

Titration calculations

1. 25 cm³ of a solution of 0.1 moldm⁻³ NaOH reacts with 50 cm³ of a solution of hydrochloric acid. What is the molarity of the acid?
2. 25.0 cm³ of a 0.10 moldm⁻³ solution of sodium hydroxide was titrated against a solution of hydrochloric acid of unknown concentration. 27.3 cm³ of the acid was required. What was the concentration of the acid?
3. 25 cm³ of a solution of sodium hydroxide reacts with 15 cm³ of 0.1 mol/dm³ HCl. What is the molar concentration of the sodium hydroxide solution?
4. Succinic acid has the formula (CH₂)_n(COOH)₂ and reacts with dilute sodium hydroxide as follows: $(\text{CH}_2)_n(\text{COOH})_2 + 2\text{NaOH} \rightarrow (\text{CH}_2)_n(\text{COONa})_2 + 2\text{H}_2\text{O}$
2.0 g of succinic acid were dissolved in water and the solution made up to 250 cm³. This solution was placed in a burette and 18.4 cm³ was required to neutralise 25 cm³ of 0.1 moldm⁻³ NaOH. Deduce the molecular formula of the acid and hence the value of n.
5. Sodium carbonate exists in hydrated form, Na₂CO₃·xH₂O, in the solid state. 3.5 g of a sodium carbonate sample was dissolved in water and the volume made up to 250 cm³. 25.0 cm³ of this solution was titrated against 0.1 moldm⁻³ HCl and 24.5 cm³ of the acid were required. Calculate the value of x given the equation:
$$\text{Na}_2\text{CO}_3 + 2\text{HCl} \rightarrow 2\text{NaCl} + \text{CO}_2 + \text{H}_2\text{O}$$
6. 25 cm³ of a sample of vinegar (CH₃COOH) was pipetted into a volumetric flask and the volume was made up to 250 cm³. This solution was placed in a burette and 13.9 cm³ were required to neutralise 25 cm³ of 0.1 moldm⁻³ NaOH. Calculate the molarity of the original vinegar solution and its concentration in gdm⁻³, given that it reacts with NaOH in a 1:1 ratio.
7. 2.5 g of a sample of ethanedioic acid, H₂C₂O₄·nH₂O, was dissolved in water and the solution made up to 250 cm³. This solution was placed in a burette and 15.8 cm³ were required to neutralise 25 cm³ of 0.1 moldm⁻³ NaOH. Given that ethanedioic acid reacts with NaOH in a 1:2 ratio, calculate the value of n.

Answers

1. 0.05 mol dm^{-3}
2. $0.092 \text{ mol dm}^{-3}$
3. 0.06 mol dm^{-3}
4. $n = 2$
5. $x = 10$
6. 1.80 mol dm^{-3} , 108 g dm^{-3}
7. $n = 2$