

## How can you write a report?

شكر خاص للأستاذة ميمونة الرياني

### Physical properties:

**Shape:** powder, crushed, crystal, plate ... etc.

**Solubility:** soluble in cold water, soluble in hot water ... etc.

**Colour:** white, yellow, green, blue, red ... etc.

**Affecting on Litmus paper:** Acidic (blue paper → red)

Basic or alkaline (red paper → blue)

Neutral (blue paper → blue, red paper → red)

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### Physical properties:

#### 1- Anions which react with dil. HCl

**Radical name:** Carbonate

**Chemical symbol of Radical:**  $\text{CO}_3^{=}$

Experiment	Observation	Result
Solid salt + dil. HCl	Effervescence and a colourless, odourless gas is evolved.	The gas is $\text{CO}_2$ the anion either $\text{CO}_3^{=}$ or $\text{HCO}_3^{-}$
Salt solution + $\text{MgSO}_4$	White ppt. is appeared immediately.	The ppt. is $\text{MgCO}_3$ the anion is $\text{CO}_3^{=}$
Salt solution + $\text{HgCl}_2$	Reddish brown ppt. is appeared immediately.	The ppt. is $\text{HgCO}_3$ the anion is $\text{CO}_3^{=}$

**Radical name:** Bicarbonate

**Chemical symbol of Radical:**  $\text{HCO}_3^-$

Experiment	Observation	Result
Solid salt + dil. HCl	Effervescence and a colourless, odourless gas is evolved.	The evolved gas is $\text{CO}_2$ the anion either $\text{CO}_3^{2-}$ or $\text{HCO}_3^-$
Salt solution + $\text{MgSO}_4$	White ppt. is appeared after heating.	The ppt. is $\text{MgCO}_3$ the anion is $\text{HCO}_3^-$
Salt solution + $\text{HgCl}_2$	Reddish brown ppt. is appeared after heating.	The ppt. is $\text{HgCO}_3$ the anion is $\text{HCO}_3^-$

**Radical name:** Nitrites

**Chemical symbol of Radical:**  $\text{NO}_2^-$

Experiment	Observation	Result
Solid salt + dil. HCl	Pungent brown fumes are evolved.	The evolved fumes are $\text{NO}_2$ the anion is $\text{NO}_2^-$
Brown ring test	Brown ring is formed.	The ring is $(\text{Fe.NO})\text{SO}_4$ the anion is $\text{NO}_2^-$
Salt solution + KI + dil. $\text{H}_2\text{SO}_4$	Pale brown colour is appeared.	The nitrite solution is an oxidizing agent.
Salt solution + $\text{KMnO}_4$ + dil. $\text{H}_2\text{SO}_4$	The purple colour of $\text{KMnO}_4$ is disappeared.	The nitrite solution is a reducing agent.

**Radical name:** Sulphites

**Chemical symbol of Radical:**  $\text{SO}_3^-$

Experiment	Observation	Result
Solid salt + dil. HCl	Colourless gas with pungent smell is evolved, which turns an acidified potassium dichromate paper green.	The gas is $\text{SO}_2$ The green colour is $\text{Cr}_2(\text{SO}_4)_3$ the anion is $\text{SO}_3^-$
Salt solution + $\text{AgNO}_3$	White ppt. is formed which dissolved in excess of sulphite.	The ppt. is $\text{Ag}_2\text{SO}_3$ the anion is $\text{SO}_3^-$
Salt solution + $\text{Pb}(\text{CH}_3\text{OO})_2$	White ppt. is formed.	The ppt. is $\text{PbSO}_3$ the anion is $\text{SO}_3^-$
Salt solution + $\text{KMnO}_4$ + dil. $\text{H}_2\text{SO}_4$	The purple colour of $\text{KMnO}_4$ is disappeared.	The sulphites solution is a reducing agent.
Salt solution + 2 drops of dil. $\text{H}_2\text{SO}_4$ + $\text{I}_2$	The brown colour of $\text{I}_2$ is disappeared.	The sulphites solution is a reducing agent.

**Radical name:** Thiosulphates

**Chemical symbol of Radical:**  $\text{S}_2\text{O}_3^-$

Experiment	Observation	Result
Solid Salt + dil. HCl	Colourless gas with pungent smell is evolved, which turns an acidified potassium dichromate paper green and a yellow ppt is appeared.	The gas is $\text{SO}_2$ The green colour is $\text{Cr}_2(\text{SO}_4)_3$ The ppt. is (S) the anion is $\text{S}_2\text{O}_3^-$
Salt solution + $\text{AgNO}_3$	White ppt. is formed which soluble in excess of thiosulphates, It changes to yellow, brown and finally to black.	The white ppt. is $\text{Ag}_2\text{S}_2\text{O}_3$ The black ppt. is $\text{Ag}_2\text{S}$ the anion is $\text{S}_2\text{O}_3^-$
Salt solution + $\text{Pb}(\text{CH}_3\text{OO})_2$	White ppt. is formed; it is turned to black on boiling.	The white ppt. is $\text{PbS}_2\text{O}_3$ The black ppt. is $\text{PbS}$ The anion is $\text{S}_2\text{O}_3^-$
Salt solution + 2 drops of dil. $\text{H}_2\text{SO}_4$ + $\text{I}_2$	The brown colour of $\text{I}_2$ is disappeared.	The thiosulphates solution is a reducing agent.

**Radical name:** Sulphides

**Chemical symbol of Radical:**  $S^{=}$

Experiment	Observation	Result
Solid Salt + dil. HCl	Colourless gas with bad smell is evolved, which turns a lead acetate paper black.	The evolved gas is $H_2S$ The black colour is $PbS$ the anion is $S^{=}$
Salt solution + $AgNO_3$	Black ppt. is formed.	The black ppt. is $Ag_2S$ the anion is $S^{=}$
Salt solution + $Pb(CH_3OO)_2$	Black ppt. is formed.	The black ppt. is $PbS$ the anion is $S^{=}$
Salt solution + Sodium nitroprusside solution	A violet colour is appeared.	The anion is $S^{=}$

**2- Anions which react with conc.  $H_2SO_4$**

**Radical name:** Chlorides

**Chemical symbol of Radical:**  $Cl^-$

Experiment	Observation	Result
Solid salt + dil. HCl	-ve	The anion is not from dil. HCl group.
Solid salt + conc. $H_2SO_4$	Effervescence and a colourless gas is evolved, and dense white fumes are formed when exposed to $NH_3$ gas.	The evolved gas is HCl The white fumes is $NH_4Cl$ the anion is $Cl^-$
Salt solution + $AgNO_3$	A dense white ppt. is formed; it is slowly turned to violet colour when exposed to bright sunlight.	The white ppt. is $AgCl$ the anion is $Cl^-$
Salt solution + $Pb(CH_3OO)_2$	White ppt. is formed which soluble in hot water and re-precipitates on cooling.	The white ppt. is $PbCl_2$ the anion is $Cl^-$

**Radical name:** Bromides

**Chemical symbol of Radical:** Br<sup>-</sup>

Experiment	Observation	Result
Solid salt + dil. HCl	-ve	The anion is not from dil. HCl group.
Solid salt + conc. H <sub>2</sub> SO <sub>4</sub>	Reddish fumes are evolved and the solution turned orange.	The evolved fumes are Br <sub>2</sub> the anion is Br <sup>-</sup>
Salt solution + AgNO <sub>3</sub>	A yellowish white ppt. is formed.	The yellowish white ppt. is AgBr the anion is Br <sup>-</sup>
Salt solution + Pb(CH <sub>3</sub> OO) <sub>2</sub>	White ppt. is formed, it is soluble in hot water and re-precipitates on cooling.	The white ppt. is PbBr <sub>2</sub> the anion is Br <sup>-</sup>

**Radical name:** Iodides

**Chemical symbol of Radical:** I<sup>-</sup>

Experiment	Observation	Result
Solid salt + dil. HCl	-ve	The anion is not from dil. HCl group.
Solid salt + conc. H <sub>2</sub> SO <sub>4</sub>	Violet fumes are evolved and a brown or black ppt. is formed	The evolved fumes are I <sub>2</sub> the anion is I <sup>-</sup>
Salt solution + AgNO <sub>3</sub>	A yellow ppt. is formed.	The yellow ppt. is AgI the anion is I <sup>-</sup>
Salt solution + Pb(CH <sub>3</sub> OO) <sub>2</sub>	A yellow ppt. is formed, it is soluble in hot water and re-crystallises on cooling.	The yellow ppt. is PbI <sub>2</sub> the anion is I <sup>-</sup>
Salt solution + HgCl <sub>2</sub>	A reddish ppt. is formed which dissolves in excess of either HgCl <sub>2</sub> or KI.	The reddish ppt. is HgI <sub>2</sub> the anion is I <sup>-</sup>
Salt solution + CuSO <sub>4</sub>	A brown ppt. is formed.	The brown ppt. is CuI and I <sub>2</sub> the anion is I <sup>-</sup>

**Radical name:** Nitrates

**Chemical symbol of Radical:**  $\text{NO}_3^-$

Experiment	Observation	Result
Solid salt + dil. HCl	-ve	The anion is not from dil. HCl group.
Solid salt + conc. $\text{H}_2\text{SO}_4$	Dense brown fumes are evolved after added small piece of Cu-metal and drops of water.	The evolved fumes are $\text{NO}_2$ the anion is $\text{NO}_3^-$
Salt solution + 2 drops of $\text{FeSO}_4$ + conc. $\text{H}_2\text{SO}_4$	Brown ring is formed.	The brown ring is $(\text{Fe.NO})\text{SO}_4$ the anion is $\text{NO}_3^-$
Salt solution + $\text{AgNO}_3$	-ve	the anion is $\text{NO}_3^-$

**3- Anions which do not react with acids**

**Radical name:** Phosphates

**Chemical symbol of Radical:**  $\text{H}_2\text{PO}_4^-$ ,  $\text{HPO}_4^{2-}$ ,  $\text{PO}_4^{3-}$

Experiment	Observation	Result
Solid salt + dil. HCl	-ve	The anion is not from dil. HCl group.
Solid salt + conc. $\text{H}_2\text{SO}_4$	-ve	The anion is not from conc. $\text{H}_2\text{SO}_4$ group.
Salt Solution + $\text{BaCl}_2$	White ppt. is formed; it is soluble in dil. acid and insoluble in excess of $\text{BaCl}_2$ .	The ppt. is $\text{BaHPO}_4$ the anion may be phosphates
Salt solution + $\text{AgNO}_3$	Yellow ppt. is formed.	The ppt. is $\text{Ag}_3\text{PO}_4$ the anion is phosphates
0.5 ml of Salt solution + 4 ml of ammonium molybdate solution + 0.5 ml of conc. $\text{HNO}_3$	Yellow ppt. is formed	The ppt. is ammonium phosphomolybdate the anion is phosphates

**Radical name:** Borate

**Chemical symbol of Radical:**  $\text{BO}_2^-$ ,  $\text{BO}_3^{3-}$ ,  $\text{B}_4\text{O}_7^{=}$

Experiment	Observation	Result
Solid salt + dil. HCl	-ve	The anion is not from dil. HCl group.
Solid salt + conc. $\text{H}_2\text{SO}_4$	-ve	The anion is not from conc. $\text{H}_2\text{SO}_4$ group.
Salt Solution + $\text{BaCl}_2$	White ppt. is formed; it is soluble in dil. acid and in excess of $\text{BaCl}_2$ .	The ppt. is $\text{Ba}(\text{PO}_2)_2$ the anion may be borates
Salt solution + $\text{AgNO}_3$	White ppt. is formed from concentrated solution and gives brown ppt. after boiling or dilution.	The white ppt. is $\text{AgBO}_2$ The brown ppt. is $\text{Ag}_2\text{O}$ the anion is borates

**Radical name:** Sulphates

**Chemical symbol of Radical:**  $\text{SO}_4^{=}$

Experiment	Observation	Result
Solid salt + dil. HCl	-ve	The anion is not from dil. HCl group.
Solid salt + conc. $\text{H}_2\text{SO}_4$	-ve	The anion is not from conc. $\text{H}_2\text{SO}_4$ group.
Salt Solution + $\text{BaCl}_2$	White ppt. is formed; it is insoluble in dil. acid and in excess of $\text{BaCl}_2$ .	The ppt. is $\text{BaSO}_4$ the anion may be sulphate
Salt solution + $\text{AgNO}_3$	White ppt. is formed from concentrated solution.	The ppt. is $\text{Ag}_2\text{SO}_4$ the anion is sulphate
Salt solution + $\text{Pb}(\text{CH}_3\text{OO})_2$	White ppt. is formed	The ppt. is $\text{PbSO}_4$ the anion is sulphate

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*Best Wishes*