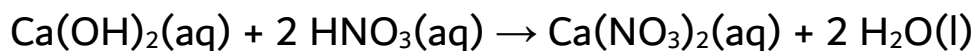


MARK SCHEME

GCSE CHEMISTRY

Titration - 2

1. What volume of 0.0400 mol/dm³ calcium hydroxide just neutralises 25.0 cm³ of 0.100 mol/dm³ nitric acid? Give your answer to 3 significant figures



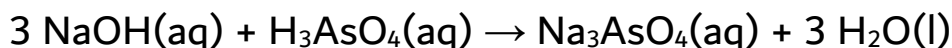
$$\text{moles HNO}_3 = \text{conc} \times \text{vol (dm}^3) = 0.100 \times 25.0/1000 = 0.00250 \text{ mol}$$

$$\text{moles Ca(OH)}_2 = 1/2 \times \text{moles of HNO}_3 = 1/2 \times 0.00250 = 0.00125 \text{ mol}$$

$$\text{volume Ca(OH)}_2 = \text{moles/conc} = 0.00125/0.0400 = 0.0313 \text{ dm}^3$$

Answer: 0.0313 dm³

2. 25.0 cm³ of arsenic acid, H₃AsO₄, required 37.5 cm³ of 0.100 mol/dm³ sodium hydroxide for neutralization.



- a) Find the concentration of the arsenic acid in mol/dm³. Give your answer to 3 significant figures.

$$\text{moles NaOH} = \text{conc} \times \text{vol (dm}^3) = 0.100 \times 37.5/1000 = 0.00375 \text{ mol}$$

$$\text{moles H}_3\text{AsO}_4 = 1/3 \times \text{moles of NaOH} = 1/3 \times 0.00375 = 0.00125 \text{ mol}$$

$$\text{conc H}_3\text{AsO}_4 = \text{moles/volume(dm}^3) = 0.00125/25.0/1000$$

$$= 0.0500 \text{ mol/dm}^3$$

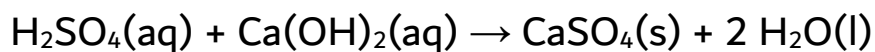
Answer: 0.0500 mol/dm³

b) Find the concentration of the arsenic acid in g/dm³. Give your answer to 3 significant figures.

$$\text{conc H}_3\text{AsO}_4 = 142 \times 0.0500 = 7.10 \text{ g/dm}^3$$

Answer: 7.10 g/dm³

3. What volume of 0.0100 mol/dm³ calcium hydroxide neutralises 25.0 cm³ of 0.140 mol/dm³ sulfuric acid? Give your answer to 3 significant figures



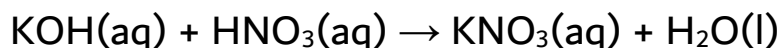
$$\text{moles H}_2\text{SO}_4 = \text{conc} \times \text{vol (dm}^3) = 0.140 \times 25.0/1000 = 0.00350 \text{ mol}$$

$$\text{moles Ca}(\text{OH})_2 = \text{moles H}_2\text{SO}_4 = 0.00350 \text{ mol}$$

$$\text{volume Ca}(\text{OH})_2 = \text{moles}/\text{conc} = 0.00350/0.0100 = 0.350 \text{ dm}^3$$

Answer: 0.350 dm³

4. What volume of 1.50 mol/dm³ potassium hydroxide reacts with 25.0 cm³ of 1.10 mol/dm³ nitric acid? Give your answer to 3 significant figures



$$\text{moles HNO}_3 = \text{conc} \times \text{vol (dm}^3) = 1.10 \times 25.0/1000 = 0.0275 \text{ mol}$$

$$\text{moles KOH} = \text{moles HNO}_3 = 0.0275 \text{ mol}$$

$$\text{volume KOH} = \text{moles}/\text{conc} = 0.0275/1.50 = 0.0183 \text{ dm}^3$$

Answer: 0.0183 dm³

5. 25.0 cm³ of sodium carbonate solution neutralises 27.9 cm³ of 0.500 mol/dm³ nitric acid solution.



- a) Find the concentration of sodium carbonate solution in mol/dm³. Give your answer to 3 significant figures

$$\text{moles HNO}_3 = \text{conc} \times \text{vol (dm}^3) = 0.500 \times 27.9/1000 = 0.01395 \text{ mol}$$

$$\text{moles Na}_2\text{CO}_3 = 1/2 \times \text{moles of HNO}_3 = 1/2 \times 0.01395 = 0.006975 \text{ mol}$$

$$\begin{aligned} \text{conc Na}_2\text{CO}_3 &= \text{moles}/\text{volume(dm}^3) = 0.006975/25.0/1000 \\ &= 0.279 \text{ mol/dm}^3 \end{aligned}$$

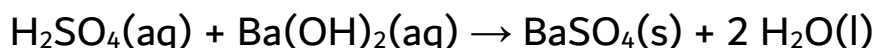
Answer: 0.279 mol/dm³

b) Find the concentration of the sodium carbonate solution in g/dm³. Give your answer to 3 significant figures

$$\text{conc Na}_2\text{CO}_3 = 106 \times 0.279 = 29.6 \text{ g/dm}^3$$

Answer: 7.43 g/dm³

6. 25.0 cm³ of 0.200 mol/dm³ sulfuric acid neutralises 18.6 cm³ of barium hydroxide solution.



a) Find the concentration of the barium hydroxide solution in mol/dm³. Give your answer to 3 significant figures.

$$\text{moles H}_2\text{SO}_4 = \text{conc} \times \text{vol (dm}^3) = 0.200 \times 25.0/1000 = 0.00500 \text{ mol}$$

$$\text{moles Ba}(\text{OH})_2 = \text{moles of H}_2\text{SO}_4 = 0.00500 \text{ mol}$$

$$\begin{aligned} \text{conc Ba}(\text{OH})_2 &= \text{moles/volume(dm}^3) = 0.00500/18.6/1000 \\ &= 0.269 \text{ mol/dm}^3 \end{aligned}$$

Answer: 0.269 mol/dm³

b) Find the concentration of the barium hydroxide solution in g/dm³. Give your answer to 3 significant figures.

$$\text{conc Ba(OH)}_2 = 171 \times 0.269 = 46.0 \text{ g/dm}^3$$

Answer: 46.0 g/dm³