



## CHEMISTRY

### NCERT - NCERT CHEMISTRY(TELUGU)

### COORDINATION COMPOUNDS

#### Example

1. On the basis of the following observations made with aqueous solutions, assign secondary valencies to metals in the following

compounds.

Formula	Moles of AgCl precipitated per mole of the compounds with excess AgNO <sub>3</sub>
(i) PdCl <sub>2</sub> · 4NH <sub>3</sub>	2
(ii) NiCl <sub>2</sub> · 6H <sub>2</sub> O	2
(iii) PtCl <sub>4</sub> · 2HCl	0
(iv) CoCl <sub>3</sub> · 4NH <sub>3</sub>	1
(v) PtCl <sub>2</sub> · 2NH <sub>3</sub>	0

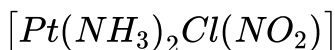
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2. Write the formulas for the follow co-ordination compounds

Tetraammineaquachloro cobalt (III) chloride

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3. Write the IUPAC names of the follow coordination compounds.



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4. Why is geometrical isomerism not possible in tetrahedral complexes having two different types of unidentate ligands Co-ordinated with the central metal ion ?

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5. Draw structures of geometrical isomers of  $[Fe(NH_3)_2(CN)_4]^-$

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6. Out of the following two Co-ordination entities which is chiral (optically active)?

a) cis-  $[CrCl_2(ox)_2]^{3-}$    b) trans-  $[CrCl_2(ox)_2]^{3-}$

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7. The spin only magnetic moment of  $[MnBr_4]^{2-}$  is 5.9 BM. Predict the geometry of the complex ion ?



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### Intext Question

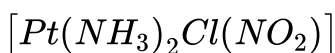
1. Write the formulae for the follow Co-ordination compounds

Tris (ethane-1, 2-diamine) chromium (III) chloride



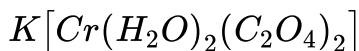
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2. Write the IUPAC names of the follow coordination compounds.



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3. Indicate the types of isomerism exhibited by the following complexes and draw the structures for these isomers :



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4. Give evidence that  $[Co(NH_3)_5Cl]SO_4$  and  $[Co(NH_3)_5SO_4]Cl$  are ionization isomers.



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5. Explain on the basis of valence bond theory that  $[Ni(CN)_4]^{2-}$  ion with square planar structure is diamagnetic and the  $[NiCl_4]^{2-}$  ion with tetrahedral geometry is paramagnetic.



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6.  $[NiCl_4]^{2-}$  is paramagnetic while  $[Ni(CO)_4]$  is diamagnetic though both are tetrahedral. Why ?



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7.  $[Fe(H_2O)_6]^{3+}$  is strongly paramagnetic whereas  $[Fe(CN)_6]^{3-}$  is weakly paramagnetic Explain.



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8. Explain  $[Co(NH_3)_6]^{3+}$  is an inner orbital complex whereas  $[Ni(NH_3)_6]^{2+}$  is an outer orbital complex.



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9. Predict the number of unpaired electrons in the square planar  $[Pt(CN)_4]^{2-}$  ion.



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10. The hexaquo manganese (II) ion contains five unpaired electrons, while the hexacyano ion contains only one unpaired electron. Explain using crystal field theory.



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11. Calculate the overall complex dissociation equilibrium constant for the  $Cu(NH_3)_4^{2+}$  ion, given that  $\beta_4$  for this complex is  $2.1 \times 10^{13}$ .



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1. Explain the bonding in coordination compounds in terms of Werner's postulates.

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2.  $FeSO_4$  solution mixed with  $(NH_4)_2SO_4$  solution in 1 : 1 molar ratio gives the test for  $Fe^{2+}$  ion but  $CuSO_4$  mixed with aqueous ammonia in 1 : 4 molar ratio does not give the test of  $Cu^{2+}$  ion. why?

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3. Explain with two examples each of the following: coordination entity, ligand, coordination number, coordination polyhedron,



homoleptic and heteroleptic.



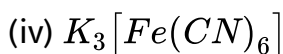
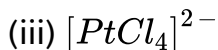
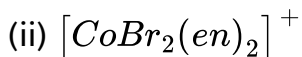
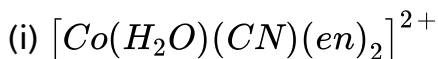
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4. What is meant by unidentate, didentate and ambidentate ligands? Give two examples for each.



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5. Specify the oxidation numbers of the metals in the following coordination entities:



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6. Using IUPAC norms write the formulas for the Tetrahydroxozincate (II)

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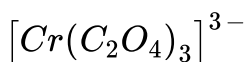
7. Using IUPAC norms write the systematic names of the  $[Co(NH_3)_6]Cl_3$

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8. List various types of isomerism possible for coordination compounds, giving an example of each.

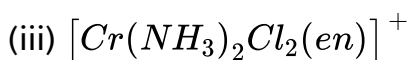
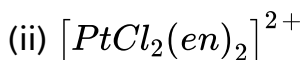
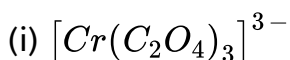
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9. How many geometrical isomers are possible in the following coordination entities ?



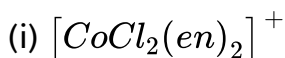
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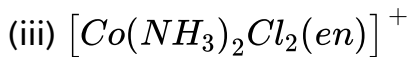
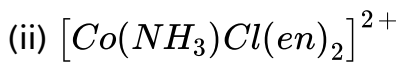
10. Draw the structures of optical isomers of:



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11. Draw all the isomers (geometrical and optical) of :





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**12.** Write all the geometrical isomers of  $[Pt(NH_3)(Br)(Cl)(py)]$  and how many of these will exhibit optical isomers?



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**13.** Aqueous copper sulphate solution (blue in colour) gives:

- (i) a green precipitate with aqueous potassium fluoride and
- (ii) a bright green solution with aqueous potassium chloride.

Explain these experimental results.



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**14.** What is the coordination entity formed when excess of aqueous KCN is added to an aqueous solution copper sulphate ? Why ?



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**15.** Discuss the nature of bonding and magnetic behaviour in the  $[Fe(CN)_6]^{4-}$  Co-ordination entities on the basis of valence bond theory.



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**16.** Sketch the splitting of d orbitals in an octahedral crystal field,



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17. What is spectrochemical series ? Explain the difference between a weak field ligand and a strong field ligand.



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18. What is crystal field splitting energy? How does the magnitude of  $\Delta_0$  decide the actual configuration of d orbitals in a coordination entity?



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19.  $[Cr(NH_3)_6]^{3+}$  is paramagnetic while  $[Ni(CN)_4]^{2-}$  is diamagnetic Why ?



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20. A solution of  $[Ni(H_2O)_6]^{2+}$  is green but a solution of  $[Ni(CN)_4]^{2-}$  is colourless. Why?



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21.  $[Fe(CN)_4]^{2-}$  and  $[Fe(H_2O)_6]^{2+}$  are of different colours in dilute solutions. Why ?



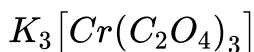
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22. Discuss the nature of bonding in metal carbonyls.



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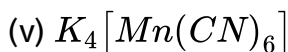
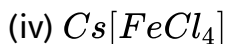
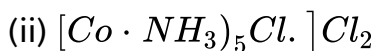
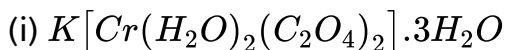
23. Write the IUPAC names of the follow coordination compounds.





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**24.** Write down the IUPAC name for each of the following complexes and indicate the oxidation state, electronic configuration and coordination number. Also give stereochemistry and magnetic moment of the complex:



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**25.** What is meant by stability of a coordination compound in solution? State the factors which govern stability of complexes.





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26. What is meant by chelate effect ? Give example.



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27. Discuss briefly giving an example in each case the role of coordination compounds in:

- (i) biological systems
- (ii) medicinal chemistry and
- (iii) analytical chemistry
- (iv) extraction/metallurgy of metals.



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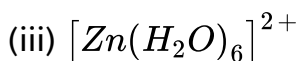
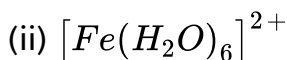
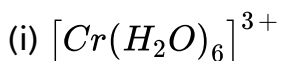
28. How many ions are produced from the complex  $Co(NH_3)_6Cl_2$  in solution?

- (i) 6 (ii) 4 (iii) 3 (iv) 2



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29. Amongst the following ions which one has the highest magnetic moment value?



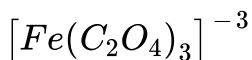
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30. What is the oxidation state of cobalt in  $K[Co(CO)_4]$



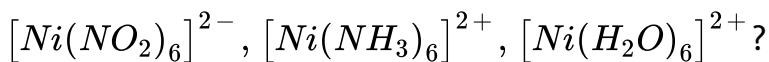
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31. Using IUPAC norms, write the systematic names of the



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32. What will be the correct order for the wavelengths of absorption in the visible region for the following:



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