2436.



 [View Text Solution](#)

8. Which of the following is tetrahedral and paramagnetic ?

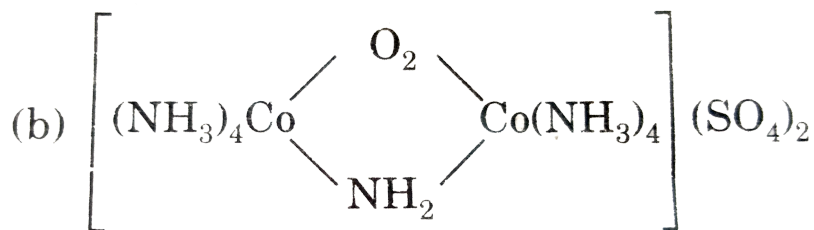
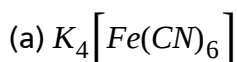


[If your answer is 5 so write 0005.]

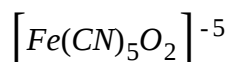
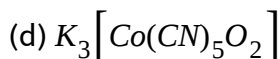
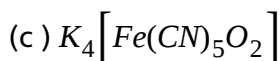
 [View Text Solution](#)

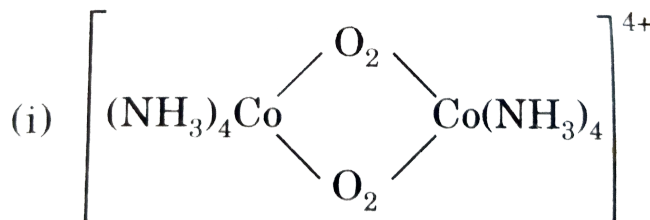
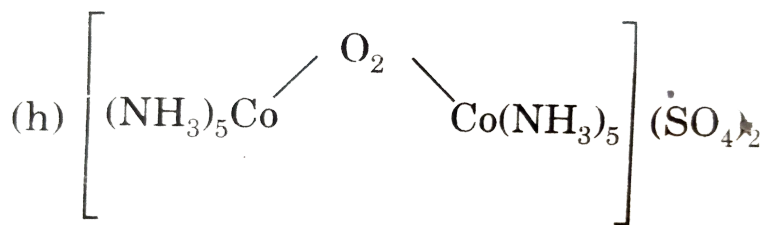
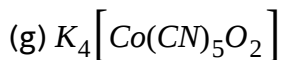
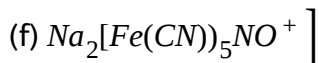
9. Find the number of paramagnetic species each central metal ion having

$t_{2g}^6 e_g^0$  configuration.



(b)





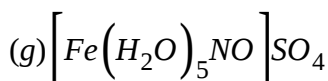
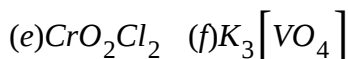
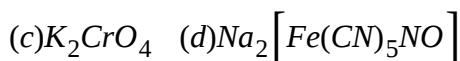
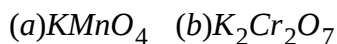
(h)

(i) 

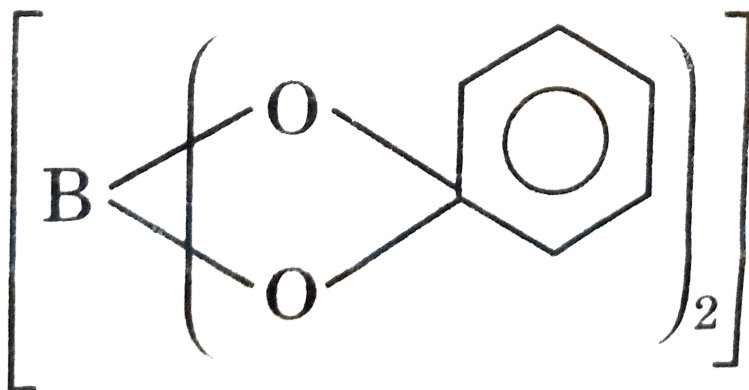
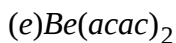
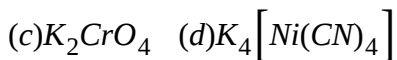
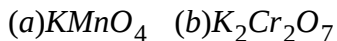


[View Text Solution](#)

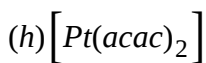
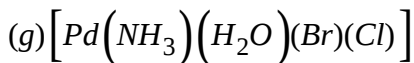
10. Which of the following compounds are coloured due to charge transfer ?

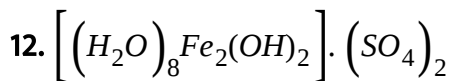


11. How many compounds are tetrahedral in shape ?



(f)



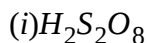
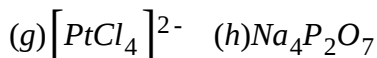
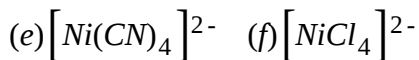
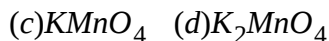
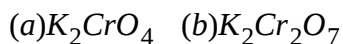


Calculate the coordination number of central metal, E.A.N., Primary valencies.

[If the coordination number is 4, EAN is 18, Primary valency = 2 than answer is 4182.]

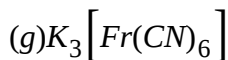
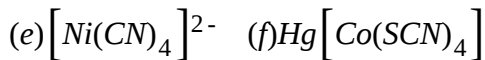
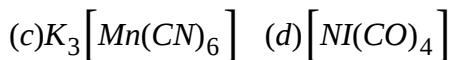
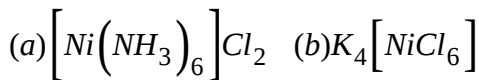
 [View Text Solution](#)

13. Find the number of compound which has four orbitals participating in hybridisation in central atom.



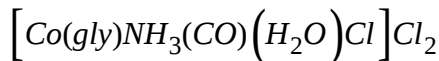
 [View Text Solution](#)

14. How many of the following has 2.8 B.M. magnetic moment ?



 [View Text Solution](#)

15. Calculate the coordination number and number of stereo isomers of



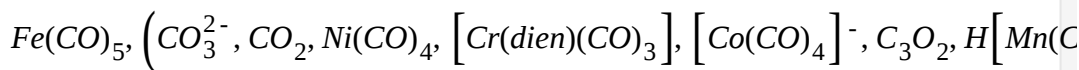
If your answer is 4 and 20 then write 0420.

 [View Text Solution](#)

16. Find the value of  $m + n$  in the anionic species  $\left[ \text{Ti}(\text{CO})_m \text{p}^{n-} \right]$ , if it follows E.A.N. rule and complex is octahedral ?

 [View Text Solution](#)

17. Find the number of species having C-O bond length greater than that in free CO molecule.



 [View Text Solution](#)

18. Consider the complex  $[Co(NH_3)_5(CO_3)]ClO_4$ , the coordination number, oxidation number, number of unpaired d-electrons respectively are :

If your answer is 4, 2, 1 write your answer as 0421.

 [View Text Solution](#)

19. Select the total number of properties which are correct with respect to

$K_4[Fe(CN)_5O_2]$  or any of its isomers ( $d^6$  configuration of central metal ion).

(a) Paramagnetic

(b) Inner orbital complex

(c) Low spin complex

(d)  $\Delta_0 > P$

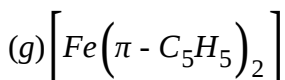
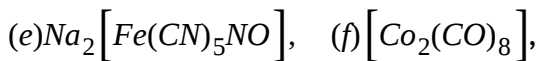
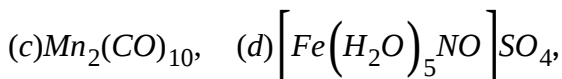
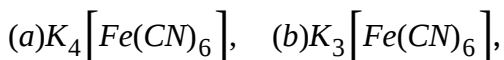
(e) Shows optical isomerism

(f) Shows linkage isomerism



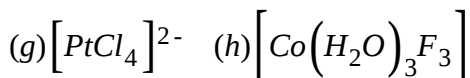
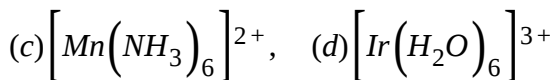
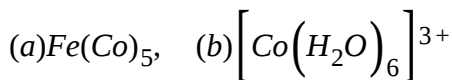
[View Text Solution](#)

20. How many of the following obey's Sidgwick EAN rule ?



[View Text Solution](#)

21. How many of the following compounds splitting energy ( $\Delta$ ) is greater than pairing energy (P) ?



 [View Text Solution](#)

22. For what minimum value of  $n$ , polymerisation isomers of  $[Fe(NH_3)_3(NO_2)_3]_n$  would not exist ?

 [View Text Solution](#)

23. If the complex  $[Mo(CO)_4Br(CPh_3)]$  follow 18 electron rule or EAN rule, find the bond order of Mo-C bond .

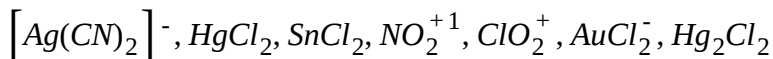






[View Text Solution](#)

24. Find the total number of compounds/ions having linear shape.



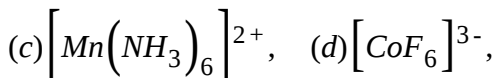
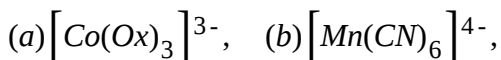
[View Text Solution](#)

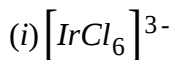
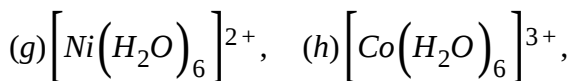
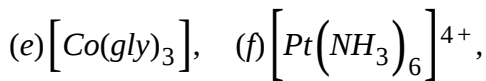
25. Find the total number of diastereomers of the complex  $M_{a_2b_2c_2}$  where M is the central metal atom/ion and a, b, c are monodentate achiral ligands.



[View Text Solution](#)

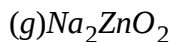
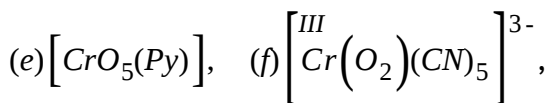
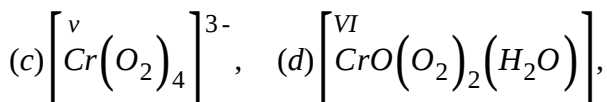
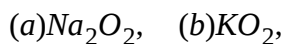
26. Find the number of complexes involving  $d^2sp^3$  hybridisation of the central metal atom/ion.





 [View Text Solution](#)

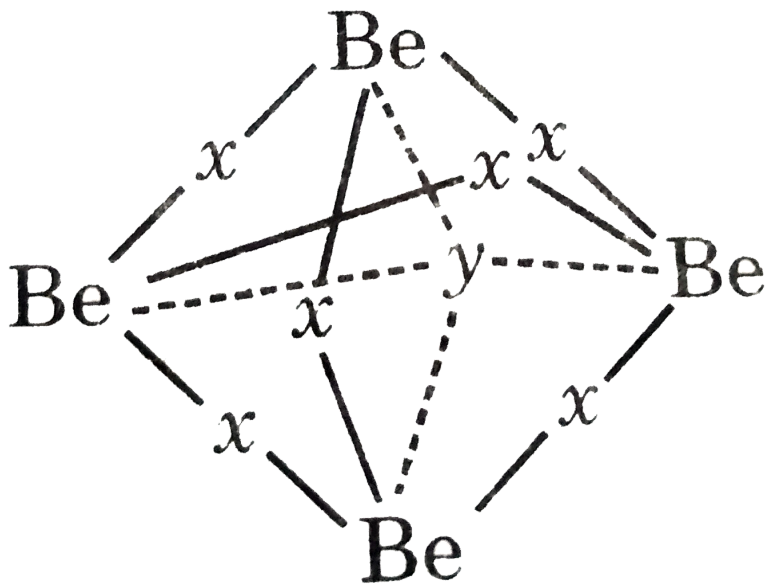
27. Find the total number of compounds or ions having O-O bond longer than that in free  $O_2$  molecule.



 [View Text Solution](#)

28. Find the total number of Fe-Fe bonds in  $Fe_3(CO)_{12}$  if it follows EAN rule.

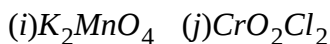
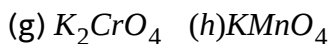
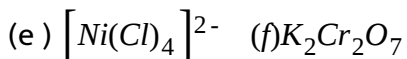
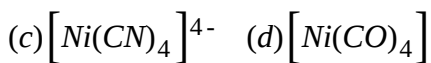
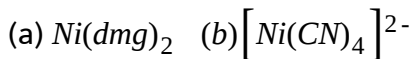
[View Text Solution](#)



29. Find the number of  $Be - \bar{y} - Be$  bond angles(s) in above structure.

[View Text Solution](#)

30. How many of the following are square planar?



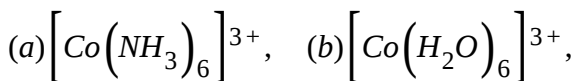
[View Text Solution](#)

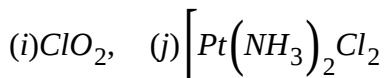
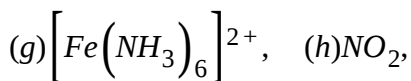
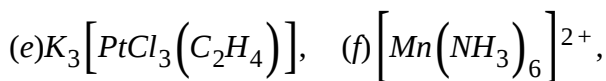
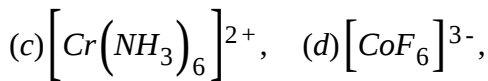
31. Consider the complex  $[Pt(S_5)_3]^{2-}$ . If  $x$ ,  $y$  and  $z$  are the number of chelates, number of optically active isomers and number of geometrical isomers respectively, find the value of  $(x + y + z)$ :



[View Text Solution](#)

32. Find the total number of complexes / species which are paramagnetic.





[View Text Solution](#)

**33.** A symmetrically bridged complex cation made of  $Co(III)$ ,  $NH_3$  molecules and oxygen (in the proper ligands form) is found to contain the following mass composition [Atomic mass of  $Co=59$ ]

$$Co=36.875\%, NH_3 = 53.125\%, O=10\%$$

The complex cation exists in three ionic forms with cationic charges  $A : (n +)$ ,  $B(n - 1)^+$  and  $C : (n - 2)^+$  such that O-O bond length in all of them is found to be more than that in  $O_2 \left[ Ptf_6 \right]$ . Calculate the value of  $n$ ,  $(n - 1)$  and  $(n - 2)$ .



[View Text Solution](#)

34. In sodium nitroprusside the oxidation number, coordination number and EAN of iron are respectively.

[If your answer is 1, 2, 24 then write the answer as 1224]

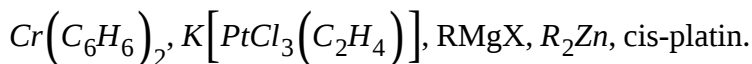
 [View Text Solution](#)

35. Give the co-ordination number of La in the compound



 [View Text Solution](#)

36. Find the number of molecules in which  $\pi$ -donation is present between metal and any ligand



 [View Text Solution](#)

37. Oxidation number of the central iron atom in the complex  $Fe_4[Fe(CN)_6]_3$  is.

 [View Text Solution](#)

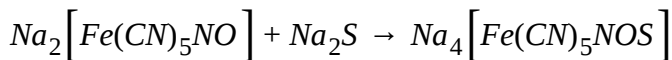
38. Find the EAN value of central atom of ferrocene  $[Fe(\pi - C_5H_5)_2]$

 [View Text Solution](#)

39. If EAN of central metal ion  $X^{2+}$  in a non-chelating complex is 34 and atomic number of X is 28. Find out the number of monodentate ligands in complex.

 [View Text Solution](#)

40. Find the change of EAN values when the complex (A) is changing into (B)



(A) (B)

 [View Text Solution](#)

41. Calculate the value of E.A.N of metal cation in  $[Cu(NH_3)_4]SO_4$  complex

 [View Text Solution](#)

42. What is the difference between the EAN value of central metal ion in  $Na_2[Fe(CN)_5NO]$  and  $[Fe(H_2O)_5NO]SO_4$

 [View Text Solution](#)

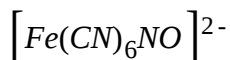
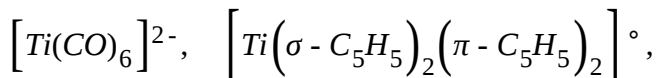
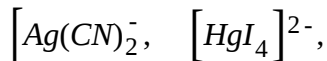
43. Find the difference in the EAN value, if the NO ligand is considered as natural and if NO ligand is considered as positive ligand in  $[Fe(H_2O)_5NO]SO_4$  complex





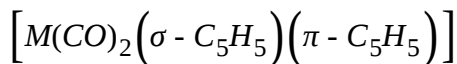
[View Text Solution](#)

44. Find the number of complexes following sidgwick EAN rule :



[View Text Solution](#)

45. If EAN of metal is 36 in



Find the atomic number of metal M



[View Text Solution](#)

46. Find number of Co-N linkage in pentaammine cobalt(III)-mu-amidodiamminetriaquacobalt(III) chloride.

 [View Text Solution](#)

47. Write simplest ratio of  $Co^{3+} : NH_3 : NO_2^-$  in : tetraamminedinitro  
N-cobalt(III)diamminetrtranitrito-N-cobaltate(III)

 [View Text Solution](#)

48. How many moles of ions (cation and anion) are present in 1 mole of  
Diamminediaquadipyridineiron(II)sulphate

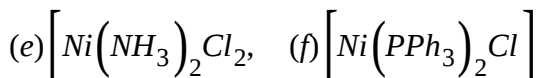
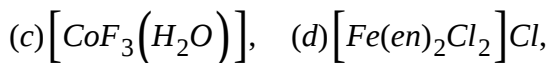
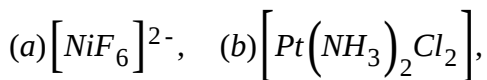
 [View Text Solution](#)

49. Find the total number of stereoisomers of  $[M(gly)_3]$

[Where M is any metal capable of forming such complexes.]`

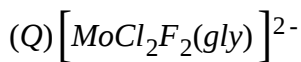
 [View Text Solution](#)

50. Find the number of diamagnetic complexes which show geometrical isomerism :



 [View Text Solution](#)

51. Consider the complexes

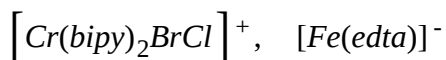
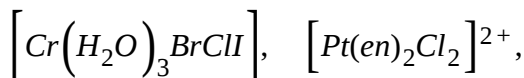
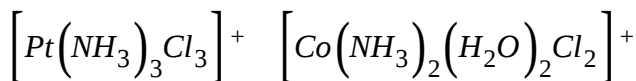


these are having number for optically active isomers a and b respectively

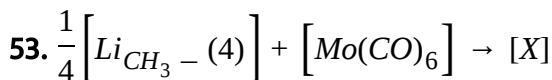
then a-b is :

 [View Text Solution](#)

52. In the given following complex compound / ions, how many exist in enantiomeric form ?



 [View Text Solution](#)



Here X is Lithium acetylpentacarbonylmolybdate(1-), then find the total number of Mo-C linkages in the complex X

 [View Text Solution](#)

54. Find the total number of geometrical isomers of  $[M(AB)(CD)(EF)]^{n+}$

 [View Text Solution](#)

55. Find the number of geometrical isomer of  $Ma_2bcde$  which have identical ligands at maximum distance. (a, b, c, d and e are monodentate ligand)

 [View Text Solution](#)

56. Find the maximum number of atoms in one plane in  $[Fe(CN)_6]^{3-}$

 [View Text Solution](#)

57. Find the number of unpaired electrons in  $e_g$  orbital of Fe in  $K_4[Fe(CN)_6]$

 [View Text Solution](#)

58. Find the number of unpaired electrons in Pentaquanitrosyliumiron(I) sulphate.



[View Text Solution](#)

59. Find the change in magnetic moment when  $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$  is converted into  $[\text{Ni}(\text{NH}_3)_6]^{2+}$



[View Text Solution](#)

60. How many non-axial d-orbitals are involved in hybridisation of  $\text{CrO}_2\text{Cl}_2$ ?



[View Text Solution](#)

61. On the basis of the following observations made with aqueous solutions, how many of them have 6 secondary valencies ?

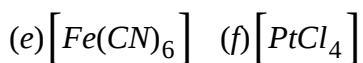
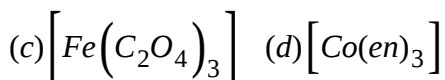
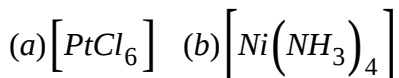
Formula	Moles of AgCl precipitated per mole of the compounds with excess
(a) $PdCl_2 \cdot 4NH_3$	2
(b) $NiCl_2 \cdot 6H_2O$	2
(c) $PtCl_4 \cdot 2HCl$	0
(d) $CoCl_3 \cdot 4NH_3$	1
(e) $PtCl_2 \cdot 2NH_3$	0

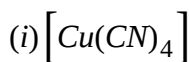
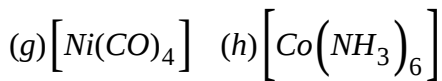
 [View Text Solution](#)

**62.** On 100% dissociation of the compound  $K_4Fe(CN)_6$ , the total number of ions produced will be

 [View Text Solution](#)

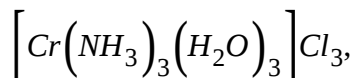
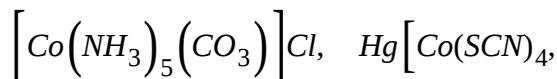
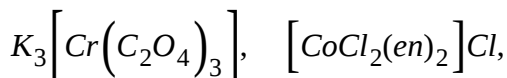
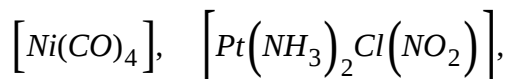
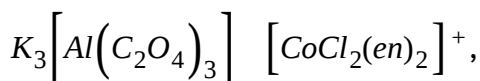
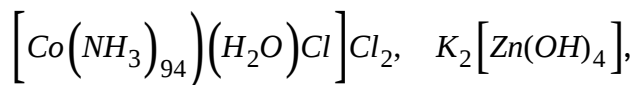
**63.** Amongst the following complexes, (mentioned without any charge) how many of them are expected to have a *vely* charged counter ion ?



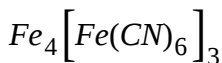
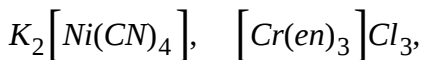
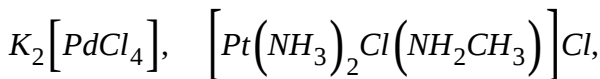
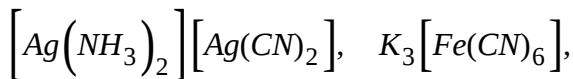
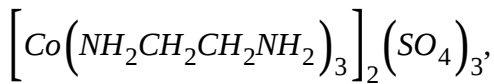


View Text Solution

64. Amongst the following complexes, find the number of complexes having oxidation number of central atom as +3. Let's say it is equal to x. Similarly find the number of complexes having oxidation number of central atom as +2. Let's say it is equal to y. All other complexes number equal to z :





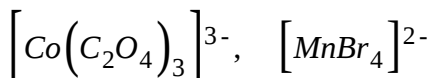
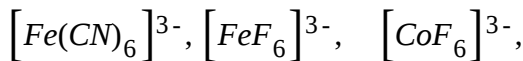
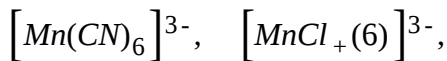


Hence, find the value of  $x - y + z$



[View Text Solution](#)

65. How many of the following complexes are expected to have  $d^2sp^3$  hybridisation ?



[View Text Solution](#)

66. Total number of isomers of  $[Pt(NH_3)(Br)(Cl)(py)]$  are

 [View Text Solution](#)

67. Estimate the numbers for the central metal ion :

(a) Oxidation state in  $[Mn(H_2O)_6]SO_4 = x$

(b) d-orbitals occupation in *cis* -  $[Cr(en)_2Cl_2]Cl = y$  (if  $d^8$  then  $y=8$ )

(c) Co-ordination number in  $K_3[Co(C_2O_4)_3] = z$

(d) Spin multiplicity in  $Cs[FeCl_4] = t$

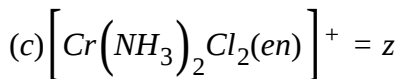
Hence, find the value of  $z - (x \times y) + t$

 [View Text Solution](#)

68. Find the total stereoisomes for :

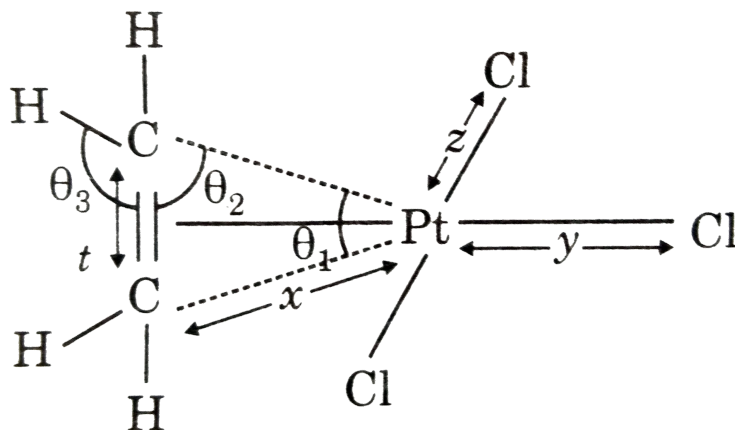
(a)  $[Cr(C_2O_4)_3]^{3-} = x$

(b)  $[PtCl_2(en)_2]^{2+} = y$



Hence write the value of  $x + y + z$

[View Text Solution](#)



Here,  $\theta_1$ ,  $\theta_2$  and  $\theta_3$  are bond angles,  $x$ ,  $y$ ,  $z$ ,  $t$  are bond lengths in ZEISE'S Salt.

Write the number of correct relationships

(a)  $y < z$  (b)  $x > z$

(c)  $x > y$  (d)  $t < y$

(e)  $\theta_1 < \theta_2$  (f)  $\theta_3 > \theta_2$

(g)  $x = y = z$  (h)  $\theta_1 = \theta_2$

[View Text Solution](#)

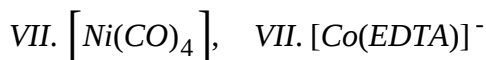
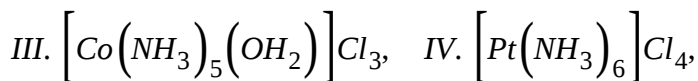
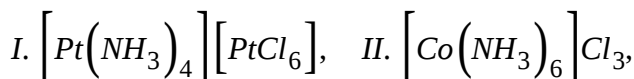
70. Find the number of complexes which satisfy at least three of the following four conditions :

(a) Primary valence=3

Secondary valence=6

Oxidation number of central atom  $< +3$

Number of ions per molecule  $> 3$



View Text Solution

71. Choose the number of correct statements.

(a) Measurement of molar conductivity was utilized by Werner to characteris the cobalt (III)-ammine compounds.

- (b) The neutral ligands can only satisfy the secondary valence but the anions may satisfy both the primary and secondary valencies.
- (c ) The secondary valencies are directional to provide the specific geometry of a complex but the primary valencies have nothing to do with the geometry of coordination compounds.
- (d) The oxyanions, aminopoly carboxylates, cysteine, histidine etc. can show the flexidentate character.
- (e ) The concept of co-ordination number in co-ordination compounds is different from that in the ionic solids .
- (f) In determining the co-ordination number in co-ordination compounds, the number of  $\pi$ -bonds formed by ligands with metal centre has no role.
- (g) Olefins can act both as monodentate and bidentate ligands depending on the conditions.
- (h) The distinction between the perfect and imperfect complexes is arbitrary.
- (i)  $\mu$ -bond is a special type of  $\sigma$  - bond



[View Text Solution](#)

72. Choose the number of correct statements.

- (a) The  $\pi$  - acid ligands can stabilize the low oxidation states of metals.
- (b) In the chelating ring produced by acac ligand, pseudo-aromaticity is maintained.

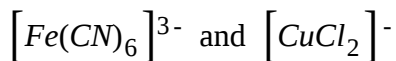
The Flexidentate character of EDTA largely depends on pH.

- (d) M-SCN linkage is bent while M-NCS linkage is linear.
- (e) Ambidentate character of a peptide linkage mainly depends on pH.
- (f) Dioxygen ( $O_2$ ), dinitrogen ( $N_2$ ) can act as  $\pi$  - acid ligands.
- (g) Ag(SCN) (solid) form a polymeric zig-zag chain.
- (h) Dithiooxalate and thiosulphate can produce the linkage isomers.
- (i) For  $\left[PtCl_2(PR_3)_2\right]$ , the trans-isomer shows 0 (zero) dipole moment but for  $\left[PtCl_2(Et_2S)_2\right]$ , the trans isomer shows a non-zero dipole moment.



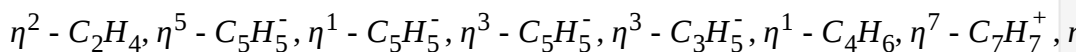
[View Text Solution](#)

73. Find the difference in the EAN of the complexes



 [View Text Solution](#)

74. Among the ligands :



The number of species which are :

$2e^-$  donors= $x$

$4e^-$  donors= $y$

$6e^-$  donors= $z$

Find the value of  $2x - y + z$ .

 [View Text Solution](#)

75. Total stereoisomers of  $[Cu(gly)_2(OH_2)_2]$  are :

 [View Text Solution](#)

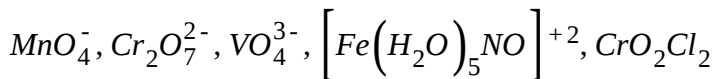
76. Total stereoisomers of  $[Co(N_2O_4)]^-$  are :

 [View Text Solution](#)

77. Number of optically active isomers of compound  $[M(AB)b_2c_2]^{\pm n}$

 [View Text Solution](#)

78. From given compounds how many have tetrahedral shape, not  $sp^3$  hybridised and coloured W.r.t. underline atoms.



 [View Text Solution](#)

79. Consider the diamagnetic complex  $[M(en)_3](ClO_4)_3$ , Where M is a first row transition metal except Sc. Find the value of  $x + y$  of M in above



complex.

If

x=oxidation state

y= number of d electrons present

 [View Text Solution](#)

**80.** Find the total number of ions which form paramagnetic complex irrespective of nature of ligand in octahedral geometry. (C.N. = 6)

$Sc^{+3}, Ti^{3+}, Cr^{+3}, Pt^{+4}, Ni^{+2}, Co^{+3}, Fe^{+3}$

 [View Text Solution](#)

**81.** In how many of the following compounds 'd' orbital (which contains no nodal plane) is used in hybridisation of central atom/ion ?

$Fe(CO)_5, MnO_4^-, Co(C_2O_4)_3^{-3},$

$NiCl_2(PPh_3)_2, PtCl_4^{2-}, Ni(CN)_4^{-2},$

$Ni(CN)_4^{-4}$

 [View Text Solution](#)

 [View Text Solution](#)

82. In octahedral complex  $Ma_2b_2cd$ , total number of stereoisomers is

 [View Text Solution](#)

83. Total number of optically active isomers in  $[Pt(NH_3)(H_2O)BrClIPy]^+$  when  $NH_3$  and  $H_2O$  are in trans position (opposite to each other)

 [View Text Solution](#)

84. Determine the difference between exchangeable pair for high spin and low spin  $d^6$  ions in an octahedral complex.

 [View Text Solution](#)

85. Total number of ligand(s) which forms five membered ring and also contains chiral centre(s).

$pn, en, tn, bn, DMG^{-1}, acac^{-1}, nta^{-3}$

 [View Text Solution](#)

86. Find the number of ions which have higher splitting energy value than the  $Mn^{+2}$  in octahedral complex considering same ligands for all ions.

$Cr^{+2}, V^{+2}, Fe^{+2}, Co^{+2}, Ni^{+2}, Cu^{+2}$

 [View Text Solution](#)

87. Find the number of correct statements ?

(a) Pd(II) and Pt(II) form mostly the 4-coordination, square planar, diamagnetic co-ordination entities.

(b) The free ions  $Pd^{+2}, Pt^{+2}$  and  $Ni^{+2}$  are paramagnetic in ground states.

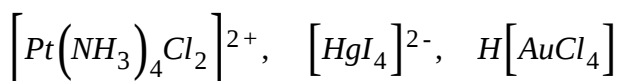
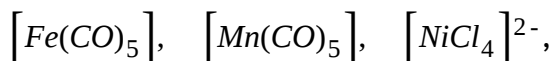
(c) Octahedral  $[Co(H_2O)_6]^{+2}$  is pink, that of tetrahedral  $[CoCl_4]^{2-}$  is blue

(d)  $\Delta_0 = \frac{4}{9}\Delta_t$

(e) If a multidentate ligand happens to be cyclic and there are no unfavourable steric effects a further increase in stability occurs. This is termed as macrocyclic effect.

 [View Text Solution](#)

88. Find the number of complexes which follow sidgwick rule of EAN



Atomic number : Fe = 26, Mn = 25, Ni = 28, Pt = 78, Hg = 80, Au = 79

 [View Text Solution](#)

89. The maximum number of N-Co-O bond angle in  $[Co(gly_3)]^\circ$  is :

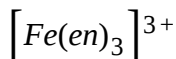
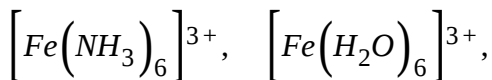
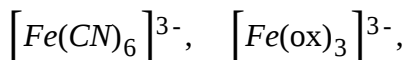
 [View Text Solution](#)

90. Find the number of ligands which behave predominantly as  $\pi$  - donor ligand (as well as non-classical ligand)



 [View Text Solution](#)

91. Find the number of complexes in which stability constant value is greater than the stability constant value of  $[FeF_6]^{3-}$



 [View Text Solution](#)

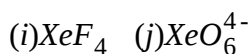
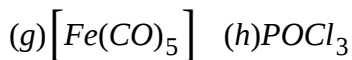
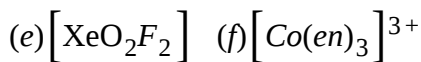
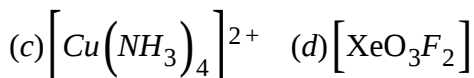
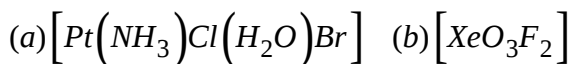
92. If we replace all the fluoride and water ligands from  $[CoF_3(H_2O)_3]$  by oxalate ligand without changing the oxidation state and co-ordination

number of central metal atom or ion, then, predict which of the following value increases in the newly formed complex.

- (a)  $\Delta_0$
- (b) Number of  $t_{2g}$  electrons
- (c) Number of  $e_g$  electrons
- (d) Number of stereo isomers
- (e) Number of geometrical isomers,
- (f) EAN value

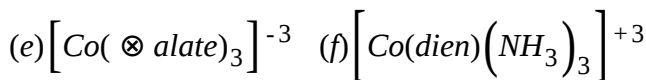
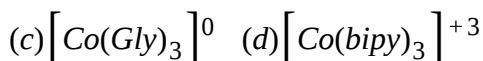
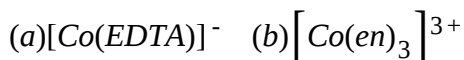
 [View Text Solution](#)

**93.** Find the number of compounds where  $d_{x^2-y^2}$  orbitals will not take part in hybridisation.



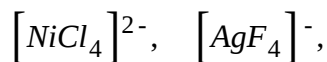
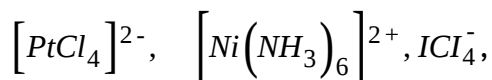
 [View Text Solution](#)

94. Find the number of complex(es) which have at least one five member chelate ring formed by two carbon atoms, two nitrogen atoms and one central metal.



 View Text Solution

95. Among the following, total number of planar molecule(s)/ions are :



 View Text Solution

96. Find the total number of compounds having equal all bond lengths equal :

$PCl_5$ ,  $PF_5$ ,  $SF_4$ ,  $XeF_2$ ,  $XeF_4$ ,  $XeF_6$ ,  $SF_6$ ,  $ClF_3$ ,  $BrF_5$ ,  $Ni(CO)_4$ ,  $IF_7$



[View Text Solution](#)