Solutions

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

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

2.1

- far apart, randomly arranged
- move quickly in all directions

2.2

- $4.5 \div 9.0$
- **0.50**

2.3

- 2.8.3
- Group 3

2.4

- crystallisation
- fractional distillation

3.1

- $(60 \times 69 + 40 \times 71) \div 100$
- $(4140 + 2840) \div 100$
- **69.8**

3.2

- elements in a group have the same number of outer-shell electrons
- reactions depend on the outer electrons, so they react in similar ways
- Group 0 atoms have full outer shells, so they do not lose, gain or share electrons

3.3

(a) $2.0 \div 8.0 =$ **0.25**; $4.8 \div 8.0 =$ **0.60**; pen A

(b) any four (1 mark each):

- draw a start line in pencil about 1 cm from the bottom of the paper
- put small spots of each ink on the line
- stand the paper in a beaker with solvent below the start line
- cover the beaker and leave until the solvent is near the top, then mark the solvent front

(c) pencil (graphite) is insoluble in the solvent, so it does not move or spread; ink would dissolve and give extra spots that confuse the result

(d) points to include:

- use simple distillation: heat the solution in a flask (K)
- water boils and the steam passes into a condenser, where it cools and condenses (K)
- collect the liquid (distillate) in a beaker; the dyes stay in the flask (K)
- the dyes have much higher boiling points than water, so they do not evaporate (An)
- test purity: pure water boils at exactly 100 °C (and freezes at 0 °C) (K)
- an impure liquid boils over a range of temperatures (An)

Levels: **5–6** a full, logical answer with correct chemistry and correct terms; **3–4** several correct points, partly linked; **1–2** one or two relevant points.