AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.2.2.8

Metals as conductors

Past-paper questions

Tier	**Foundation**
Question groups	**9**
Available paper years	**2007–2023**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.2.2.8 Metals as conductors

Question 01

June 2007 | CHY1A | Original Q4 | Legacy

QUESTION FOUR

These are some of the properties of four metals.

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

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

	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 which has a density of 1.0 grams per cm^3.

4.2.2.8 Metals as conductors

Question 02

June 2008 | CHY1AP | Original Q4 | Legacy

QUESTION FOUR

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** . . . .

4.2.2.8 Metals as conductors

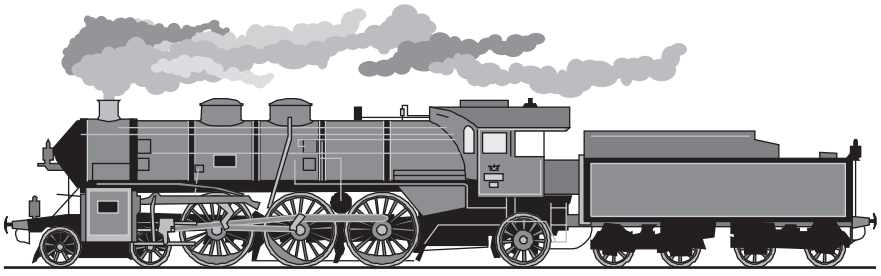
Question 03

June 2009 | CHY1AP | Original Q9 | Legacy

QUESTION NINE

Read the following newspaper extract.

Copper shortage puts the brakes on Flying Scotsman renovation



A major overhaul of the steam locomotive Flying Scotsman has been delayed by more than a year because of the lack of copper for the engine's firebox.

Copper is at a record high price because of huge demand from China's rapidly growing economy. The price had been falling over the previous 30 years, which had discouraged exploration for new supplies.

Other users have been forced to switch to cheaper materials, with plumbers using plastic rather than copper pipes, and telecoms firms using fibre-optic cables rather than copper wire.

9A The firebox of a steam locomotive is where coal is burned to boil water.

Which of these properties is **not** important when using copper in the firebox of a steam locomotive?

1 Copper is a good conductor of heat.

2 Copper has a high melting point.

3 Copper is a good conductor of electricity.

4 Copper is easily hammered and bent into shape.

9B Which row in the table explains why copper was important to plumbers and telecoms firms?

	Plumbers	Telecoms firms
1	High melting point	Good heat conductor
2	Good electrical conductor	High melting point
3	Resistant to corrosion	Good electrical conductor
4	High boiling point	Good electrical conductor

9C Which of the following would make the copper shortage in China and other countries worse?

1 recycling scrap copper rather than burying it in landfill sites

2 developing alternative materials to do the same job as copper

3 extraction of copper from low-grade ores

4 forcing suppliers to reduce the price of copper

9D Why is it environmentally important to recycle copper rather than mine fresh copper ore?

1 Copper ores are non-renewable, and a lot of energy is needed to extract copper from its ore.

2 There are enormous reserves of copper ore which are not expected to run out for hundreds of years.

3 Copper ores are cheap, and scrap copper is easy to dispose of in landfill sites.

4 Copper recycling is difficult and uses more energy when compared with processing new ores.

END OF TEST

4.2.2.8 Metals as conductors

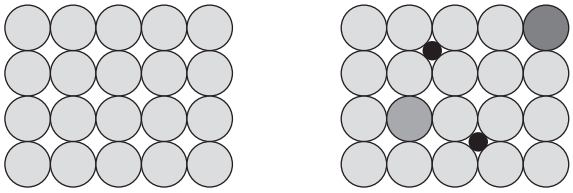
Question 04

June 2011 | CHY1AP | Original Q8 | Legacy

QUESTION EIGHT

This question is about iron and different types of steel.

8A The diagrams show the arrangement of atoms in pure iron and in stainless steel.



Pure iron Stainless steel

Pure iron is soft and easily shaped because the atoms . . .

1 are not arranged in a regular pattern.

2 are small and spherical.

3 are in layers that can slide over each other.

4 are of different sizes.

8B Stainless steel rather than pure iron is used for making cutlery.

Which row in the table gives two reasons why stainless steel is used?

Stainless steel . . .		
1	is harder.	is a better heat conductor.
2	is more resistant to corrosion.	is harder.
3	is a better heat conductor.	can be more easily shaped.
4	can be more easily shaped.	is more resistant to corrosion.

4.2.2.8 Metals as conductors

Question 04 · continued June 2011 | CHY1AP | Original Q8 | Legacy

8C Which type of iron or steel is used to make hammer heads and chisels?

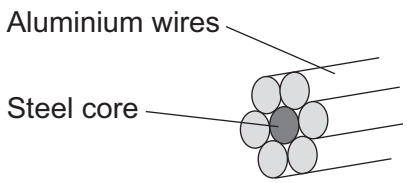
1 cast iron (iron from a blast furnace)

2 pure iron

3 low carbon steel

4 high carbon steel

8D The diagram shows the structure of an overhead power cable. The steel core gives strength to the cable.



Aluminium is used because it is a good conductor of electricity and . . .

1 it has a low density.

2 it is a good conductor of heat.

3 it can be hammered into shape.

4 it is a hard metal.

4.2.2.8 Metals as conductors

Question 05

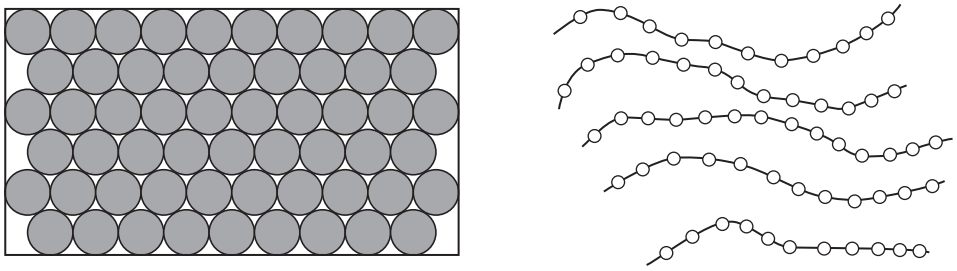
June 2017 | CH2FP | Original Q6 | Legacy

6 **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Metals and thermosoftening polymers have different properties.

Figure 12 shows structures of a metal and a thermosoftening polymer.

Figure 12



Explain how the properties of a metal and a thermosoftening polymer relate to their structures.

In your answer you should describe the structures of a metal and a thermosoftening polymer.

[6 marks]

4.2.2.8 Metals as conductors

Question 06

November 2020 | 8462/1F | Original Q5

0 5 This question is about aluminium.

0 5 . 1 Aluminium is a metal.

Draw **one** line from each property of aluminium to the correct reason for that property.

[2 marks]

Property	Reason
	Aluminium has delocalised electrons
Conducts electricity	Aluminium has layers of atoms which can slide
	Aluminium has strong metallic bonds
High melting point	Aluminium has weak intermolecular forces
	Aluminium has a random arrangement of atoms

0 5 . 2 Aluminium can be used to make alloys.

What is meant by an 'alloy'?

[1 mark]

4.2.2.8 Metals as conductors

Question 06 · continued

Aluminium is extracted from bauxite.

Bauxite is a mixture which contains aluminium oxide.

0 5 . 3 Bauxite contains between 15% and 25% aluminium.

Aluminium oxide always contains 53% aluminium.

How does this show that bauxite is a mixture and **not** a compound?

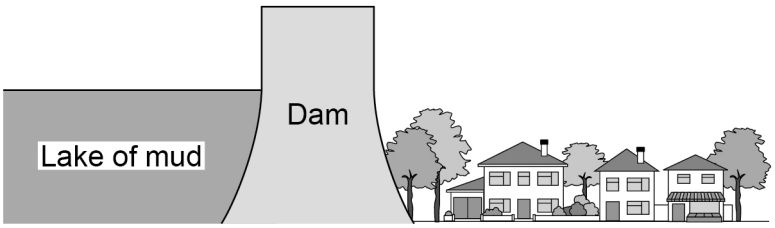
[1 mark]

0 5 . 4 The waste material from the bauxite is stored in lakes of mud.

The lakes of mud are held in place by dams.

Figure 6 shows one of these lakes.

Figure 6



Suggest **two** possible problems with storing the waste material in lakes of mud.

[2 marks]

1

2

4.2.2.8 Metals as conductors

Question 06 · continued

Aluminium is extracted by electrolysis.

The aluminium oxide is mixed with cryolite and melted.

The mixture is then electrolysed.

0 5 . 5 The formula of cryolite is Na_3AlF_6

Give the total number of atoms in the formula.

[1 mark]

Number of atoms = _____

0 5 . 6 What is the reason for adding cryolite to the aluminium oxide?

[1 mark]

Tick (✓) **one** box.

To increase the amount of aluminium extracted ☐

To lower the melting point of the mixture ☐

To reduce the amount of aluminium oxide needed ☐

4.2.2.8 Metals as conductors

Question 06 · continued

0 5 . 7 Complete the sentences.

Choose answers from the box.

[2 marks]

aluminium	**carbon**	**fluorine**
oxygen	**sodium**	

When the molten aluminium oxide and cryolite mixture is electrolysed the product at the positive electrode is _____.

This product reacts with the positive electrode because the positive electrode is made of _____.

0 5 . 8 A sample of bauxite contains 25% aluminium.

Calculate the maximum mass of aluminium that can be extracted from 300 000 kg of the sample of bauxite.

Give your answer in standard form.

[3 marks]

_____

_____

_____

_____

_____

Maximum mass (in standard form) = _____ kg

13

4.2.2.8 Metals as conductors

Question 07

November 2021 | 8462/1F | Original Q8

0 8 This question is about carbon and its compounds.

Fullerenes are molecules of carbon atoms.

The first fullerene to be discovered was Buckminsterfullerene (C_{60}).

0 8 . 1 What shape is a Buckminsterfullerene molecule?

[1 mark]

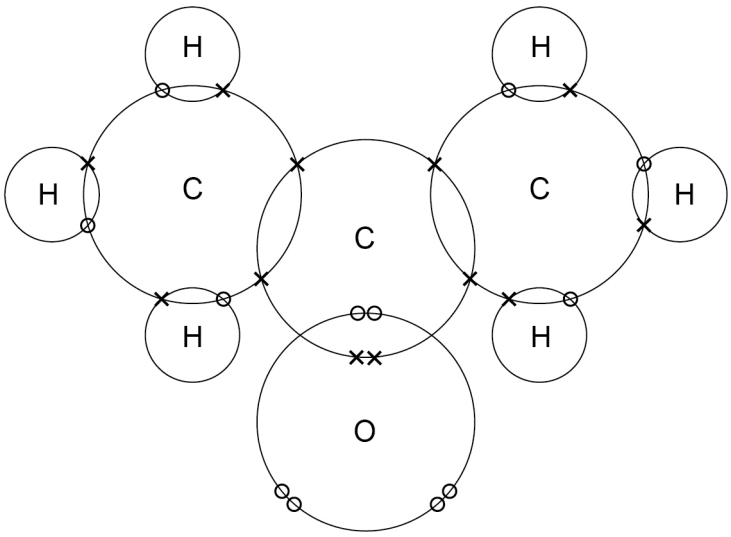
0 8 . 2 Give **one** use of a fullerene.

[1 mark]

Propanone is a compound of carbon, hydrogen and oxygen.

Figure 13 shows the dot and cross diagram for a propanone molecule.

Figure 13



Question 07 · continued

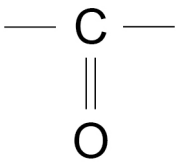
0 8 . 3 Complete **Figure 14** to show a propanone molecule.

Use a line to represent each single bond.

Use **Figure 13**.

[1 mark]

Figure 14



0 8 . 4 Determine the molecular formula of propanone.

Use **Figure 13**.

[1 mark]

Molecular formula = _____

0 8 . 5 Propanone is a liquid with a low boiling point.

Why does propanone have a low boiling point?

[1 mark]

Tick (✓) **one** box.

The covalent bonds are strong. ☐

The covalent bonds are weak. ☐

The intermolecular forces are strong. ☐

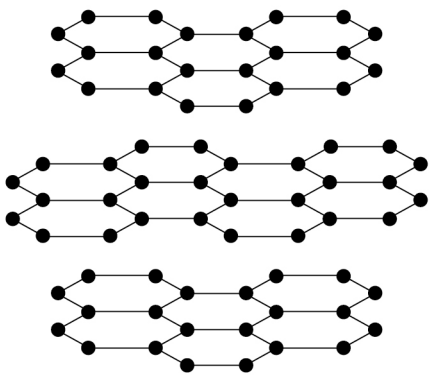
The intermolecular forces are weak. ☐

4.2.2.8 Metals as conductors

Question 07 · continued

0 8 . 6 **Figure 15** represents the structure of graphite.

Figure 15



Explain why graphite is:

- a good electrical conductor
- soft and slippery.

You should answer in terms of structure and bonding.

[6 marks]

11

4.2.2.8 Metals as conductors

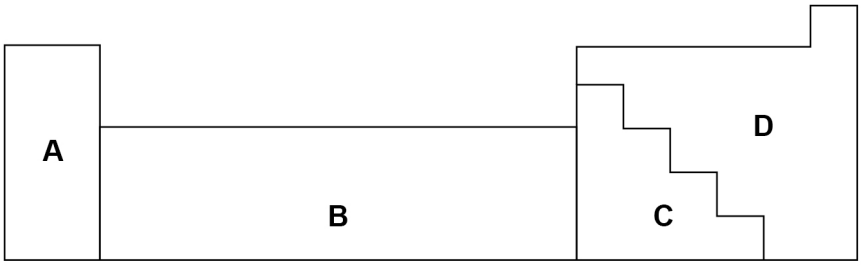
Question 08

June 2022 | 8462/1F | Original Q9

0 9 This question is about metals and non-metals.

Figure 15 shows an outline of part of the periodic table.

Figure 15



0 9 . 1 Element **Q** is a dull solid with a melting point of 44 °C.

Element **Q** does not conduct electricity.

Which section of the periodic table in **Figure 15** is most likely to contain element **Q**?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 9 . 2 Element **R** forms ions of formula R^{2+} and R^{3+}

Which section of the periodic table in **Figure 15** is most likely to contain element **R**?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 9 . 3 Give **two** differences between the physical properties of the elements in Group 1 and those of the transition elements.

[2 marks]

1 _____

_____

2 _____

_____

4.2.2.8 Metals as conductors

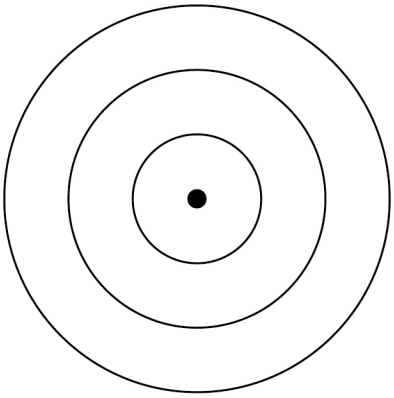
Question 08 · continued

0 9 . 4 Complete **Figure 16** to show the electronic structure of an aluminium atom.

Use the periodic table.

[1 mark]

Figure 16



0 9 . 5 Aluminium is a metal.

Describe how metals conduct electricity.

Answer in terms of electrons.

[3 marks]

0 9 . 6 Name the type of bonding in compounds formed between metals and non-metals.

[1 mark]

4.2.2.8 Metals as conductors

Question 08 · continued

0 9 . 7 Magnesium oxide is a compound formed from the metal magnesium and the non-metal oxygen.

Describe what happens when a magnesium atom reacts with an oxygen atom.

You should refer to electrons in your answer.

[4 marks]

13

4.2.2.8 Metals as conductors

Question 09

June 2023 | 8462/1F | Original Q6

0 6 This question is about metals.

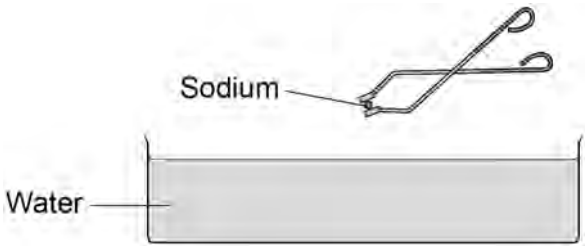
0 6 . 1 Platinum is used to make jewellery.

Suggest **one** reason why platinum is used to make jewellery.

[1 mark]

0 6 . 2 **Figure 7** shows a piece of sodium being added to water.

Figure 7



Give **two** observations that could be seen when sodium is added to water.

[2 marks]

1

2

Question 6 continues on the next page

4.2.2.8 Metals as conductors

Question 09 · continued

0 6 . 3 Copper is a transition element.

Sodium is a Group 1 element.

What are **two** differences between copper and sodium?

[2 marks]

Tick (✓) **two** boxes.

- Copper has a lower melting point. ☐
- Copper is harder. ☐
- Copper is less dense. ☐
- Copper is less reactive. ☐
- Copper is less strong. ☐

4.2.2.8 Metals as conductors

Question 09 · continued

0 6 . 4 The metals aluminium and copper can be used to make pans for cooking.

Table 2 shows information about the two metals.

The higher the value for thermal conductivity, the better the metal conducts thermal energy.

Table 2

	Aluminium	Copper
Thermal conductivity in arbitrary units	250	400
Density in g/cm^3	2.7	8.9
Cost of metal per kg in £	1.50	7.00

Evaluate the use of pans made of aluminium and of copper.

Use **Table 2**.

[4 marks]

9