

## Maths skills

### 1 Core mathematics

#### Practice questions

- 1 a  $1.413 \times 10^3$  °C    b  $1.0 \times 10^{-7}$  m  
c  $1.806 \times 10^{21}$  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  $5 \times 10^9$  mJ  
c  $1 \times 10^7$  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  $0.02 \text{ mol}$   
 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  $5.93 \text{ mol}$

## 5 Percentage yields and percentage errors

### Practice questions

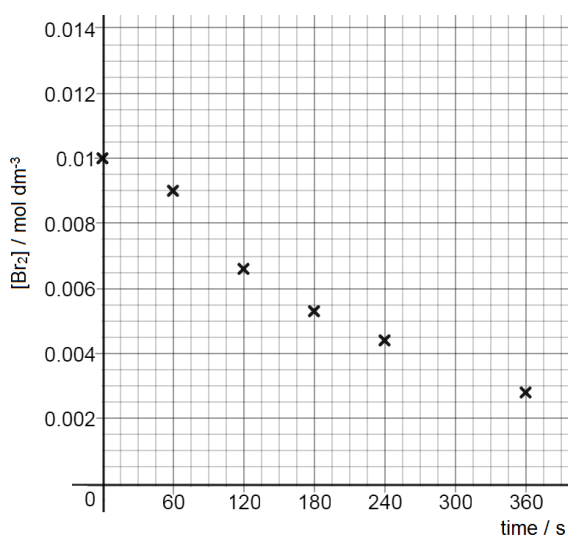
- 1  $3.19/4.75 \times 100 = 67.2\%$
- 2  $6.25/12.00 \times 100 = 52.1\%$
- 3 a  $0.5/21 \times 100 = 2.38\%$                       b  $0.5/43 \times 100 = 1.16\%$
- 4 a  $0.5 \times (2/12) \times 100 = 8.33\%$             b  $0.5 \times (2/37.6) \times 100 = 2.66\%$

## 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