# Metals

## Question Paper 1

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|---|---|
| **Level** | IGCSE |
| **Subject** | Chemistry |
| **Exam Board** | CIE |
| **Topic** | Metals |
| **Sub-Topic** | |
| **Paper Type** | Alternative to Practical |
| **Booklet** | Question Paper 1 |

**Time Allowed:** **47 minutes**

**Score:** **/39**

**Percentage:** **/100**

**1** Copper(II) oxide and carbon are both black solids. Copper(II) oxide reacts with dilute sulfuric acid to form aqueous copper(II) sulfate. Carbon does not react with dilute sulfuric acid.
You are given a mixture of copper(II) oxide and carbon and access to dilute sulfuric acid.
Plan an experiment to investigate the percentage of copper(II) oxide in the mixture.

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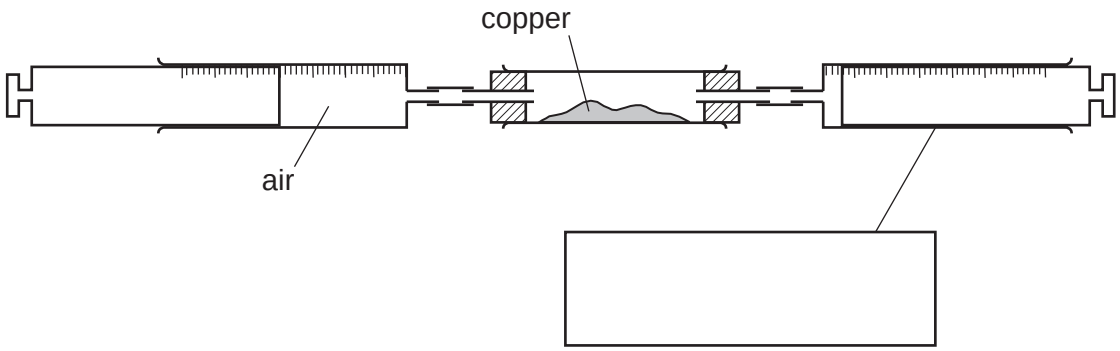
..... [6]

[Total: 6]

**2** A student investigated the reaction of air with copper. 100 $cm^3$ of air was passed continuously over heated copper using the apparatus below. When the volume remained constant, the apparatus was left to cool and the volume of gas was measured.




**(a)** **(i)** Complete the box to show the apparatus labelled. [1]

**(ii)** Indicate on the diagram, with an arrow, where heat is applied. [1]

**(b)** What should be used to transfer the copper from a bottle to the apparatus?

..... [1]

**(c)** The copper changed colour from brown to ..... [1]

**(d)** Why was the apparatus left to cool before measuring the final volume of gas?

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..... [2]

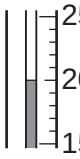
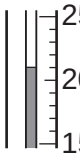
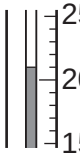
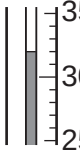
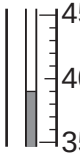
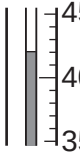
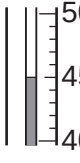
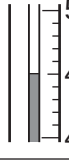
[Total: 6]

**3** A student investigated the reaction between aqueous copper(II) sulfate and two different metals, zinc and iron.
Two experiments were carried out.

*Experiment 1*
Using a measuring cylinder, 25 $cm^3$ of aqueous copper(II) sulfate was poured into a polystyrene cup. The temperature of the solution was measured. The timer was started and the temperature was measured every half a minute for one minute.

At 1 minute, 5 g of zinc powder was added to the cup and the mixture stirred with the thermometer. The temperature of the mixture was measured every half minute for an additional three minutes.

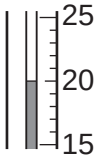
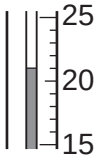
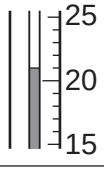
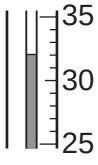
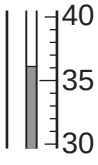
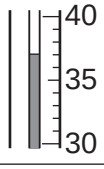
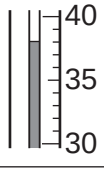
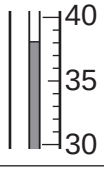
**(a)** Use the thermometer diagrams in the table to record the temperatures.

| time / min | thermometer diagrams | temperature / °C |
|---|---|---|
| 0.0 |  | |
| 0.5 |  | |
| 1.0 |  | |
| 1.5 |  | |
| 2.0 |  | |
| 2.5 |  | |
| 3.0 |  | |
| 3.5 |  | |
| 4.0 |  | |

[3]

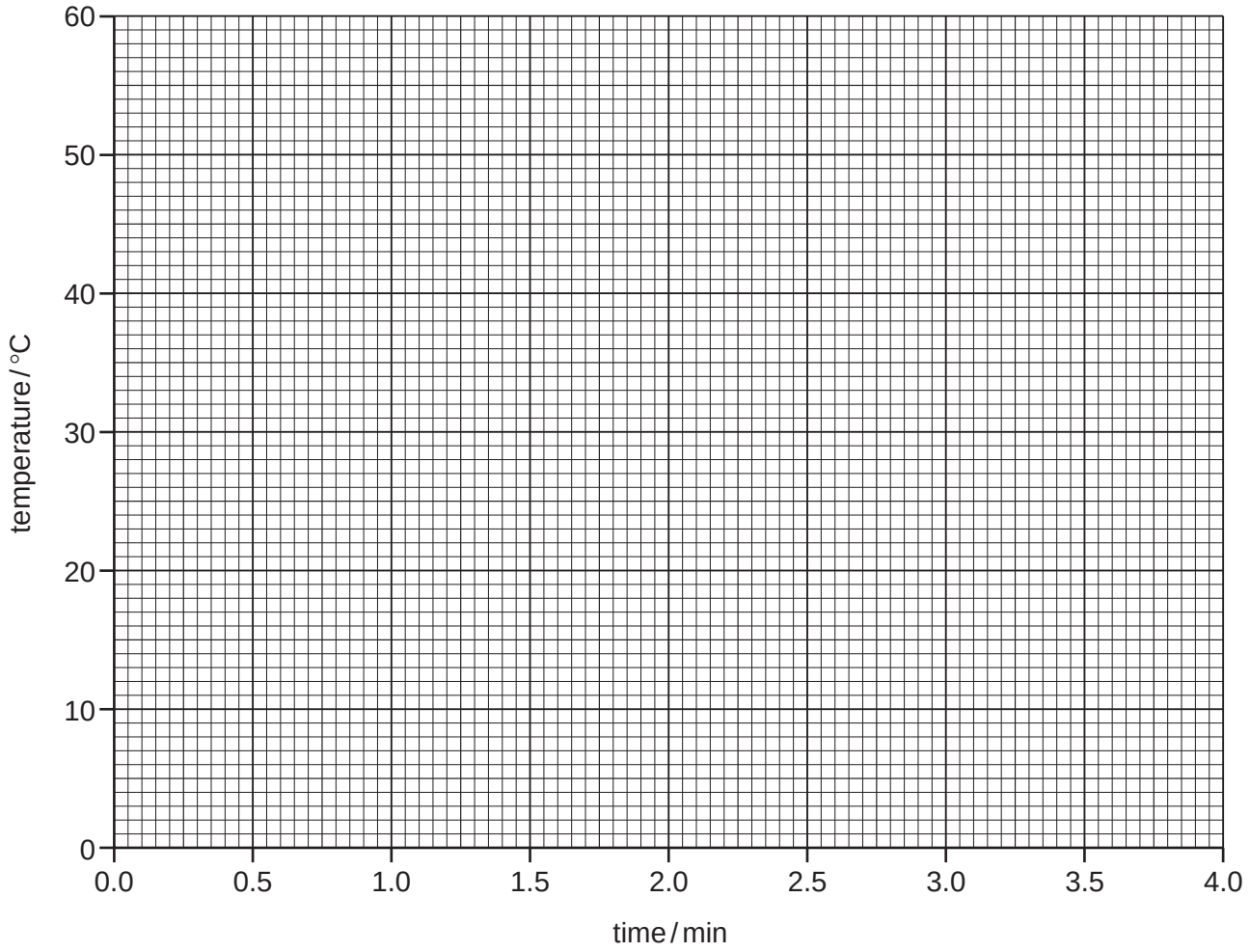
*Experiment 2*
Experiment 1 was repeated using 5 g of iron powder instead of the zinc powder.

**(b)** Use the thermometer diagrams in the table to record the temperatures.

| time / min | thermometer diagrams | temperature / °C |
|---|---|---|
| 0.0 |   | |
| 0.5 |   | |
| 1.0 |   | |
| 1.5 |   | |
| 2.0 |   | |
| 2.5 |   | |
| 3.0 |   | |
| 3.5 |   | |
| 4.0 |   | |

[3]

**(c)** Plot the results of both experiments on the grid below. Draw two smooth line graphs. Clearly label your graphs.




[5]

**(d)** **From your graph**, work out the temperature of the reaction mixture in Experiment 1 after 1 minute 15 seconds. Show clearly **on the graph** how you worked out your answer.

..... [3]

**(e)** What type of chemical process occurs when zinc and iron react with aqueous copper(II) sulfate?

..... [1]

**(f)** **(i)** Compare the temperature changes in Experiments 1 and 2.

..... [1]

**(ii)** Suggest an explanation for the difference in temperature changes.

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..... [1]

**(g)** Explain how the temperature changes would differ in the experiments if 12.5 $cm^3$ of copper(II) sulfate solution were used.

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..... [2]

**(h)** Predict the effect of using lumps of zinc in Experiment 1. Explain your answer.

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..... [2]

[Total: 21]

**4** Malachite is a naturally occurring form of copper carbonate. Outline how a sample of copper metal could be obtained from large lumps of malachite in the laboratory.
Copper is one of the least reactive metals.
Your answer should include any chemicals used and conditions.

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..... [6]

[Total: 6]