

Maths skills

1 Core mathematics

Practice questions

- 1 a 1.413×10^3 °C b 1.0×10^{-7} m
c 1.806×10^{21} atoms
- 2 a 0.000 0055 b 290
c 11150 d 0.001 412
e 72
- 3 a 36.9 b 260
c 0.043 d 8 000 000
- 4 Number of molecules = $0.5 \text{ moles} \times 6.022 \times 10^{23} = 3.011 \times 10^{23} = 3.01 \times 10^{23}$
- 5 a 4.8 b 0.54
c 1.01 d 2.000
- 6 a 0.0003 m b 5×10^9 mJ
c 1×10^7 kW

2 Balancing chemical equations

Practice questions

- 1 a $2\text{C} + \text{O}_2 \rightarrow 2\text{CO}$ b $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$
c $\text{C}_2\text{H}_4 + 3\text{O}_2 \rightarrow 2\text{H}_2\text{O} + 2\text{CO}_2$
- 2 a $\text{C}_6\text{H}_{14} + 9\frac{1}{2}\text{O}_2 \rightarrow 6\text{CO}_2 + 7\text{H}_2\text{O}$ or $2\text{C}_6\text{H}_{14} + 19\text{O}_2 \rightarrow 12\text{CO}_2 + 14\text{H}_2\text{O}$
b $2\text{NH}_2\text{CH}_2\text{COOH} + 4\frac{1}{2}\text{O}_2 \rightarrow 4\text{CO}_2 + 5\text{H}_2\text{O} + \text{N}_2$
or $4\text{NH}_2\text{CH}_2\text{COOH} + 9\text{O}_2 \rightarrow 8\text{CO}_2 + 10\text{H}_2\text{O} + 2\text{N}_2$
- 3 a $\text{Mg}(\text{OH})_2 + 2\text{HNO}_3 \rightarrow \text{Mg}(\text{NO}_3)_2 + 2\text{H}_2\text{O}$
b $3\text{Fe}(\text{NO}_3)_2 + 2\text{Na}_3\text{PO}_4 \rightarrow \text{Fe}_3(\text{PO}_4)_2 + 6\text{NaNO}_3$

3 Rearranging equations and calculating concentrations

Practice questions

- 1 a $n = cv$ b $v = \frac{n}{c}$
- 2 a $n = \frac{PV}{RT}$ b $T = \frac{PV}{nR}$
- 3 $\frac{0.2}{0.050} = 4.0 \text{ mol dm}^{-3}$
- 4 $\frac{0.05}{2} = 0.025 \text{ mol dm}^{-3}$
- 5 $\frac{36}{1000} \times 0.1 = 3.6 \times 10^{-3} \text{ mol}$

4 Molar calculations

Practice questions

- 1 a $\frac{0.486}{24.3} = 0.02 \text{ mol}$ b 0.02 mol
c $0.02 \times 40.3 = 0.806 \text{ g}$
- 2 a $\frac{4.25}{85} = 0.05 \text{ mol}$ b $\frac{0.05}{2} = 0.025 \text{ mol}$
- 3 a $\frac{500}{84.3} = 5.93 \text{ mol}$ b 5.93 mol

5 Percentage yields and percentage errors

Practice questions

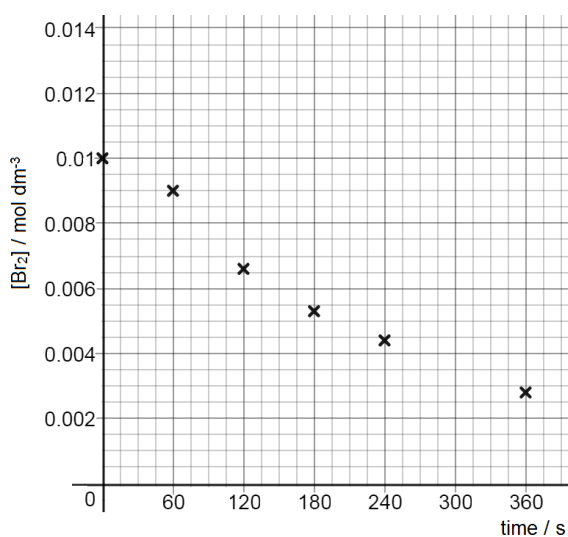
- 1 $3.19/4.75 \times 100 = 67.2\%$
- 2 $6.25/12.00 \times 100 = 52.1\%$
- 3 a $0.5/21 \times 100 = 2.38\%$ b $0.5/43 \times 100 = 1.16\%$
- 4 a $0.5 \times (2/12) \times 100 = 8.33\%$ b $0.5 \times (2/37.6) \times 100 = 2.66\%$

6 Graphs and tangents

Practice questions

1 $\frac{-1.25}{65} = -0.0192$

2 a



- b Half-life is approximately 180 seconds c The reaction is first order