

# Metals

## Question Paper 2

<b>Level</b>	IGCSE
<b>Subject</b>	Chemistry
<b>Exam Board</b>	CIE
<b>Topic</b>	Metals
<b>Sub-Topic</b>	
<b>Paper Type</b>	Alternative to Practical
<b>Booklet</b>	Question Paper 2

**Time Allowed:** 53 minutes

**Score:** /44

**Percentage:** /100

- 1 A student investigated the temperature change produced when equal lengths of magnesium ribbon reacted with excess dilute sulfuric acid of different concentrations (labelled solutions **A**, **B**, **C**, **D** and **E**).

Five experiments were carried out.

### *Experiment 1*

Using a measuring cylinder, 20 cm<sup>3</sup> of sulfuric acid solution **A** was poured into a beaker. The initial temperature of the solution was measured. A length of magnesium ribbon was added to the solution and stirred. The highest temperature reached was measured.

### *Experiment 2*

Experiment 1 was repeated using solution **B** instead of solution **A**. The initial and highest temperatures were measured as before.

### *Experiment 3*

Experiment 1 was repeated using solution **C**. The initial and highest temperatures were measured.

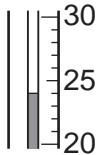
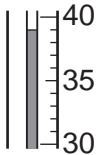
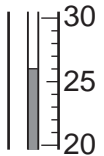
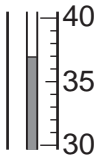
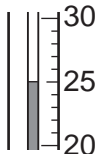
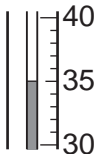
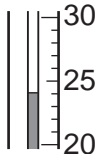
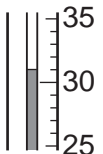
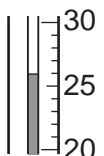
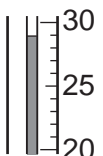
### *Experiment 4*

Experiment 1 was repeated using solution **D**. The initial and highest temperatures were measured.

### *Experiment 5*

Experiment 1 was repeated using solution **E**. The initial and highest temperatures were measured.

Use the thermometer diagrams in the table on page 6, to record the initial and highest temperatures in each experiment.

solution of sulfuric acid	thermometer diagram	initial temperature /°C	thermometer diagram	highest temperature /°C	change in temperature /°C
<b>A</b>					
<b>B</b>					
<b>C</b>					
<b>D</b>					
<b>E</b>					

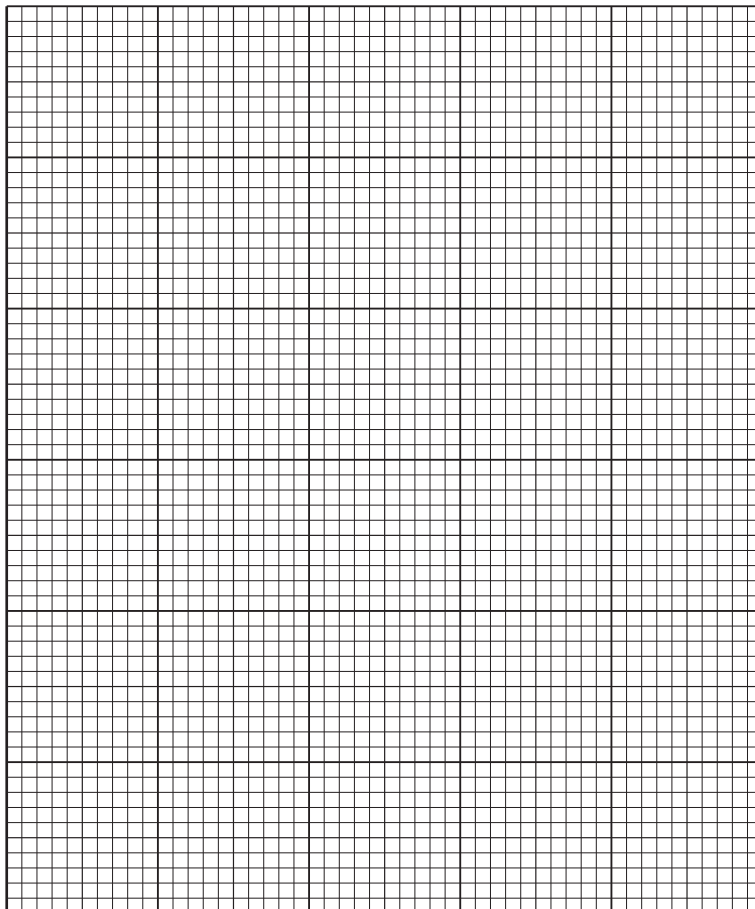
[4]

(a) Work out the temperature change for each experiment and record the values in the table.

[1]

- (b) Draw a labelled bar chart of the results for Experiments 1, 2, 3, 4 and 5 on the grid below. [4]

change in temperature / °C



Use the results and observations to answer the following questions.

- (c) What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid? [1]
- .....

- (d) (i) Which Experiment produced the largest temperature change? [1]
- .....

- (ii) Suggest why this Experiment produced the largest temperature change. [1]
- .....
- .....

(e) Predict the effect on the temperature changes that would happen if

(i) equal masses of magnesium powder were used in the Experiments.

..... [1]

(ii) 40 cm<sup>3</sup> of dilute sulfuric acid was used in Experiment 1.

..... [1]

(iii) Explain your answer to (e)(ii).

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

(f) Give **one** possible source of experimental error in this investigation.

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

[Total: 16]

- 2 A student investigated the reaction between potassium manganate(VII) and a metallic salt solution.

Two experiments were carried out.

*Experiment 1*

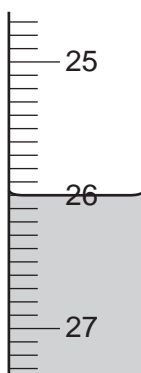
- (a) About 1 cm<sup>3</sup> of aqueous sodium hydroxide was added to a little of the salt solution **A** and the observation noted.

**observation**

*green precipitate formed*

- (b) A burette was filled with potassium manganate(VII) solution up to the 0.0 cm<sup>3</sup> mark. By using a measuring cylinder, 25 cm<sup>3</sup> of solution **A** of the salt was placed into a conical flask. The flask was shaken to mix the contents. The potassium manganate(VII) solution was added to the flask, and shaken to mix thoroughly. Addition of potassium manganate(VII) solution was continued until there was a pale pink colour in the contents of the flask.

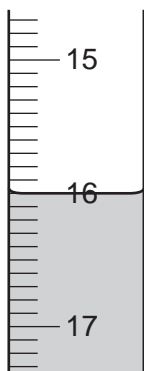
Use the burette diagram to record the volume in the table and complete the column.



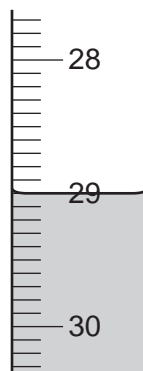
final reading

*Experiment 2*

- (c) Experiment 1(b) was repeated using a different solution **B** of the salt, instead of solution **A**. Use the burette diagrams to record the volumes in the table and complete the table.



initial reading



final reading

- (d) About 1 cm<sup>3</sup> of aqueous sodium hydroxide was added to a little of the solution in the flask and the observation noted.

**observation**

*red-brown precipitate*

Table of results

Burette readings / cm<sup>3</sup>

	Experiment 1	Experiment 2
final reading		
initial reading		
difference		

[4]

- (e) (i) In which Experiment was the greatest volume of potassium manganate(VII) solution used?

..... [1]

- (ii) Compare the volumes of potassium manganate(VII) solution used in Experiments 1 and 2.

.....  
 ..... [2]

- (iii) Suggest an explanation for the difference in the volumes.

.....  
 ..... [2]

- (f) Predict the volume of potassium manganate(VII) solution which would be needed to react completely with 50 cm<sup>3</sup> of solution B.

.....  
 ..... [2]

**(g)** Explain one change that could be made to the experimental method to obtain more accurate results.

change .....

explanation ..... [2]

**(h)** What conclusion can you draw about the salt solution from

**(i)** experiment **1(a)**,

..... [1]

**(ii)** experiment **2(d)**?

..... [1]

[Total: 15]



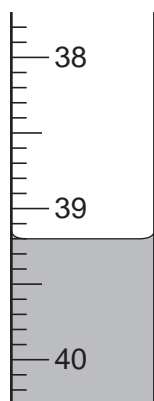
- 3 A student investigated the reaction between sodium thiosulphate and potassium iodate.

Two experiments were carried out.

*Experiment 1*

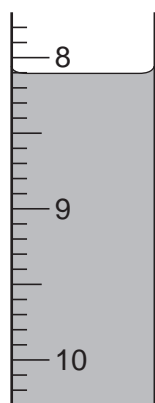
A burette was filled up to the 0.0 cm<sup>3</sup> mark with sodium thiosulphate solution. By using a measuring cylinder, 20 cm<sup>3</sup> of solution **A** of potassium iodate was placed into a conical flask. Dilute sulphuric acid and potassium iodide were also added to the flask. The flask was shaken to mix the contents and produce a red solution of iodine.

The sodium thiosulphate solution was added to the flask. When the contents of the flask were yellow, 1 cm<sup>3</sup> of starch solution was added to the flask. Addition of sodium thiosulphate to the flask was continued until the solution turned colourless. Use the burette diagram to record the final volume in the table and complete the column in the table of results on page 6.

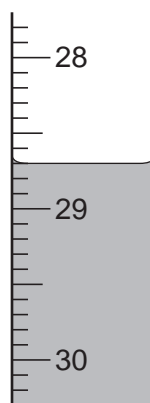


*Experiment 2*

Experiment 1 was repeated using a different solution of potassium iodate, solution **B**. Use the burette diagrams to record the volumes and complete the table on page 6.



initial



final

Table of results

Burette readings / cm <sup>3</sup>		
	Experiment 1	Experiment 2
final reading		
initial reading	0.0	8.1
difference		

[4]

(a) Suggest why the starch was used.

..... [1]

(b) (i) In which experiment was the greatest volume of sodium thiosulphate solution used?

..... [1]

(ii) Compare the volumes of sodium thiosulphate solution used in Experiments 1 and 2.

..... [1]

(iii) Suggest an explanation for the difference in the volumes.

.....  
 ..... [2]

(c) Predict the volume of sodium thiosulphate solution which would be needed to react completely with 10 cm<sup>3</sup> of solution B.

.....  
 ..... [2]

(d) Explain one change that could be made to the experimental **method** to obtain more accurate results, without changing the apparatus.

change .....

explanation ..... [2]

[Total: 13]