1. Which one of the following octahedral complexes will not show geometric isomerism (*A* and *B* are monodentate ligands)

(a) $[MA_5B]$ (b) $[MA_2B_4]$

(c) $[MA_3B_3]$ (d) $[MA_4B_2]$

2. The number of unpaired electrons in the complex ion $[CoF_6]^{3-}$ is (Atomic no. of $Co = 27$)

(a) Zero (b) 2

(c) 3 (d) 4

3. Which would exhibit co-ordination isomerism

(a) $[Cr(NH_3)_6][Co(CN)_6]$ (b) $[Co(en)_2Cl_2]$

(c) $[Cr(NH_3)_6]Cl_3$ (d) $[Cr(en)_2Cl_2]^+$

4. $[Co(NH_3)_5NO_2]Cl_2$ and $[Co(NH_3)_5(ONO)]Cl_2$ are related to each other as

(a) Geometrical isomers (b) Optical isomers

(c) Linkage isomers (d) Coordination isomers

5. $[Co(NH_3)_5Br]SO_4$ and $[Co(NH_3)_5SO_4]Br$ are examples of which type of isomerism

(a) Linkage (b) Geometrical

(c) Ionization (d) Optical

6. $[Co(NH_3)_4Cl_2]NO_2$ and $[Co(NH_3)_4Cl.NO_2]Cl$ are ..... isomers

(a) Geometrical (b) Optical

(c) Linkage (d) Ionization

7. Which would exhibit ionisation isomerism

(a) $[Cr(NH_3)_6]Cl_3$ (b) $[Co(NH_3)_5Br]SO_4$

(c) $[Cr(en)_2Cl_2]$ (d) $[Cr(en)_3Cl_3]$

8. $[Ti(H_2O)_6]^{+3}$ is paramagnetic in nature due to

(a) One unpaired e^- (b) Two unpaired e^-

(c) Three unpaired e^- (d) No unpaired e^-

9. Coordination isomerism is caused by the interchange of ligands between the

(a) *Cis* and *Trans* structure

(b) Complex cation and complex anion

(c) Inner sphere and outer sphere

(d) Low oxidation and higher oxidation states

10. Which one of the following will not show geometrical isomerism

(a) $[Cr(NH_3)_4Cl_2]Cl$ (b) $[Co(en)_2Cl_2]Cl$

(c) $[Co(NH_3)_5NO_2]Cl_2$ (d) $[Pt(NH_3)_2Cl_2]$

11. Paramagnetic co-ordination compounds contain ..... electrons

(a) No

(b) Both paired and unpaired

(c) Paired
(d) Unpaired

12. Which of the following isomeric pairs shows ionization isomerism
(a) $[Co(NH_3)_6][Cr(CN)_6]$ and $[Cr(NH_3)_6][Co(CN)_6]$
(b) $[Cr(H_2O)_6]Cl_3$ and $[Cr(H_2O)_5Cl]Cl_2.H_2O$
(c) $[Pt(NH_3)_2Cl_2]$ and $[Pt(NH_3)_4][PtCl_4]$
(d) $[Co(NH_3)_5Br]SO_4$ and $[Co(NH_3)_5SO_4]Br$

13. Among the following ions which one has the highest paramagnetism
(a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(H_2O)_6]^{2+}$
(c) $[Cu(H_2O)_6]^{2+}$ (d) $[Zn(H_2O)_6]^{2+}$

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

15. $[Co(NH_3)_4Cl_2]^+$ exhibits
(a) Geometrical isomerism (b) Optical isomerism
(c) Bonding isomerism (d) Ionisation isomerism

16. The compound which does not show paramagnetism is
(a) $[Cu(NH_3)_4]Cl_2$ (b) $[Ag(NH_3)_2]Cl$
(c) NO (d) NO_2

17. The number of geometrical isomers for $[Pt(NH_3)_2Cl_2]$ is
(a) Two (b) One
(c) Three (d) Four

18. The pair of complex compounds $[Cr(H_2O)_6Cl_3]$ and $[Cr(H_2O)_5Cl]Cl_2H_2O$ are an example of
(a) Linkage isomerism (b) Ionisation isomerism
(c) Coordination isomerism (d) Hydrate isomerism

19. The number of geometrical isomers of the complex $[Co(NO_2)_2(NH_3)_2]$ is
(a) 2 (b) 3
(c) 4 (d) 0

20. The type of isomerism present in nitropentamine chromium (III) chloride is
(a) Optical (b) Linkage
(c) Ionization (d) Polymerisation

21. Which of the following compounds exhibits linkage isomerism

(a) $[Co(en)_3]Cl_3$ (b) $[Co(NH_3)_6[Cr(CN)_6]$

(c) $[Co(en)_2 NO_2Cl]Br$ (d) $[Co(NH_3)_5 Cl]Br_2$

22. Pick out from the following complex compounds, a poor electrolytic conductor in solution

(a) $K_2[PtCl_6]$ (b) $[Co(NH_3)_3(NO_2)_3]$

(c) $K_4[Fe(CN)_6]$ (d) $[Cu(NH_3)_4]SO_4$

23. The possible number of optical isomers in $[Co(en)_2 Cl_2]^+$ are

(a) 2 (b) 3

(c) 4 (d) 6

24. Magnetic moment of $[Cu(NH_3)_4]^{2+}$ ion is

(a) 1.414 (b) 1.73

(c) 2.23 (d) 2.38

25. What is true for $[Fe(CN)_6]^{3-}$ and $[FeF_6]^{3-}$

(a) Both are paramagnetic

(b) Only $[Fe(CN)_6]^{3-}$ is paramagnetic

(c) Only $[FeF_6]^{3-}$ is paramagnetic

(d) Both are diamagnetic

26. Which of the following is paramagnetic

(a) $[Ni(CO)_4]$ (b) $[Co(NH_3)_6]^{3+}$

(c) $[Ni(CN)_4]^{2-}$ (d) $[NiCl_4]^{2-}$

27. The total number of possible isomers for the complex compound $[Cu^{II}(NH_3)_4][Pt^{II}Cl_4]$ are

(a) 3 (b) 4

(c) 5 (d) 6

28. Which one of the following shows maximum paramagnetic character

(a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$

(c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$

29. The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$

(a) Linkage isomerism (b) Geometrical isomerism

(c) Coordination isomerism (d)Ionisation isomerism

30. Which of the following exhibits highest molar conductivity

(a) $[Co(NH_3)_6]Cl_3$ (b) $[Co(NH_3)_5 Cl]Cl_2$

(c) $[Co(NH_3)_4 Cl_2]Cl$ (d) $[Co(NH_3)_3 Cl_3]$

1. (a) Octahedral complexes of the type $[MA_4B_2],[MA_2B_4],[MA_3B_3]$ exhibit geometrical isomerism.

2. (d) The number of unpaired electrons in the Complex ion $[CoF_6]^{3-}$ is 4.

3. (A)

4. (c) $\begin{bmatrix} & NH_3 & \\ H_3N & & ONO \\ & Co & \\ H_3N & & NH_3 \\ & NH_3 & \end{bmatrix}^{2+} \begin{bmatrix} & NH_3 & \\ H_3N & & NO_2 \\ & Co & \\ H_3N & & NH_3 \\ & NH_3 & \end{bmatrix}$

Here more than one atom function as donor, as oxygen in first one and nitrogen in second, so they show linkage isomerism

5. (c) The two given compounds have same composition but in solution both will give different ions. The isomerism is known as ionisation isomerism.

6. (d) Both produce different ions in solution state-

$[Co(NH_3)_4Cl_2]NO_2 \rightleftharpoons [Co(NH_3)_4Cl_2]^+ NO_2^-$

$[Co(NH_3)_4Cl.NO_2]Cl \rightleftharpoons [Co(NH_3)_4Cl.NO_2]^+ + Cl^-$

7. (b) The compound which has same composition but give different ions in solution, show ionization. So $[Co(NH_3)_5Br]\ SO_4$ is ionization isomer.

$[Co(NH_3)_5Br]SO_4 \rightleftharpoons [Co(NH_3)_5Br]^{2+} + SO_4^{2-}$

$[Co(NH_3)_5SO_4]Br \rightleftharpoons [Co(NH_3)SO_4]^+ + Br^-$.

8. (A)

9. (a) Co-ordination isomerism is caused by the interchange of ligands between cis and trans structure.

10. (c) $[Co(NH_3)_5NO_2]Cl_2$ will not show geometrical isomerism because this complex showed 4 and 6 co-ordination number.

11. (D)

12. (D)

13. (b) $[Fe(H_2O)_6]^{2+}$ has four unpaired electrons, $[Cr(H_2O)_6]^{3+}$, $[Cu(H_2O)_6]^{2+}$ and $[Zn(H_2O)_6]^{2+}$ have 3, 1, 0 unpaired electrons respectively.

14. (c) The electronic configuration of *Ni* in $[Ni(CN)_4]^{2-}$,$[Ni(Cl_4)]^{2-}$ and $Ni(CO)_4$ are as following

Ni^+ in $[Ni(CN)_4]^{2-}$ –

↿⇂	↿⇂	↿⇂	↿⇂	××	××	××	××	
3*d*					4*s*	4*p*		

dsp^2

Ni^{2+} in $[Ni(Cl_4)]^{2-}$ –

↿⇂	↿⇂	↿⇂	1	1	××	××	××	××
3*d*					4*s*	4*p*		

sp^3

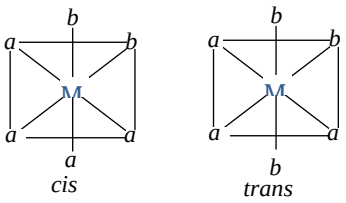
Ni in $[Ni(CO)_4]$ –

↿⇂	↿⇂	↿⇂	↿⇂	↿⇂	××	××	××	××
3*d*					4*s*	4*p*		

sp^2

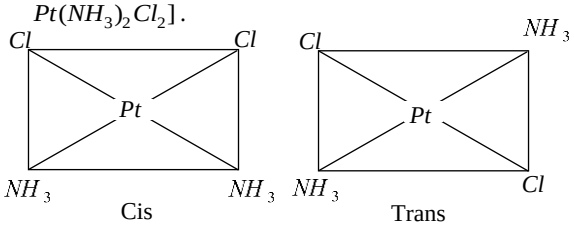
CO and CN^- are strong ligands so they induces pairing of electrons so their complexes are diamagnetic while Cl^- is a weak ligand so it does not induce the pairing of electrons so its complex is paramagnetic.

15. (a) $[Co\ (NH_3)_4\ Cl_2]^+$ is the Ma_4b_2 and Ma_2b_3 type complex.



16. (b) In $[Ag(NH_3)_2]Cl, Ag^+$ contains d^{10} configuration. All others contain unpaired electrons.

17. (a) $Pt(NH_3)_2Cl_2]$.



18. (D)

19. (a)

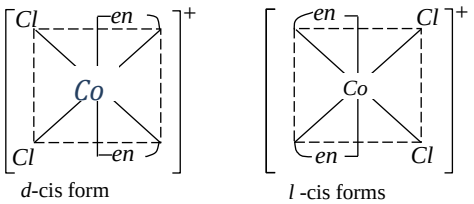
Cis Trans

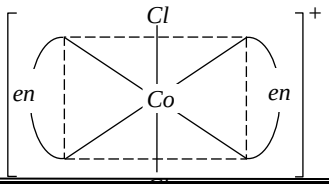
20. (B)

21. (c) $[Co(en)_2NO_2Cl]Br$; $[Co(en)_2ONOCl]Br$

22. (b) Because it will not give any ions in solution.

23. (b) $[Co\ (en)_2Cl_2]^+$ have three optical isomers which are.





Trans form

24. (a) Magnetic moment of $[Cu(NH_3)_4]^{2+}$ ion is 1.414 due to the presence of one unpaired electron.

25. (a) Due to the presence of one unpaired electron, both are slightly paramagnetic.

26. (D)

27. (d) 1. $[Cu(NH_3)_4].[PtCl_4]$

2. $[Cu(NH_3)_3Cl].[PtCl_3(NH_3)]$

3. $[Cu(NH_3)_2Cl_2].[PtCl_2(NH_3)_2]$cis

4. $[Cu(NH_3)_2Cl_2].[PtCl_2(NH_3)_2]$Trans

5. $[Cu(NH_3)Cl_3].[Pt(Cl)(NH_3)_3]$

6. $[Pt(NH_3)_4Cl].[CuCl_4]$

28. (A)

29. (c) Co-ordination isomerism is possible when both *+ve* and *-ve* ions of a salt are complex ions and the two isomers differ in the distribution of ligands in the cation and the anion.

30. (a) On ionisation it gives maximum number of (four) ions.