



# Professional 1-1 Chemistry Tuition

- Online
- Worthing
- Brighton

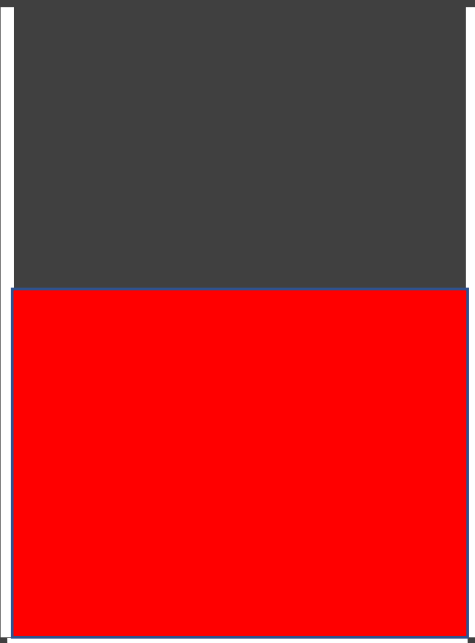
ChemistryTuition.Net

Dr Simon Orchard

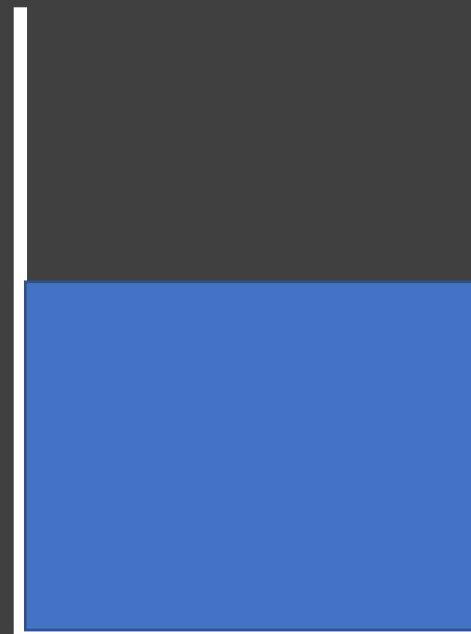
## Solution Calculations and Titration Experiments

These slides may be downloaded at <https://www.chemistrytuition.net/>

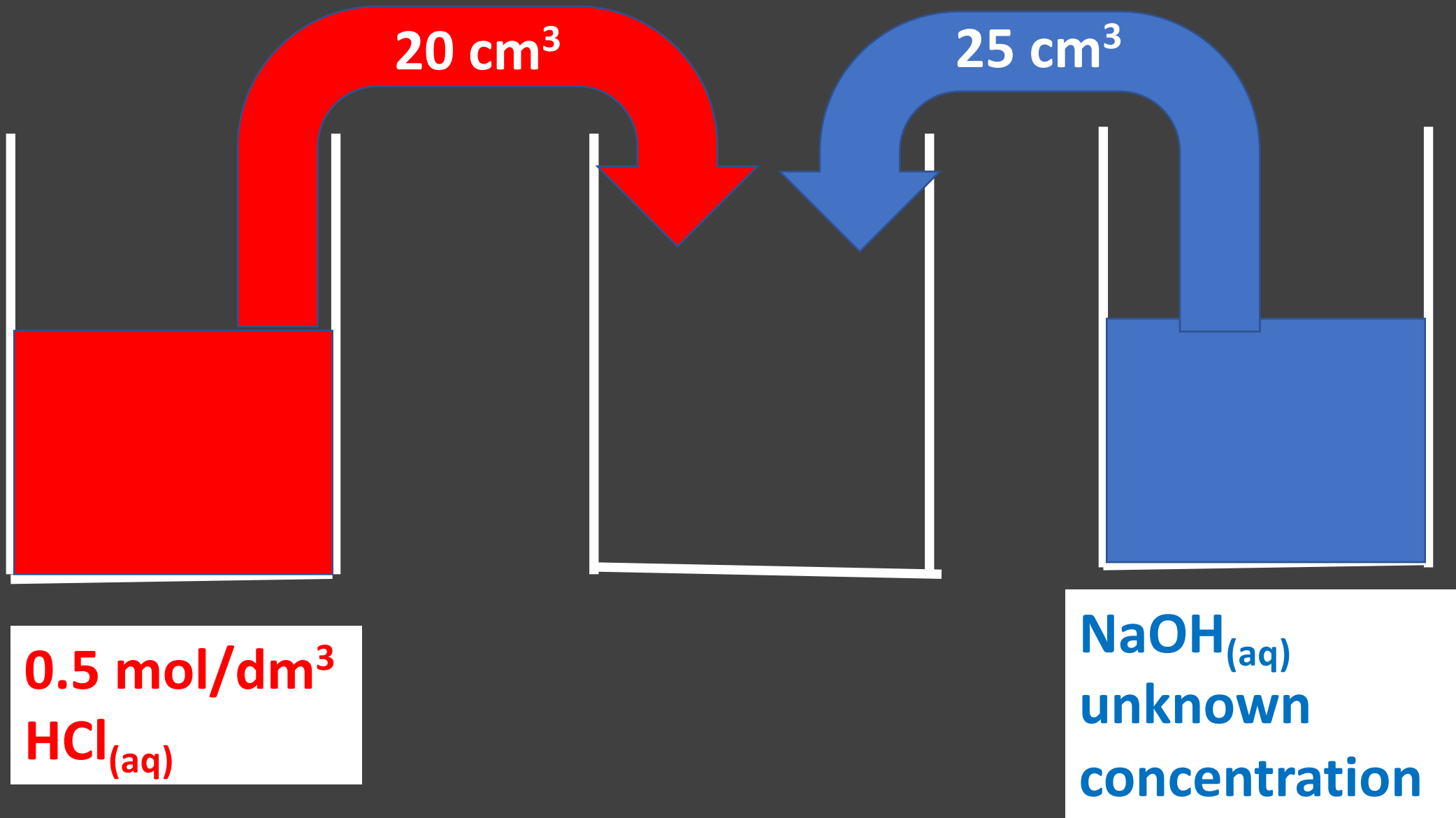
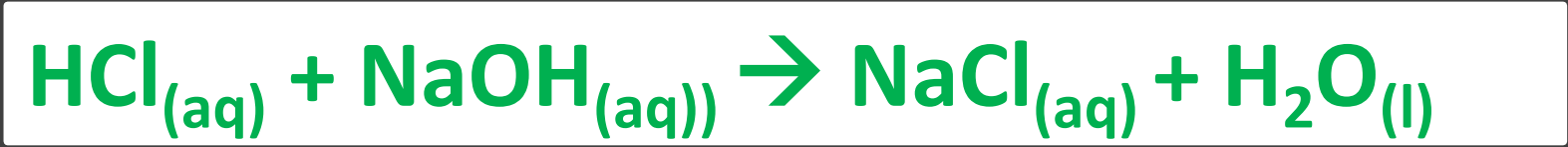
# Reacting Solutions

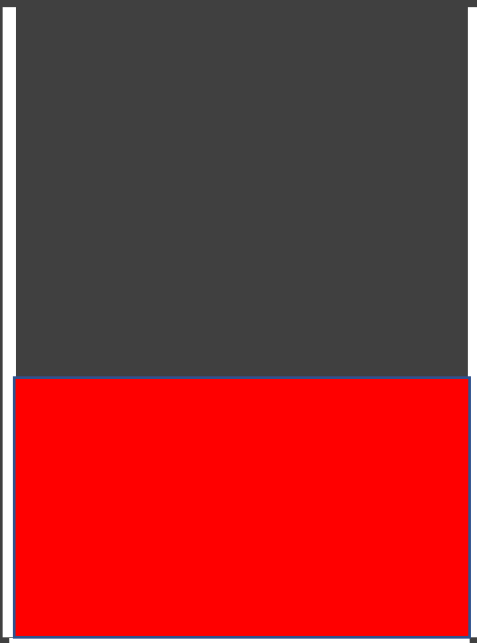


**0.5 mol/dm<sup>3</sup>**  
**HCl<sub>(aq)</sub>**

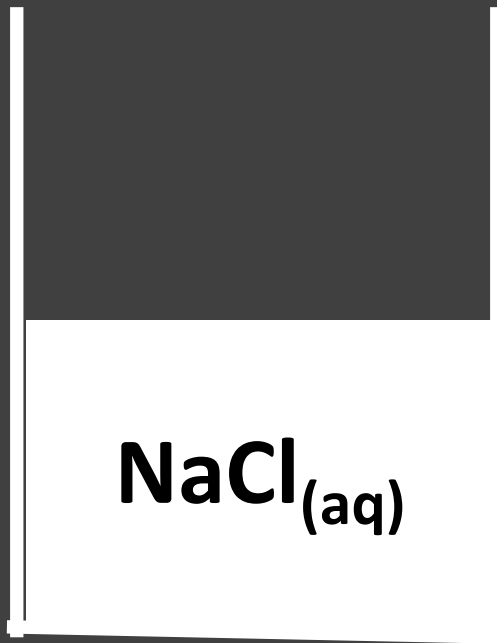


**NaOH<sub>(aq)</sub>**  
**unknown**  
**concentration**

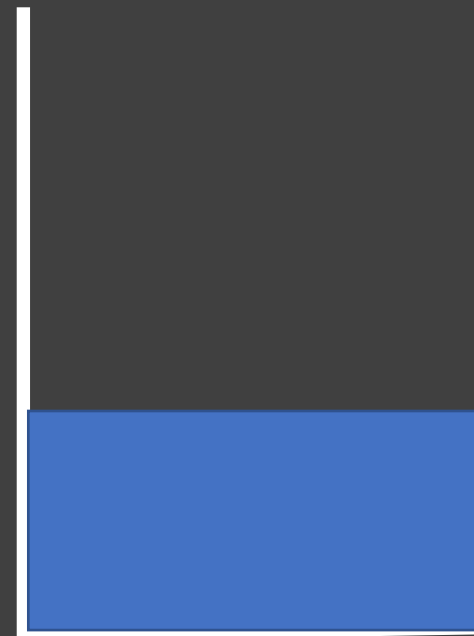




**0.5 mol/dm<sup>3</sup>**  
**HCl<sub>(aq)</sub>**



**NaCl<sub>(aq)</sub>**



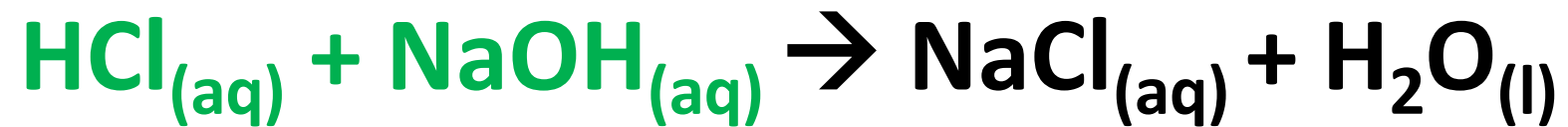
**NaOH<sub>(aq)</sub>**  
**unknown**  
**concentration**



0.020 dm<sup>3</sup> of 0.5  
mol/dm<sup>3</sup> HCl<sub>(aq)</sub>

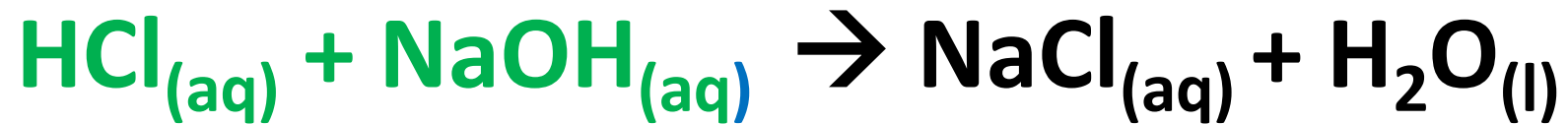
0.025 dm<sup>3</sup> of  
NaOH<sub>(aq)</sub> unknown  
concentration

Moles of HCl = conc x volume = 0.5 x 0.020 = 0.010 moles



0.020 dm<sup>3</sup> of 0.5  
mol/dm<sup>3</sup> HCl<sub>(aq)</sub>

0.025 dm<sup>3</sup> of  
NaOH<sub>(aq)</sub> unknown  
concentration



0.020 dm<sup>3</sup> of 0.5  
mol/dm<sup>3</sup> HCl<sub>(aq)</sub>

0.025 dm<sup>3</sup> of  
NaOH<sub>(aq)</sub> unknown  
concentration

Moles of HCl = conc x volume = 0.5 x 0.020 = 0.010 moles



0.020 dm<sup>3</sup> of 0.5  
mol/dm<sup>3</sup> HCl<sub>(aq)</sub>

0.025 dm<sup>3</sup> of  
NaOH<sub>(aq)</sub> unknown  
concentration

Moles of HCl = conc x volume = 0.5 x 0.020 = 0.010 moles

1HCl : 1NaOH



Moles of NaOH = 0.010 moles





0.020 dm<sup>3</sup> of 0.5  
mol/dm<sup>3</sup> HCl<sub>(aq)</sub>

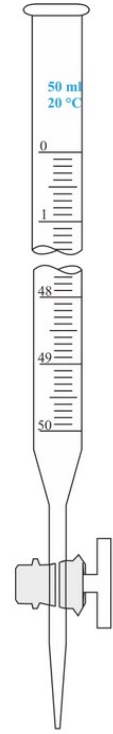
0.025 dm<sup>3</sup> of  
NaOH<sub>(aq)</sub> unknown  
concentration

Moles of HCl = conc x volume = 0.5 x 0.020 = 0.010 moles

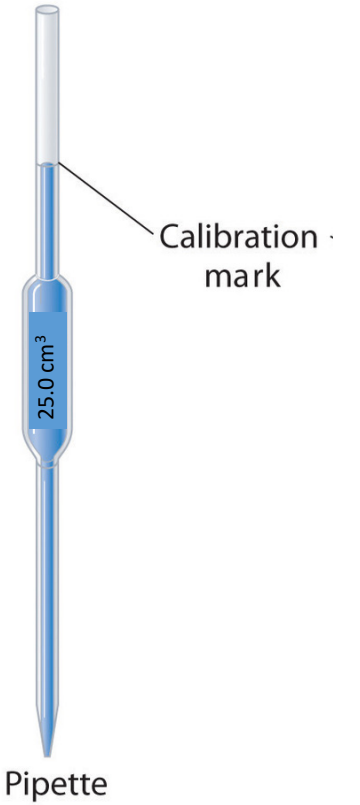
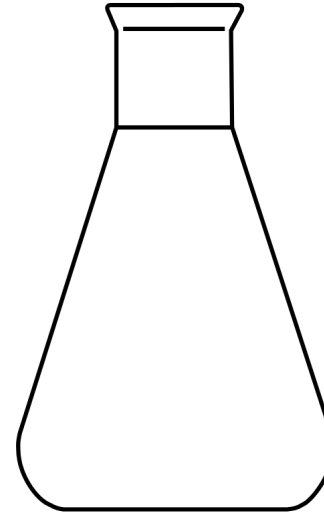
1HCl : 1NaOH

Moles of NaOH = 0.010 moles

Concentration of NaOH =  $\frac{\text{moles}}{\text{Vol}} = \frac{0.010}{0.025} = 0.40 \text{ mol/dm}^3$



burette



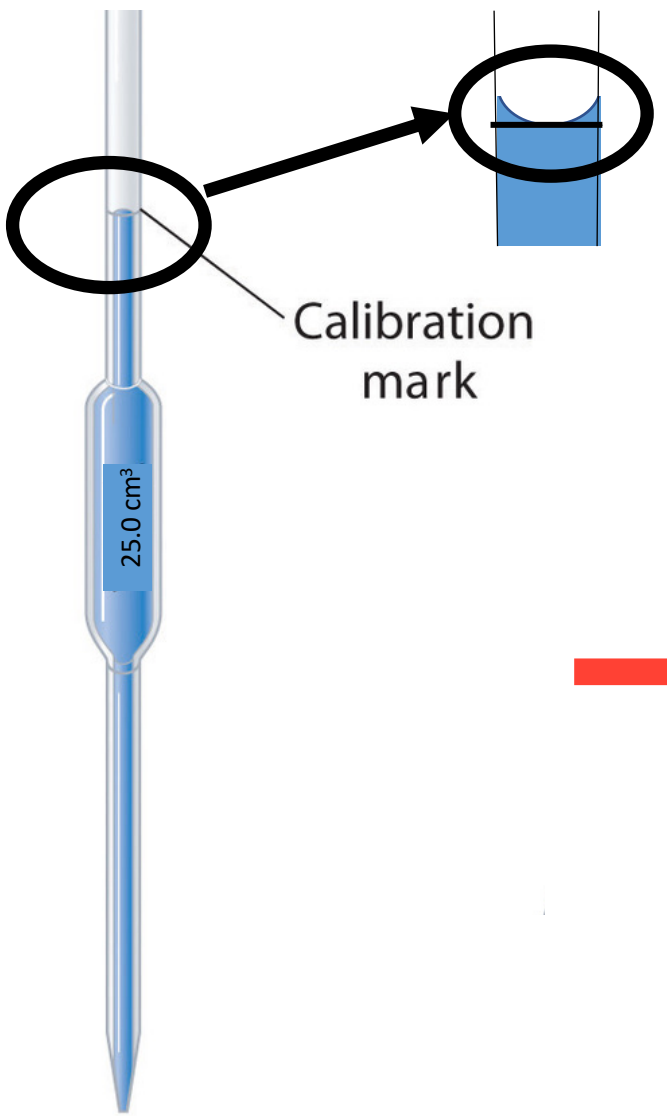
Pipette

# Experimental Procedure

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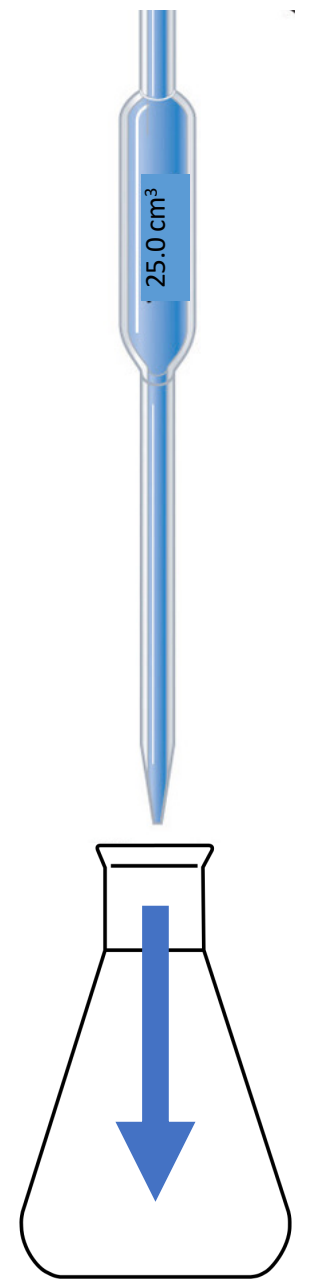
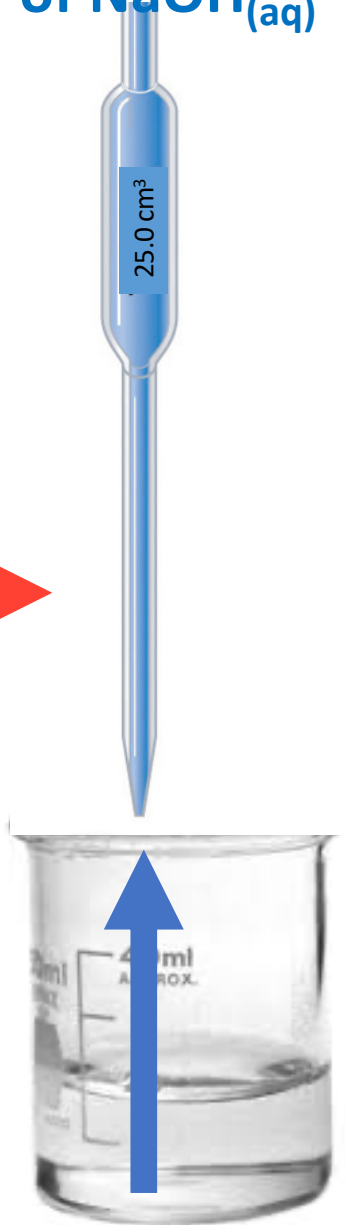
# Pipette

$\text{NaOH}_{(aq)}$

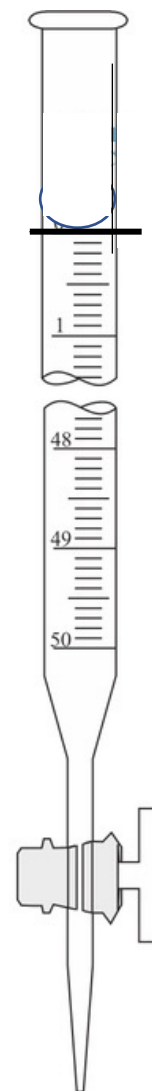
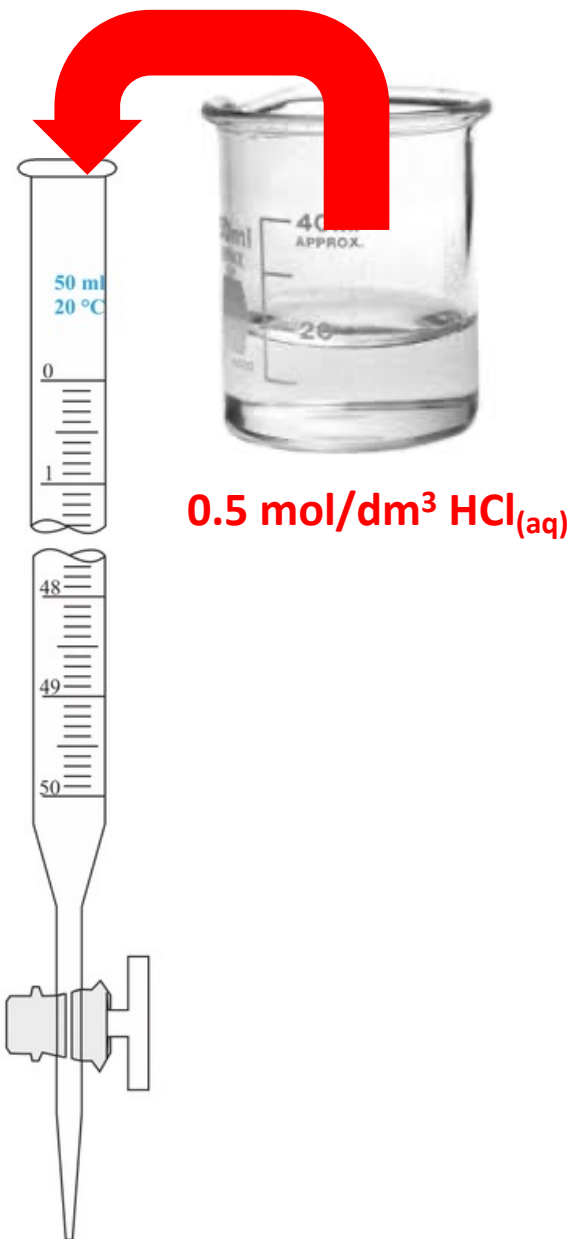


Pipette measures accurately  $25.0 \text{ cm}^3$

Collect  $25.0 \text{ cm}^3$  of  $\text{NaOH}_{(aq)}$



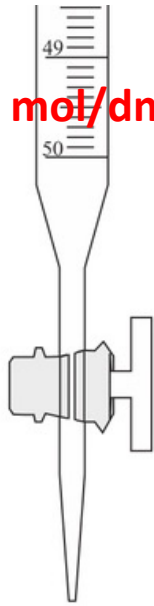
# Burette



Each division is  $0.01 \text{ cm}^3$

The volume can be read to the nearest  $0.05 \text{ cm}^3$

**0.5 mol/dm<sup>3</sup> HCl<sub>(aq)</sub>**



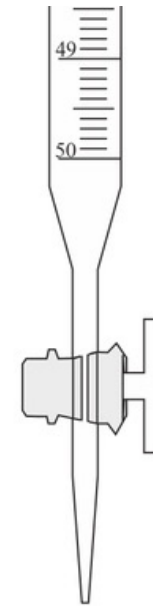
**Tap to let  
out the  
HCl<sub>(aq)</sub>  
slowly**

## Add indicator

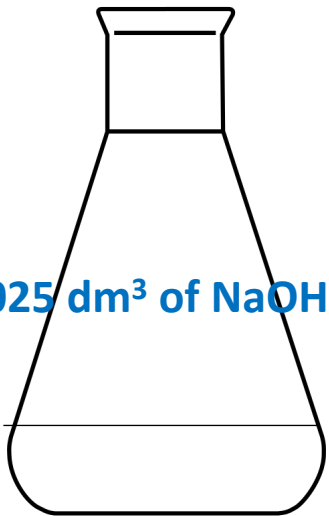


Record initial burette  
reading = 0.00 cm<sup>3</sup>

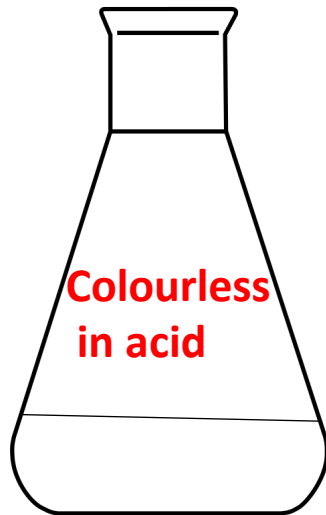
**0.5 mol/dm<sup>3</sup> HCl<sub>(aq)</sub>**



**0.025 dm<sup>3</sup> of NaOH<sub>(aq)</sub>**



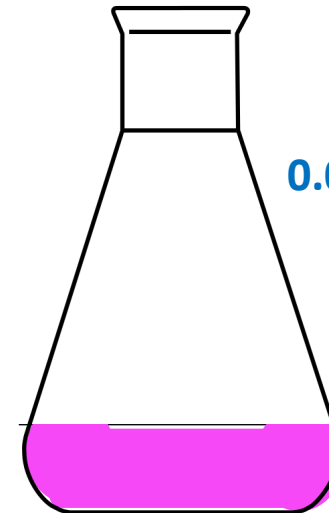
**Colourless  
in acid**

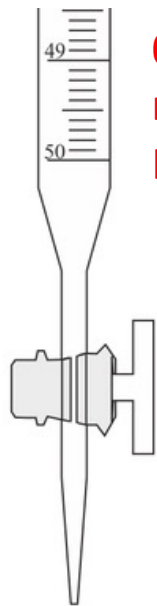


**Pink in  
alkali**



**0.025 dm<sup>3</sup> of NaOH<sub>(aq)</sub>**





**0.5  
mol/dm<sup>3</sup>  
HCl<sub>(aq)</sub>**

Add HCl<sub>(aq)</sub> until you see a very light pink colour – the end point.

Record final burette reading = 20.20 cm<sup>3</sup>

Subtract the initial burette reading from the first = 20.20 – 0.00 = 20.20 cm<sup>3</sup>

This is your first titre reading

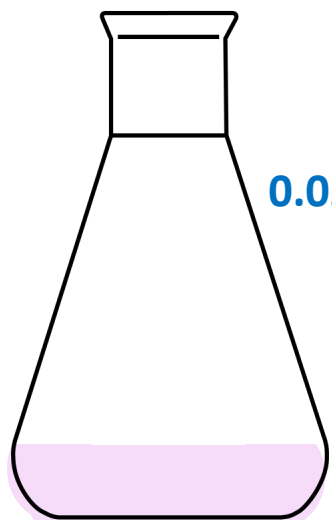
Repeat until you obtain two titre reading within 0.1 cm<sup>3</sup> of each other.

Second titre = 19.95 cm<sup>3</sup>

Third titre = 20.05 cm<sup>3</sup>

Work out the average titre using the two results within 0.1 cm<sup>3</sup>

Average titre =  $\frac{19.95 + 20.05}{2} = 20.00 \text{ cm}^3$  **This is your result.**



**0.025 dm<sup>3</sup> of NaOH<sub>(aq)</sub>**

A ball-and-stick molecular model is shown in the background, rendered in a dark, semi-transparent style. It features a central blue sphere, several black spheres, and several white spheres connected by grey rods. The model is positioned behind the text, which is overlaid on a dark grey background.

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