

### Properties and uses of metals

1. This question is about the properties of transition metals.  
Match properties, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

- A** good conductors
- B** high melting points
- C** made into alloys
- D** tough

	What this tells you about transition metals
<b>1</b>	They are mixed with similar metals to make them harder for everyday use.
<b>2</b>	They are liquids only if they are very hot.
<b>3</b>	They allow an electric current to pass through them easily.
<b>4</b>	They do not crack or crumble if you hit them with a hammer.

2. Metals are used for different purposes depending on their properties.  
Match properties, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

- A** a good conductor of electricity
- B** easy to bend when hot
- C** resistant to corrosion
- D** very easily worn away

Iron is used for making garden gates because it is . . . **1** . . . .

Aluminium is used for window frames because it is . . . **2** . . . .

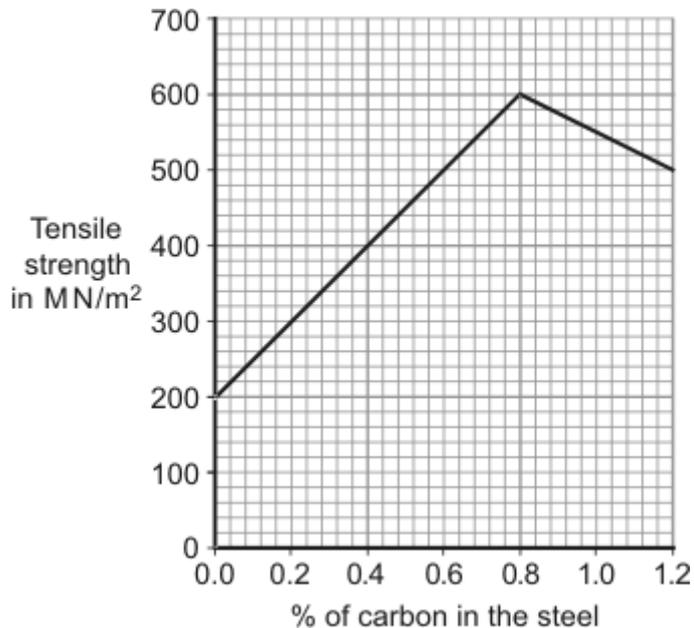
Copper wire is used in electrical circuits because it is . . . **3** . . . .

Pure gold is not normally used for jewellery because it is . . . **4** . . . .

3. Materials with a high tensile strength do **not** break easily when pulled.

To measure the tensile strength of steel, a sample is pulled with a larger and larger force until it breaks.

The graph shows how the tensile strength of different steels depends on the percentage (%) of carbon the steels contain.



- (a) One type of steel has a tensile strength of 400 MN/m<sup>2</sup>.  
How much carbon does it contain?
- 1 0.3%
  - 2 0.4%
  - 3 0.5%
  - 4 4.0%
- (b) The steel with the highest tensile strength is one with . . .
- 1 0.6% carbon.
  - 2 0.8% carbon.
  - 3 1.2% carbon.
  - 4 8.0% carbon.
- (c) From the evidence on the graph, what is the best way to describe how carbon affects the tensile strength of steel?
- 1 As the carbon content decreases, the tensile strength increases.
  - 2 As the carbon content increases, the tensile strength decreases.
  - 3 As the carbon content increases, the tensile strength increases then decreases.
  - 4 The tensile strength increases when the carbon content is greater than 0.8%.

(d) The diagram shows one type of bridge design.



The tensile strength of concrete is very low compared with the tensile strength of steel. Some other comparisons of concrete and steel are shown below.

	Compressive strength (MN/m <sup>2</sup> )	Density (kg/m <sup>3</sup> )	Cost
Concrete	30	2300	Low
Steel	250	7700	Medium

Two reasons why the bridge is **not** made only of steel are that . . .

- 1 steel has a high density and is expensive.
- 2 steel has a high compressive strength and a high density.
- 3 steel has a high tensile strength and a high compressive strength.
- 4 steel has a high tensile strength and a high density.

4. In each part choose only **one** answer.

Iron is about twice as strong as aluminium.

Some other properties of aluminium and iron are shown in the table.

	Electrical conductivity	Density in grams per cm <sup>3</sup>	Resistance to corrosion
Aluminium	very good	2.7	good
Iron	good	7.8	poor

**A** Iron is better than aluminium for making bridges.

This is because iron . . .

- 1 is a better insulator.
- 2 is more easily painted.
- 3 is stronger.
- 4 has a higher density.

**B** Aluminium is better than iron for making cans for fizzy drinks.

The main reason is that . . .

- 1 aluminium conducts electricity better.
- 2 aluminium is harder.
- 3 iron cannot be recycled.
- 4 aluminium is more resistant to corrosion.

Unit C1, C1.3.3

- C** Aluminium has a low density and good electrical conductivity.  
Which use for aluminium depends on **both** of these properties?
- 1 for cooking pans
  - 2 for aeroplanes
  - 3 for overhead power cables
  - 4 for racing cars
- D** Most of the iron that is made is converted into steel.  
Compared with low carbon steel, high carbon steel . . .
- 1 corrodes more quickly.
  - 2 is a better electrical conductor.
  - 3 is harder.
  - 4 is more easily shaped.