

Question #60326, Chemistry, General Chemistry

TITRATION LAB:

Q: what is the concentration of acid in aspirin?

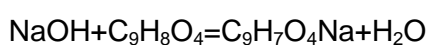
Here is the data table:

	Trial 1	Trial 2	Trial 3	Trial 4
Mass of Aspirin (g)	0.6 g	0.59 g	0.6 g	0.57 g
Initial volume of NaOH (ml)	0.5 ml	14 ml	27.7 ml	8.7 ml
Final volume of NaOH (ml)	14 ml	27.7 ml	40.9 ml	18.7 ml

Show me the calculations for all four trials step by step.

Answer:

The reaction during titration goes according to equation:



	Trial 1	Trial 2	Trial 3	Trial 4
Mass of Aspirin (g)	0.6 g	0.59 g	0.6 g	0.57 g
Initial volume of NaOH (ml)	0.5 ml	14 ml	27.7 ml	8.7 ml
Final volume of NaOH (ml)	14 ml	27.7 ml	40.9 ml	18.7 ml
Used volume of NaOH (ml)	13.5 ml	13.7 ml	13.2 ml	10.0 ml

$$C_M = n/V \quad n = m/M$$

$$M(\text{C}_9\text{H}_8\text{O}_4) = 180 \text{ g/mol}$$

$$m(\text{C}_9\text{H}_8\text{O}_4) = C_M VM$$

If the concentration of NaOH is 0.1 M, than:

$$\begin{aligned} m_1(\text{C}_9\text{H}_8\text{O}_4) &= 0.1 \cdot (13.5/1000) \cdot 180 = 0.243 \text{ g} & \%(\text{C}_9\text{H}_8\text{O}_4)_1 &= 0.243/0.6 \cdot 100\% = 40.5\% \\ m_2(\text{C}_9\text{H}_8\text{O}_4) &= 0.1 \cdot (13.7/1000) \cdot 180 = 0.247 \text{ g} & \%(\text{C}_9\text{H}_8\text{O}_4)_2 &= 0.247/0.59 \cdot 100\% = 41.8\% \\ m_3(\text{C}_9\text{H}_8\text{O}_4) &= 0.1 \cdot (13.2/1000) \cdot 180 = 0.248 \text{ g} & \%(\text{C}_9\text{H}_8\text{O}_4)_3 &= 0.248/0.6 \cdot 100\% = 39.6\% \\ m_4(\text{C}_9\text{H}_8\text{O}_4) &= 0.1 \cdot (10.0/1000) \cdot 180 = 0.18 \text{ g} & \%(\text{C}_9\text{H}_8\text{O}_4)_4 &= 0.18/0.57 \cdot 100\% = 31.6\% \\ \%(\text{C}_9\text{H}_8\text{O}_4)_{\text{average}} & & &= (40.5 + 41.8 + 39.6 + 31.6)/4 = 38.4\% \end{aligned}$$