Solution

COORDINATION COMPOUNDS

Class 12 - Chemistry

1. **(c)** 3
   Explanation:
   The complex $[Co(NH_3)_6]Cl_2$ ionize to give 3 ions .i.e., $[Co(NH_3)_6]^+$ along with two Cl^- ion.

2. **(a)** Diamminedichloridoplatinum (II)
   Explanation:
   Diamminedichloridoplatinum (II)

3. **(a)** 6
   Explanation:
   Coordination number is the number of ligands joined to the central metal ion or atom. Since ethylenediamine is a bidentate ligand, Co has coordination number of 6.

4. **(b)** 4
   Explanation:
   Cobalt atoms have an electronic configuration of $4s^2\ 3d^7$ but its electronic configuration becomes $4s^0\ 3d^6$ after losing three electrons. Thus Co^{3+} ions have 4 unpaired electrons present in 3d orbital.

5. **(c)** NH_4^+
   Explanation:
   NH_4^+ ion does not have a lone pair of electrons which it can donate to central metal ion. Hence it cannot behave as a ligand.

6. $[Co(NH_3)_6]_2\ (SO_4)_3$

7. $[Cr(Cl)_6]^{3-} < [Cr(NH_3)_6]^{3+} < [Cr(CN)_6]^{3-}$

8. $AgBr + 2Na_2S_2O_3 \rightarrow Na_3[Ag(S_2O_3)_2] + NaBr$

9. $[CoF_6]^{3-} < [Co(NH_3)_6]^{3+} < [Co(CN)_6]^{3-}$

10. i. A complex formed by a bidentate or a polydentate ligand.
    $[Co(ox)_3]^{3-}$
    ii. Complexes in which a metal is bound to more than one kind of donor groups or ligands.
    $[Co(NH_3)_4Cl_2]^+$

11. **(d)** A is false but R is true.
    Explanation:
    The outer electronic configuration of platinum in ground state is $5d^9\ 6s^1$. The Pt^{2+} ion formed by the loss of two electrons has outer electronic configuration of $5d^8$. In the presence of strong ligands (NH_3 molecules) two unpaired electrons in the 5d subshell pair up. This is followed by dsp^2 hybridisation resulting in the formation of four hybridised vacant orbitals which accommodate four pairs of electrons from four ligands (two from ammonia and two from Cl^-). As such the resulting complex is square planar.

12. **(a)** Both A and R are true and R is the correct explanation of A.
    Explanation:
    Both A and R are true and R is the correct explanation of A.

13.

(d) A is false but R is true.

Explanation:

$[FeF_6]^{3-}$ is a high spin complex since F is a weak ligand.

14.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

Both A and R are true but R is not the correct explanation of A.

15.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

The tetra coordination complexes with a square planar geometry do not show optical isomerism because they contain a plane of symmetry.

16.

(b) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)

Explanation:

(a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)

17.

(b) Chlorophylls are green pigments in plants and contain calcium

Explanation:

Chlorophylls are green pigments in plants and contain magnesium rather than calcium

18.

(b) $CoCl_3$.$4NH_3$ can be represented as $[Co(NH_3)_4Cl_2]Cl$. Cl^- is outside the square bracket and hence is the counter ion. Also the coordination entity is $[Co(NH_3)_4Cl_2]^+$ as this is within the square brackets and represents the coordination sphere. So, options B and C are correct.

Explanation:

Both Counter ion is Cl^- and Coordination entity is $[Co(NH_3)_4\ Cl_2]^+$ are correct.

19.

(d) $[CO(en)_3]^{3+}$

Explanation:

$[CO(en)_3]^{3+}$

20. **(a)** (a)-(iii), (b)-(i), (c)-(v), (d)-(ii)

Explanation:

- $[Cr\ (H_2O)_6]3+$ - d^2sp^3, 3
- $[Co(CN)_4]^{2-}$ - dsp^2, 1
- $[Ni(NH_3)_6]^{2+}$ - sp^3d^2, 2
- $[MnF_6]^{4-}$ - sp^3d^2, 5

21. State True or False:

(i) **(b)** False

Explanation: {

False

(ii) **(b)** False
Explanation: {
False

(iii) **(a)** True
Explanation: {
True

(iv) **(b)** False
Explanation: {
False

(v) **(b)** False
Explanation: {
False

22. Fill in the blanks:

(i) 1. Optical

(ii) 1. Tetrahedral

(iii) 1. Paramagnetic

(iv) 1. Bidentate

(v) 1. d^2sp^3