

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:

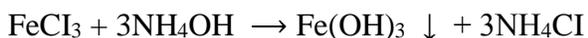
Name:

- (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 dissolve 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

(iii)



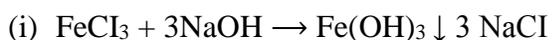
Yellow solution reddish brown ppt. colourless in solution

Question 5:

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

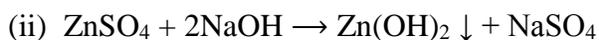
- (a) FeCl_3
- (b) ZnSO_4
- (c) $\text{Pb}(\text{NO}_3)_2$
- (d) CuSO_4

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

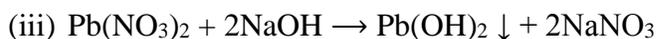


Colourless white gelatinous ppt. colourless

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



Sodium zincate (colourless)



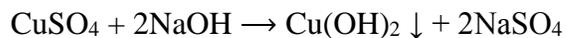
White ppt (colourless)

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



Sodium plumbate

{ colourless }



Blue colourless pale blue ppt. { colourless }

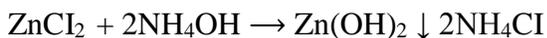
In excess of alkali, pale blue precipitate of $\text{Cu}(\text{OH})_2$ is insoluble

Question 6:

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

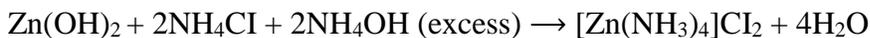
Solution 6:

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) $\text{Zn}(\text{OH})_2$

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:

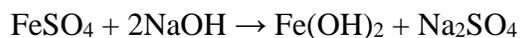
What do you observe when freshly precipitated aluminium hydroxide reacts with caustic soda solution? Give balanced equation.

Solution 9:

(a) (iii)

Aqueous solution of copper sulphate is blue.

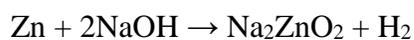
(b) (iii)



(Dirty green, (Colourless)

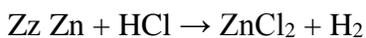
gelatinous ppt.)

(c) (iii)



Sodium zincate

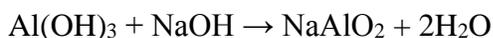
(Colourless)

**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.

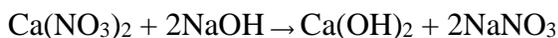
Question 12:

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 balance 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 $\text{Zn}(\text{OH})_2$