

Chapter 9

1) TEST FOR CATIONS :

- aluminium (Al^{3+})
 - sodium hydroxide: white ppt...soluble in excess giving a colourless solution
 - aqueous ammonia: white ppt...insoluble in excess
- ammonium (NH_4^+)
 - sodium hydroxide: ammonia produced on warming
 - aqueous ammonia: —
- calcium (Ca^{2+})
 - sodium hydroxide: white ppt...insoluble in excess
 - aqueous ammonia: no ppt
- copper (II) (Cu^{2+})
 - sodium hydroxide: light blue ppt...insoluble in excess
 - aqueous ammonia: light blue ppt...soluble in excess giving a dark blue solution
- iron(II) (Fe^{2+})
 - sodium hydroxide: green ppt...insoluble in excess
 - aqueous ammonia: green ppt...insoluble in excess
- iron(III) (Fe^{3+})
 - sodium hydroxide: red-brown ppt...insoluble in excess
 - aqueous ammonia: red-brown ppt...insoluble in excess
- zinc (Zn^{2+})
 - sodium hydroxide: white ppt...soluble in excess giving a colourless solution
 - aqueous ammonia: white ppt...soluble in excess giving a colourless solution

EASY MEMORISATIONS :

AQUEOUS SODIUM HYDROXIDE:

S
—
i
—
i
—
i
—
S

AQUEOUS AMMONIA:

i
—
—
S
—
i
—
i
—
S

Order of cations is given
— given cations' colours are given for the sodium hydroxide

4) DIFFERENT GASES TO TEST :

- adding an acid and silvery / grey powder (Hydrogen)
- adding a silvery / grey powder to a colourless solution (Hydrogen)
- adding acid to non-silvery / grey powder (e.g. white / green powder) (Carbon dioxide)
- warm an alkali (e.g. aqueous sodium hydroxide) and white powder / colourless solution (Ammonia)
- heating a solid powder (Carbon dioxide)
 - other gases to test:
 - oxygen
 - ammonia (if the gas has a pungent smell)
 - nitrogen dioxide (if a brown gas is evolved)

2) TEST FOR ANIONS :

- carbonate (CO_3^{2-})
 - Test: add dilute acid
 - Test results: effervescence, carbon dioxide produced
- chloride (Cl^-) (in solution)
 - Test: acidify with dilute nitric acid, add aqueous silver nitrate
 - Test results: white ppt.
- nitrate (NO_3^-) (in solution)
 - Test: add aqueous sodium hydroxide, then aluminium foil: warm carefully
 - Test results: ammonia produced
- sulfate (SO_4^{2-}) (in solution)
 - Test: acidify with dilute nitric acid, add aqueous barium nitrate
 - Test results: white ppt.

5) FLAME TEST :

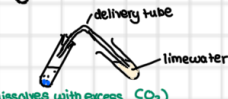
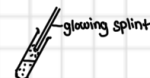
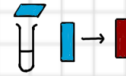
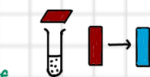
- lilac $\rightarrow K^+$ *DON'T NEED RMB
- Brick Red $\rightarrow Ca^{2+}$
- Green $\rightarrow Cu^{2+}$
- Brilliant white $\rightarrow Mg^{2+}$
- Yellowish-orange $\rightarrow Na^+$

6) USE OF SOME CHEMICALS :

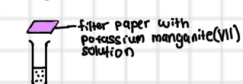
- aqueous cobalt(II) nitrate (a red solution): Test for zinc ion (red cobalt(II) nitrate solution will turn green when heated)
- solid sodium chloride: When dissolving solid sodium chloride in copper (II) salt solution, it will result in a change of the colour of copper (II) salt solution from blue to green
- aqueous sodium carbonate: Test for acidic solution
Precipitation of insoluble metal carbonate

3) TEST FOR GASES :

- ammonia gas (NH_3)
 - colour and smell: colourless and pungent
 - Test results: turns damp red litmus paper blue
- chlorine gas (Cl_2)
 - colour and smell: yellow-green and pungent
 - Test results: bleaches damp litmus paper
- hydrogen gas (H_2)
 - colour and smell: colourless and odourless
 - Test results: 'pops' with a lighted splint
- oxygen (O_2)
 - colour and smell: colourless and odourless
 - Test results: relights a glowing splint
- Carbon dioxide (CO_2)
 - colour and smell: colourless and odourless
 - Test results: gives white ppt. with limewater (ppt. dissolves with excess CO_2)
- Sulfur dioxide (SO_2)
 - colour and smell: yellow-green and pungent
 - Test results:



OR



7) OXIDISING AND REDUCING :

-OXIDISING AGENT

- Acidified potassium manganate(VII) solution: the acidified potassium manganate (VII) solution turned from purple to colourless
- Iron (II) chloride solution: solution turned from reddish brown to green (Iron(II) ion formed was confirmed by adding NaOH which formed a green ppt.)
- Iodine solution: solution turned from brown to colourless (Iodide formed was confirmed by adding aqueous silver nitrate which formed a yellow precipitate)

-REDUCING AGENT

- Acidified potassium iodide solution: the acidified potassium iodide solution turned from colourless to brown (Iodide formed was confirmed by adding starch which turned dark blue)
- Acidified iron(II) sulfate solution: solution turned from green to yellow (Iron(III) ion formed was confirmed by adding NaOH which formed a reddish brown ppt.)