Book Name: Selina Concise

EXERCISE- 1 (A)

Solution 1:

(a) Ferrous salts : **Light green**
(b) Ammonium salts : **Colourless**
(c) Cupric salts : **Blue**
(d) Calcium salts : **Colourless**
(e) Aluminium salts : **Colourless**

Solution 2:

(a) $Cu(OH)_2$
(b) ZnO
(c) NaOH
(d) NH_4OH
(e) Na^+, Ca^{2+}
(f) Fe^{2+}, Mn^{2+}
(g) Aluminium
(h) $Zn(OH)_2$ and $Al(OH)_3$
(i) PbO
(j) Ammonium ion

Solution 3:

$2Al + 2NaOH + 2H_2O \longrightarrow 2NaAlO_2 + 3H_2$

(Hot and conc.) Sodium meta aluminate (colourless)

$PbO + 2NaOH \longrightarrow Na_2PbO_2 + H_2O$

(Yellow) sodium plumbate (colourless, soluble)

Solution 4:

(i)

$CuSO_4 + 2NH_4OH \longrightarrow Cu(OH)_2 \downarrow (NH_4)_2\ SO_4$

Blue pale blue ppt. colourless is solution

With excess of NH_4OH, ppt dissolves

$CU(OH)_2 + (NH_4)_2SO_4 + 2NH_4OH \longrightarrow [Cu(NH_3)_4]SO_4 + 4H_2O$

Excess Tetrammine Copper(II) Sulphate

(ii)

$ZnSO_4 + 2NH_4OH \longrightarrow Zn(OH)_2 + (NH_4)_2\ SO_4$

Colourless white, gelatinous ppt colourless

With excess of NH_4OH, ppt dissolves

$Zn(OH)_2 + (NH_4)_2SO_4 + 2NH_4OH \longrightarrow [Zn(NH_3)_4]SO_4 + 4H_2O$

(excess) Tetramminezinc(II) Sulphate (colourless)

(iii)

$FeCI_3 + 3NH_4OH \longrightarrow Fe(OH)_3 \downarrow + 3NH_4CI$

Yellow solution reddish brown ppt. colourless in solution

Solution 5:

(i) $FeCI_3 + 3NaOH \longrightarrow Fe(OH)_3 \downarrow 3\ NaCI$

Yellow reddish brown, ppt colourless in solution

In excess of alkali, the reddish brown ppt, of $Fe(OH)_3$ remains insoluble

(ii) $ZnSO_4 + 2NaOH \longrightarrow Zn(OH)_2 \downarrow + NaSO_4$

Colourless white gelatinous ppt. colourless

In excess of alkali, white gelatinous ppt. of $Zn(OH)_2$ becomes soluble

$Zn(OH)_2 + 2NaOH$ (Excess) $\longrightarrow Na_2ZnO2 + 2H_2O$

Sodium zincate (colourless)

(iii) $Pb(NO_3)_2 + 2NaOH \longrightarrow Pb(OH)_2 \downarrow + 2NaNO_3$
White ppt (colourless)

In excess of alkali, white precipitate of $Pb(OH)_2$ becom essoluble:
$Pb(OH)_2 + 2NaOH(excess) \longrightarrow Na_2PbO_2 + 2H_2O$
Sodium plumbate
{colourless}
$CuSO_4 + 2NaOH \longrightarrow Cu(OH)_2 \downarrow + 2NaSO_4$
Blue colourless pale blue ppt. { colourless}
In excess of alkali, pale blue precipitate of $Cu(OH)_2$ is insoluble

Solution 6:

Zinc chloride ($ZnCl_2$) is soluble in excess of ammonium hydroxide.
$ZnCI_2 + 2NH_4OH \longrightarrow Zn(OH)_2 \downarrow 2NH_4CI$
Colourless White gelatinous ppt.
With excess of NH_4oh ppt dissolves
$Zn(OH)_2 + 2NH_4CI + 2NH_4OH (excess) \longrightarrow [Zn(NH_3)_4]CI_2 + 4H_2O$
Tetram mine zinc (II) Chloride
Colourless

Solution 7:

(a) $ZnCl_2$
(b) $Zn(OH)_2$

Solution 8:

(a) PbO
(b) ZnO
(c) K_2ZnO_2

Solution 9:

(a) (iii)

Aqueous solution of copper sulphate is blue.

(b) (iii)

$FeSO_4 + 2NaOH \rightarrow Fe(OH)_2 + Na_2SO_4$

(Dirty green, (Colourless)

gelatinous ppt.)

(c) (iii)

$Zn + 2NaOH \rightarrow Na_2ZnO_2 + H_2$

Sodium zincate

(Colourless)

Zz $Zn + HCl \rightarrow ZnCl_2 + H_2$

Solution 10:

When freshly precipitated aluminum hydroxide reacts with caustic soda solution, whitesalt of sodium meta aluminate is obtained.

$Al(OH)_3 + NaOH \rightarrow NaAlO_2 + 2H_2O$

Sodium meta aluminate

Solution 11:

(a) Distinguish by adding Sodium hydroxide solution:

(i) $Ca(NO_3)_2 + 2NaOH \quad Ca(OH)_2 + 2NaNO_3$

On adding excess of NaOH, ppt. of $Ca(OH)_2$ is sparingly soluble.

$Pb(NO_3)_2 + 2NaOH \quad Pb(OH)_2 + 2NaNO_3$

On adding excess of NaOH, ppt of $Pb(OH)_2$ is soluble.

(ii) $Pb(NO_3)_2 + 2NaOH \quad Pb(OH)_2 + 2NaNO_3$

On adding excess of NaOH, ppt of $Pb(OH)_2$is soluble.

$ZnSO_4 + 2NaOH \quad Zn(OH)_2 + Na_2SO_4$

With excess of NaOH, white gelatinous ppt. of $Zn(OH)_2$ is soluble. So, these two cannot be distinguished by NaOH alone. However white ppt. of $Pb(OH)_2$is readily soluble in acetic acid also.

(iii) $CuSO_4 + 2NaOH \quad Cu(OH)_2 + Na_2SO_4$

With excess of NaOH, alkali pale blue ppt of $Cu(OH)_2$ is insoluble.

$FeSO_4 + 2NaOH \quad Fe(OH)_2 + Na_2SO_4$

With excess of NaOH, dirty green ppt. of $Fe(OH)_2$ is insoluble.

(iv) $FeSO_4 + 2NaOH \quad Fe(OH)_2 + NaSO_4$

With excess of NaOH, dirty green ppt of $Fe(OH)_2$ is insoluble.

$FeCl_3 + 3NaOH \quad Fe(OH)_3 + 3NaCl$

With excess of NaOH, reddish brown ppt of $Fe(OH)_3$ is insoluble.

(b) Distinguish by adding Ammonium hydroxide solution:

(i) On addition of NH_4OH to calcium salts no precipitation of $Ca(OH)_2$ occurs even with addition of excess of NH_4OH because the concentration of OH^- ions from ionization of NH_4OH is so low that it cannot precipitate the hydroxide of calcium.
$Pb(NO_3)_2 + 2\ NH_4OH \quad Pb(OH)_2 + 2NH_4NO_3$
On adding excess of NH_4OH, chalky white ppt. of $Pb(OH)_2$ is insoluble.

(ii) $Pb(NO_3)_2 + 2\ NH_4OH \quad Pb(OH)_2 + 2NH_4NO_3$
On adding excess of NH_4OH, chalky white ppt. of $Pb(OH)_2$ is insoluble.
$ZnSO_4 + 2NH_4OH \quad Zn(OH)_2 + (NH_4)_2SO_4$
With excess of NH_4OH, white gelatinous ppt. of $Zn(OH)_2$ is soluble.

(iii) $CuSO_4 + 2NH_4OH \quad Cu(OH)_2 + (NH_4)_2SO_4$
With excess of NH_4OH, pale blue ppt. of $Cu(OH)_2$ is soluble.
$FeSO_4 + 2NH_4OH \quad Fe(OH)_2 + (NH_4)_2SO_4$
With excess of NH_4OH, dirty green ppt. of $Fe(OH)_2$ is insoluble.

(iv) $FeSO_4 + 2NH_4OH \quad Fe(OH)_2 + (NH_4)_2SO_4$
With excess of NH_4OH, dirty green ppt. of $Fe(OH)_2$ is insoluble.
$FeCl_3 + 3NH_4OH \quad Fe(OH)_3 + 3NH_4Cl$
With excess of NH_4OH, reddish brown ppt of $Fe(OH)_3$ is insoluble.

Solution 12:

Reagent bottles A and B can identified by using calcium salts such as $Ca(NO_3)_2$.
On adding NaOH to $Ca(NO_3)_2$, $Ca(OH)_2$ is precipitated as white precipitate which is sparingly soluble in excess of NaOH.
$Ca(NO_3)_2 + 2NaOH \rightarrow Ca(OH)_2 + 2NaNO_3$
Whereas, on addition of NH_4OH to calcium salts, no precipitation of $Ca(OH)_2$ occurs even with addition of excess of NH_4OH because the concentration of OH^- ions from the ionization of NH_4OH is so low that it cannot precipitate the hydroxide of calcium.
So the reagent bottle which gives white precipitate is NaOH and the other is NH_4OH.

INTEXT QUESTIONS:

Solution 1:

(i) **Analysis:** The determination of chemical components in a given sample is called analysis.
(ii) **Qualitative analysis:** The analysis which involves the identification of the unknown substances in a given sample is called qualitative analysis.
(iii) **Reagent:** A reagent is a substance that reacts with another substance.
(iv) **Precipitation:** It is the process of formation of an insoluble solid when solutions are mixed. The solid thus formed is called precipitate.

Solution 2:

(i) Yellow
(ii) Colourless
(iii) PaleGreen
(iv) Colourless
(v) Colourless

Solution 3:

(i) Fe^{3+}
(ii) Cu^{2+}
(iii) Cu^{+2}
(iv) Mn^{2+}

Solution 4:

(i) $Ca(OH)_2$
(ii) $Fe(OH)_2$ and $Cu(OH)_2$
(iii) $Zn(OH)_2$ and $Pb(OH)_2$

Solution 5:

When ammonium salt is heated with caustic soda solution, ammonia gas is evolved.
The balance equation is:

$$NH_4Cl + NaOH \xrightarrow{\Delta} NaCl + H_2O + NH_3$$

$$(NH_4)_2SO_4 + 2NaOH \xrightarrow{\Delta} Na_2SO_4 + 2H_2O + 2NH_3$$

Solution 6:

NH_4OH and NaOH can be distinguished by using calcium salts.
For example on adding NaOH to $Ca(NO_3)_2$, $Ca(OH)_2$ is obtained as white precipitate which is sparingly soluble in excess of NaOH.

$Ca(NO_3)_2 + 2NaOH \quad Ca(OH)_2 + 2NaNO_3$

On addition of NH_4OH to calcium salts, no precipitation of $Ca(OH)_2$ occurs even with the addition of excess of NH_4OH. This is because the concentration of OH^- ions from the ionization of NH_4OH is so low that it cannot precipitate the hydroxide of calcium.

Solution 7:

(i) $Fe(OH)_2$ and $Pb(OH)_2$
(ii) $Cu(OH)_2$ and $Zn(OH)_2$