

## Chapter 12. Practical Chemistry

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### Short Questions

**Question 1:** Name the three ions which can be identified by  $K_4[Fe(CN)_6]$  solution.

**Answer:**  $Fe^{3+}$ ,  $Z^{2+}$ ,  $Cu^{2+}$

**Question 2:** State the colour of the following :

- (i) Lead monoxide (h) Hat zinc oxide
- (iii) Copper carbonate (iv) Copper nitrate crystals

**Answer:** (i) Lime yellow (ii) Yellow

(iii) Emerald green (iv) Deep blue

**Question 3:** Mention the colour changes observed when the following indicators are added to acids :

- (i) Alkaline phenolphthalein solution (ii) Methyl orange solution
- (iii) Neutral litmus solution

**Answer:** (i) From pink to colourless (ii) From orange to pink (red)

(iii) From colourless to red

**Question 4:** Identify the anion present in the following compounds :

- (i) Compound X on heating, with copper turnings and concents sulphuric acid liberates a reddish brown gas.
- (ii) When a solution of compound Y is treated with silver nitrate solution a white precipitate is obtained which is soluble in excess of ammonium hydroxide solution.
- (iii) Compound Z which on reacting with dilute sulphuric acid liberates a gas which lime lunc water milky, but the gas has no effect on acidified potassium dichromate solution.
- (iv) Compound L on reacting with barium chloride solution gives a white precipitate insoluble in dilute hydrochloric acid or dilute nitric acid.

**Answer:** (i) Nitrate ion,  $NO_3^-$  (ii) Chloride ion,  $Cl^-$

(iii) Carbonate ion,  $CO_3^-$  (iv) Sulphate ion,  $SO_4^{2-}$

**Question 5:** Identify the substances P, Q, R, S and T in each case based on the information given below:

- (i) The deliquescent salt P, turns yellow on dissolving in water, and gives a reddish brown precipitate with sodium hydroxide solution.
- (ii) The white crystalline solid Q is soluble in water. It liberates a pungent smelling gas when heated with sodium hydroxide solution.

- (iii) The pale green solid R turns reddish brown on heating. Its aqueous solution gives a white precipitate with barium chloride solution. The precipitate is insoluble in mineral acids.
- (iv) The reddish brown liquid S is dissolved in water. When Ethyne gas is passed through it, turns colourless.

**Answer:** (i) Hydrogen chloride gas (ii) Nitric oxide (iii) Oxygen (iv) Ammonia

**Question 6:** Select from the list given (A to E) one substance in each case which matches the description given in parts (i) to (v). (Note: Each substance is used only once in the answer.)

(A) Nitroso Iron(II) sulphate (B) Iron(III) Chloride (C) Chromium sulphate (D) Lead(II) Chloride (E) Sodium chloride.

(i) A compound which is deliquescent.

(ii) A compound which is insoluble in cold water, but soluble in hot water.

(iii) The compound responsible for the brown ring during the brown ring test of nitrate ion.

(iv) A compound whose aqueous solution is neutral in nature.

(v) The compound which is responsible for the green colouration when sulphur dioxide is passed through acidified potassium dichromate solution.

**Answer:** (i) B, Iron (III) chloride

(ii) D, Lead (II) chloride

(iii) A, Nitroso Iron (II) sulphate

(iv) E, Sodium chloride

(v) C, Chromium sulphate

**Question 7:** The questions (i) to (v) refer to the following salt solutions listed A to F:

A. Copper nitrate B. Iron (II) sulphate.

C. Iron (III) chloride D. Lead nitrate

E. Magnesium sulphate F. Zinc chloride.

(i) Which two solutions will give a white precipitate when treated with dilute Hydrochloric acid followed by Barium chloride solution ?

(ii) Which two solutions will give a white precipitate when treated with dilute Nitric acid followed by Silver nitrate solution ?

(iii) Which solution will give a white precipitate when either dilute Hydrochloric acid or dilute Sulphuric acid is added to it ?

(iv) Which solution becomes a deep /inky blue colour when excess of Ammonium hydroxide is added to it ?

(v) Which solution gives a white precipitate with excess Ammonium hydroxide solution ?

**Answer:** (i) B and E (Iron II sulphate and magnesium sulphate).

(ii) C and F (Iron III chloride and zinc chloride)

(iii) D (lead nitrate)

(iv) A (copper nitrate)

(v) F (zinc chloride)

**Question 8:** A white crystalline solid A on dissolving in water forms a neutral solution. When solid A is heated with calcium hydroxide, it gives off colourless gas B having a sharp biting

smell. The gas fumes very strongly in air and turns red litmus blue. The aqueous solution of A on treating with lead acetate solution forms a white precipitate C. The precipitate is insoluble in all acids.

- (i) Name the cation present in solid A.
- (ii) Name the anion present in solid A.
- (iii) Name the solid A and write its chemical formula.
- (iv) Name the colourless gas B.
- (v) Write one more chemical test for the identification of gas B.
- (vi) Name the white precipitate C.
- (vii) Write fully balanced chemical equations for:
  - (a) Solid A and calcium hydroxide.
  - (b) Solution of solid A and lead acetate solution.

**Answer:** (i) Cation in A is ammonium ( $\text{NH}_4^+$ )

(ii) Anion in A is sulphate ( $\text{SO}_4^{2-}$ )

(iii) Solid A is ammonium sulphate  $[(\text{NH}_4)_2\text{SO}_4]$

(iv) The colourless gas B is ammonia gas.

(v) Bring a rod dipped in HCl sol. near the gas. The dense white fumes of ammonium chloride are formed.

(vi) White precipitate C is lead sulphate.

(vii)

(a)  $(\text{NH}_4)_2\text{SO}_4 + \text{Ca}(\text{OH})_2 \rightarrow \text{CaSO}_4 + 2\text{NH}_3 + 2\text{H}_2\text{O}$

(b)  $(\text{NH}_4)_2\text{SO}_4 + (\text{CH}_3\text{COO})_2\text{Pb} \rightarrow \text{PbSO}_4 + 2\text{CH}_3\text{COONH}_4$

**Question 9:** Identify the following solids.

(i) A silvery white solid which floats on the surface of water and reacts violently to give tiny bubbles of a colourless gas. The gas burns in air with a pop sound. The chloride of solid gives a non-persistent lilac colour to non-luminous bunsen flame.

(ii) A pale yellow compound gives a persistent golden yellow colour in non-luminous bunsen burner flame. When treated with water, it liberates a colourless gas, which burns with a pop sound.

(iii) A white solid on treating with water gives off a colourless gas which has a sharp biting smell and turns red- litmus blue. The white solid formed after the reaction is soluble in conc. sodium hydroxide solution.

**Answer:** (i) The solid is potassium metal (ii) The solid is sodium hydride

(iii) The solid is aluminium nitride

**Question 10:** Identify the cations and anions in each case and write relevant equations wherever necessary.

(i) A white crystalline solid on heating swells and gives off colourless vapours, which condense to form a colourless liquid X. The X turns anhydrous copper sulphate solution blue. The flame test shows the flame as persistent golden yellow. When the solution of solid is treated with HCl, it gives off a colourless gas Y which turns lime water milky.

(ii) A blue solid gives a non-persistent green flame during the flame test. When the solid is heated strongly, it leaves behind a white residue. The residue on treating with few drops of water changes to blue colour.

(iii) A white solid gives a non-persistent brick red flame. On treating with dilute sulphuric acid, it gives off a colourless gas which turns acidified potassium dichromate solution green.

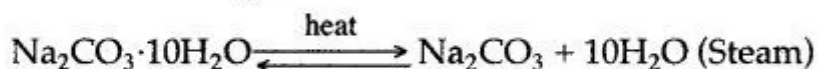
(iv) A white solid gives a non-persistent black colour. On treating with dilute sulphuric acid, it gives off a highly offensive smell. The gas turns lead acetate paper black.

**Answer:**

(i) Cation  $\Rightarrow$  Sodium ( $\text{Na}^+$ );

Anion  $\Rightarrow$  Carbonate ( $\text{CO}_3^{2-}$ )

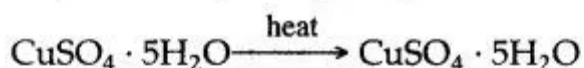
X is water of crystallisation.



Y is carbon dioxide gas.

(ii) Cation  $\Rightarrow$  Copper ( $\text{Cu}^{2+}$ );

Anion  $\Rightarrow$  Sulphate ( $\text{SO}_4^{2-}$ ) Salt is  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$



(iii) Cation  $\Rightarrow$  Calcium ( $\text{Ca}^{2+}$ );

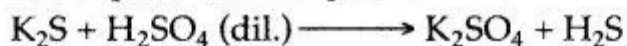
Anion  $\Rightarrow$  Sulphite ( $\text{SO}_3^{2-}$ ) Salt is  $\text{CaSO}_3$ .



(iv) Cation  $\Rightarrow$  Potassium ( $\text{K}^+$ );

Anion  $\Rightarrow$  Sulphide ( $\text{S}^{2-}$ )

Salt is potassium sulphide.



### Figure/Table Based Questions

**Question 1:** Salts A, B, C, D and E undergo reactions (i) to (v) respectively. Identify the anion present in these salts on the basis of these reactions. Tabulate your answers in the format given below :

(i) When silver nitrate solution is added to a solution of A, a white precipitate, insoluble in dilute nitric acid, is formed.

(ii) Addition of dilute hydrochloric acid to B produces a gas which turns lead acetate paper black.

(iii) When a freshly prepared solution of ferrous sulphate is added to a solution of C and concentrated sulphuric acid is gently poured from the side of the test-tube, a brown ring is formed.

(iv) When dilute sulphuric acid is added to D, a gas is produced which turns acidified potassium dichromate solution from orange to green.

(v) Addition of dilute hydrochloric acid to E produces an effervescence. The gas produced turns lime water milky but does not affect acidified potassium dichromate solution.

Salt	Anion
A	
B	
C	
D	
E	

**Answer:**

(i) A—Chloride,

(ii) B—Sulphide,

(iii) C—Nitrate,

(iv) D—Sulphite,

(v) E—Carbonate.

**Question 2:** Sodium hydroxide solution is added first in a small quantity, then in excess to the aqueous salt solutions of copper (II) sulphate, zinc nitrate, lead nitrate, calcium chloride and iron (III) sulphate. Copy the following table and write the colour of the precipitate in (i) to (v) and the nature of the precipitate (soluble or insoluble) in (vi) to (x).

Aqueous salt solution	Colour of precipitate when NaOH is added in a small quantity	Nature of precipitate (soluble or insoluble) when NaOH is added in excess
Copper (II) sulphate	(i)	(vi)
Zinc nitrate	(ii)	(vii)
Lead nitrate	(iii)	(viii)
Calcium chloride	(iv)	(ix)
Iron (III) sulphate	(v)	(x)

**Answer:**

Aqueous salt solution	Colour of precipitate when NaOH is added in a small quantity.	Nature of precipitate (soluble or insoluble) when NaOH is added in excess.

Copper (II) sulphate	Blue	Insoluble
Zinc nitrate	White	Soluble
Lead nitrate	White	Soluble
Calcium chloride	White	Insoluble
Iron (II) sulphate	Reddish Brown	Insoluble

## Chemical Tests

### Question 1:

1. Zinc sulphate solution and Zinc chloride solution.
2. Iron (II) chloride solution and Iron (III) chloride solution.
3. Calcium nitrate solution and Calcium chloride solution.
4. Sodium carbonate and sodium sulphite.
5. Ferrous nitrate and Lead nitrate
6. Manganese dioxide and Copper (II) oxide.
7. Sodium chloride and sodium nitrate.
8. Calcium nitrate and lead nitrate.
9. Lead nitrate and zinc nitrate.
10. Sodium sulphite and sodium sulphate
11. Ammonium chloride and ammonium nitrate.
12. Zinc carbonate and lead carbonate.
13. Potassium chloride and sodium chloride.
14. Powdered coke and manganese dioxide.
15. Copper oxide and manganese dioxide.
16. Washing soda and baking soda.
17. Potassium nitrate and potassium nitrite.
18. Mercuric oxide and red lead.
19. Ferrous ions and ferric ions.

### Answer:

1. When  $\text{BaCl}_2$  solution is added to the given solution,  $\text{ZnSO}_4$  gives a white ppt while no ppt. is obtained with  $\text{ZnCl}_2$  solution.
2. When  $\text{NaOH}$  solution is added to the given solution, Iron (II) chloride gives dirty green ppt. while reddish brown ppt. is obtained with Iron (III) chloride.
3. When  $\text{AgNO}_3$  solution is added to the given solution,  $\text{CaCl}_2$  solution will give a white ppt. while no change is observed with calcium nitrate solution.
4. Sodium carbonate when treated with dil  $\text{H}_2\text{SO}_4$  will liberate colourless odourless gas with brisk effervescence. The gas will turn lime water milky and will have no effect on acidified potassium permanganate solution.  
Sodium sulphite when treated with dil  $\text{H}_2\text{SO}_4$  will liberate a colourless gas having suffocating – smell of burning sulphur. The gas will turn acidified potassium permanganate solution from pink to colourless.
5. Aqueous ferrous nitrate when treated with  $\text{NaOH}$  solution gives a dirty green ppt. Aqueous lead nitrate when treated with  $\text{NaOH}$  solution gives a white ppt. which dissolves in excess of  $\text{NaOH}$ .

6. When manganese dioxide is heated with cone. HCl a pungent smelling greenish yellow chlorine gas is evolved. When copper oxide is heated with cone. HCl no such gas is evolved.
7. On heating with cone.  $H_2SO_4$  sodium chloride gives pungent colourless gas which turns silver nitrate solution curdy white, whereas sodium nitrate gives a brown gas which shows no effect on silver nitrate solution.
8. Aqueous solution of calcium nitrate gives a white precipitate with sodium hydroxide which is insoluble in excess of sodium hydroxide solution. The aqueous solution of lead nitrate gives a white precipitate with caustic soda solution which dissolves in excess of caustic soda solution.
9. Aqueous solution of lead nitrate gives white precipitate with ammonium hydroxide which is insoluble in excess ammonium hydroxide while the sodium of zinc nitrate gives a white precipitate which is soluble in excess ammonium hydroxide.
10. Solution of both gives white precipitate with barium chloride solution. The precipitate of barium Sulphite is soluble in dil hydrochloric acid, while the precipitate of barium sulphite is insoluble in dil. hydrochloric acid.
11. Heat each of salt strongly in a hard glass test tube. In case of ammonium chloride, sublimation takes place and white powdery deposits settles near the mouth of test tube. In case of ammonium nitrate, an explosion takes place and nitrous oxide and steam are given off. No residue is left in the test tube.
12. Heat each of the carbonates strongly in a hard glass test tube. In case of zinc carbonate, residue is yellow when hot and white then cold. In case of lead carbonate, residue is reddish-brown when hot and yellow when cold.
13. Make a thick paste of each salt in HCl. Take a small amount of the paste on clean platinum wire and introduce it in non-luminous bunsen flame. In case of potassium chloride, a non-persistent lilac flame is formed. In case of sodium chloride, a persistent golden yellow flame is formed.
14. Heat each of the substances with cone, hydrochloric acid. In case of coke, no visible reaction takes place. In case of manganese dioxide, greenish-yellow gas chlorine is evolved.
15. Warm each of the oxides with dilute hydrochloric acid. In case of copper oxide, a greenish-blue solution of copper chloride is formed. In case of manganese dioxide, no reaction takes place.
16. Heat each of the salt strongly in a hard glass test tube and pass the gas evolved through lime-water. In case of washing soda, lime-water does not turn milky. In case of baking soda, lime-water turns milky.
17. Treat each of the salts with dilute sulphuric acid and gently warm. In case of potassium nitrate, no visible reaction takes place. In case of potassium nitrite, reddish-brown gas, nitrogen dioxide is given off.
18. Heat each of the oxides strongly in a hard glass test tube. In case of mercuric oxide, tiny droplets of mercury are seen near the mouth of the test tube and residue is black. In case of red lead, no tiny droplets are seen. The residue is reddish-brown when hot and yellow when cold.
19. Treat the solution of each ion with sodium hydroxide solution. In case of ferrous ions, a dirty green ppt. of ferrous hydroxide is formed. In case of ferric ions, a reddish-brown ppt. of ferric hydroxide is formed.