Self Practice Paper (SPP)

1. When a salt is heated with dilute H_2SO_4 and $KMnO_4$ solution, the pink colour of $KMnO_4$ is discharged, the salt is :
(1) a sulphite (2) a carbonate (3) a nitrate (4) a bicarbonate

2. Solution of a salt in dilute H_2SO_4 or acetic acid produces deep blue colour with starch iodide solution. The salt contains :
(1) Br^- (2) I^- (3) NO_3^- (4) NO_2^-

3. A test tube containing a nitrate and another containing a bromide and MnO_2 are treated with concentrated H_2SO_4. The reddish brown fumes evolved are passed through water. The water will be coloured by :
(1) the nitrate (2) the bromide (3) both (4) none of the two

4. Which of the following combines with Fe(II) ions to form a brown complex?
(1) N_2O (2) NO (3) N_2O_3 (4) N_2O_4

5. Colourless salt (A) + dil. H_2SO_4 or CH_3COOH + KI $\longrightarrow$ blue colour with starch. (A) can be
(1) K_2SO_3 (2) Na_2CO_3 (3) NH_4NO_2 (4) NH_4Cl

6. There are four test tubes containing dilute HCl, $BaCl_2$, $CdCl_2$ and KNO_3 solutions. Which of the following reagents will help in the identification of $BaCl_2$?
(1) NaOH (2) K_2CrO_4 (3) $AgNO_3$ (4) both (2) and (3)

7. Which one of the following ions does not give borax bead test ?
(1) Cr^{3+} (2) Cu^{2+} (3) Mn^{2+} (4) Zn^{2+}

8. A brick red colour is imparted to Bunsen flame by a :
(1) Ca salt (2) Sr salt (3) Na salt (4) Co salt

9. Which one of the following metal salts produces a blue coloured bead in cobalt nitrate charcoal cavity test ?
(1) Zn^{2+} (2) Mg^{2+} (3) Sn^{2+} (4) Al^{3+}

10. $BaCl_2$ solution gives a white precipitate with a solution of a salt, which dissolves in dilute hydrochloric acid with the evolution of colourless, pungent smelling gas. The gas as well as the salt both are used as bleaching agent in the textile industries. The salt contains:
(1) sulphite (2) sulphide (3) acetate (4) carbonate

11. Pink colour of acidified $KMnO_4$ is decolourised but there is no evolution of any gas. This may happen with the compound containing the following acid radical.
(1) SO_3^{2-} (2) NO_2^- (3) S^{2-} (4) All of these

12. When KI is added to acidified solution of sodium nitrite :
(1) NO gas is liberated and I_2 is set free (2) N_2 gas is liberated and HI is produced
(3) N_2O gas is liberated and I_2 is set free (4) N_2 gas is liberated and HOI is produced

13. Zinc pieces are added to acidified solution of SO_3^{2-}. Gas liberated can :
(1) turn lead acetate paper black (2) turn lime water milky
(3) give white precipitate with $AgNO_3$ solution (4) None of these

14. A substance on treatment with dilute H_2SO_4 liberates a colourless gas which produces (i) turbidity with baryta water and (ii) turns acidified dichromate solution green. The reaction indicates the presence of :
(1) CO_3^{2-} (2) S^{2-} (3) SO_3^{2-} (4) NO_2^-

15. Ammonium molybdate test is used for the estimation of :
(1) PO_4^{3-} (2) NO_3^- (3) SO_3^{2-} (4) SO_4^{2-}

16. A colorless gas is dissolved in water and the resulting solution turns red litmus blue ; the gas may have been which one of the following ?
(1) HCl (2) H_2S (3) SO_2 (4) NH_3

17. NaCl, NaBr, NaI mixture on adding conc. H_2SO_4 gives gases, respectively :
(1) HCl, HBr, HI (2) HCl, Br_2, I_2 (3) Cl_2, Br_2, I_2 (4) None of these

18. Which of the following pair of acid radicals can be distinguished by using dil. H_2SO_4 ?
(I) $C_2O_4^{2-}$ and NO_3^- (II) NO_3^- and NO_2^- (III) Cl^- and Br^- (IV) HCO_3^- and CO_3^{2-}
(1) I and II (2) II only (3) II and IV (4) III and IV

19. Identify the compound which turns black with ammonia solution.
(1) Lead chloride (2) Mercurous chloride (3) Mercuric chloride (4) Silver chloride

20. A white crystalline substance dissolves in water. On passing H_2S in this solution, a black precipitate is obtained. The black precipitate dissolves completely in hot HNO_3. On adding a few drops of concentrated H_2SO_4, a white precipitate is obtained which is soluble in ammonium acetate. The white precipitate is that of :
(1) $BaSO_4$ (2) $SrSO_4$ (3) $PbSO_4$ (4) Ag_2SO_4

21. The composition of golden spangles is :
(1) $PbCrO_4$ (2) PbI_2 (3) As_2S_3 (4) $BaCrO_4$

22. In which of the following solvents, AgBr will have the highest solubility ?
(1) 10^{-3} M NaBr (2) 10^{-3} M NH_4OH (3) Pure water (4) 10^{-3} M HBr

23. Which one among the following pairs of ions can not be separated by H_2S in presence of dilute hydrochloric acid?
(1) Cd^{2+}, Sn^{2+} (2) Al^{3+}, Hg^{2+} (3) Zn^{2+}, Cu^{2+} (4) Ni^{2+}, Bi^{3+}

24. Which of the following is not precipitated as sulphide by passing H_2S in the presence of concentrated HCl ?
(1) Copper (2) Arsenic (3) Cadmium (4) Lead

25. Which of the following metal cation is reduced from its higher oxidation state (+2) to (+1) by both KI solution and excess of KCN solution ?
(1) Zn^{2+} (2) Hg^{2+} (3) Cu^{2+} (4) None

26. Which of the following reagents gives a yellow precipitate with a hot faintly acidic solution of Bi^{3+} ions ?
(1) Ammonia solution (excess).
(2) Freshly prepared 10% solution of pyrogallol.
(3) Potassium iodide solution.
(4) Freshly prepared 0.125 M alkaline sodium tetrahydroxidostannate (II) solution.

27. Which of the following compounds on reaction with NaOH and Na_2O_2 gives yellow colour solution?
(1) $Cr(OH)_3$ (2) $Zn(OH)_2$ (3) $Al(OH)_3$ (4) $Fe(OH)_3$

28. $FeCl_3 + K_3[Fe(CN)_6] + H_2O_2 \longrightarrow$ Precipitate. The colour of the precipitate is :
(1) sky blue (2) brown (3) prussian blue (4) white

29. $CrO_4^{2-} + H^+ + H_2O_2 \xrightarrow{\text{ether}} X + H_2O$
Identify the correct statement with respect to X.
(1) It is an acid anhydride of chromic acid.
(2) It is a red colour compound which can be extracted easily into the etherial phase.
(3) It is chromium peroxide which produces blue colouration in etheral layer on gentle shaking.
(4) It is Cr_2O_3 which is used as a green pigment.

30. In the fourth group, white precipitate of $Mn(OH)_2$ on heating with PbO_2 and concentrated HNO_3 gives red-violet (purple) colour due to the formation of :
(1) $HMnO_4$ (2) Mn_2O_7 (3) $MnO(OH)_2$ (4) $PbMnO_4$

31. Precipitate of $Zn(OH)_2$ is soluble in :
(1) excess of sodium hydroxide (2) excess of ammonia solution
(3) solutions of ammonium salts (4) all of these

32. Select the correct statement with respect to Ca^{2+} ions.
(1) K_2CrO_4 gives white precipitate in the presence of acetic acid.
(2) Potassium hexacyanidoferrate (II) solution gives white precipitate.
(3) It gives lilac colour in Bunsen flame.
(4) Prolonged passage of carbon dioxide gas through its aqueous solution produces white precipitate.

33. A mixture of two salts is not water soluble but dissolves completely in dilute HCl to form a colourless solution. The mixture could be :
(1) $AgNO_3$ and KBr (2) $BaCO_3$ and ZnS (3) $FeSO_4$ and Na_2CO_3 (4) $Mn(NO_3)_2$ and $MgSO_4$

34. Which of the following cation does not give red colour precipitate/solution with dimethylglyoxime (DMG) in alkaline solution ?
(1) Zn^{+2} (2) Ni^{+2} (3) Fe^{2+} (4) both (1) and (3)

35. Potassium chromate K_2CrO_4 is NOT used to identify.
(1) Pb^{+2} (2) Ba^{+2} (3) $Ag^{\oplus}$ (4) Ca^{+2}

36. Aq. (1) + $K_2CrO_4 \longrightarrow$ (2) $\xrightarrow{\text{aq. } NH_3}$ (3)
(Red ppt.) (Black)
A is :
(1) $AgNO_3$ (2) $Pb(NO_3)_2$ (3) $Hg_2(NO_3)_2$ (4) $Ca(NO_3)_2$

37. Chromyl chloride vapours are dissolved in water and acetic acid and barium acetate solution is added, then:
(1) the solution will remain colourless. (2) the solution will become dark green.
(3) a yellow solution will be obtained. (4) a yellow precipitate will be obtained.

38. A metal salt solution gives a yellow precipitate with silver nitrate. The precipitate dissolves in dilute nitric acid as well as in dilute ammonia solution. The solution contains :
(1) bromide ions (2) iodide ions (3) phosphate ions (4) chromate ions

39. Which of the following will not give positive chromyl chloride test ?
(1) Copper chloride, $CuCl_2$. (2) Mercuric chloride, $HgCl_2$.
(3) Zinc chloride, $ZnCl_2$. (4) Anilinium chloride $C_6H_5NH_3Cl$.

40. A solution containing SCN^- ions can be used to test one or more out of : Fe^{3+}, Co^{2+} , Cu^{2+}, Ag^+ and Hg^{2+}.
(1) Fe^{3+} and Co^{2+} only (2) Co^{2+}, Cu^{2+}, Ag^+ and Hg^{2+}
(3) Fe^{3+} , Cu^{2+}, Co^{2+} and Hg^{2+} (4) all

41. **Statement-1 :** In a mixture containing Br^- and I^-, violet colour (of I_2) appears first in chloroform layer, when chlorine gas is passed through the mixture dissolved in water.
Statement-2 : The order of the strength of reducing properties is as follows $I^- > Br^- > Cl^- > F^-$.
(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.
(3) Statement-1 is True, Statement-2 is False.
(4) Statement-1 is False, Statement-2 is True.
(5) Both Statements are False.

42. **Statement-1 :** $PbCl_2$ and AgCl precipitates can be separated by ammonia solution.
Statement-2 : $PbCl_2$ precipitate is soluble in hot water and concentrated potassium chloride solution.
(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.
(3) Statement-1 is True, Statement-2 is False.
(4) Statement-1 is False, Statement-2 is True.
(5) Both Statements are False.

43. **Statement-1 :** Hg_2Cl_2 is blackened by NH_3 due to the formation of iodide of Millon's base.
Statement-2 : Hg^{2+} ions give deep-bule crystalline precipitate with cobalt(II) thiocyanate.
(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.
(3) Statement-1 is True, Statement-2 is False.
(4) Statement-1 is False, Statement-2 is True.
(5) Both Statements are False.

44. **Statement-1 :** Cu^{2+} and Cd^{2+} ions react with KCN solution (in excess) forming the colourless soluble complexes.
Statement-2 : Of these colourless soluble complexes only cadmium complex gives yellow precipitate with H_2S gas in slightly acidic medium.
(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.
(3) Statement-1 is True, Statement-2 is False.
(4) Statement-1 is False, Statement-2 is True.
(5) Both Statements are False.

45. **Statement-1 :** Borax bead test can be used for the identification of coloured cations of transition metals.
Statement-2 : They give different coloured beads with glassy transparent borax bead ($NaBO_2 + B_2O_3$).
(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.
(3) Statement-1 is True, Statement-2 is False.
(4) Statement-1 is False, Statement-2 is True.
(5) Both Statements are False.

SPP Answers

1.	(1)	**2.**	(4)	**3.**	(2)	**4.**	(2)	**5.**	(3)	**6.**	(2)	**7.**	(4)
8.	(1)	**9.**	(4)	**10.**	(1)	**11.**	(4)	**12.**	(1)	**13.**	(1)	**14.**	(3)
15.	(1)	**16.**	(4)	**17.**	(2)	**18.**	(2)	**19.**	(2)	**20.**	(3)	**21.**	(2)
22.	(2)	**23.**	(1)	**24.**	(3)	**25.**	(3)	**26.**	(2)	**27.**	(1)	**28.**	(3)
29.	(3)	**30.**	(1)	**31.**	(4)	**32.**	(2)	**33.**	(2)	**34.**	(1)	**35.**	(4)
36.	(3)	**37.**	(4)	**38.**	(3)	**39.**	(2)	**40.**	(4)	**41.**	(1)	**42.**	(2)
43.	(4)	**44.**	(2)	**45.**	(1)								

SPP Solutions

1. SO_3^{2-} reduces $KMnO_4$ to colourless Mn^{2+}

$$5SO_3^{2-} + 2MnO_4^- + 6H^+ \longrightarrow 2Mn^{2+} + 5SO_4^{2-} + 3H_2O$$

2. Nitrite ion liberates I_2 from potassium iodide turning starch blue.

$$2NO_2^- + 3I^- + 4CH_3COOH \longrightarrow I_3^- + 2NO\uparrow + 4CH_3COO^- + 2H_2O$$

I_2 + starch $\longrightarrow$ blue colour

3. NO_3^- gives NO_2 with concentrated H_2SO_4 which on passing through water form colourless $HNO_3(\ell)$and$HNO_2(\ell)$. Br^- + MnO_2 on heating with concentrated H_2SO_4 gives Br_2 gas which on passing through water imparts it a reddish brown colour.

4. $Fe^{2+} + NO + 5H_2O \longrightarrow [Fe(H_2O)_5NO]^{2+}$ (brown complex)

5. $2NO_2^- + 3I^- + 4CH_3COOH \longrightarrow I_3^- + 2NO\uparrow + 4CH_3COO^- + 2H_2O$.

I_3^- + starch $\longrightarrow$ blue colouration.

6. $Ba^{2+} + CrO_4^{2-} \longrightarrow BaCrO_4\downarrow$ (yellow); $Ag^+ + Cl^- \longrightarrow AgCl\downarrow$ (white).

7. Zn^{2+} is colourless and borax bead test is given by coloured ions such as Cu^{2+}, Mn^{2+}, Fe^{3+} etc.

8. Ca salts impart brick red colour to the flame.

9. Al_2O_3.CoO formed in the test is blue in colour. It is called as thenard's blue.

10. $Ba^{2+} + SO_3^{2-} \longrightarrow BaSO_3\downarrow$ (white)

$BaSO_3 + 2HCl \longrightarrow BaCl_2 + SO_2$(colourless pungent smelling gas) + H_2O

SO_3^{2-} and SO_2 both act as bleaching agent.

11. (1) $5SO_3^{2-} + 2MnO_4^- + 6H^+ \longrightarrow 2Mn^{2+} + 5SO_4^{2-} + 3H_2O$

(2) $2MnO_4^- + 5NO_2^- + 6H^+ \longrightarrow 2Mn^{2+} + 5NO_3^- + 3H_2O$

(3) $2MnO_4^- + H_2S + 6H^+ \longrightarrow 2Mn^{2+} + 5S\downarrow + 8H_2O$

12. $NO_2^- + 2I^- + 4CH_3COOH \rightarrow I_2 + 2NO\uparrow + 4\,CH_3COO^- + 2H_2O$

13. $SO_3^{2-} + Zn + 8H^+ \longrightarrow H_2S \uparrow + 3Zn^{2+} + 3H_2O$

$Pb^{2+} + S^{2-} \longrightarrow PbS \downarrow$ (black)

$Ag^+ + S^{2-} \longrightarrow Ag_2S \downarrow$ (black)

14. $SO_3^{2-} + Ba(OH)_2 \longrightarrow BaSO_3 \downarrow$ (white) $+ 2OH^-$.

$3SO_2 + Cr_2O_7^{2-} + 2H^+ \longrightarrow 2Cr^{3+}$ (green colour solution) $+ 3SO_4^{2-} + H_2O$.

16. NH_3 is basic

17. HBr and HI are strong reducing agents and are oxidized by H_2SO_4 to Br_2 and I_2, respectively.

18. (I) $\begin{cases} \rightarrow C_2O_4^{2-} + 2H^+ \xrightarrow{dil.H_2SO_4} \text{No vapors or gas is evolved} \\ \rightarrow NO_3^- : \text{No reaction with dil.} H_2SO_4 \end{cases}$

(II) $\begin{cases} \rightarrow NO_3^- : \text{No reaction with dil. } H_2SO_4 \xrightarrow{\text{disproportionation}} HNO_3 + NO\uparrow \xrightarrow{\text{atm. air}} NO_2\uparrow \\ \rightarrow NO_2^- + H^+ \xrightarrow{dil.H_2SO_4} HNO_2 \end{cases}$

Hence, distincition is posssible.

(III) Both Cl^- and Br^- have no reaction with dil. H_2SO_4.

(IV) Both HCO_3^- and CO_3^{2-} produce $CO_2 \uparrow$ which evolves with efferverscences.

19. $Hg_2Cl_2 + 2NH_3 \longrightarrow Hg\begin{matrix} Cl \\ NH_2 \end{matrix} \downarrow$ (white) + $Hg\downarrow$ (black) + NH_4Cl

Black

20. The white precipitate obtained with H_2SO_4 is that of $PbSO_4$. The white crystalline substance may be that of $Pb(NO_3)_2$.

$Pb^{2+} + S^{2-} \longrightarrow PbS \downarrow$ (black) ; $3PbS \downarrow + 8HNO_3 \longrightarrow 3Pb^{2+} + 6NO_3^- + 3S \downarrow + 2NO + 4H_2O$

$Pb^{2+} + SO_4^{2-} \longrightarrow PbSO_4 \downarrow$ (white)

$PbSO_4 + 2CH_3COONH_4 \longrightarrow (NH_4)_2[Pb(CH_3COO)_4] + (NH_4)_2SO_4$

BaS and SrS precipitates are not black in colour. Ag_2SO_4 is white precipitate but does not dissolve in ammonium acetate.

21. PbI_2 is yellow (known as golden spangles).

22. AgBr has the highest solubility in 10^{-3} M NH_4OH

AgBr dissolves in all other solvents poorly.

23. Both Cd^{2+} and Sn^{2+} are precipitated as yellow sulphides in the presence of dilute HCl.

24. $Cd^{2+} + H_2S \longrightarrow CdS\downarrow + 2H^+$, reaction is reversible; if the concentration of strong acid in the solution is above 0.5 M, precipitation is incomplete. Concentrated acid dissolves the precipitate for the same reason.

25. $2Cu^{2+} + 4I^- \longrightarrow Cu_2I_2\downarrow + I_2$

$Cu^{2+} + 3CN^- \longrightarrow CuCN \downarrow + (CN)_2$

26. (1) $Bi^{3+} + 3NH_4OH \longrightarrow Bi(OH)_3\downarrow$ (white) $+ 3NH_4^+$

(2) $Bi^{3+} + C_6H_3(OH)_3 \longrightarrow Bi(C_6H_3O_3)\downarrow$ (yellow) $+ 3H^+$

(3) $Bi^{3+} + 3I^- \longrightarrow BiI_3\downarrow$ (black) ; $BiI_3 + I^- \longrightarrow [BiI_4]^-$ (orange solution)

(4) $Bi^{3+} + 3OH^- \longrightarrow Bi(OH)_3\downarrow$ (white) ; $2Bi(OH)_3\downarrow + 3[Sn(OH)_4]^{2-} \longrightarrow 2Bi\downarrow$ (black) $+ 3[Sn(OH)_6]^{2-}$

27. $3Na_2O_2 + 2Cr(OH)_3 \xrightarrow{\Delta} 2NaOH + 2H_2O + 2Na_2CrO_4$ (yellow)

28. On adding H_2O_2 in alkaline medium or $SnCl_2$ solution in acidic medium, the $[Fe(CN)_6]^{3-}$ part of the compound is reduced and prussian blue is precipitated.

29. $CrO_4^{2-} + 2H^+ + 2H_2O_2 \longrightarrow CrO_5$ (chromium peroxide) $+ 3H_2O$

It in etheral layer develops blue colouration.

30. $Mn(OH)_2 + 2HNO_3 \longrightarrow Mn(NO_3)_2 + 2H_2O$.

$2Mn(NO_3)_2 + 5PbO_2 + 6HNO_3 \longrightarrow 2HMnO_4$ (red – violet or purple colour) $+ 5Pb(NO_3)_2 + 2H_2O$.

31. (1) $Zn(OH)_2\downarrow + 2OH^- \rightleftharpoons [Zn(OH)_4]^{2-}$

(2) and (3) $Zn(OH)_2\downarrow + 4NH_3 \rightleftharpoons [Zn(NH_3)_4]^{2+} + 2OH^-$

or NH_4^+

32. (1) No precipitate with K_2CrO_4 in acetic acid as its k_{sp} is high.

(2) $Ca^{2+} + 2K^+ + [Fe(CN)_6]^{4-} \longrightarrow K_2Ca[Fe(CN)_6]\downarrow$ (white)

(3) It imparts brick red colour to Bunsen flame.

(4) $Ca(HCO_3)_2$ is formed which is water soluble.

33. (2) $BaCO_3$ + ZnS mixture dissolves in HCl but is insoluble in water. Further the solution in HCl will be colourless due to the formation of soluble $BaCl_2$ and $ZnCl_2$.

34. Ni^{2+} and Fe^{2+} both on reaction with alkaline solution of dimethyl glyoxime give red precipitate and red solution respectively but not zinc.

35. (1) $Pb^{+2} + CrO_4^{-2} \longrightarrow PbCrO_4$ (yellow ppt)

(2) $Ba^{+2} + CrO_4^{-2} \longrightarrow BaCrO_4$ (Yellow ppt)

(3) $Ag^{\oplus} + CrO_4^{-2} \longrightarrow Ag_2CrO_4$ (Brick like red ppt)

(4) $Ca^{+2} + CrO_4^{-2} \longrightarrow CaCrO_4$ (soluble)

36. $Hg_2(NO_3)_2 + K_2CrO_4 \longrightarrow \underset{\text{(Red ppt.)}}{Hg_2CrO_4} \xrightarrow{\text{aq. } NH_3} \underset{\text{(Black)}}{Hg(NH_2)I} + Hg$

37. $CrO_2Cl_2 + 2H_2O \longrightarrow H_2CrO_4 + 2HCl$

$H_2CrO_4 + (CH_3COO)_2Ba \longrightarrow BaCrO_4\downarrow$ (Yellow) $+ 2CH_3COOH$

38. Ag_3PO_4 is yellow precipitate which is soluble both in dilute ammonia solution and dilute HNO_3.

$HPO_4^{2-} + 3Ag^+ \longrightarrow Ag_3PO_4\downarrow + H^+$

$Ag_3PO_4 + 2H^+ \longrightarrow H_2PO_4^-\downarrow + 3Ag^+$; $Ag_3PO_4\downarrow + 6NH_3 \longrightarrow 3[Ag(NH_3)_2]^+ + PO_4^{3-}$

Pale yellow precipitate of AgBr is not soluble in dilute HNO_3; bright yellow precipitate of AgI is not soluble in both; Ag_2CrO_4 is obtained as red precipitate.

39. $HgCl_2$ fails to give positive chromyl chloride test because of its covalent nature i.e., it does not dissociate to give Cl^-.

40. $CoCl_2 + 4NH_4SCN \xrightarrow{\text{ether}} (NH_4)_2[Co(SCN)_4]$ (blue colour in ethereal layer) + $2NH_4Cl$.

$Cu^{2+} + 3SCN^- \longrightarrow CuSCN\downarrow$ (white) + $(SCN)_2$.

$FeCl_3 + 3NH_4SCN \xrightarrow{\text{ether}} Fe(SCN)_3$ (blood red colour) + $3NH_4Cl$.

$Ag^+ + SCN^- \longrightarrow AgSCN\downarrow$ (white).

$Co^{2+} + 4SCN^- + Hg^{2+} \longrightarrow Co[Hg(SCN)_4]\downarrow$ (deep blue).

41. As I^- is stronger reducing agent than Br^- so it will oxidised prior to Br^- liberating iodine gas according to the following reaction,

$2I^- + Cl_2 \longrightarrow I_2 + 2Cl^-$; $2Br^- + Cl_2 \longrightarrow Br_2 + 2Cl^-$

42. **Statement-1 :** $AgCl + 2NH_3 \longrightarrow [Ag(NH_3)_2]Cl$ (soluble complex)

$Pb^{2+} + 2NH_3 + 2H_2O \longrightarrow Pb(OH)_2\downarrow$ (white) + $2NH_4^+$

Statement-2 : $PbCl_2\downarrow + 2Cl^- \longrightarrow [PbCl_4]^{2-}$ [soluble complex] ; $PbCl_2$ is also soluble in hot water.

43. **Statement-1 :** $Hg_2Cl_2 + 2NH_3 \longrightarrow Hg\begin{matrix}NH_2\\Cl\end{matrix} + Hg + NH_4Cl$

(black)

Statement-2 : $Hg^{2+} + Co^{2+} + 4SCN^- \longrightarrow Co[Hg(SCN)_4]\downarrow$

(deep-blue)

44. **Statement-1 :** $Cu^{2+} + 4CN^- \longrightarrow [Cu(CN)_4]^{3-}$ (colourless)

$Cd^{2+} + 4CN^- \longrightarrow [Cd(CN)_4]^{2-}$ (colourless)

Statement-2 : Cd^{2+} complex is less stable, therefore, it reacts with H_2S forming yellow precipitate of CdS.

Where as $[Cu(CN)_4]^{3-}$ is more stable and thus is unaffected by H_2S gas.

45. Coloured cations of transition metals form different colour metaborates with borax bead.