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# Cations

- reagents used 2 identify cations:

$\text{NaOH(aq)}$  – aqueous sodium hydroxide

$\text{NH}_3(\text{aq})$  – aqueous ammonia

Cations 2 b tested 4:

1. Aluminium ion,  $\text{Al}^{3+}$
  2. Zinc ion,  $\text{Zn}^{2+}$
  3. Calcium ion,  $\text{Ca}^{2+}$
  4. Ammonium ion,  $\text{NH}_4^+$
  5. Copper (II) ion,  $\text{Cu}^{2+}$
  6. Iron (II) ion,  $\text{Fe}^{2+}$
  7. Iron (III) ion,  $\text{Fe}^{3+}$
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Steps 2 test 4 them

1.  $\text{Al}^{3+}$

$\rightarrow \text{Al(OH)}_3$

- drops of  $\text{NaOH(aq)}$  = white ppt of Aluminium hydroxide
- excess  $\text{NaOH(aq)}$  = ppt dissolves in excess forming colourless solution
- drops  $\text{NH}_3(\text{aq})$  = white ppt of  $\text{Al(OH)}_3$
- excess  $\text{NH}_3(\text{aq})$  = ppt dissolves, forms colourless solution

## 2. $Zn^{2+}$

- drops of  $NaOH(aq)$  = white ppt of zinc hydroxide,  $Zn(OH)_2$
- excess  $NaOH(aq)$  = ppt dissolves, forms colourless solution
- drops  $NH_3(aq)$  = white ppt of  $Zn(OH)_2$
- excess  $NH_3(aq)$  = ppt dissolves, forms colourless solution

## 3. $Ca^{2+}$

- drops  $NaOH(aq)$  = white ppt of calcium hydroxide,  $Ca(OH)_2$
- excess  $NaOH(aq)$  = ppt insoluble in excess
- drops  $NH_3(aq)$  = no ppt  $\rightarrow$  from this
- excess  $NH_3(aq)$  = no change

## 4. $NH_4^+$

- drops  $NaOH(aq)$  = no ppt, but when heated, ammonia gas given off
- turns damp red litmus paper  $\uparrow$  blue

## 5. $Cu^{2+}$

- drops of  $NaOH(aq)$  = light blue ppt of copper(II) hydroxide  $Cu(OH)_2$
- excess  $NaOH(aq)$  = ppt insoluble in excess
- drops  $NH_3(aq)$  = light blue ppt of  $Cu(OH)_2$

- excess  $\text{NH}_3(\text{aq})$  = ppt dissolves in excess, forming dark blue solution

## 6. $\text{Fe}^{2+}$



- drops of  $\text{NaOH}(\text{aq})$  = green ppt of Iron(II) hydroxide

- excess  $\text{NaOH}(\text{aq})$  = ppt insoluble in excess, turns brown on standing

- drops  $\text{NH}_3(\text{aq})$  = green ppt of  $\text{Fe}(\text{OH})_2$

- excess  $\text{NH}_3(\text{aq})$  = ppt insoluble, turns brown on standing

## 7. $\text{Fe}^{3+}$



- drops  $\text{NaOH}(\text{aq})$  = red-brown ppt of Iron(III) hydroxide

- excess  $\text{NaOH}(\text{aq})$  = ppt insoluble in excess

- drops  $\text{NH}_3(\text{aq})$  = red-brown ppt of  $\text{Fe}(\text{OH})_3$

- excess  $\text{NH}_3(\text{aq})$  = ppt insoluble in excess