

METALS & NON-METALS 2

Q1. Brass is a mixture of two metals, copper and zinc.

(i) A mixture of two metals is called _____.

(1 mark)

(ii) Draw a ring around the correct answer to complete the sentence.

Copper and zinc atoms are different sizes.

This makes brass

harder
more flexible
softer

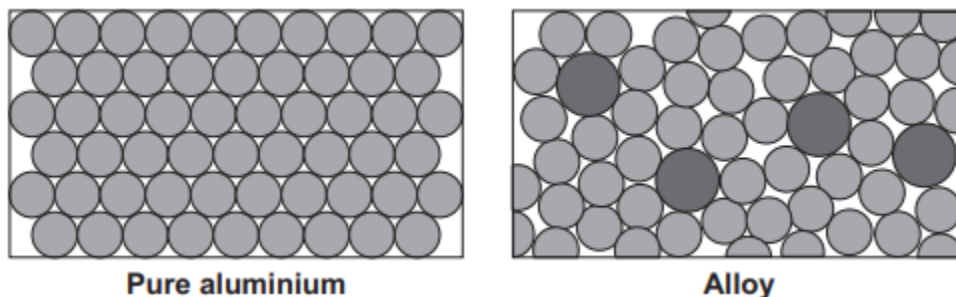
 than the pure metals.

(1 mark)

Q2.

(a) Aluminium is used in an alloy with magnesium to make drinks cans.

The diagrams show the arrangement of atoms in pure aluminium and in the alloy.



The alloy is harder than pure aluminium.

Explain why. Use the diagrams to help you.

(2 marks)

(b) Aluminium is a metal.

Explain why aluminium conducts electricity.

(2 marks)

Q3. This picture shows a sword. The sword is about 3400 years old. It is made of an alloy called bronze.



Bronze is made from copper and tin.

Bronze made better swords than pure copper. This is because bronze is harder than pure copper.

Explain why bronze is harder than pure copper.

Your answer should include details of:

- how the atoms are arranged in pure copper and bronze
- why pure copper is relatively soft
- why bronze is harder.

(4 marks)

Q4. Glass can be coloured using tiny particles of gold. Gold is a metal.

Describe the structure of a metal.

(3 marks)

Q5. Alloys are used to make dental braces and coins.

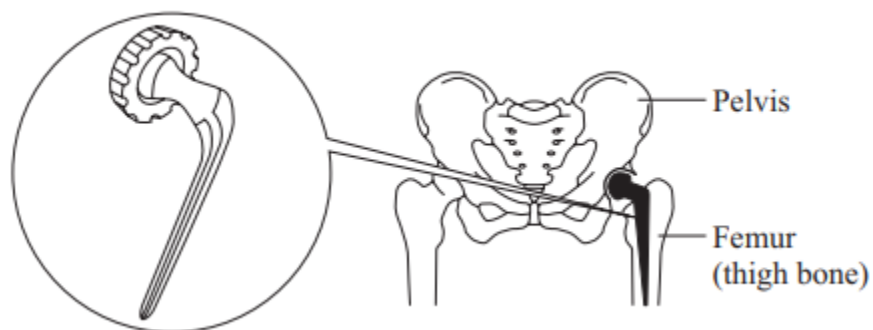
(i) Nitinol is an alloy used in dental braces. Why is Nitinol used in dental braces?

(1 mark)

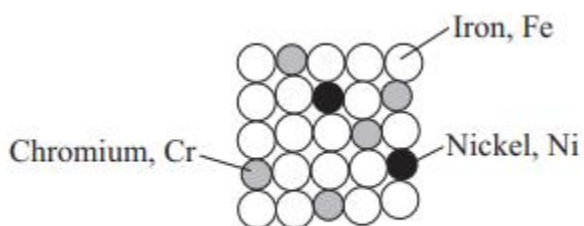
(ii) Suggest one reason why coins are not made of pure copper. Do **not** give cost as a reason.

(1 mark)

Q6. The hip joint between the femur and pelvis sometimes has to be replaced. Early hip replacement joints were made from stainless steel.



Stainless steel is an alloy of iron, chromium and nickel. The diagram below represents the particles in stainless steel.



Particle diagram of stainless steel

(a) Use the particle diagram to complete the percentages of metals in this stainless steel. The first one has been done for you.

Element	Percentage (%)
Iron, Fe	72
Chromium, Cr	
Nickel, Ni	

(2 marks)

(b) Pure iron is a relatively soft, metallic element.

(i) Why is iron described as an element?

(1 mark)

(ii) Suggest why pure iron would not be suitable for a hip replacement joint.

(1 mark)

(iii) Use the particle diagram to help you to explain why stainless steel is harder than pure iron.

(2 marks)

Q7. Steels are used to make cars, bridges and knives.

The main element in steel is iron.

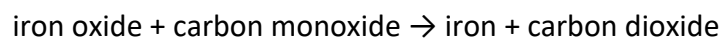
(a) Iron is extracted from an ore that contains about 60% iron oxide, Fe_2O_3 .

(i) What is the meaning of ore?

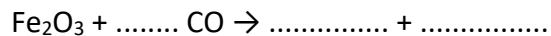
(1 mark)

(ii) In a blast furnace, iron oxide reacts with carbon monoxide to produce iron.

The word equation for this reaction is:



Complete and balance the chemical equation for this reaction.



(2 marks)

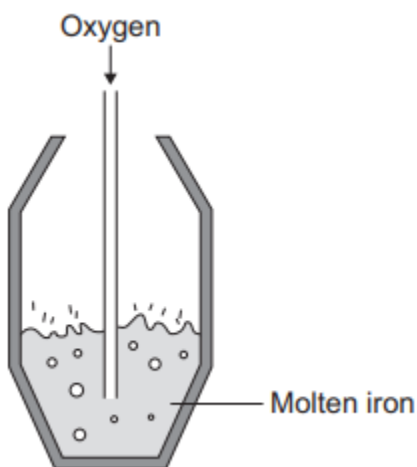
(iii) Name the type of reaction that produces a metal from its metal oxide.

(1 mark)

(b) Steels are produced from molten iron in two stages:

Stage 1 blowing oxygen into molten iron from the blast furnace.

Stage 2 adding other metals to make different steels.



(i) In Stage 1, suggest how the oxygen removes most of the carbon from the molten iron.

(2 marks)

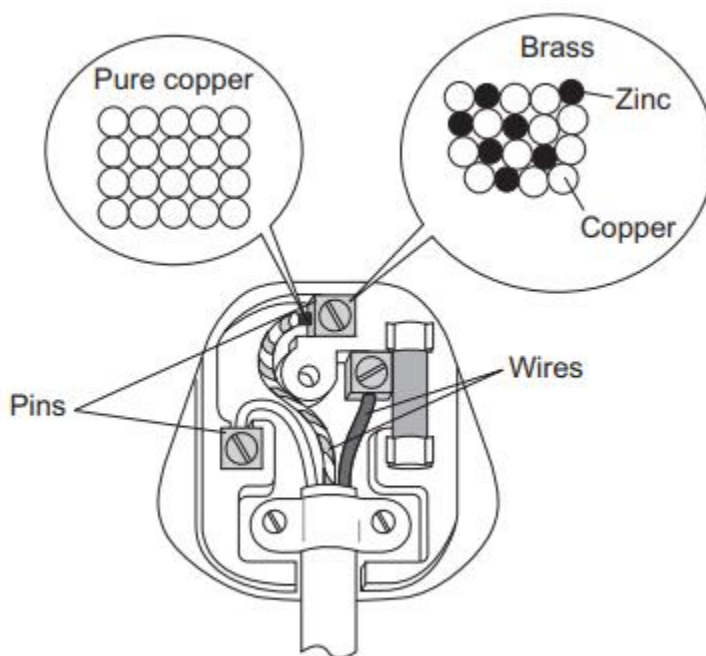
(ii) Stage 2 produces different steels. Suggest why different steels are needed.

(1 mark)

(c) Old 5p and 10p coins in the UK were made from cupro-nickel. Cupro-nickel is 75% copper and 25% nickel. New 5p and 10p coins in the UK are now made from nickel-plated steel and not from cupro-nickel. Explain why.

(2 marks)

Q8. The diagram shows an electric plug.



An ore contains a mixture of zinc carbonate and lead carbonate. Zinc and lead are produced from this ore by two reactions.

(a)(i) **Reaction 1:** The carbonates in the ore are converted into a mixture of zinc oxide and lead oxide.

Name this type of reaction

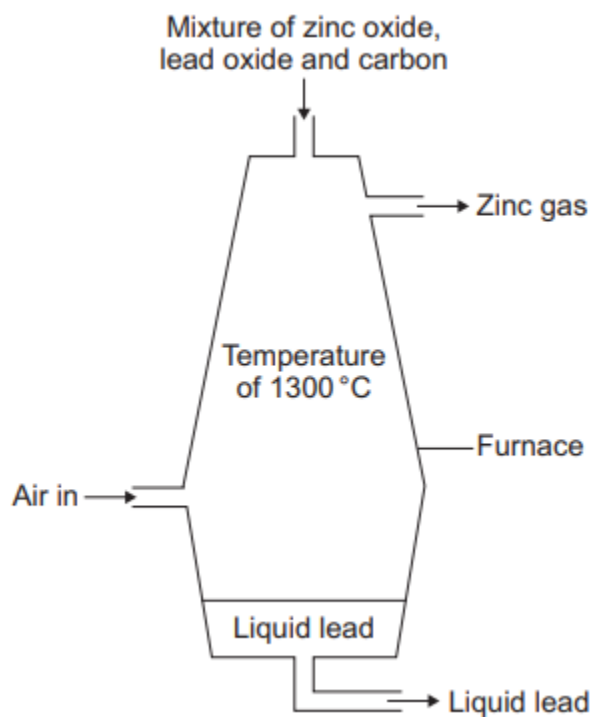
How is this reaction done?

(2 marks)

(ii) **Reaction 2:** The metal oxides are mixed with carbon and heated in a furnace to produce zinc and lead. Explain why zinc and lead are produced.

(2 marks)

(iii) The diagram represents a furnace used to produce zinc and lead from their oxides.



Metal	Melting point in °C	Boiling point in °C	Density in g per cm ³
Lead	328	1751	11.3
Zinc	420	908	7.1

Use the diagram and the information in the table to explain how zinc and lead are separated in the furnace.

(2 marks)

Q9. While extracting copper, CuO is reduced using carbon. Describe and explain what happens during this reaction.

(2 marks)

Total marks (38)