

Quiz (Acid-Alkali Titration)

Important Remark:

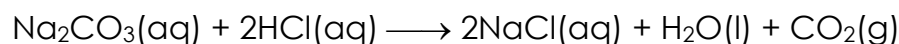
- The end point is the stage at which the indicator changes colour sharply.
- The equivalence point is the stage at which the acid and the alkali have just reacted completely during titration.

1. 2.65 g of sodium carbonate were dissolved in water and made up to a 250.0 cm³ solution. 25.0 cm³ of the solution required 20.00 cm³ of a hydrochloric acid for complete reaction. Find the molarity of the hydrochloric acid.
(Relative atomic masses: C = 12.0, O = 16.0, Na = 23.0)
2. What is the volume of 0.050 M sulphuric acid required for complete reaction with each of the following solutions?
 - (a) 25.0 cm³ of 0.100 M NaOH(aq)
 - (b) 100.0 cm³ of 0.100 M Na₂CO₃(aq)

Suggested Answer

1. Number of moles of Na_2CO_3 used
= mass of Na_2CO_3 / molar mass of Na_2CO_3
= $2.65 / (23.0 \times 2 + 12.0 + 16.0 \times 3)$
= 0.025

Molarity of the 250.0 cm^3 Na_2CO_3 solution
= $0.025 / 0.25$
= 0.1 M



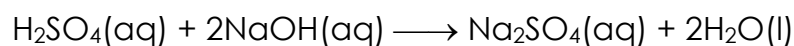
Number of moles of Na_2CO_3 in 25.0 cm^3 of solution
= 0.1×0.025
= 2.5×10^{-3}

From the equation, mole ratio of Na_2CO_3 : HCl = 1 : 2.

Number of moles of HCl in 20.00 cm^3 of solution
= $2.5 \times 10^{-3} \times 2$
= 5×10^{-3}

Molarity of $\text{HCl}(\text{aq})$
= $5 \times 10^{-3} / 0.02$
= 0.25 M

2. (a) Number of moles of NaOH used
= 0.100×0.025
= 2.5×10^{-3}

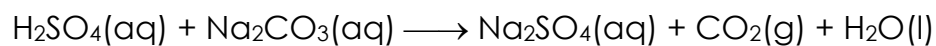


From the equation, mole ratio of NaOH to H_2SO_4 = 2 : 1.

Number of moles of 0.050 M H_2SO_4 required
= $2.5 \times 10^{-3} / 2$
= 1.25×10^{-3}

Volume of 0.050 M H_2SO_4 required
= $1.25 \times 10^{-3} / 0.050$
= 0.025 dm^3 (25.0 cm^3)

(b) Number of moles of Na_2CO_3 used
= 0.100×0.1
= 0.01



From the equation, mole ratio of Na_2CO_3 to $\text{H}_2\text{SO}_4 = 1 : 1$.

Number of moles of 0.050 M H_2SO_4 required
= 0.01

Volume of 0.050 M H_2SO_4 required
= $0.01 / 0.050$
= 0.20 dm^3 (200.0 cm^3)