

# CHEMISTRY

BOOKS - BETTER CHOICE PUBLICATION

## CO-ORDINATION COMPOUNDS

### Question Bank

1. Discuss the main postulates of Werner's coordination theory.



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2. Discuss the main postulates of Werner's coordination theory.



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3. Write two difference between double salt and complex compound.



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4. Explain with two examples each of the following: coordination entity, ligand, coordination number, coordination polyhedron, homoleptic and heteroleptic.



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5. Explain with two examples the following  
Central atom or ion.



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6. Explain with two examples the following ligands.



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7. What is meant by the term 'coordination number' ?



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8. Explain with two examples the following  
Coordination sphere.



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9. Explain with two examples each of the  
following: coordination entity, ligand,  
coordination number, coordination  
polyhedron, homoleptic and heteroleptic.



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**10.** Explain with two examples the following oxidation number of central atom.



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**11.** Explain with two examples the following homoleptic and heteroleptic complexes.



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**12.** What is meant by unidentate and ambidentate ligands ? Give two examples for each.



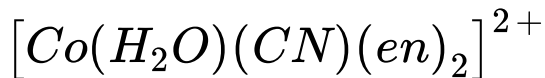
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**13.** Define chelate and chelating ligand. Give one example of chelate complex.



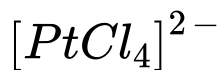
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14. Specify the oxidation numbers of the metals in the following coordination entities:



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



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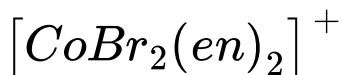


16. Specify the oxidation numbers of the metals in the following coordination entities:



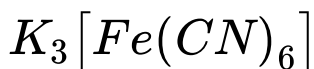
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17. Specify the oxidation numbers of the metals in the following coordination entities:



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



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**19.** Define ionisation isomerism. Give example.  
How can you distinguish between the two isomers ?



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20. The complex  $[Co(NH_3)_5Br]SO_4$  give white precipitates with  $BaCl_2$  solution while  $[Co(NH_3)_5SO_4]Br$  give yellow precipitate with  $AgNO_3$  solution. Explain.



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21. Define ionisation isomerism and write one ionisation isomer of :  $[CoSO_4(NH_3)_5]Br$ .



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22. Define linkage isomerism and write one linkage isomer of  $[Co(ONO)(NH_3)_5]Cl_2$ .



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23. Explain hydrate isomerism with the help of an example.



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24. Write a note on Co-ordinate isomerism.





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**25.** Write a note on geometrical isomerism.



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**26.** Write a note on optical isomerism.



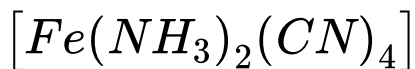
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27. Why is geometrical isomerism not possible in tetrahedral compounds having two different types of unidentate ligands with the central metal ion ?



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28. Draw structures of geometrical isomers of



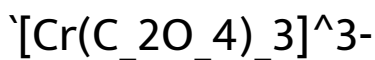
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29. Is the following compound chiral (optically active)? *cis* -  $[CrCl_2(ox)_2]^{3-}$  -



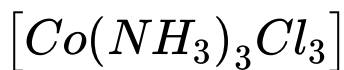
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30. How many geometrical isomers are possible in the following coordination entities:



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**31.** How many geometrical isomers are possible in the following co-ordination entity?



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**32.** What are inner and outer orbital complexes ?



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**33.** On the basis of valence bond theory explain the shape and magnetic character of  $K_4[Fe(CN)_6]$  or  $[FeCN_6]^{4-}$  ion.



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**34.** On the basis of valence bond theory explain the structure and magnetic nature of  $[Ni(CN)_4]^{2-}$  complex ion.



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**35.** Write the structure and the hybridisation of the central atom in  $[Ni(CO)_4]$



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**36.** How does valence bond theory account for:

$[Ni(Cl_4)]^{2-}$  is diamagnetic and tetrahedral

(At number of Ni = 28)



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**37.** Explain:  $[Ni(CN)_4]^{2-}$  is diamagnetic while  $[Ni(Cl)_4]^{2-}$  is paramagnetic.



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**38.** Explain:  $[Ni(CN)_4]^{2-}$  is diamagnetic while  $[Ni(Cl)_4]^{2-}$  is paramagnetic.



**Watch Video Solution**

**39.** Explain:  $[Ni(CN)_4]^{2-}$  is diamagnetic while  $[Ni(Cl)_4]^{2-}$  is paramagnetic.



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**40.** Using valence bond theory of complexes, explain the geometry and diamagnetic nature of the ion  $[Cr(NH_3)_6]^{3+}$ . Given the atomic number of Cr = 24.



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**41.** Discuss structure of  $[Co(NH_3)_6]^{3+}$  complex ion.



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**42.** On the basis of valence bond theory, explain the structure of  $[Fe(CN)_6]^{3-}$  complex.



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**43.** Explain magnetic Behaviour of

$[Fe(CN)_6]^{4-}$  and  $[Fe(CN)_6]^{3-}$  anions.



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**44.** Explain magnetic Behaviour of

$[Fe(CN)_6]^{4-}$  and  $[Fe(CN)_6]^{3-}$  anions.



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**45.** Predict the shape of hexafluoroferrate(III) on the basis of valence bond theory.



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**46.** Explain the formation of H<sub>2</sub> molecule on the basis of valence bond theory.



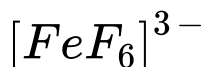
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**47.** Discuss the nature of bonding in the following coordination entity on the basis of valence bond theory :



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**48.** Discuss the nature of bonding in the following coordination entity on the basis of valence bond theory :







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49. Discuss the nature of bonding in the following coordination entities on the basis of valence bond theory:  $[Co(C_2O_4)_3]^{3-}$



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



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51. 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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52. Using valence bond theory predict the geometry and magnetic behaviour of  $[Pt(CN)_4]^{2-}$ .



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**53.** The hexaquo manganese(II) ion contains five unpaired electrons, while the hexacyanoion contains only one unpaired electron. Explain using Crystal Field Theory.



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**54.**  $\text{NiCl}_4^{2-}$  is paramagnetic while  $\text{NiCO}_4$  is diamagnetic though both are tetrahedral why



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



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56.  $[Fe(CN)_6]^{4-}$  and  $[Fe(H_2O)_6]^{2+}$  are of different colours in dilute solutions. Why?



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**57.** Discuss the nature of bonding in metal carbonyls.



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



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**59.** What is meant by the chelate effect? Give an example.



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**60.** Discuss briefly giving an example in each case the role of coordination compounds in: biological systems



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61. Write short note on the importance of complex compounds in different fields.



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## Question From Previous Board Examination

1. Write the IUPAC name of coordination compound  $[Co(NH_3)_3ONO]Cl_2$ .



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2. How many isomers are possible for the neutral complex  $[Co(NH_3)_3Cl_3]$ ? Draw their structures.



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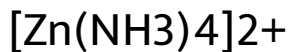
3. Discuss the nature of bonding in the following coordination entities on the basis of valence bond theory:  $[Fe(CN)_6]^{4-}$



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4. Write the IUPAC name for the coordination compound.



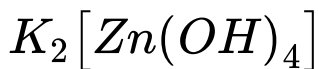
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5. Explain:  $[\text{Ni}(\text{CN})_4]^{2-}$  is diamagnetic while  $[\text{Ni}(\text{Cl})_4]^{2-}$  is paramagnetic.



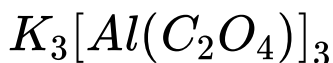
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6. Write IUPAC name of the following



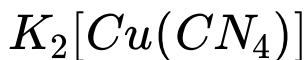
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7. Write IUPAC name of the following



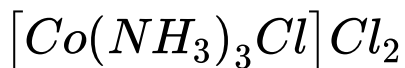
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8. Write IUPAC name of the following



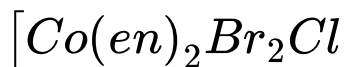
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9. Write IUPAC name of the following



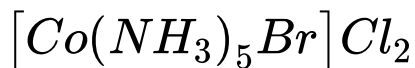
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10. Write IUPAC name of the following



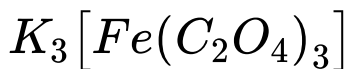
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11. Write IUPAC name of the following



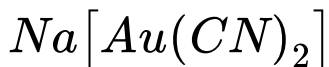
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12. Write IUPAC name of the following



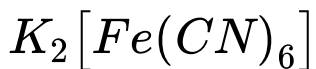
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13. Write IUPAC name of the following



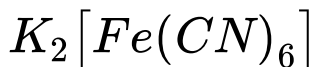
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14. Write IUPAC name of the following



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15. Write IUPAC name of the following



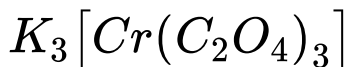
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16. Write the IUPAC name of the following :



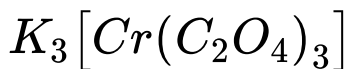
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17. Write IUPAC name of the following



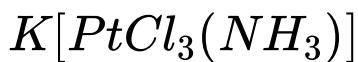
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18. Write IUPAC name of the following



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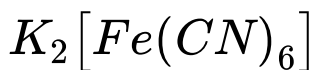
19. Write IUPAC name of the following



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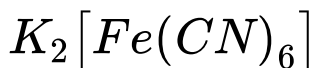


20. Write IUPAC name of the following



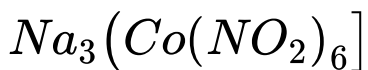
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21. Write IUPAC name of the following



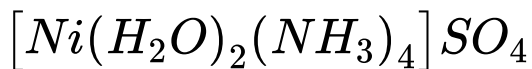
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22. Write the IUPAC name of the following :



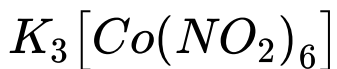
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23. Write the IUPAC name of the following:



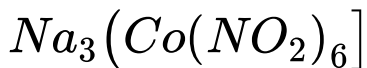
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24. Write IUPAC name of the following



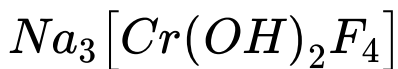
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25. Write the IUPAC name of the following :



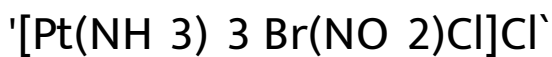
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26. Write IUPAC name of the following:



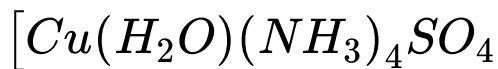
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27. Write IUPAC name of the following:



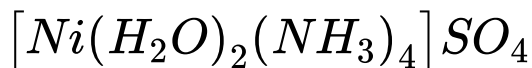
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**28.** Write IUPAC name of the following:



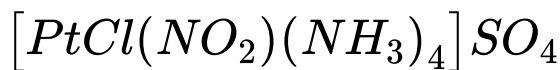
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**29.** Write the IUPAC name of the following:



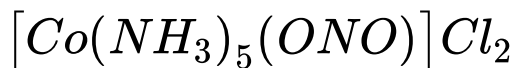
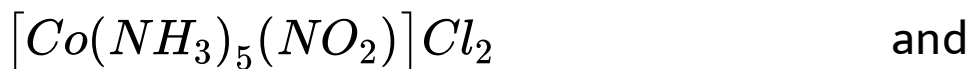
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30. Write IUPAC name of the following:



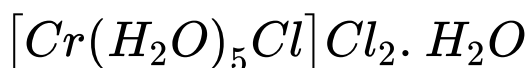
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31. Name the type of isomerism exhibited by the following pair of isomers.



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32. Name the type of isomerism exhibited by the following pair of isomers.



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33. Name the type of isomerism exhibited by the following pair of isomers.



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**34.** Write the formula of ferrocyanide ion.



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**35.** Give one example of hinge joint?



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**36.** Give one example of linkage isomer.



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**37.** What is the state of hybridisation and geometry in  $[\text{Fe}(\text{CN})_6]^{3-}$  ?



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**38.** What is the state of hybridisation and geometry in  $[\text{Cr}(\text{CO})_6]$  ?



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**39.** What is the state of hybridisation and geometry in  $[\text{Ni}(\text{CN})_4]^{2-}$



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**40.** Discuss structure of  $[\text{Co}(\text{NH}_3)_6]^{3+}$  ion the basis of V.B.T.



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41. What is the state of hybridisation and geometry in  $[\text{Ni}(\text{CN})_4]^{2-}$



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42. What is the state of hybridisation and geometry in  $[\text{Ni}(\text{CN})_4]^{2-}$



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43. Explain  $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$  is paramagnetic.



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**44.** With the help of crystal field theory, predict the number of unpaired electrons in  $[Fe(CN)_6]^{4-}$  and  $[Fe(H_2O)_6]^{2+}$ .



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**45.** predict the number of unpaired electrons in  $[CoF_6]^{3-}$  and  $[Co(NH_3)_6]^{3+}$



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**46.** With the help of the crystal field theory predict the number of unpaired electrons in  $[Fe(CN)_6]^{3-}$  and  $[FeF_6]^{3-}$ .



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**47.** Account for the different magnetic behaviour of hexacyanoferrate (III) and hexafluoroferrate(III).



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**48.** Explain :  $[Co(CN)_6]^{3-}$  is diamagnetic while  $[CoF_6]^{3-}$  is paramagnetic.



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**49.** Draw the geometrical isomers of  $[Co(en)_2Cl_2]^+$  ion. Which of these is optically active ?



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50. Draw the geometrical isomers of  $[Co(en)_2Cl_2]^+$  ion. Which of these is optically active ?



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51. Discuss the main postulates of valence bond theory.



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52. Write the name of ionisation isomer of the compound  $[Co(NH_3)_5Br]SO_4$ .



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53. Draw the geometrical isomers of  $[Co(en)_2Cl_2]^+$  ion. Which of these is optically active?



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54. Write the name of ionisation isomer of the compound  $[CO(NH_3)_4Cl_2]NO_2$



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55. Draw the geometrical isomers of  $[Pt(NH_3)_2 \cdot Cl_2]$ . Which of these is optically active.



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**56.** Draw the geometrical isomers of  $[Pt(NH_3)_2 \cdot Cl_2]$ . Which of these is optically active.



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**57.** Explain the difference between a weak field ligand and a strong field ligand.



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58. Write the structure and hybridisation of the central atom in  $[CoCl_2(NH_3)_4]$



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59.  $[Ti(H_2O)_6]^{3+}$  is coloured while  $[Sc(H_2O)_6]^{3+}$  is colourless. Explain.



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