

EXERCISE- 1 (A)**Question 1:**

Write the probable colour of the following salts.

- (a) Ferrous salts
- (b) Ammonium salts
- (c) Cupric salts
- (d) Calcium salts
- (e) Aluminium Salts

Solution 1:

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

Question 2:

Name:

- (a) a metallic hydroxide soluble in excess of NH_4OH .
- (b) a metallic oxide soluble in excess of caustic soda solution.
- (c) a strong alkali
- (d) a weak alkali
- (e) two coloured metal ions
- (f) two coloured metal ions
- (g) a metal that evolves a gas which burns with a pop sound when boiled with alkali solutions.
- (h) two bases which are not alkalis but dissolves in alkalis to yield colourless solutions.
- (j) a coloured cation not a representative element.

Solution 2:

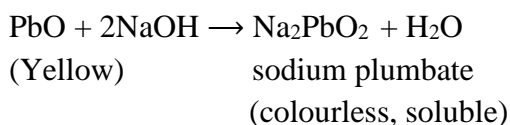
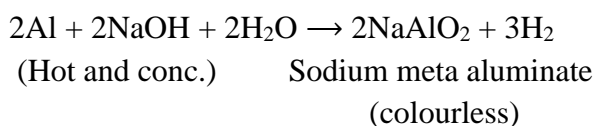
- (a) $\text{Cu}(\text{OH})_2$
- (b) ZnO
- (c) NaOH
- (d) NH_4OH
- (e) Na^+ , Ca^{2+}
- (f) Fe^{2+} , Mn^{2+}
- (g) Aluminium



- (h) Zn(OH)_2 and Al(OH)_3
(i) PbO
(j) Ammonium ion

Question 3:

Write balanced equations for Q.2 (g) and (i)

Solution 3:**Question 4:**

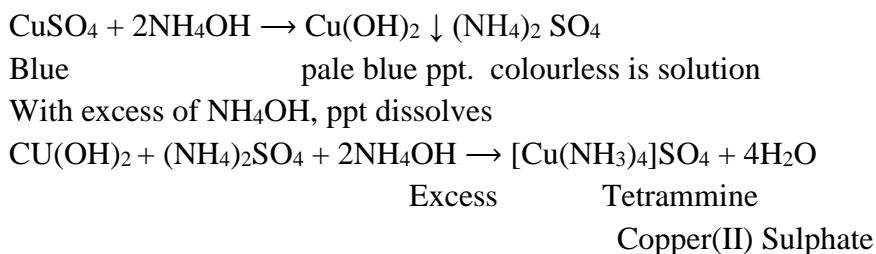
What happens when ammonia solution is added first dropwise and then in excess to the following solution:

- (i) CuSO_4 (ii) ZnSO_4 (iii) FeCl_3

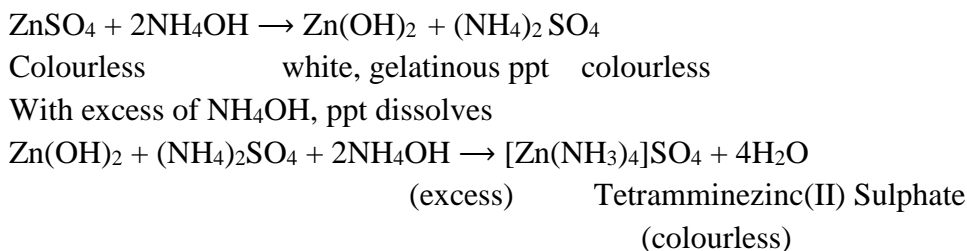
Write balanced equations for these reactions.

Solution 4:

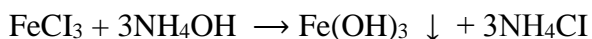
(i)



(ii)



(iii)



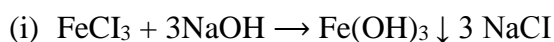
Yellow solution reddish brown ppt. colourless in solution

Question 5:

What do you observe when caustic soda solution is added to the following solution, first a little and then in excess:

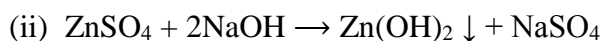
(a) FeCl_3 (b) ZnSO_4 (c) $\text{Pb}(\text{NO}_3)_2$ (d) CuSO_4

Write balanced equations for these reactions.

Solution 5:

Yellow reddish brown, ppt colourless in solution

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

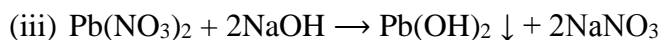


Colourless white gelatinous ppt. colourless

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



Sodium zincate (colourless)



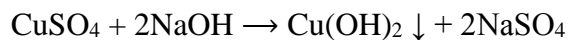
White ppt (colourless)

In excess of alkali, white precipitate of $\text{Pb}(\text{OH})_2$ become soluble:



Sodium plumbate

{ colourless }



Blue colourless pale blue ppt. { colourless }

In excess of alkali, pale blue precipitate of $\text{Cu}(\text{OH})_2$ is insoluble

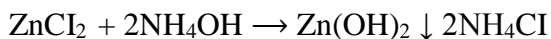


Question 6:

Name the chloride of a metal which is soluble in excess of ammonium hydroxide. Write equation for the same.

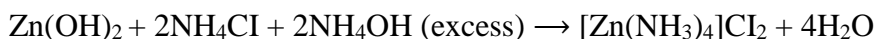
Solution 6:

Zinc chloride (ZnCl_2) is soluble in excess of ammonium hydroxide.



Colourless White gelatinous ppt.

With excess of NH_4OH ppt dissolves



Tetramine zinc (II) Chloride

Colourless

Question 7:

On adding dilute ammonia solution to a colourless solution of a salt, a white gelatinous precipitate appears. This precipitate however dissolves on addition of excess of ammonia solution identify (choose from Na, Al, Zn, Pb, Fe)

(a) Which metal salt solution was used?

(b) what is the formula of the white gelatinous precipitate obtained?

Solution 7:

(a) ZnCl_2

(b) Zn(OH)_2

Question 8:

Name:

(a) a yellow monoxide that dissolves in hot and concentrated caustic alkali

(b) a white, insoluble oxide that dissolves when fused with caustic soda or caustic potash

(c) a compound containing zinc in the anion

Solution 8:

(a) PbO

(b) ZnO

(c) K_2ZnO_2



Question 9:

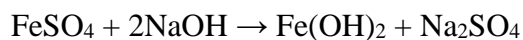
What do you observe when freshly precipitated aluminium hydroxide reacts with caustic soda solution? Give balanced equation.

Solution 9:

(a) (iii)

Aqueous solution of copper sulphate is blue.

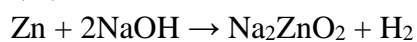
(b) (iii)



(Dirty green, (Colourless)

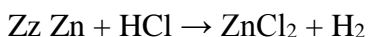
gelatinous ppt.)

(c) (iii)



Sodium zincate

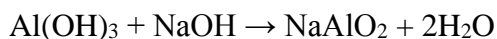
(Colourless)

**Question 10:**

What do you understand by amphoteric oxide Give the balanced equations for the reaction with three different amphoteric oxides with a caustic alkali. Write your observation if any.

Solution 10:

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



Sodium meta aluminate

Question 11:

Distinguish by adding:

(a) sodium hydroxide solution and

(b) Ammonium hydroxide solution to

(i) Calcium salt solution and lead salt solution

(ii) Lead salt solution and ferrous salt solution

(iii) copper salt solution and ferrous salt solution

(iv) Fe (II) salt solution and Fe (III) Salt solution

(v) Ferrous nitrate and lead nitrate



Solution 11:**(a) Distinguish by adding Sodium hydroxide solution:**

- (i) $\text{Ca}(\text{NO}_3)_2 + 2\text{NaOH} \rightarrow \text{Ca}(\text{OH})_2 + 2\text{NaNO}_3$
On adding excess of NaOH, ppt. of $\text{Ca}(\text{OH})_2$ is sparingly soluble.
 $\text{Pb}(\text{NO}_3)_2 + 2\text{NaOH} \rightarrow \text{Pb}(\text{OH})_2 + 2\text{NaNO}_3$
On adding excess of NaOH, ppt of $\text{Pb}(\text{OH})_2$ is soluble.
- (ii) $\text{Pb}(\text{NO}_3)_2 + 2\text{NaOH} \rightarrow \text{Pb}(\text{OH})_2 + 2\text{NaNO}_3$
On adding excess of NaOH, ppt of $\text{Pb}(\text{OH})_2$ is soluble.
 $\text{ZnSO}_4 + 2\text{NaOH} \rightarrow \text{Zn}(\text{OH})_2 + \text{Na}_2\text{SO}_4$
With excess of NaOH, white gelatinous ppt. of $\text{Zn}(\text{OH})_2$ is soluble. So, these two cannot be distinguished by NaOH alone. However white ppt. of $\text{Pb}(\text{OH})_2$ is readily soluble in acetic acid also.
- (iii) $\text{CuSO}_4 + 2\text{NaOH} \rightarrow \text{Cu}(\text{OH})_2 + \text{Na}_2\text{SO}_4$
With excess of NaOH, alkali pale blue ppt of $\text{Cu}(\text{OH})_2$ is insoluble.
 $\text{FeSO}_4 + 2\text{NaOH} \rightarrow \text{Fe}(\text{OH})_2 + \text{Na}_2\text{SO}_4$
With excess of NaOH, dirty green ppt. of $\text{Fe}(\text{OH})_2$ is insoluble.
- (iv) $\text{FeSO}_4 + 2\text{NaOH} \rightarrow \text{Fe}(\text{OH})_2 + \text{Na}_2\text{SO}_4$
With excess of NaOH, dirty green ppt of $\text{Fe}(\text{OH})_2$ is insoluble.
 $\text{FeCl}_3 + 3\text{NaOH} \rightarrow \text{Fe}(\text{OH})_3 + 3\text{NaCl}$
With excess of NaOH, reddish brown ppt of $\text{Fe}(\text{OH})_3$ is insoluble.

(b) Distinguish by adding Ammonium hydroxide solution:

- (i) On addition of NH_4OH to calcium salts no precipitation of $\text{Ca}(\text{OH})_2$ 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.
 $\text{Pb}(\text{NO}_3)_2 + 2\text{NH}_4\text{OH} \rightarrow \text{Pb}(\text{OH})_2 + 2\text{NH}_4\text{NO}_3$
On adding excess of NH_4OH , chalky white ppt. of $\text{Pb}(\text{OH})_2$ is insoluble.
- (ii) $\text{Pb}(\text{NO}_3)_2 + 2\text{NH}_4\text{OH} \rightarrow \text{Pb}(\text{OH})_2 + 2\text{NH}_4\text{NO}_3$
On adding excess of NH_4OH , chalky white ppt. of $\text{Pb}(\text{OH})_2$ is insoluble.
 $\text{ZnSO}_4 + 2\text{NH}_4\text{OH} \rightarrow \text{Zn}(\text{OH})_2 + (\text{NH}_4)_2\text{SO}_4$
With excess of NH_4OH , white gelatinous ppt. of $\text{Zn}(\text{OH})_2$ is soluble.
- (iii) $\text{CuSO}_4 + 2\text{NH}_4\text{OH} \rightarrow \text{Cu}(\text{OH})_2 + (\text{NH}_4)_2\text{SO}_4$
With excess of NH_4OH , pale blue ppt. of $\text{Cu}(\text{OH})_2$ is soluble.
 $\text{FeSO}_4 + 2\text{NH}_4\text{OH} \rightarrow \text{Fe}(\text{OH})_2 + (\text{NH}_4)_2\text{SO}_4$
With excess of NH_4OH , dirty green ppt. of $\text{Fe}(\text{OH})_2$ is insoluble.
- (iv) $\text{FeSO}_4 + 2\text{NH}_4\text{OH} \rightarrow \text{Fe}(\text{OH})_2 + (\text{NH}_4)_2\text{SO}_4$
With excess of NH_4OH , dirty green ppt. of $\text{Fe}(\text{OH})_2$ is insoluble.
 $\text{FeCl}_3 + 3\text{NH}_4\text{OH} \rightarrow \text{Fe}(\text{OH})_3 + 3\text{NH}_4\text{Cl}$
With excess of NH_4OH , reddish brown ppt of $\text{Fe}(\text{OH})_3$ is insoluble.



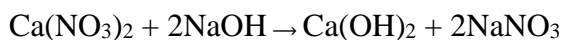
Question 12:

You are provided with two reagent bottles marked A and B. One of which contains NH_4OH solution and the other contains NaOH solution. How will you identify them by a chemical test?

Solution 12:

Reagent bottles A and B can be identified by using calcium salts such as $\text{Ca}(\text{NO}_3)_2$.

On adding NaOH to $\text{Ca}(\text{NO}_3)_2$, $\text{Ca}(\text{OH})_2$ is precipitated as white precipitate which is sparingly soluble in excess of NaOH .



Whereas, on addition of NH_4OH to calcium salts, no precipitation of $\text{Ca}(\text{OH})_2$ 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:**Question 1:**

What do you understand by the following:

- (i) Analysis
- (ii) Qualitative analysis
- (iii) Reagent
- (iv) Precipitation

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.

Question 2:

Write the probable colour of the following salts:

- (i) Iron (III) chloride
- (ii) Potassium nitrate



- (iii) Ferrous sulphate
- (iv) Aluminium acetate
- (v) Calcium carbonate

Solution 2:

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

Question 3:

Name the probable cation present in each of the following solution:

- (i) Yellow coloured solution
- (ii) blue coloured solution
- (iii) Light blue coloured solution
- (iv) Pink coloured solution

Solution 3:

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

Question 4:

Name the metal hydroxides which are:

- (i) Sparingly soluble
- (ii) Insoluble
- (iii) Soluble

In caustic soda solution

Solution 4:

- (i) $\text{Ca}(\text{OH})_2$
- (ii) $\text{Fe}(\text{OH})_2$ and $\text{Cu}(\text{OH})_2$
- (iii) $\text{Zn}(\text{OH})_2$ and $\text{Pb}(\text{OH})_2$



Question 5:

What do you observe when ammonium salt is heated with caustic soda solution? Write the balanced equation.

Solution 5:

When ammonium salt is heated with caustic soda solution, ammonia gas is evolved.

The balanced equation is:

**Question 6:**

How will you distinguish NH_4OH solution from NaOH solution?

Solution 6:

NH_4OH and NaOH can be distinguished by using calcium salts.

For example on adding NaOH to $\text{Ca}(\text{NO}_3)_2$, $\text{Ca}(\text{OH})_2$ is obtained as white precipitate which is sparingly soluble in excess of NaOH .



On addition of NH_4OH to calcium salts, no precipitation of $\text{Ca}(\text{OH})_2$ 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.

Question 7:

Name the metal hydroxides which are:

(i) Insoluble (ii) Soluble.

In ammonium hydroxide solution

Solution 7:

(i) $\text{Fe}(\text{OH})_2$ and $\text{Pb}(\text{OH})_2$

(ii) $\text{Cu}(\text{OH})_2$ and $\text{Zn}(\text{OH})_2$

