

Determining the concentration of an aqueous solution of sodium hydroxide,  $\text{NaOH}$ .



Method 1- Titration •For the titration, it is necessary to dilute the Sodium Hydroxide so that it is an easier concentration to titrate. Using a 25cm<sup>3</sup> pipette, washed out with some of the NaOH solution, transfer 25cm<sup>3</sup> of the solution to a 250 cm<sup>3</sup> volumetric flask, and fill to the line with distilled water. The alkali will now have a concentration of 0. 1 mol dm<sup>-3</sup>.

•In the titration, the NaOH will be in the burette, and will be titrated into HCl in a conical flask:  $\text{NaOH (aq) + HCl (aq) \rightarrow NaCl (aq) + H}_2\text{O (l)}$  The reaction is 1: 1 between NaOH and HCl, so a solution of 0. 2 mol dm<sup>-3</sup> should be used.

•Rinse a 25cm<sup>3</sup> pipette out with some of this solution, and then transfer 25cm<sup>3</sup> of it to a clean conical flask. •Add 3 drops of phenolphthalein.

•Wash a burette with some of the diluted alkali and then fill the burette to the top of the graduations. •Titrate the alkali into the acid until the indicator in the flask has turned a pink colour. •Repeat the process until two titres are obtained within 0. 1cm<sup>3</sup> of each other, as well as a rough titre.

e. g. Average titre = 24. 0 cm<sup>3</sup>. Moles of acid used =  $5 \times 10^{-3}$  Acid neutralised by 24. 80 cm<sup>3</sup> NaOH Therefore concentration of NaOH =  $(5 \times 10^{-3} \times 1000) / 24$ .

$8 = 0. 2016129...$  Diluted by factor of 10, so:  $0. 2016129... \times 10 = 2. 01 \text{ mol dm}^{-3}$ . Method 2- ? H of neutralisation •Transfer 25cm<sup>3</sup> of NaOH into a polystyrene cup with a lid, and put the cup into a plastic beaker.

•Take the temperature of the contents of the cup using a thermometer accurate to 0. 1 cm<sup>3</sup>. •Add excess HCl and replace the lid of the cup. •Stir the contents constantly until the maximum temperature has been reached.

Record the temperature change. •Use the formula  $q = - (mc \Delta t)$  to work out the energy change of the quantities used.

- Work out the number of moles that reacted, then find the energy change that would have occurred had 1 mole been used. •This gives  $\Delta H$  of neutralisation. •Use this to work out the concentration of NaOH. Safety
- Wear safety glasses so no concentrated acid or alkali gets in your eyes.

References •Essential A2 Chemistry for OCR- Ted Lister and Janet Renshaw  
•NaOH Hazcard •Chemistry Data Book