Answers to maths skills practice questions

1 Core mathematics

1 **a** $1.413 \times 10^3\,°C$ **b** $1.0 \times 10^{-7}\,m$

 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 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** $5 \times 10^9\,mJ$

 c $1 \times 10^7\,kW$

2 Balancing chemical equations

1 **a** $2C + O_2 \rightarrow 2CO$ **b** $N_2 + 3H_2 \rightarrow 2NH_3$

 c $C_2H_4 + 3O_2 \rightarrow 2H_2O + 2CO_2$

2 **a** $C_6H_{14} + 9\frac{1}{2}O_2 \rightarrow 6CO_2 + 7H_2O$ **or** $2C_6H_{14} + 19O_2 \rightarrow 12CO_2 + 14H_2O$

 b $2NH_2CH_2COOH + 4\frac{1}{2}O_2 \rightarrow 4CO_2 + 5H_2O + N_2$

 or $4NH_2CH_2COOH + 9O_2 \rightarrow 8CO_2 + 10H_2O + 2N_2$

3 **a** $Mg(OH)_2 + 2HNO_3 \rightarrow Mg(NO_3)_2 + 2H_2O$

 b $3Fe(NO_3)_2 + 2Na_3PO_4 \rightarrow Fe_3(PO_4)_2 + 6NaNO_3$

3 Rearranging equations and calculating concentrations

1 **a** $n = cv$ **b** $v = \dfrac{n}{c}$

2 **a** $n = \dfrac{PV}{RT}$ **b** $T = \dfrac{PV}{nR}$

3 $\dfrac{0.2}{0.050} = 4.0\,mol\,dm^{-3}$

4 $\dfrac{0.05}{2} = 0.025\,mol\,dm^{-3}$

5 $\dfrac{36}{1000} \times 0.1 = 3.6 \times 10^{-3}\,mol$

4 Molar calculations

1 **a** $\dfrac{0.486}{24.3} = 0.02\,mol$ **b** $0.02\,mol$

 c $0.02 \times 40.3 = 0.806\,g$

2   **a** $\dfrac{4.25}{85} = 0.05 \, \text{mol}$ **b** $\dfrac{0.05}{2} = 0.025 \, \text{mol}$

3   **a** $\dfrac{500}{84.3} = 5.93 \, \text{mol}$ **b** 5.93 mol

5 Percentage yields and percentage errors

1   3.19/4.75 × 100 = 67.2%

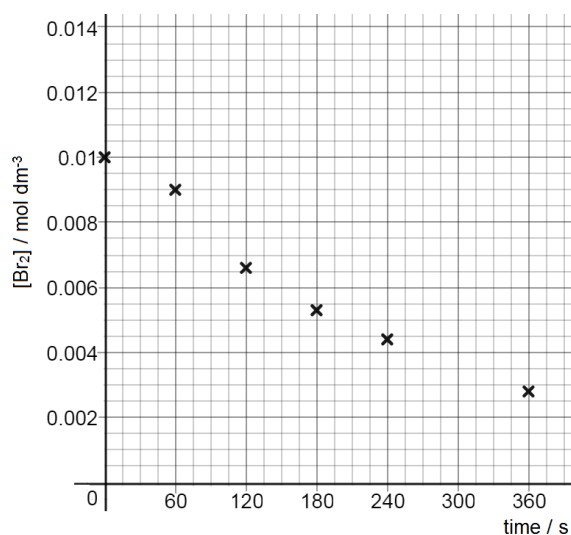**2**   6.25/12.00 × 100 = 52.1%

3   **a** 0.5/21 × 100 = 2.38%   **b** 0.5/43 × 100 = 1.16%

4   **a** 0.5 × (2/12) × 100 = 8.33%   **b** 0.5 × (2/37.6) × 100 = 2.66%

6 Graphs and tangents

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

2   **a**

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