

6: Metals and the reactivity series – Topic questions**Paper 6**

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

| Question | Year | Series | Paper number |
|----------|------|--------|--------------|
| 2 | 2016 | June | 63 |

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

- 2 A student investigated what happens when dilute hydrochloric acid and copper(II) sulfate solution react with different metals.

Five experiments were carried out.

(a) Experiment 1

A measuring cylinder was used to pour 10 cm³ of dilute hydrochloric acid into a boiling tube. The temperature of the hydrochloric acid was measured. 1 g of zinc was added to the boiling tube and the mixture stirred with a thermometer. The maximum temperature reached by the mixture was measured.

Experiment 2

Experiment 1 was repeated using 1 g of iron instead of zinc.

Experiment 3

Experiment 1 was repeated using 1 g of magnesium instead of zinc.

Use the thermometer diagrams to record the results in the table. Complete the final column in the table.

| experiment | thermometer diagram | initial temperature of acid / °C | thermometer diagram | maximum temperature reached / °C | temperature rise / °C |
|------------|---------------------|----------------------------------|---------------------|----------------------------------|-----------------------|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |

[3]

- (b)** The gas produced in experiment 3 was tested with a lighted splint and the result recorded below.

test ...lighted splint.....

result ...popped.....

Name the gas given off in experiment 3.

..... [1]

(c) *Experiment 4*

A measuring cylinder was used to pour 10 cm³ of copper(II) sulfate solution into a boiling tube. The temperature of the solution was measured.


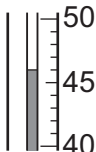
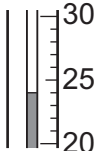
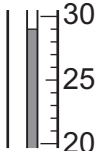
1 g of magnesium was added to the boiling tube and the mixture stirred with a thermometer. The maximum temperature reached by the mixture was measured.

Experiment 5

Experiment 4 was repeated using 1 g of iron instead of magnesium. The observation was recorded below.

.....The solution turned colourless and a brown deposit formed.....

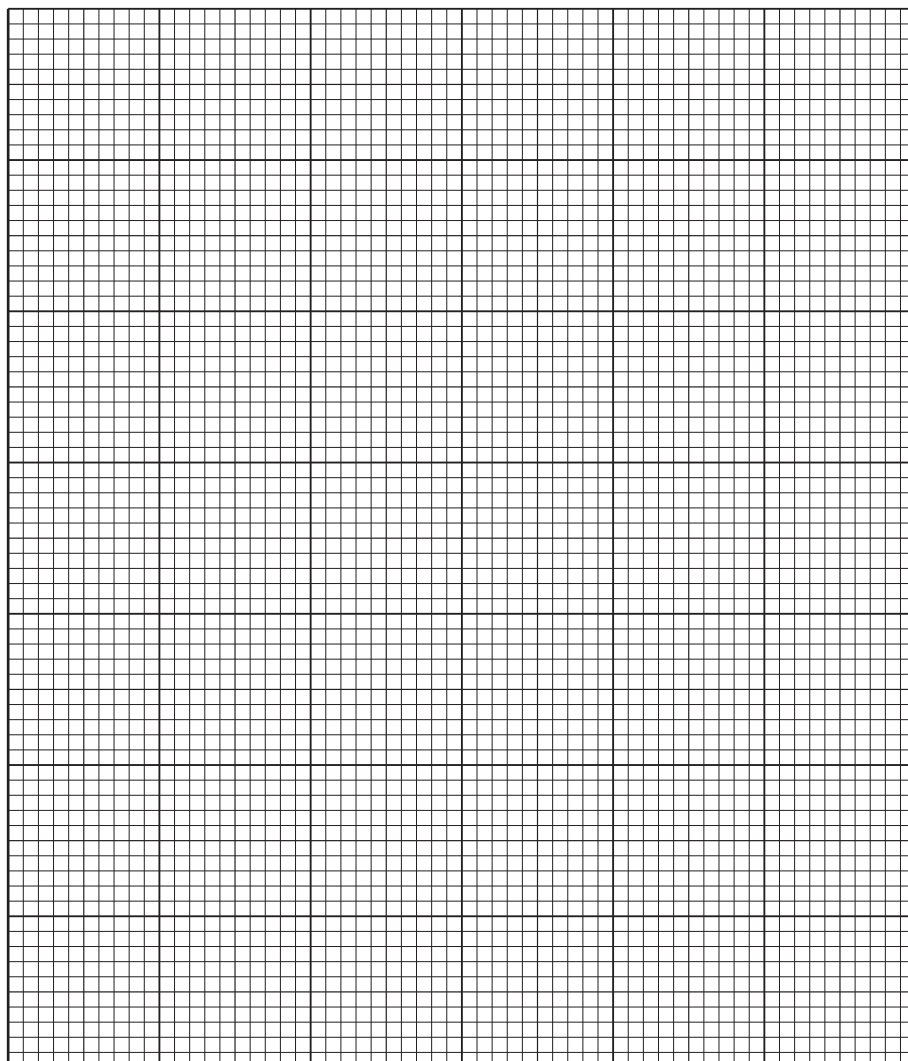
Use the thermometer diagrams to record the results in the table. Complete the final column in the table.

| experiment | thermometer diagram | initial temperature of acid / °C | thermometer diagram | maximum temperature reached / °C | temperature rise / °C |
|------------|---|----------------------------------|---|----------------------------------|-----------------------|
| 4 |  | |  | | |
| 5 |  | |  | | |

[2]

(d) Draw a labelled bar chart for the results of experiments 1, 2, 3, 4 and 5 on the grid below.

temperature
rise / °C



[3]

(e) Use the results for experiments 1, 2 and 3 to answer the following questions.

(i) Which experiment, 1, 2 or 3, produced the largest temperature rise?

..... [1]

(ii) Suggest why this experiment produced the largest temperature rise.

.....
..... [1]

(f) Explain the observations in experiment 5.

.....

.....

..... [2]

(g) Suggest why potassium was **not** used as one of the metals in these experiments.

..... [1]

(h) Give **one** advantage of using a measuring cylinder to add the hydrochloric acid to the boiling tube.

..... [1]

(i) Suggest and explain **one** improvement to increase the accuracy of these experiments.

.....

.....

..... [2]

[Total: 17]

| Question | Answer | Mark |
|------------|--|-----------|
| 2 (a) | initial temperature boxes completed correctly: 22, 21, 24; | 1 |
| | maximum temperature boxes completed correctly: 25, 23, 61; | 1 |
| | temperature differences completed correctly: 3, 2, 37; | 1 |
| 2 (b) | hydrogen | 1 |
| 2 (c) | all temperature boxes completed correctly: 21, 46 and 24, 29; | 1 |
| | differences completed correctly: 25, 5; | 1 |
| 2 (d) | y-axis scale linear and highest temperature change over half way up y-axis | 1 |
| | all 5 bars at the correct height; | 1 |
| | bars clearly labelled; | 1 |
| 2 (e) (i) | experiment <u>3</u> | 1 |
| 2 (e) (ii) | magnesium is the most reactive metal | 1 |
| 2 (f) | copper formed | 1 |
| | iron is more reactive/displacement reaction | 1 |
| 2 (g) | potassium is too reactive/dangerous | 1 |
| 2 (h) | quick/easy to use | 1 |
| 2 (i) | insulate / lag tube / use a lid; | 1 |
| | to reduce heat losses; | 1 |
| | OR | |
| | use a pipette / burette; | 1 |
| | instead of measuring cylinder / more accurate; | 1 |
| | | Total: 19 |