Year 12 Chemistry

Quick Quiz: Titration Question

Some drugs taken in solid tablet form contain sodium carbonate to assist the drug delivery to the body's blood stream. The following procedure was used to determine the percentage, by mass, of sodium carbonate contained on average in each tablet.

Step 1 Three tablets, of total mass 3.02 g, were crushed and added to 250.0 mL of 0.0100 mol L^{-1} H_2SO_4. Excess H_2SO_4 remained after the reaction was complete.

$$Na_2CO_3 + H_2SO_4 \rightarrow Na_2SO_4 + H_2O + CO_2$$

Step 2 25.0 mL samples of the excess H_2SO_4 were titrated with 0.0200 mol L^{-1} KOH solution.

(a) Calculate the initial number of moles of H_2SO_4 present before the reaction in Step 1.

(b) The equation for the titration reaction in Step 2 is shown below:

$$H_2SO_4 + 2KOH \rightarrow 2H_2O + K_2SO_4$$

The average titre value for this titration was 10.85 mL.

(i) Calculate the number of moles of KOH needed to neutralise the H_2SO_4 in Step 2.

(ii) Hence state the number of moles of H_2SO_4 in each 25.0 mL sample.

(iii) Hence calculate the total number of moles of excess H_2SO_4 that remained after the reaction with the tablets in Step 1.

(c) Calculate the number of moles of H_2SO_4 that reacted with the tablets in Step 1.

(d) Hence state the number of moles of Na_2CO_3 in the three tablets.

(e) Calculate the total mass of Na_2CO_3 in the three tablets.

(f) Calculate the percentage mass of Na_2CO_3 contained on average in each tablet.