



# CHEMISTRY

## BOOKS - SHARAM PUBLICATION

### CO -ORDINATION COMPOUNDS

#### Exercise

1. A group of atoms can function as a ligand only when?

- A. it is a small molecule
- B. it has an unshared electron pair
- C. it is negatively charged ion
- D. it is a positively charged ion.

**Answer:**



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2. The oxidation state of  $Fe$  in the brown ring complex  $[Fe(H_2O)_5NO]SO_4$  is

A. +3

B. 0

C. +2

D. +1

**Answer:**



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**3.** How many EDTA molecules are required to make an octahedral complex with a  $(Ca^{2+} \text{ ion})$  ?

A. six

B. three

C. one

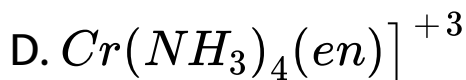
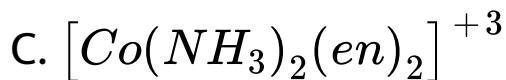
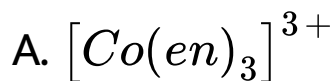
D. two

**Answer:**



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**4.** Which one of the following complex ions has geometrical isomers ?

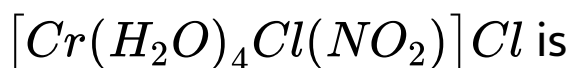


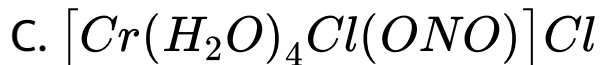
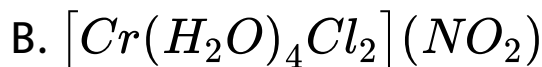
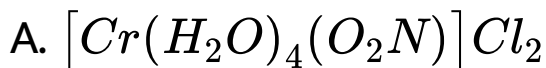
**Answer:**



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5. The ionisation isomer of





**Answer:**



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6. The number of water molecules directly bonded to the metal centre in  $CuSO_4 \cdot 5H_2O$  is

A. 1

B. 2

C. 3

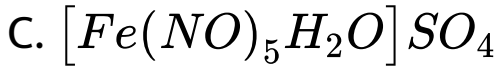
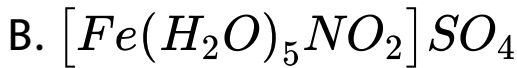
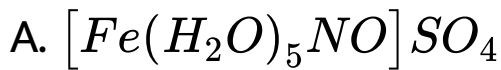
D. 4

**Answer:**



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7. The complex formed in the ring test of qualitative analysis for  $NO_3^-$  ion is



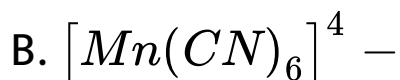
**Answer:**



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**8.** Which of the following complex is outer orbital complex ?





**Answer:**



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9. Among the properties (a) reducing (b) oxidising (c) complexing, the set of properties shown by  $CN^{-1}$  towards metal species is

A. c,a

B. b,c

C. a,b

D. a,b,c

**Answer:**



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**10.** Number of unpaired electrons in

$[CoF_6]^{3-}$  – is

A. 4

B. 2

C. 3

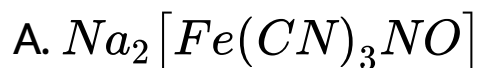
D. 1

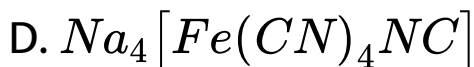
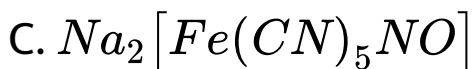
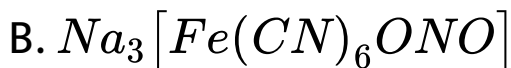
**Answer:**



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**11.** The formula of sodium nitroprusside is:



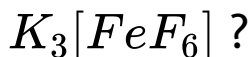


**Answer:**



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**12.** What is the magnetic momentum of



A.  $5.91BM$

B.  $4.898BM$

C.  $3.87BM$

D.  $6.928BM$

**Answer:**



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**13.** Which of the following has magnesium ?

A. Chlorophyll

B. Haemoglobin

C. Carbonic anhydrase

D. Vitamin  $B_{12}$

**Answer:**



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**14.** Ammonia forms complex  $[Cu(NH_3)_4]^{2+}$  with copper ion in alkaline solution and not in acidic solution. The reason for this is

A. In acidic solution, the protons coordinate with the ammonia molecule forming  $NH_4^+$  ion and  $NH_3$  molecules are not available.

B. In alkaline solution, insoluble  $Cu(OH)_2$  is precipitated which is soluble in any alkali

C.  $Cu(OH)_3$  is an amphoteric substance

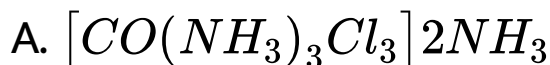
D. In acidic solution, hydration protects copper ion.

**Answer:**

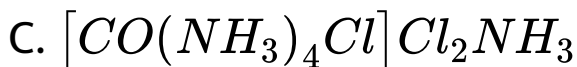
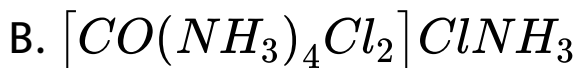


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15. One mole of complex compound  $Co(NH_3)_5Cl_3$  gives 3 moles of ions on dissolution in water. One mole of the same complex reacts with two moles of  $AgNO_3$  solution to yield two moles of  $AgCl_s$ , The structure of the complex is







**Answer:**



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**16.** The existence of two different coloured complexes of  $[Co(NH_3)_4Cl_2]^+$  due to

A. ionisation isomerism

B. co- ordination isomerism

C. linkage isomerism

D. geometrical isomerism

**Answer:**



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

A. five

B. 2

C. 4

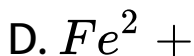
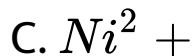
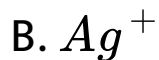
D. 3

**Answer:**



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**18.** Which of the following forms with excess of  $CN^-$  ions a complex having co - ordination number two



**Answer:**



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**19.** The co - ordination number of the central metal ion in a complex is determined by

- A. Number of ligands around a metal ion bonded by sigma and  $\pi$  bonds both
- B. The number of ligands around a metal ion bonded by  $\pi$  bonds.
- C. The number of ligands around a metal ion bonded by sigma bonds
- D. The number of only an ionic ligands bonded to the metal ion.

**Answer:**



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20. The IUPAC name of the co - ordination compound  $K_3 [Fe(CN)_6]$  is

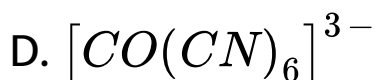
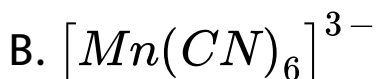
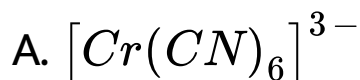
- A. Potassium hexacyanoferrate (II)
- B. Potassium hexacyanoferrate (III) ion
- C. Potassium hexa cyano iron (III)
- D. None

**Answer:**



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21. Which of the following cyano complexes would exhibit the lowest value of paramagnetic behaviour

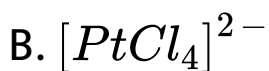


**Answer:**



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22. Which of the following has a square planar geometry ?



**Answer:**



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23. According to IUAPC system sodium nitropruside is named as :

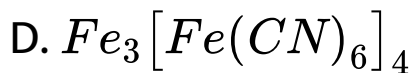
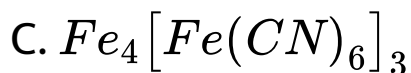
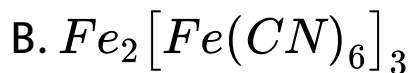
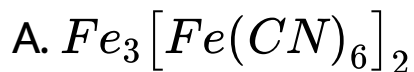
- A. Sodium nitroferricynide
- B. Sodium nitroferrocynide
- C. Sodium pentacyno nitrosyl ferrate II
- D. Sodium pentacyno nitrosyl ferrate III.

**Answer:**



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24. Prussian blue is :

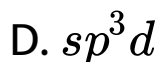
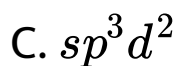
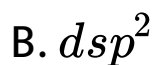


**Answer:**



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25. The hybridisation involved in the formation of octahedral complex is

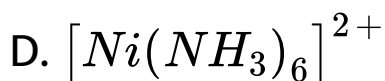
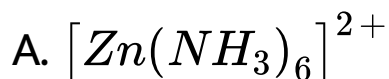


**Answer:**



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

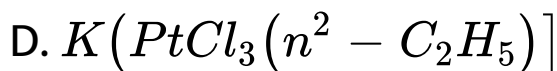
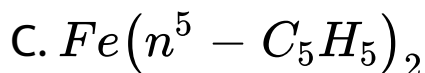
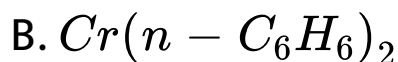
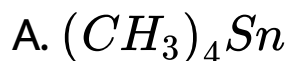


**Answer:**



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27. Among the following which is not the pi - bonded organometallic compound ?

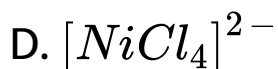
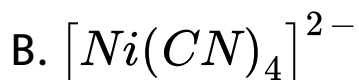


**Answer:**



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28. The species having tetrahedral shape is



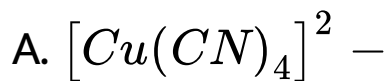
**Answer:**



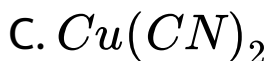
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29.  $CuSO_4$  de colours is an addition of  $KCN$

the product is



B.  $Cu^{2+}$  gets reduced to form



**Answer:**



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30. The spin only magnetic moment value (in Bohr magnetic units) of  $[Cr(CO)_6]$  is

- A. 0
- B. 2.84
- C. 6.92
- D. 1

**Answer:**



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31. With  $K_4[Fe(CN)_6]$ ,  $Cu^{2+}$  ion gives

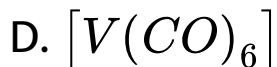
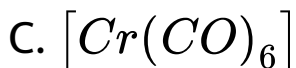
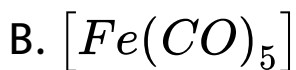
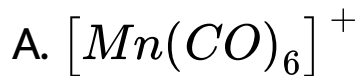
- A. a blue ppt
- B. a bluish green ppt
- C. a blood red
- D. a reddish brown ppt

**Answer:**



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32. Among the following metal carbonyls, the C-O bond length is lowest in

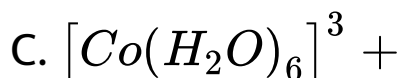
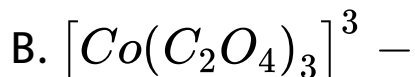


**Answer:**



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33. In which of the following co - ordination entitles the magnitude of  $\Delta_0$  will be maximum

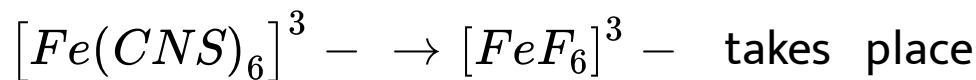


**Answer:**



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34. The reaction



with

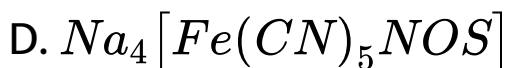
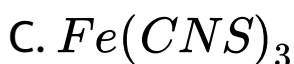
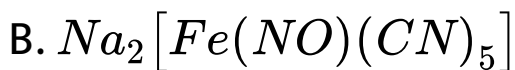
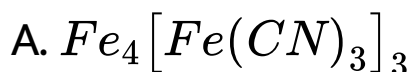
- A. decrease in magnetic moment
- B. increase in magnetic moment
- C. decrease in co-ordinating number
- D. increase in co-ordinating number

**Answer:**



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35. Which of the following complex formation indicates the presence of sulphur in organic compound when sodium nitropruside is added to sodium extract of the compounds



**Answer:**



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**36.** Write the formula of the following complex.

Pottasium hexafluoro platinate (IV).



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**37.** Write the formula of the following complexes:

Potassium trioxalatoaluminate (III),



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38. The co - ordination number of  $Cr$  in  $[Cr(en)_2NH_3(NCS)]$  is



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39. Which ligand is used for the estimation of hardness in water ?



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40. Give examples of two ambidentate ligands.



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41. Oxidation state of Ni in  $[Ni(CO)_4]$  \_\_\_\_\_.



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42. Write the various types of valencies in complex compounds.



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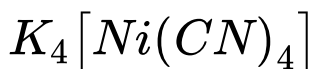


**43.** What are primary and secondary valencies?



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**44.** Calculate the oxidation number of the central metal atom in the following.



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**45.** Calculate the oxidation number of the central metal atom in the following.



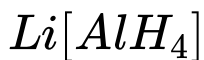
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**46.** Write the IUPAC of the complex compound.



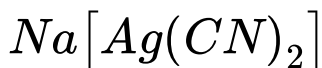
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**47.** Write the IUPAC name of the following complexes.



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**48.** Write the IUPAC name of the following complexes.



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49. Write the IUPAC name of the following complexes.



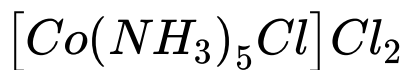
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50. Write the IUPAC name of  $K_3[Fe(CN)_6]$



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51. Write the IUPAC name of



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52. Write the IUPAC name of  $K_4[Fe(CN)_6]$ .



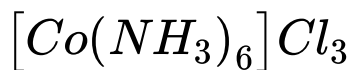
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53. Write the IUPAC name of  $K_2[PtCl_6]$ .



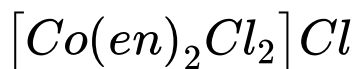
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54. Write the IUPAC name of the followings.



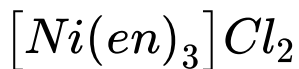
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55. Write the IUPAC name of the followings.



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56. Write the IUPAC name of the followings.



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57. Write the IUPAC name of the followings.



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58.

Write the name and formula of the complex formed when excess of dil ammonium hydroxide is added to  $CuSO_4$  solution .



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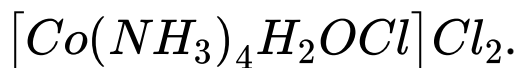
59. Write the formula of the following compound: Ammonium diamine tetra-thiocyanato chromate (III)



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60. Write the name of the compound .



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61. Write the name of the compound .



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62. Find EAN of Fe in  $K_4[Fe(CN)_6]$



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63. The oxidation number of Fe in

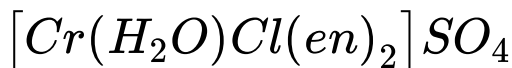
$K_4[Fe(CN)_6]$  is :



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64. Write the name of the compound .

Write the IUPAC name of the compound



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**65.** Write the formula of the following complexes :

Tetra carbonyl nickel (0)



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**66.** Write the formula of the following complexes :

Hexa aqua nickel (II) perchlorate,



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**67.** Write the formula of the following complexes :

Dichloro tetrammine platinum IV ion.



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**68.** Name the metal present in haemoglobin



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**69.** Name of the metal which present in chlorophyll.



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**70.** Prussian blue is :



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71. Fill in the blanks : The formula of the complex formed by addition of  $KCN$  to  $CuSO_4$  solution is .....



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72. Fill in the blanks : If a monodentated ligand in a complex compound contains more than one donor atom, the isomerism shown by it will be .....



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73. The oxidation number of 'Co' in the complex  $K[Co(CO)_4]$  is \_\_\_\_\_



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74. Fill in the blanks : In the compound lithium tetrahydrido aluminate, the ligand is .....



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**75.** Fill in the blanks : The addition compounds which retain their identity in solution are called .....



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**76.** The oxidation state of  $Fe$  in the brown ring complex  $[Fe(H_2O)_5NO]SO_4$  is



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77. Fill in the blanks :  $[Ni(CN_4)]^{2-}$  is diamagnetic and has ..... Shape.



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78. Fill in the blanks : The number of ions produced from 1 mole of  $K_4[Fe(cn)_6]$  is .....



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**79.** Fill in the blanks : The metal present in chlorophyll is ..... and the metal present in *Vita min B<sub>12</sub>* is .....



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**80.** Fill in the blanks : In octahedral complex with  $d^8$  metal ion configuration the CFSE is .....



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**81.** Fill in the blanks : The formula of sodium nitro prusside is ..... And its IUPAC name is .....



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**82.** Fill in the blanks : The ligand SCN linked to metal atom through 'S' is called ..... , where as when linked through 'N' is called .....



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**83.** Fill in the blanks : When a ligand forms a closed ring with metal atom, the complex formed is called .....



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**84.** Fill in the blanks : Unidentate ligands having more than one co -ordinating atoms are called ..... ligands.



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**85.** Fill in the blanks : The most common name of bis (cyclopentadienyl) iron is .....



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**86.** Fill in the blanks : Octahedral complexes involving  $d^2 sp^3$  hybridisation are called ..... complexes and those involving  $sp^3 d^2$  hybridisation are called .....



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**87.** Fill in the blanks : Complexes in which the metal atom is linked to more than one type of ligands are called.....



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**88.** Fill in the blanks : Two compounds of the formula  $[Co(NH_3)_4Cl_2]^+ Cl^-$  exist. One of them has violet colour and other is green. One of them is ..... isomer and the other is ..... Isomer.



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**89.** What is ligand ? Give examples.



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**90.** What is effective atomic number?



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**91.** Give examples of neutral , negative and positively charged ligands.



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**92.** Define and explain the term co-ordination sphere.



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**93.** What happens when  $NH_3$  is added to Copper sulphate solution.



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94. Why does  $AgCl$  dissolve in ammonia ?



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95. Define chelating ligand. Give an example.



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96. What is the oxidation number of nickel in  $Ni(CO)_4$  ?



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**97.** Distinguish between double salt and complex salt



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**98.** Explain the types of valencies shown by a central metal atom of a complex compound.



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**99.** What do you mean by oxidation number of the Central metal ion in the complex ?



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**100.** What are homoleptic and heteroleptic complexes ? Give example.



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**101.** What are homonuclear and polynuclear complexes ? Give example.



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**102.** Discuss the splitting of d- orbitals in square planar crystal field.



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**103.** Discuss the structure of  $[Cu(NH_3)_4]^{2+}$  +  
on the basis of VBT.



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**104.** Discuss the structure of  $[Fe(CN)_6]^{3-}$  –  
on the basis of VBT.



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**105.** What is the shape and magnetic character of  $[Fe(CN)_6]^{4-}$  ?



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**106.** What do you mean by inner orbital and outer orbital complexes ?



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**107.** Write short notes on : Werner's theory of co-ordination compounds.



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**108.** Write notes on :

Valence Bond Theory



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**109.** Write notes on any two :

Crystal field Theory



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**110.** Write notes on any two :

Importance of co-ordination compounds.



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**111.** Discuss the structure of  $[Cr(NH_3)_6]^{3+}$ ,  $[Co(NH_3)_6]^{3+}$  and  $[Ni(CO)_4]$  on the basis of valence bond theory.



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**112.** Write the draw backs of VBT.



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