Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

- count the atoms: 3 C and 8 H: $\mathbf{C_3H_8}$

2.2

- ethane: divide by 2: $\mathbf{CH_3}$
- glucose: divide by 6: $\mathbf{CH_2O}$

2.3

- ammonium sulfate: $2 \times (1+)$ balances $2-$: $\mathbf{(NH_4)_2SO_4}$
- calcium hydroxide: $2+$ balances $2 \times (1-)$: $\mathbf{Ca(OH)_2}$

2.4

- $N_2 + 3H_2 \rightarrow 2NH_3$
- state symbols: $N_2(g)$, $H_2(g)$, $NH_3(g)$

2.5

- magnesium + hydrochloric acid → magnesium chloride + hydrogen
- $Mg + 2HCl \rightarrow MgCl_2 + H_2$
- state symbols: Mg(s), HCl(aq), $MgCl_2$(aq), $H_2(g)$

3.1

B

- CH_4 and C_3H_8 cannot be divided further; C_2H_6 gives CH_3 and C_3H_6 gives CH_2

3.2

C

- one Ca^{2+} balances two NO_3^-; the brackets keep the compound ion together

3.3

- mass of $CH_2O = 12 + 2 + 16 = 30$; $60 \div 30 = 2$
- molecular formula $\mathbf{C_2H_4O_2}$

3.4

(a) Fe^{3+} and O^{2-}: $2 \times (3+) = 3 \times (2-)$: $\mathbf{Fe_2O_3}$

(b)

- correct formulae: Fe, O_2, Fe_2O_3
- $4Fe + 3O_2 \rightarrow 2Fe_2O_3$

(c)

- formulae: $FeCl_3 + NaOH \rightarrow Fe(OH)_3 + NaCl$
- balanced: $FeCl_3 + 3NaOH \rightarrow Fe(OH)_3 + 3NaCl$
- state symbols: (aq), (aq), (s), (aq)

(d)

- $Fe^{3+}(aq) + 3OH^-(aq) \rightarrow Fe(OH)_3(s)$

(e) **sodium ions and chloride ions**, Na^+ and Cl^-