

Exercise walk-through

Alloys and their properties ■ 9.3

eXercise

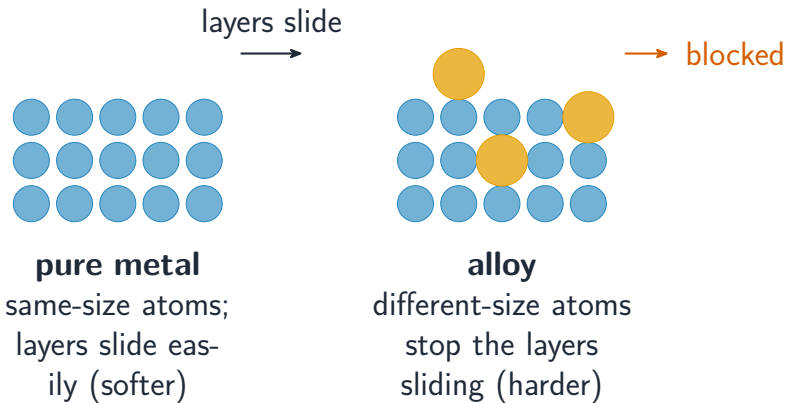
You must be able to

- define an alloy and give examples (brass, stainless steel)
- explain why alloys are harder than pure metals
- link the property to a use

Method — Why alloys are harder

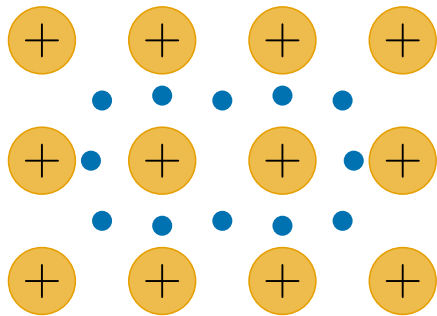
- **alloy:** a mixture of a metal with other element(s).
- **brass** = copper + zinc; **stainless steel** = iron + chromium/nickel/carbon.

Method — Why alloys are harder



Same-size atoms slide easily; different-sized atoms in an alloy block sliding

Method — Why alloys are harder



'sea' of **delocalised electrons**, free to move and carry charge

positive metal ions in a fixed lattice

Alloying distorts the metallic lattice, changing properties

Practice 2.1 ■ 1 mark

Define an alloy.

Solution 2.1

Worked steps

a mixture of a metal with one or more other elements **B1**.

Practice 2.2 ■ 2 marks

Name the two metals in brass.

Solution 2.2

Worked steps

copper **B1**; zinc **B1**.

Exam-style 3.1 ■ 1 mark

Alloys are usually harder than pure metals because the different-sized atoms:

- A** are more reactive
- B** stop the layers sliding over each other
- C** make the metal lighter
- D** conduct better

Solution 3.1

Method: Why alloys are harder

- A are more reactive
- B stop the layers sliding over each other 
- C make the metal lighter
- D conduct better

Worked steps

B. Different-sized atoms stop the layers sliding.

Exam-style 3.2 ■ 2 marks

Stainless steel is used for cutlery.

- (a) Name two elements (other than iron) found in stainless steel.
- (b) State two properties that make it suitable for cutlery.

Solution 3.2

Method: Why alloys are harder

Worked steps

- (a) chromium and nickel (or carbon) **B1** **B1**.
- (b) it is hard and does not rust (resists corrosion) **B1** **B1**.

Exam-style 3.3 ■ 2 marks

Explain, using their structures, why an alloy is harder than the pure metal it is made from.

Solution 3.3

Method: Why alloys are harder

Worked steps

in a pure metal the atoms are the same size, so layers slide easily **M1**; in an alloy different-sized atoms distort the layers and stop them sliding, making it harder **A1**.