

Exercise walk-through

Physical and Chemical Changes ■ 4.4

eXercise

You must be able to

- classify a change as **physical** 物理变化 or **chemical** 化学变化
- justify with whether **new substances** form
- recognise state changes as physical

Method — The key test

A **chemical change** makes **new substances** with new properties (and is usually hard to reverse). A **physical change** keeps the same substance, only its form or state changing.

Method — Physical changes

Melting, boiling, dissolving, crushing, and mixing (without reacting) are physical — the substance's identity is unchanged and often easily reversed.

Method — Chemical changes

Burning, rusting, digestion, and reactions producing a gas or precipitate are chemical — new substances form and bonds are rearranged.

Method — A worked judgement

Boiling water: liquid $\rightarrow$ gas, still H_2O $\rightarrow$ **physical**. Burning wood: makes CO_2 , ash, water $\rightarrow$ new substances $\rightarrow$ **chemical**.

Practice 2.1 ■ 1 mark

Classify melting ice as physical or chemical.

Solution 2.1

Worked steps

Physical **B1**.

Practice 2.2 ■ 2 marks

Classify iron rusting, with a reason.

Solution 2.2

Worked steps

Chemical — a new substance (iron oxide) forms **M1** **A1**.

Practice 2.3 ■ 1 mark

What is the single best test for a chemical change?

Solution 2.3

Method: The key test

Worked steps

Whether new substances (with new properties) form **B1**.

Exam-style 3.1 ■ 1 mark

Which is a **chemical** change?

- A boiling water
- B dissolving salt
- C burning paper
- D breaking glass

Solution 3.1

Method: The key test

- A boiling water
- B dissolving salt
- C burning paper
- D breaking glass



Worked steps

C — burning paper forms new substances.

Exam-style 3.2 ■ 1 mark

A student heats sugar until it turns black and gives off a smell.

- (a) State whether this is physical or chemical.
- (b) Justify your answer.

Solution 3.2

Worked steps

(a) Chemical **B1**. (b) New substances form (the black solid and the smell are different materials), so it is a chemical change **M1** **A1**.

Exam-style 3.3 ■ 3 marks

Classify each and give a one-word reason: (a) evaporating alcohol, (b) a battery discharging, (c) tearing paper.

Solution 3.3

Worked steps

(a) physical (state change); (b) chemical (reaction); (c) physical (shape)

B1 **B1** **B1**.