

1.4 Composition of Mixtures

Name: _____ Class: _____ Date: _____

Total: 14 marks**KEY WORDS** mixture 混合物 • mass percent 质量分数 • moles 摩尔 • molar mass 摩尔质量

Objective

Build the skills to answer exam questions on **the composition of mixtures**.**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

1 Worked examples

Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

■ 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.

■ 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.

■ Percents sum to 100

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

2 Practice

Now apply the methods above.

2.1 A 200 g solution is 15% sugar by mass. Find the mass of sugar. [2]**2.2** State one way a mixture differs from a pure compound. [1]**2.3** An alloy is 60% iron; the rest is carbon. Find the mass percent of carbon. [1]**2.4** A sample contains 24 g of carbon ($M = 12$). Find the moles of carbon. [2]

3 Exam-style questions

3.1 Which statement about a mixture is true? [1]

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

3.2 A 40 g mixture contains 10 g of salt. The mass percent of salt is [1]

- **A** 10%
- **B** 25%
- **C** 40%
- **D** 4%

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

(a) Find the mass of copper. [2]

(b) Find the mass of zinc. [1]

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

(a) Find the moles of each. [2]

(b) State whether the composition of a mixture is fixed. [1]

Solutions

2.1 $0.15 \times 200 = 30$ g.

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

2.3 $100 - 60 = 40\%$.

2.4 $n = m/M = 24/12 = 2$ mol.

3.1 B — its composition can vary.

3.2 B — $10/40 \times 100 = 25\%$.

3.3 (a) $0.65 \times 250 = 162.5$ g. (b) $0.35 \times 250 = 87.5$ g.

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