

Exercise walk-through

Composition of Mixtures ■ 1.4

eXercise

You must be able to

- distinguish a **mixture** 混合物 (variable composition) from a pure compound
- calculate the **mass percent** 质量分数 of a component
- use the fact that all components' mass percents add to 100%
- convert a component mass to moles with its molar mass

Method — Mixtures vary

A mixture has no fixed formula: salt water can be weak or strong. Its components keep their identity and can be separated physically.

Method — Mass percent

$$\% \text{ component} = \frac{\text{mass of component}}{\text{mass of mixture}} \times 100\%.$$

A 50 g alloy that is 30% copper contains $0.30 \times 50 = 15$ g of copper.

Method — Percents sum to 100

If an alloy is 60% iron, the rest (40%) is the other metal.

Practice 2.1 ■ 2 marks

A 200 g solution is 15% sugar by mass. Find the mass of sugar.

Solution 2.1

Method: Mass percent

Worked steps

$$0.15 \times 200 = 30 \text{ g } \text{M1} \text{A1}.$$

Practice 2.2 ■ 1 mark

State one way a mixture differs from a pure compound.

Solution 2.2

Worked steps

A mixture has variable composition (or can be separated physically) **B1**.

Practice 2.3 ■ 1 mark

An alloy is 60% iron; the rest is carbon. Find the mass percent of carbon.

Solution 2.3

Worked steps

$$100 - 60 = 40\% \text{ B1}.$$

Practice 2.4 ■ 2 marks

A sample contains 24 g of carbon ($M = 12$). Find the moles of carbon.

Solution 2.4

Method: Mass percent

Worked steps

$$n = m/M = 24/12 = 2 \text{ mol} \quad \text{M1} \quad \text{A1}.$$

Exam-style 3.1 ■ 1 mark

Which statement about a mixture is true?

- A** it has a fixed formula
- B** its composition can vary
- C** it cannot be separated
- D** it is always a solid

Solution 3.1

- A** it has a fixed formula
- B** its composition can vary
- C** it cannot be separated
- D** it is always a solid



Worked steps

B — its composition can vary.

Exam-style 3.2 ■ 1 mark

A 40 g mixture contains 10 g of salt. The mass percent of salt is

A 10%

B 25%

C 40%

D 4%

Solution 3.2

Method: Mass percent

A 10%

B 25%



C 40%

D 4%

Worked steps

B — $10/40 \times 100 = 25\%$.

Exam-style 3.3 ■ 2 marks

A 250 g brass sample is 65% copper and 35% zinc by mass.

- (a) Find the mass of copper.
- (b) Find the mass of zinc.

Solution 3.3

Method: Mass percent

Worked steps

(a) $0.65 \times 250 = 162.5 \text{ g}$ **M1** **A1**. (b) $0.35 \times 250 = 87.5 \text{ g}$ **B1**.

Exam-style 3.4 ■ 2 marks

A mixture contains 18 g of water ($M = 18$) and 46 g of ethanol ($M = 46$).

- (a) Find the moles of each.
- (b) State whether the composition of a mixture is fixed.

Solution 3.4

Worked steps

(a) water = $18/18 = 1$ mol; ethanol = $46/46 = 1$ mol **M1** **A1**. (b) No — it is variable **B1**.