

## Exercise-4

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:**

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

2. Name:

- (a) a metallic hydroxide soluble in excess of  $\text{NH}_4\text{OH}$ .  
(b) a metallic oxide soluble in excess of caustic soda solution.  
(c) a strong alkali.  
(d) a weak alkali.  
(e) Two colourless 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 strong alkalis.  
(i) a coloured metallic oxide which dissolves in alkalis to yield colourless solutions.  
(j) a colourless cation not a representative element.

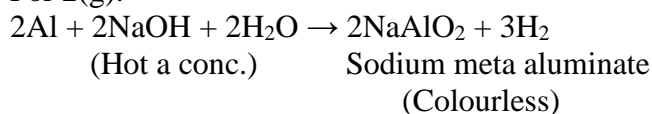
**Solution:**

- (a)  $\text{Cu}(\text{OH})_2$   
(b)  $\text{ZnO}$   
(c)  $\text{NaOH}$   
(d)  $\text{NH}_4\text{OH}$   
(e)  $\text{Na}^+$ ,  $\text{Ca}^{2+}$   
(f)  $\text{Fe}^{2+}$ ,  $\text{Mn}^{2+}$   
(g) Aluminium  
(h)  $\text{Zn}(\text{OH})_2$  and  $\text{Al}(\text{OH})_3$   
(i)  $\text{PbO}$   
(j) Ammonium ion

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

**Solution:**

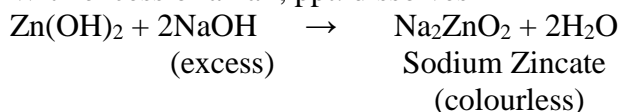
For 2(g):



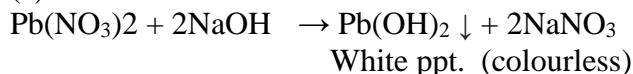
For 2(i):



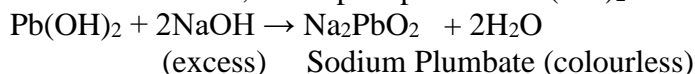
With excess of alkali, ppt. dissolves



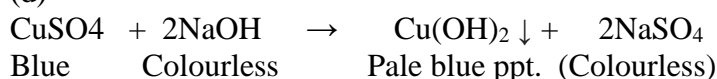
(c)



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



(d)

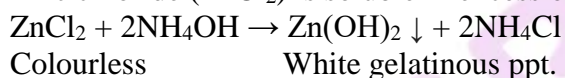


In excess of alkali, pale blue precipitate of  $\text{Cu(OH)}_2$  is soluble.

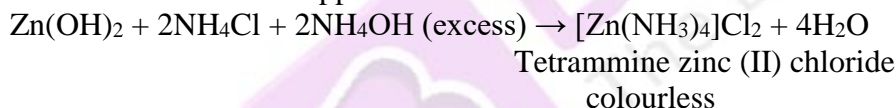
**6. Name the chloride of a metal which is soluble in excess of ammonium hydroxide. Write equation for the same.**

**Solution:**

Zinc chloride ( $\text{ZnCl}_2$ ) is soluble in excess of ammonium hydroxide.



With excess of  $\text{NH}_4\text{OH}$  ppt. dissolves



**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:**

(a)  $\text{ZnCl}_2$

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

**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:**

(a)  $\text{PbO}$

- (b) ZnO  
(c)  $K_2ZnO_2$

9. Select the correct answers:

(a) Colour of an aqueous solution of copper sulphate is

- (i) Green                      (ii) Brown  
(iii) Blue                     (iv) Yellow

(b) Colour of the precipitate formed on adding NaOH solution to iron (II) sulphate solution is

- (i) White                      (ii) Brown  
(iii) Green                    (iv) Pale blue

(c) A metal which produces hydrogen on reacting with alkali as well as with acid.

- (i) Iron                        (ii) Magnesium  
(iii) Zinc                      (iv) Copper

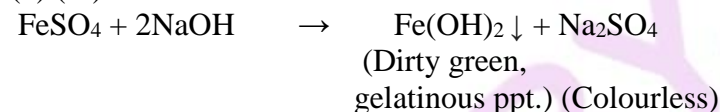
(d) The salt solution which does not react with ammonium hydroxide is

- (i) Calcium nitrate        (ii) Zinc nitrate  
(iii) Lead nitrate         (iv) Copper nitrate

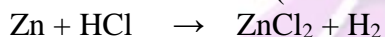
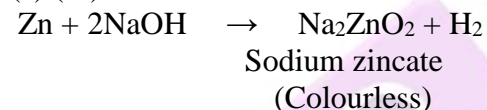
**Solution:**

(a) (iii) Aqueous solution of copper sulphate is blue.

(b) (iii)



(c) (iii)



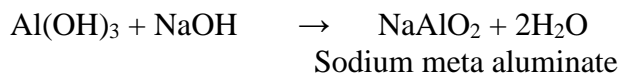
(d) (i) Calcium nitrate

The salt solution which does not react with ammonium hydroxide is calcium nitrate.

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

**Solution:**

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



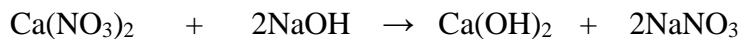
11. You are provided with two reagent bottles marked A and B. One of which contains  $NH_4OH$  solution and the other contains NaOH solution. How will you identify them by a chemical test?

**Solution:**

Reagent bottles A and B can be identified by using calcium salts such as  $Ca(NO_3)_2$ .

On adding NaOH to  $Ca(NO_3)_2$ , a white precipitate  $Ca(OH)_2$  is formed which is sparingly soluble in

excess of NaOH.



On the other hand, addition of  $\text{NH}_4\text{OH}$  to calcium salts, no precipitation of  $\text{Ca}(\text{OH})_2$  is seen even with addition of excess of  $\text{NH}_4\text{OH}$  because the concentration of  $\text{OH}^-$  ions from the ionization of  $\text{NH}_4\text{OH}$  is so low that it cannot precipitate the hydroxide of calcium.

Thus, the reagent bottle which gives white precipitate is NaOH and the other one should contain  $\text{NH}_4\text{OH}$ .

**12. Distinguish by adding: sodium hydroxide solution and ammonium hydroxide solution to**

- (a) Calcium salt solution and lead salt solution
- (b) Lead nitrate solution and zinc nitrate solution
- (c) Copper salt solution and ferrous salt solution
- (d) Fe(II) salt solution and Fe(III) salt solution
- (e) Ferrous nitrate and lead nitrate

**Solution:**

- (a) Sodium hydroxide and ammonium hydroxide on reaction with calcium salt gives a milky white precipitate  $\text{Ca}(\text{OH})_2$ , while that of with lead salt solution it gives chalky white precipitate  $\text{Pb}(\text{OH})_2$ .
- (b) Sodium hydroxide and ammonium hydroxide on reaction with lead salt gives brown coloured precipitate, and with zinc it forms white gelatin like precipitate.
- (c) Sodium hydroxide and ammonium hydroxide on reaction with Copper salt gives pale blue coloured precipitate, and with ferrous salt solution it forms dirty green coloured precipitate.
- (d) Sodium hydroxide and ammonium hydroxide on reaction with Fe(II) salt gives dirty green coloured precipitate, while that of with Fe(III) salt solution it forms reddish brown insoluble precipitate.
- (e) Ammonium hydroxide on reaction with lead nitrate gives a chalky white insoluble precipitate, and with ferrous nitrate will not give any precipitation.

**13. How will you distinguish lead carbonate and zinc carbonate in solution?**

**Solution:**

They can be distinguished by dissolving it dilute nitric acid and then with ammonium hydroxide in excess.

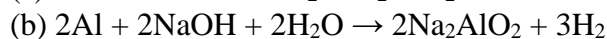
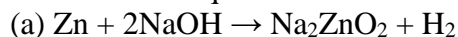
When lead carbonate is dissolved in dilute nitric acid and then ammonium hydroxide is added to it. A white precipitate is formed which is insoluble in excess of ammonium hydroxide.

Whereas, when zinc carbonate is dissolved in dilute nitric acid and then ammonium hydroxide is added to it. A white precipitate is formed which is soluble in excess of ammonium hydroxide.

**14. What is observed when hot concentrated caustic soda solution is added to (a) Zinc (b) Aluminium? Write balanced equations.**

**Solution:**

The balanced equations are as follows:



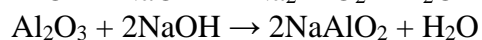
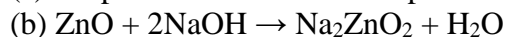
15. (a) What do you understand by amphoteric oxide?

(b) Give the balanced equations for the reaction with two different amphoteric oxides with a caustic alkali.

(c) Name the products formed.

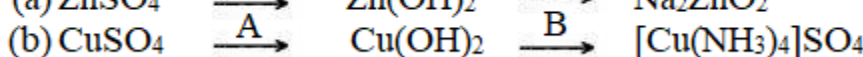
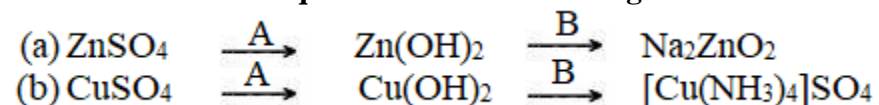
**Solution:**

(a) Amphoteric oxides are compounds which react with both acids and alkalis to form salt and water.



(c) Sodium zincate and Aluminium zincate are the products formed.

16. Write balanced equations for the following conversions:



**Solution:**

