

Board – ICSE

Class – 10<sup>th</sup>

Chapter – Analytical Chemistry

1. Write the probable colour of the following salts?

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

- Ans.** (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.

- Ans.** (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).

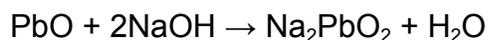
**Ans.** For 2(g):



(Hot a conc.) Sodium meta aluminate

(Colourless)

For 2(i):



(Yellow) Sodium Plumbate

(Colourless, soluble)

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

(i)  $\text{CuSO}_4$                       (ii)  $\text{ZnSO}_4$                       (iii)  $\text{FeCl}_3$

Write balanced equations for these reactions.

**Ans.** (i)



Blue Pale blue ppt. colourless in solution

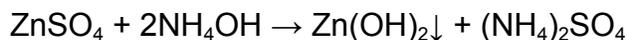
With an excess of  $\text{NH}_4\text{OH}$ , ppt. dissolves



excess Tetrammine

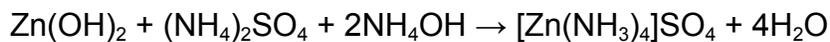
Copper(II) sulphate

(ii)



Colourless white, gelatinous ppt Colourless

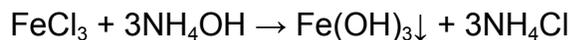
With an excess of  $\text{NH}_4\text{OH}$ , ppt. dissolves



(excess) Tetrammine zinc(II) sulphate

(colourless)

(iii)



Yellow solution Reddish-brown ppt. Colourless in solution

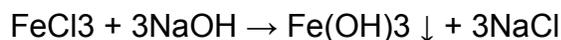
5. What do you observe when caustic soda solution is added to the following solution: first a little and then in excess.

(a)  $\text{FeCl}_3$ ,                      (b)  $\text{ZnSO}_4$ ,                      (c)  $\text{Pb}(\text{NO}_3)_2$ ,                      (d)  $\text{CuSO}_4$ ?

Write balanced equations for these reactions.

**Ans.** Caustic soda is Sodium hydroxide ( $\text{NaOH}$ )

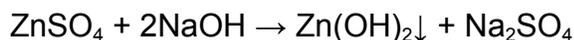
(a)



Yellow solution Reddish-brown ppt. Colourless in solution

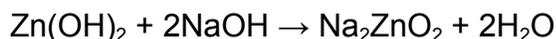
In excess of alkali, the reddish-brown ppt. of  $\text{Fe}(\text{OH})_3$  remains insoluble.

(b)



Colourless white, gelatinous ppt Colourless

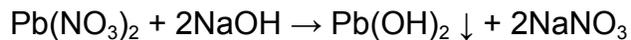
With an excess of alkali, ppt. dissolves



(excess) Sodium Zincate

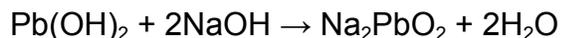
(colourless)

(c)



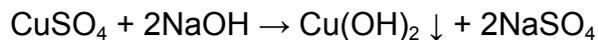
White ppt. (colourless)

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



(excess) Sodium Plumbate (colourless)

(d)

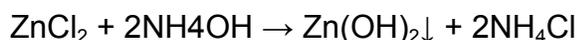


Blue Colourless Pale blue ppt. (Colourless)

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

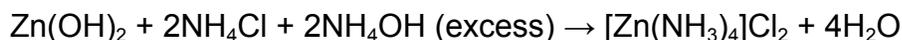
6. Name the chloride of a metal which is soluble in excess of ammonium hydroxide. Write an equation for the same.

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



Colourless White gelatinous ppt.

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



Tetrammine zinc (II) chloride (colourless)

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 an excess of ammonia solution. Identity (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?

**Ans.** (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.

- Ans.** (a) 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.

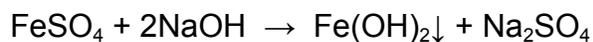
- (i) Iron (ii) Magnesium  
(iii) Zinc (iv) Copper

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

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

**Ans.** (a) (iii) An aqueous solution of copper sulphate is blue.

(b) (iii)



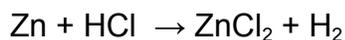
(Dirty green,  
gelatinous ppt.) (Colourless)

(c) (iii)



Sodium zincate

(Colourless)

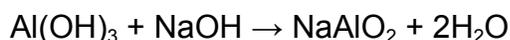


(d) (i) Calcium nitrate

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 a balanced equation.

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

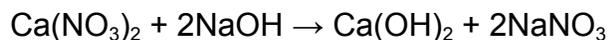


Sodium meta aluminate

**11.** You are provided with two reagent bottles marked A and B. One of which contains  $\text{NH}_4\text{OH}$  solution and the other contains  $\text{NaOH}$  solution. How will you identify them by a chemical test?

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

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



On the other hand, the addition of  $\text{NH}_4\text{OH}$  to calcium salts, no precipitation of  $\text{Ca}(\text{OH})_2$  is seen even with the addition of an 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  $\text{NaOH}$  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

- Ans.** (a) Sodium hydroxide and ammonium hydroxide on reaction with calcium salt give a milky white precipitate  $\text{Ca(OH)}_2$ , while that of with lead salt solution it gives chalky white precipitate  $\text{Pb(OH)}_2$ .
- (b) Sodium hydroxide and ammonium hydroxide on reaction with lead salt give brown coloured precipitate, and with zinc, it forms a white gelatin-like precipitate.
- (c) Sodium hydroxide and ammonium hydroxide on reaction with Copper salt give pale blue coloured precipitate, and with a ferrous salt solution, it forms a dirty green coloured precipitate.
- (d) Sodium hydroxide and ammonium hydroxide on reaction with Fe(II) salt give dirty green coloured precipitate, while that with Fe(III) salt solution it forms a 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?

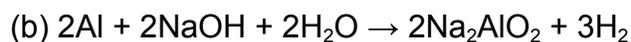
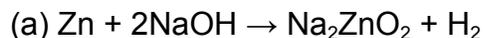
- Ans.** They can be distinguished by dissolving it dilute nitric acid and then with ammonium hydroxide in excess.

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.

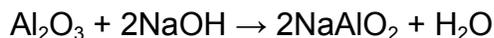
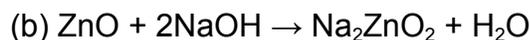
- 14.** What is observed when hot concentrated caustic soda solution is added to (a) Zinc (b) Aluminium? Write balanced equations.

**Ans.** The balanced equations are as follows:



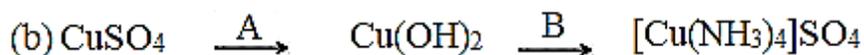
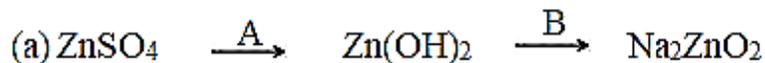
- 15.** (a) What do you understand about amphoteric oxide?  
(b) Give the balanced equations for the reaction with two different amphoteric oxides with caustic alkali.  
(c) Name the products formed.

**Ans.** (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:



Ans.

