

# METALS & NON-METALS 6

**Q1.** Cans for food and drinks are made from steel or aluminium.

The main metal in steel is iron.



Iron is extracted by heating a mixture of iron oxide and carbon in a blast furnace.

**(i)** Name this type of reaction.

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(1 mark)

**(ii)** Balance the symbol equation for this reaction.



(1 mark)

**Q2.** These are some of the properties of four metals.

Metal		Electrical conductivity	Density in grams per cm <sup>3</sup>	Melting point in °C	Boiling point in °C
<b>A</b>	Aluminium	very good	2.7	660	2470
<b>B</b>	Iron	good	7.8	1535	2750
<b>C</b>	Mercury	very good	13.6	-39	357
<b>D</b>	Potassium	good	0.9	64	774

Match metals, A, B, C and D, with the numbers 1– 4 in the table below.

What we can say about the metal	
1	It is a liquid at room temperature (20 °C).
2	It is used in making overhead electricity cables because it is a very good conductor and has a low density.
3	It has the highest melting and boiling points.
4	It will float on a liquid that has a density of 1.0 grams per cm <sup>3</sup> .

(4 marks)

**Q3.** This question is about metals.

**(a)** A scientist investigated some reactions of three metals, K, L and M.

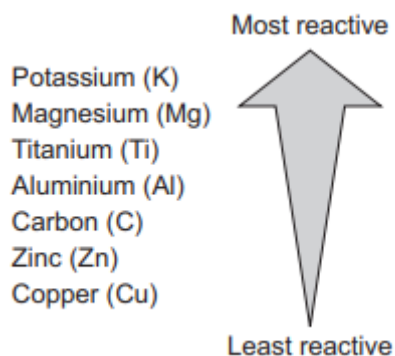
- Metal L can be extracted by mixing its oxide with carbon and heating.
- Metal M cannot be extracted by mixing its oxide with carbon and heating.
- Hydrogen will displace metal K from its oxide but will not displace metal L from its oxide.
- The oxide of metal K is decomposed to the metal on heating alone.

The order of reactivity for the three metals, with the most reactive first, is . . .

- 1 K, L, M.
- 2 M, L, K.
- 3 L, K, M.
- 4 K, M, L.

(1 mark)

**(b)** The order of reactivity for some metals and carbon is shown below.



Which of the following shows a correctly balanced equation for a possible reaction?

- 1  $\text{ZnO} + \text{C} \rightarrow \text{Zn} + \text{CO}_2$
- 2  $\text{Cu} + \text{MgO} \rightarrow \text{CuO} + \text{Mg}$
- 3  $2\text{Mg} + \text{K}_2\text{O} \rightarrow 2\text{MgO} + 2\text{K}$
- 4  $2\text{Al} + 3\text{ZnO} \rightarrow 3\text{Zn} + \text{Al}_2\text{O}_3$

(1 mark)

Titanium is extracted from titanium chloride. A mixture of titanium chloride and sodium is heated. The reaction takes place in a furnace above 500 °C. It is a batch process; this means that the furnace does not operate continuously but is cooled after each operation so that the titanium can be removed.

(c) Which row in the table correctly describes the reaction for the extraction of titanium?

	Why the reaction occurs	Products of the reaction
1	Sodium is more reactive than titanium	Titanium, sodium and chlorine
2	Titanium is more reactive than sodium	Titanium and chlorine
3	Titanium is more reactive than sodium	Titanium and sodium chloride
4	Sodium is more reactive than titanium	Titanium and sodium chloride

(1 mark)

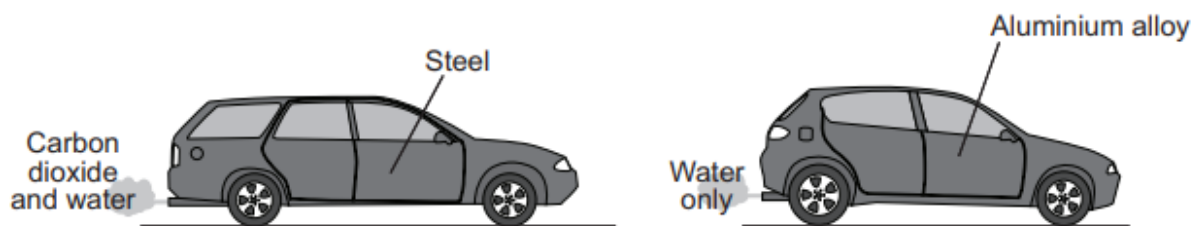
(d) The extraction of iron in a blast furnace is a continuous process.

Over a period of 12 months, the batch method for extraction of titanium needs much more energy per tonne of metal than the continuous method for the extraction of iron. This is because . . .

- 1 the batch process is completed more quickly.
- 2 titanium is less reactive than iron.
- 3 the titanium furnace is not kept at the reaction temperature.
- 4 titanium chloride is not as pure as iron oxide

(1 mark)

**Q4.** The picture shows two different cars.



**(a)** Some properties of aluminium are given below.

Tick (✓) two reasons why aluminium is better than steel for car bodies.

Reason	Tick (✓)
Aluminium is not a transition metal.	
Aluminium has a low density.	
Aluminium is expensive to extract.	
Aluminium is resistant to corrosion.	

(2 marks)

**(b)** Each car body is made from an alloy.

**(i)** What is an alloy?

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(1 mark)

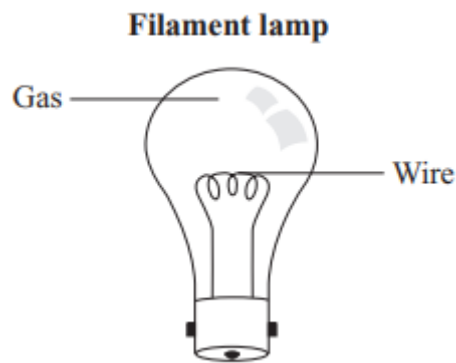
**(ii)** An alloy is used to make a car body. A pure metal is not used to make a car body. Suggest why.

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(1 mark)

**Q5.** When electricity passes through a thin wire, the wire gets hot. If the wire gets very hot, it may glow. This idea is used in filament lamps.



The table shows some metals and their melting points.

<b>Metal</b>	<b>Melting point in °C</b>
Aluminium	660
Copper	1084
Iron	1540
Tungsten	3410

Which metal in the table should be used to make the wire in a filament lamp?

Give a reason for your answer.

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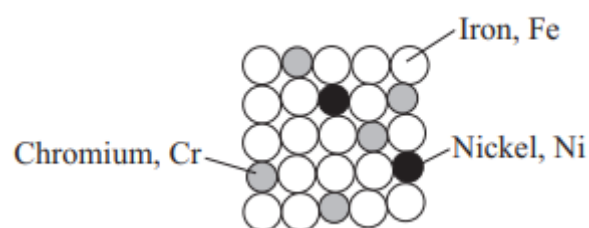
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(2 marks)

**Q6.** Stainless steel is mostly iron.

The diagram represents the particles in stainless steel.



Use the correct words from the box to complete the sentences about alloys.

<b>metal</b>	<b>mixture</b>	<b>molecule</b>	<b>polymer</b>	<b>smart</b>	<b>structure</b>
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Stainless steel is an alloy because it is a \_\_\_\_\_ of iron, chromium and nickel.

An alloy is made up of more than one type of \_\_\_\_\_.

Stainless steel alloys are harder than iron because the different sized atoms added change \_\_\_\_\_.

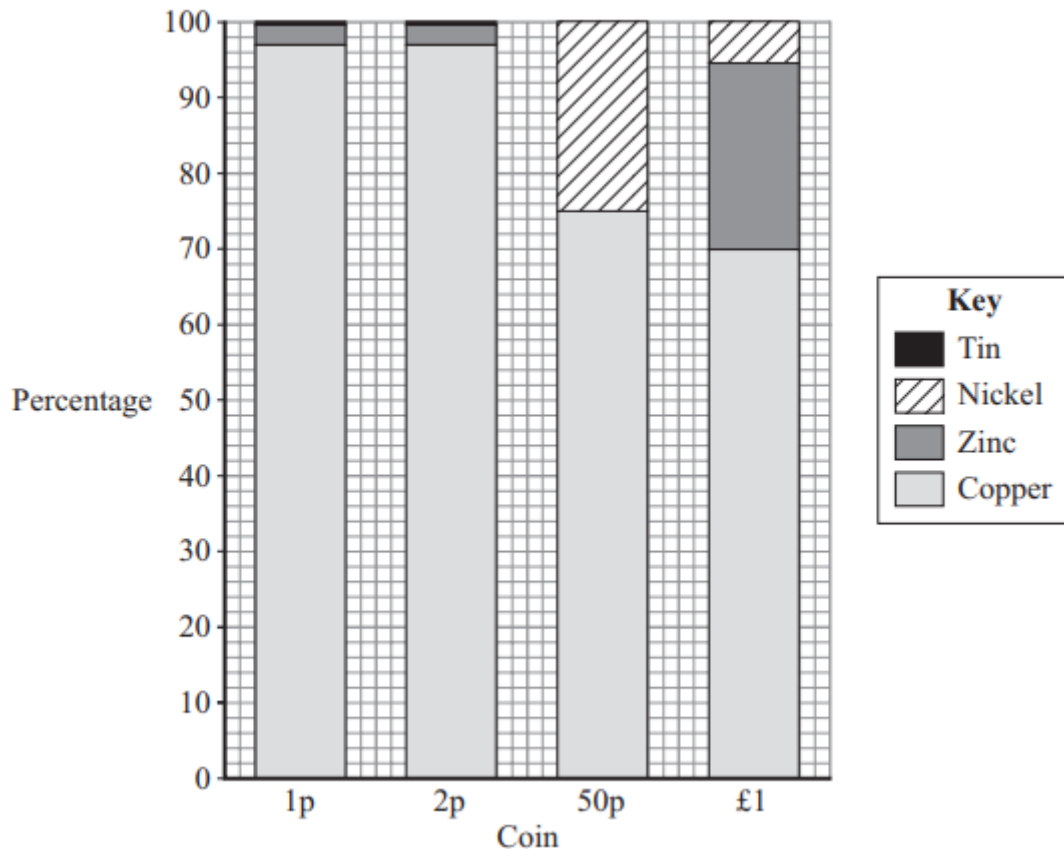
An alloy that can return to its original shape after being deformed is called a \_\_\_\_\_ alloy.

(4 marks)

Q7. This is the headline from a newspaper:

**'Why is a 2p coin worth 3.3p?'**

(a) The bar chart shows the percentages of metals in UK coins in 1991.



Use the bar chart to answer these questions.

(i) Which metal is in all of these coins?

\_\_\_\_\_ (1 mark)

(ii) Which coin does not contain zinc?

\_\_\_\_\_ (1 mark)

(iii) What is the percentage of nickel in a 50p coin?

Percentage = ..... %

(1 mark)

(iv) Draw a ring around the correct metal to complete the sentence.

Pure copper is too soft to be used for 1p and 2p coins.

Copper is mixed with zinc and 

nickel
tin
iron

 for 1p and 2p coins.

(1 mark)

(b) The value of the metal in 2p coins which were made in 1991 is now 3.3p.

(i) Suggest why a 2p coin made in 1991 is worth 3.3p.

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(1 mark)

(ii) Suggest why copper-plated steel is now used for 1p and 2p coins.

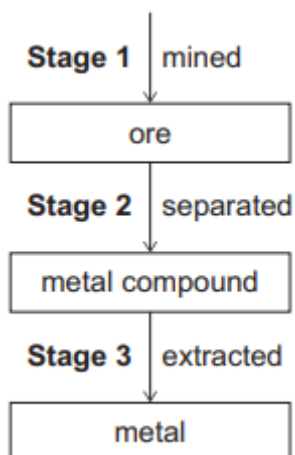
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(1 mark)

**Q8.** An ore contains a metal compound.

A metal is extracted from its ore in three main stages, as shown in the figure.



Explain why Stage 2 needs to be done.

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(2 marks)

Total marks (28)