

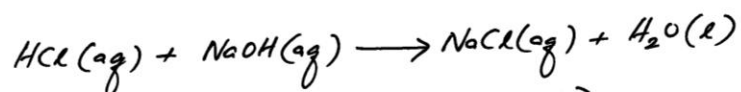
Back Titration

To determine the amount of insoluble salt:

Example 2

1.425g sample of chalk was placed in a 250 mL conical flask and 125.00 mL 0.2150 M HCl (aq) was added. The excess HCl was then titrated with 0.2140 M NaOH. 32.50 mL NaOH (aq) was required. Calculate the mass of CaCO_3 , in grams, present in the chalk sample.

Solution:

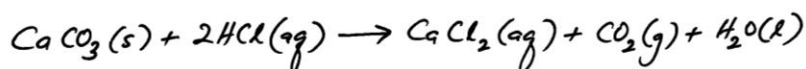


$$n_{\text{NaOH}} = \frac{MV}{1000} = \frac{(0.2140\text{M})(32.50\text{mL})}{1000} \\ = 6.96 \times 10^{-3} \text{ mol}$$

$$n_{\text{HCl (titrated)}} = n_{\text{NaOH}} \\ = 6.96 \times 10^{-3} \text{ mol}$$

$$n_{\text{HCl total}} = \frac{(0.2150\text{M})(125.00\text{mL})}{1000} \\ = 0.0269 \text{ mol} = 2.69 \times 10^{-2} \text{ mol}$$

$$\therefore n_{\text{HCl reacted with calcium carbonate}} = (2.69 \times 10^{-2}) - (6.96 \times 10^{-3}) \\ = 1.99 \times 10^{-2}$$



$$\frac{n_{\text{CaCO}_3}}{n_{\text{HCl}}} = \frac{1}{2} \Rightarrow n_{\text{CaCO}_3} = \frac{1}{2} \times n_{\text{HCl}}$$

$$\frac{m_{\text{CaCO}_3}}{100.09 \text{ g mol}^{-1}} = \frac{1}{2} \times 1.99 \times 10^{-2} \\ \therefore m_{\text{CaCO}_3} = \frac{(1.99 \times 10^{-2})(100.09)}{2} \\ = 0.9959 \text{ g (Ans)}$$

$$M_r (\text{CaCO}_3) \\ = 100.09 \text{ g mol}^{-1}$$