Co-odination Chemistry

SET Self Evaluation Test - 20

1. An, example for a double salt is **[KCET 2002]**
(a) Potassium ferricyanide
(b) Cobalt hexamine chloride
(c) Cuprous sulphate
(d) Mohr's salt

2. The complex $[Pt(NH_3)_6]Cl_4$ furnishes **[MP PET 1995]**
(a) 5 ions (b) 4 ions
(c) 3 ions (d) 2 ions

3. How many isomers are possible in $[Co(en)_2Cl_2]$ **[Orissa JEE 2004]**
(a) 2 (b) 4
(c) 6 (d) 1

4. π-bonding is not present in **[MP PET 2003]**
(a) Grignard reagent
(b) Dibenzene chromium
(c) Zeise's salt
(d) Ferrocene

5. Grignard reagent is a
(a) Coordinate compound
(b) Double salt
(c) Organometallic compound
(d) None of these

6. Which one of the following complexes is paramagnetic **[RPMT 1997]**
(a) $[Co(F)_6]^{3+}$ (b) $[Co(H_2O)_6]^{3+}$
(c) $[CoF_3(H_2O)_3]$ (d) All of these

7. The oxidation state of *Fe* in the complex $[Fe(CO)_5]$ is **[MP PMT 2003]**
(a) –1 (b) +2
(c) +4 (d) Zero

8. Which of the following is non-ionizable
(a) $[Co(NH_3)_3Cl_3]$ (b) $[Co(NH_3)_4Cl_2]Cl$
(c) $[Co(NH_3)_5Cl]Cl_2$ (d) $[Co(NH_3)_6]Cl_2$

9. The coordination and oxidation number of *X* in the compound $[X(SO_4)(NH_3)_5]Cl$ will be **[JIPMER 1997; DCE 2004]**
(a) 6 and 4 (b) 10 and 3
(c) 2 and 6 (d) 6 and 3

10. In $[NiCl_4]^{2-}$, the number of unpaired electron is **[BHU 2003]**
(a) 4.5 (b) 2
(c) 3 (d) 4

11. $AgCl$ precipitate dissolves in ammonia due to the formation of **[AIIMS 1991; MP PET 1993; CBSE PMT 1998]**
(a) $[Ag(NH_4)_2]OH$
(b) $[Ag(NH_4)_2]Cl$
(c) $[Ag(NH_3)_2]OH$
(d) $[Ag(NH_3)_2]Cl$

12. The oxidation number of cobalt in $K[Co(CO)_4]$ is **[MP PMT 2001; J & K CET 2005]**
(a) +1 (b) –1
(c) +3 (d) –3

13. The complex salt can be made by the combination of $[Co^{III}(NH_3)_5Cl]^x$ with: **[Pb. CET 2001]**
(a) PO_4^{3-} (b) Cl^-
(c) $2Cl^-$ (d) $2K^+$

14. Which one of the following is an inner orbital complex as well as diamagnetic in behaviour (Atomic number : *Zn* = 30), *Cr* = 24, *Co* = 27, *Ni* = 28) **[CBSE PMT 2005]**
(a) $[Zn(NH_3)_6]^{2+}$ (b) $[Cr(NH_3)_6]^{3+}$
(c) $[Co(NH_3)_6]^{3+}$ (d) $[Ni(NH_3)_6]^{2+}$

15. The oxidation state of *Fe* in $K_4[Fe(CN)_6]$ is **[Pb. CET 2003; MP PET 2002]**
(a) +2 (b) –2
(c) +3 (d) +4

16. The number of moles of $AgCl$ precipitate when excess of $AgNO_3$ is added to one mole of $[Cr(NH_3)_4Cl_2]Cl$ is **[EAMCET 1998]**
(a) Zero (b) 1.0
(c) 2.0 (d) 3.0

17. An anion solution gives a white ppt. With $AgNO_3$ solution. The ppt. dissolves in dil. ammonia due to the formation of **[MP PMT 1997]**
(a) $AgNO_3$ (b) NH_4NO_3

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(c) $[Ag(NH_3)_2]Cl$ (d) $[Ag(NH_3)_2]Br$

18. The diamagnetic specie is **[AIIMS 2005]**

(a) $[Ni(CN)_4]^{2-}$ (b) $[NiCl_4]^{2-}$ (c) $[CoCl_4]^{2-}$ (d) $[CoF_6]^{2-}$

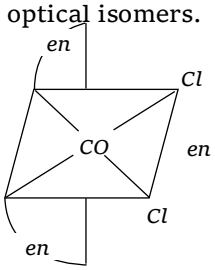
Answers and Solutions

(SET -20)

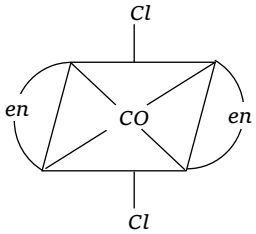
1. (d) Mohr's salt ($FeSO_4.(NH_4)_2SO_4.6H_2O$) is a double salt.

2. (a) $[Pt.(NH_3)_6]Cl_4 \rightleftharpoons [Pt.(NH_3)_6]^{4+} + 4Cl^-$ (5 ions) .

3. (b) $[Co(en)_2Cl_2]$ has 2 geometrical isomers & 2 optical isomers.

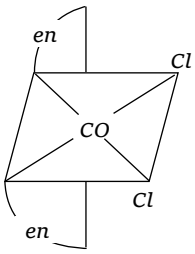


Cis isomer

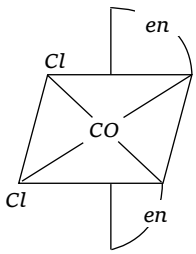


Trans

Again Cis isomer can give 2 optical isomers.



Cis isomer



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4. (a) Grignard reagent is, $R-Mg-X$.

5. (c) The organometallic compound of Mg is known as Grignard reagent $(R-Mg-X)$.

6. (d) As all the ligands are weak so they do to induce pairing of electrons so they show paramagnetism.

7. (d) In $[Fe(CO)_5]$, $x+5(0)=0$, so oxidation number of Fe is zero.

8. (a) Atoms present with in co-ordination sphere do not ionise.

9. (d) Co-ordination no. is 6

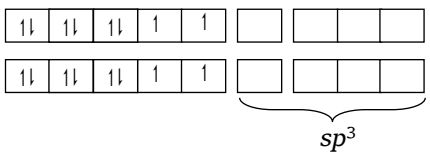
oxidation state in $[\underset{x}{X}(\underset{-2}{SO_4})(\underset{0}{NH_3})_5]\underset{-1}{Cl}$ is

$x-2+0-1=0, \quad x=+3.$

10. (b) $[NiCl_4]^{2-}$

O.N. of Ni = +2

$Ni^{+2}(d^8)$



$[NiCl_4]^{2-}$

Which has two unpaired electrons that is why it is paramagnetic.

11. (d) $AgCl + NH_3 \rightarrow \underset{\text{Diammine silver (I)chloride}}{[Ag(NH_3)_2]Cl}$ ***

12. (b) $1\times(+1)+x+4\times(0)=0$

$1+x=0 \Rightarrow x=-1$ Oxidation number of Co $=-1$.

13. (c) In the complex ion $[Co^{(III)}(NH_3)_5Cl]^x$, charge on the complex ion

$x=3+(0\times5)+(-1)$

$x=3-1=2$

Hence, it will combine with that species which have –2 charge to produce a neutral complex salt. So it will combine with $2Cl^-$ to produce $[Co(NH_3)_5Cl]Cl_2$ complex.

14. (c) $[Co(NH_3)_6]^{3+}$

O. N. of Co $=+3$

$Co^{3+}(d^6)$ ↑↓ | 1 | 1 | 1 | 1 |

$[Co(NH_3)_6]^{3+}$ ↑↓ | ↑↓ | ↑↓ | | | | | | |

d^2sp^3 (Inner)

Due to paired e^- it is diamagnetic.

15. (a) $4\times(+1)+x+6\times-1=0$

or $x=+6-4=+2$

Oxidation state of $Fe=+2$

16. (b) In this complex chloride ion in the form of ionic isomerism and show primary valency.

$AgNO_3$ is added in excess then result precipitation will occur.

17. (c) $AgNO_3 + Cl^- \rightarrow AgCl + NO_3^-$

$AgCl + 2NH_3 \rightarrow \underset{\text{diammine silver (I)chloride.}}{[Ag(NH_3)_2]Cl.}$

18. (a) $[Ni(CN)_4]^{2-}$ ↑↓ | ↑↓ | ↑↓ | | ×× | | ×× | ×× | |

diamagneti

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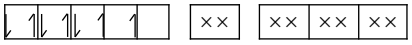
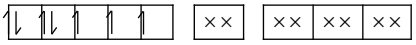
$[NiCl_4]^{2-}$ 

paramagneti

$[CoCl_4]^{2-}$ 

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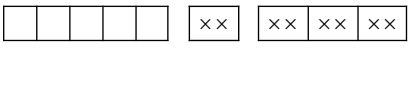
$[CoF_6]^{2-}$ 

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