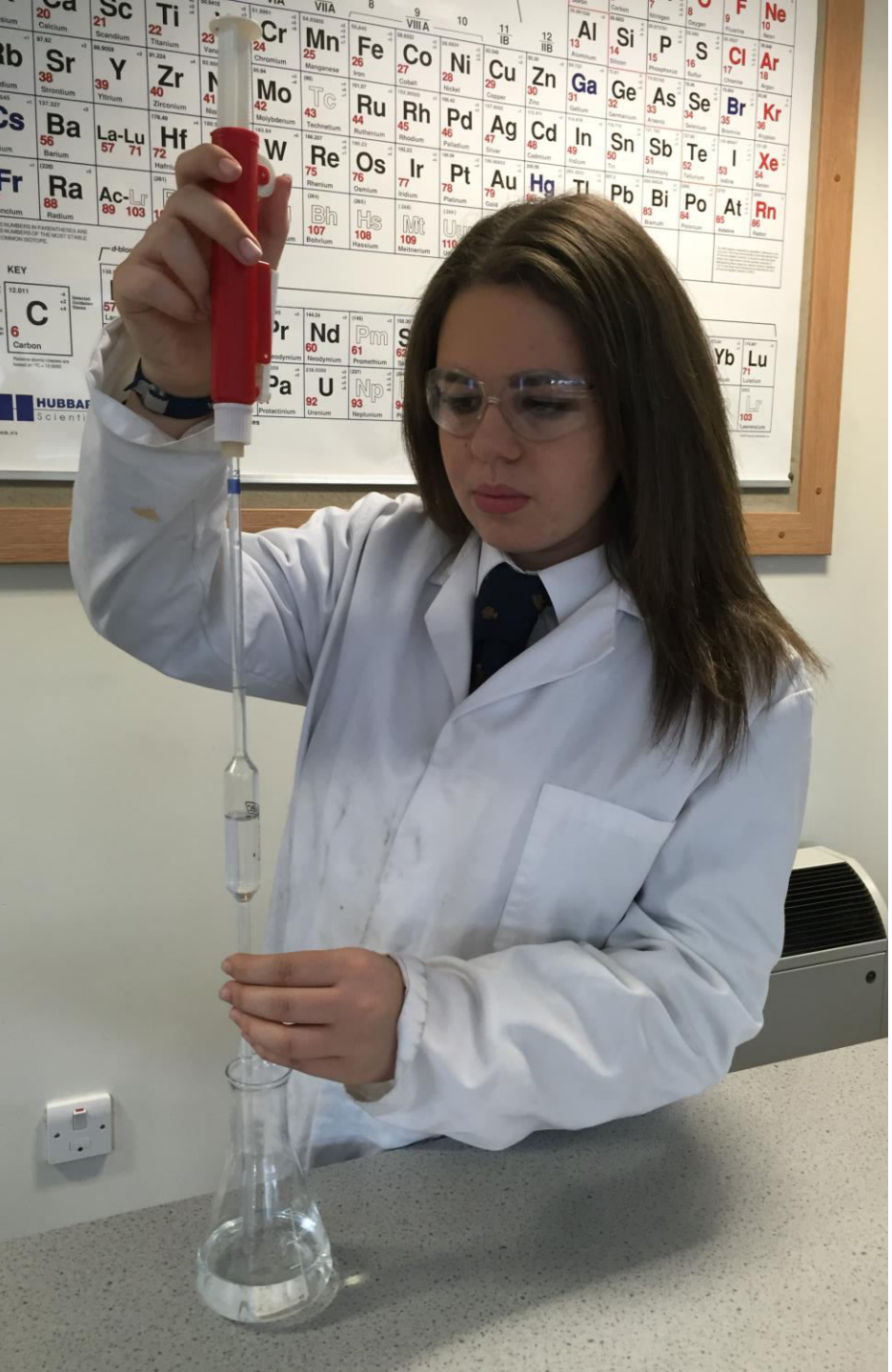
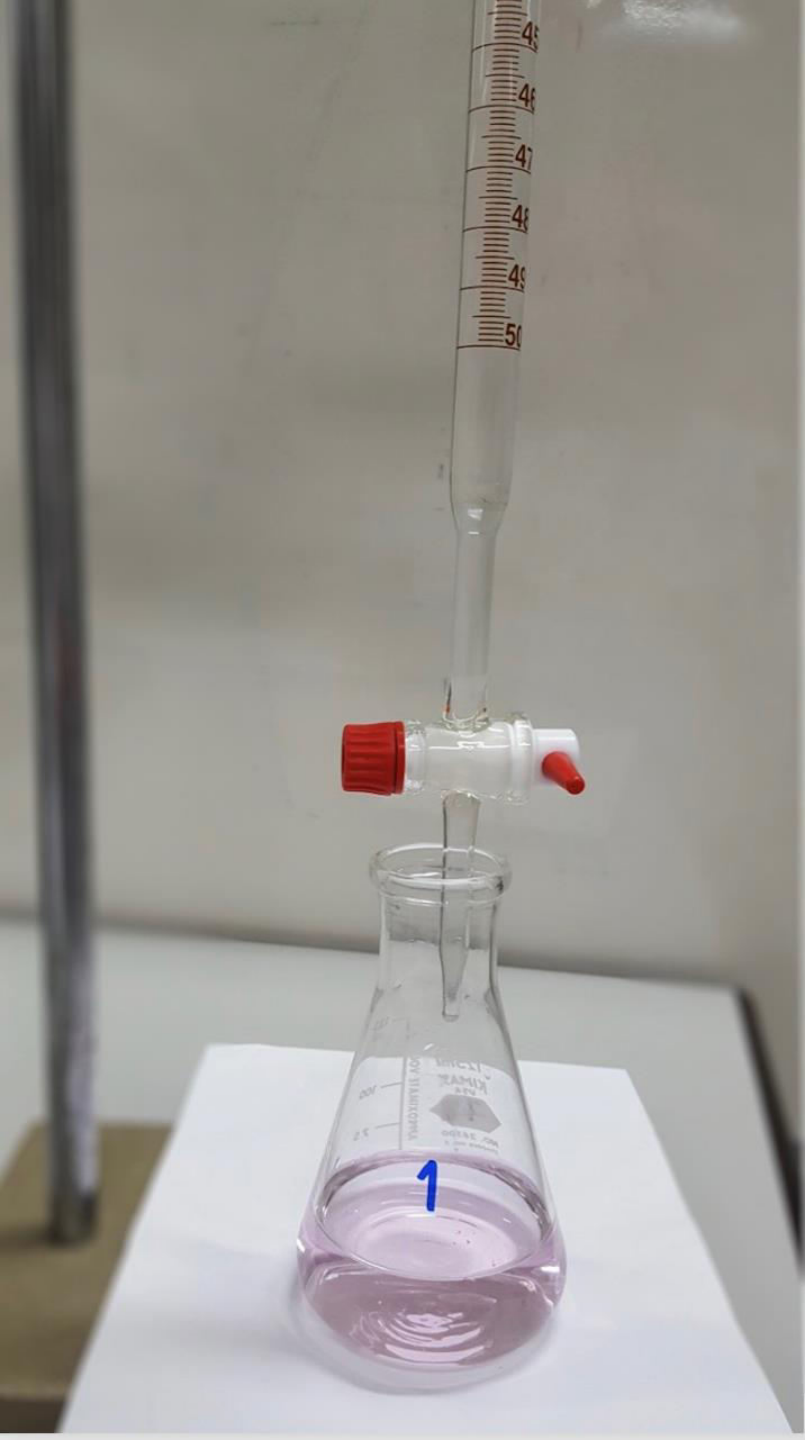
WWW.CHEMSHEETS.CO.UK

TITRATION CALCULATIONS



- Standard solution of acid/alkali prepared in volumetric flask
- 25 cm^3 samples taken out with pipette and put into conical flask



- Indicator + acid/alkali in conical flask
- acid/alkali added from burette until permanent colour change

SIMPLE TITRATION EXAMPLE

Calculate the concentration barium hydroxide solution. 25.00 cm^3 of $Ba(OH)_2$ reacts with 23.38 cm^3 of 0.200 mol dm^{-3} hydrochloric acid.

$$2\,HCl + Ba(OH)_2 \rightarrow \text{.....}$$

moles HCl = $0.200 \times \frac{23.28}{1000} = 0.04656$

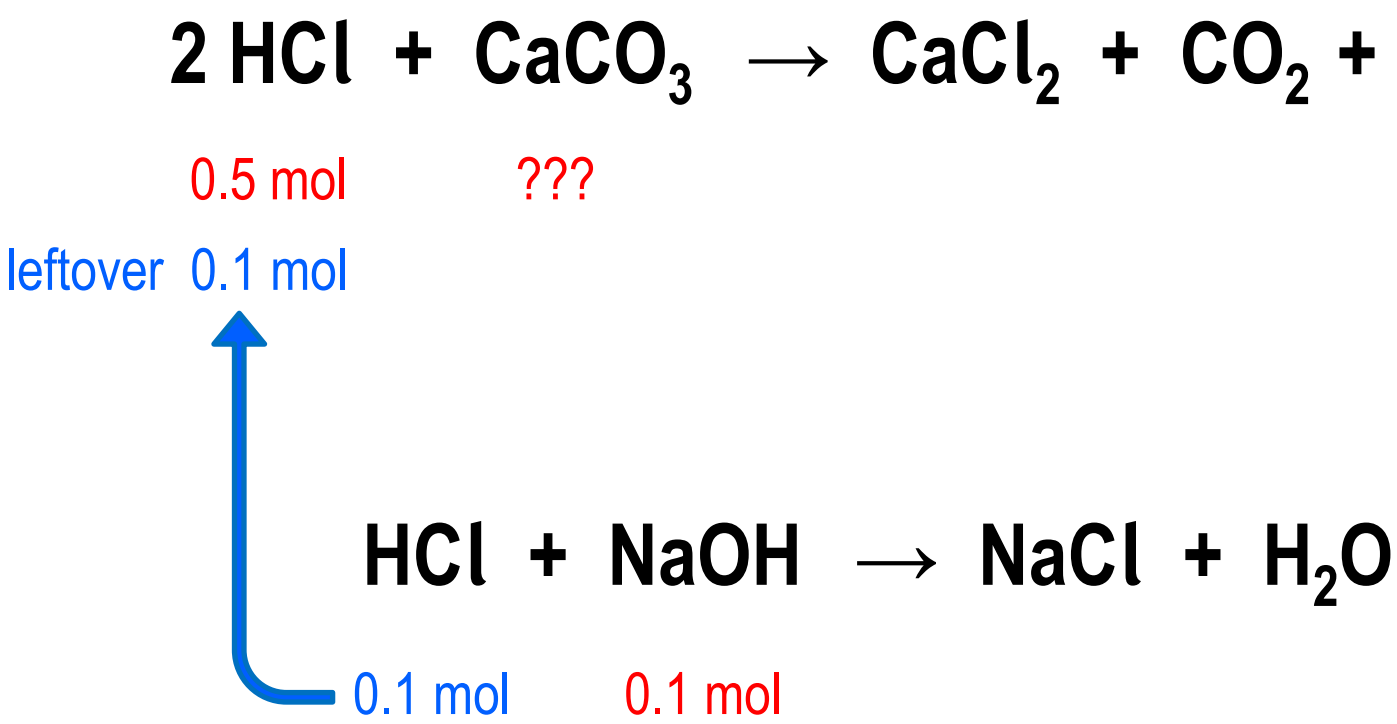
moles $Ba(OH)_2$ = ½ x 0.04656 = 0.02328

$[Ba(OH)_2] = \frac{0.02328}{\frac{25.00}{1000}} = 0.0931$ mol dm^{-3}

BACK TITRATIONS

- Used where reaction between acid and base is slow (e.g. low solubility in water)
- React an excess of an acid/base with the acid/base – some is leftover
- Titrate the leftover acid/base to see how much leftover

BACK TITRATIONS



BACK TITRATIONS

$$2\,HCl + CaCO_3 \rightarrow CaCl_2 + CO_2 + H_2O$$

	$2\,HCl$	$CaCO_3$
	0.5 mol	???
leftover	0.1 mol	
reacted	0.4 mol	0.2 mol

$$HCl + NaOH \rightarrow NaCl + H_2O$$

HCl	$NaOH$
0.1 mol	0.1 mol

BACK TITRATIONS

$$2\,HCl + CaCO_3 \rightarrow CaCl_2 + CO_2 + H_2O$$

0.8 mol ???

leftover 0.3 mol

x 10

leftover HCl made into 250 cm^3 and 25 cm^3 used in each titration

$$HCl + NaOH \rightarrow NaCl + H_2O$$

0.03 mol 0.03 mol

BACK TITRATIONS

$$2\,HCl + CaCO_3 \rightarrow CaCl_2 + CO_2 + H_2O$$

	0.8 mol	???
leftover	0.3 mol	
reacted	0.5 mol	0.25 mol

leftover HCl made into 250 cm^3 and 25 cm^3 used in each titration

$$HCl + NaOH \rightarrow NaCl + H_2O$$

0.03 mol	0.03 mol

BACK TITRATIONS

Calculate mass of aspirin in one tablet. Aspirin is a monoprotic acid with M_r 180.0. One tablet was crushed and 25.0 cm^3 of 0.100 mol dm^{-3} NaOH. The mixture was made up to 250 cm^3 volumetric solution. 25.0 cm^3 of this solution required 27.38 cm^3 of 0.00300 mol dm^{-3} HCl in titration.

$$HCl + NaOH \rightarrow NaCl + H_2O$$

moles HCl = $0.00300 \times \frac{27.38}{1000} = 8.214 \times 10^{-5}$

moles NaOH = 8.214×10^{-5}

moles NaOH leftover from aspirin reaction = $10 \times 8.214 \times 10^{-5} = 8.214 \times 10^{-4}$

BACK TITRATIONS

Calculate mass of aspirin in one tablet. Aspirin is a monoprotic acid with M_r 180.0. One tablet was crushed and 25.0 cm^3 of 0.100 mol dm^{-3} NaOH. The mixture was made up to 250 cm^3 volumetric solution. 25.0 cm^3 of this solution required 27.38 cm^3 of 0.00300 mol dm^{-3} HCl in titration.

$$HA + NaOH \rightarrow NaA + H_2O$$

moles NaOH leftover from aspirin reaction = 10 x 8.214 x 10^{-5} = 8.214 x 10^{-4}

moles NaOH added to aspirin = 0.100 x $\frac{25.0}{1000}$ = 0.00250

moles NaOH reacting with aspirin = 0.00250 – 8.214 x 10^{-4} = 0.00168

moles aspirin = 0.00168

mass aspirin = 0.00168 x 180.0 = 0.302 g