

Centre Number

Candidate Number

Name

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education**CHEMISTRY****0620/06**

Paper 6 Alternative to Practical

October/November 2006

**1 hour**Candidates answer on the Question Paper.  
No additional materials required.**READ THESE INSTRUCTIONS FIRST**

Write your name, Centre number and candidate number at the top of this page.  
Write in dark blue or black pen in the spaces provided on the Question Paper.  
You may use a pencil for any diagrams, graphs or rough working.  
Do not use staples, paper clips, highlighters, glue or correction fluid.

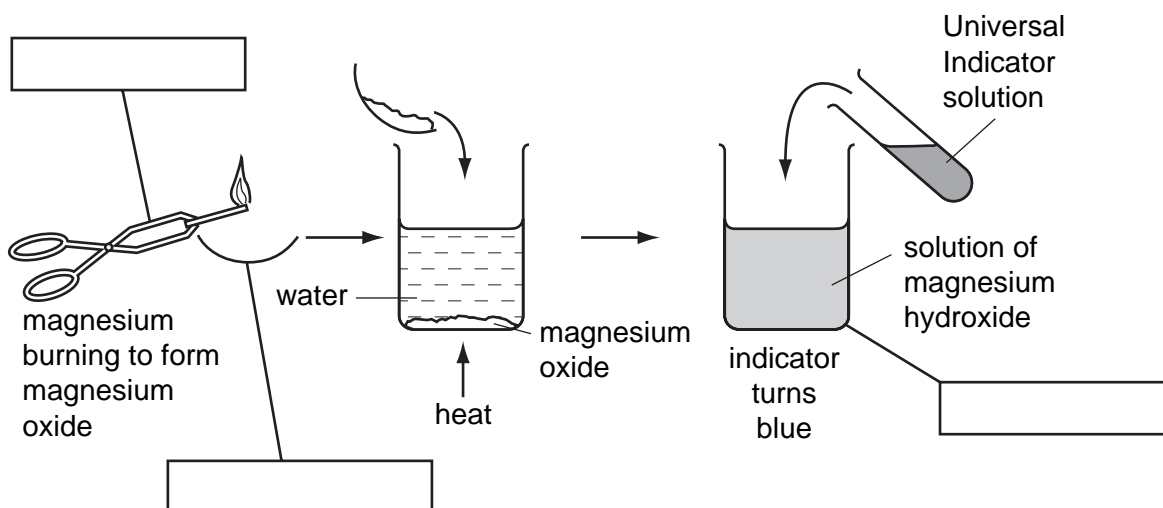
Answer **all** questions.

The number of marks is given in brackets [ ] at the end of each question or part question.

| For Examiners Use |  |
|-------------------|--|
| 1                 |  |
| 2                 |  |
| 3                 |  |
| 4                 |  |
| 5                 |  |
| 6                 |  |
| <b>Total</b>      |  |

This document consists of **13** printed pages and **3** blank pages.

- 1 The diagram shows the formation of a solution of magnesium hydroxide from magnesium.



- (a) Complete the empty boxes to name the pieces of apparatus. [3]

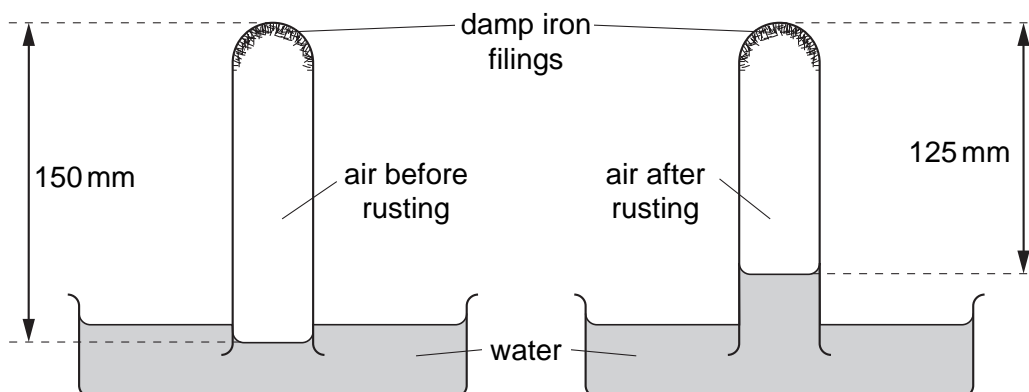
- (b) What type of chemical reaction is the burning of magnesium? [1]

.....

- (c) Suggest a pH for the solution of magnesium hydroxide. [1]

.....

- 2 The diagram shows the rusting of a sample of iron filings.



- (a) What colour are the rusty filings? [1]

.....

- (b) Why does the water rise up the tube after rusting? [1]

.....

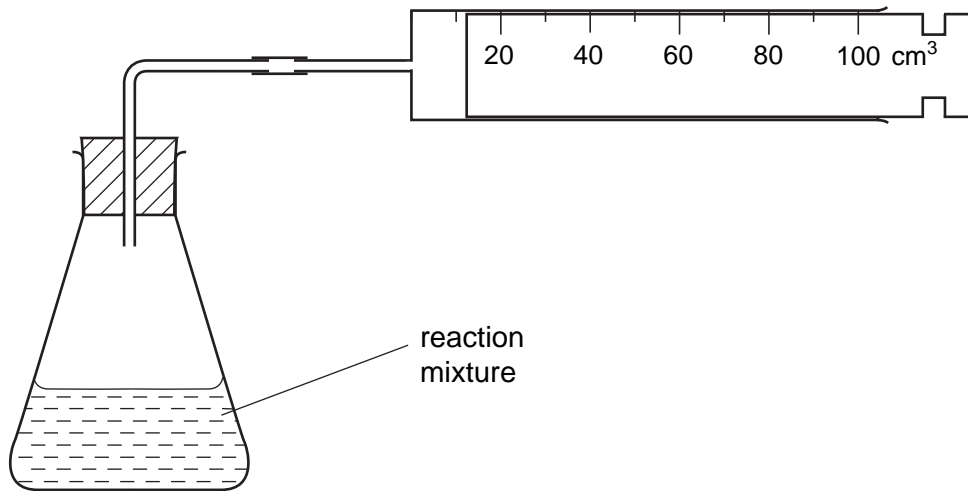
(c) Calculate the percentage of air used in the rusting of the iron.

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

(d) How would the results differ if pure oxygen was in the tube instead of air before rusting?

..... [1]

- 3 An investigation into the reaction of calcium with water was carried out using the apparatus below. The temperature of the water increased during the experiment.

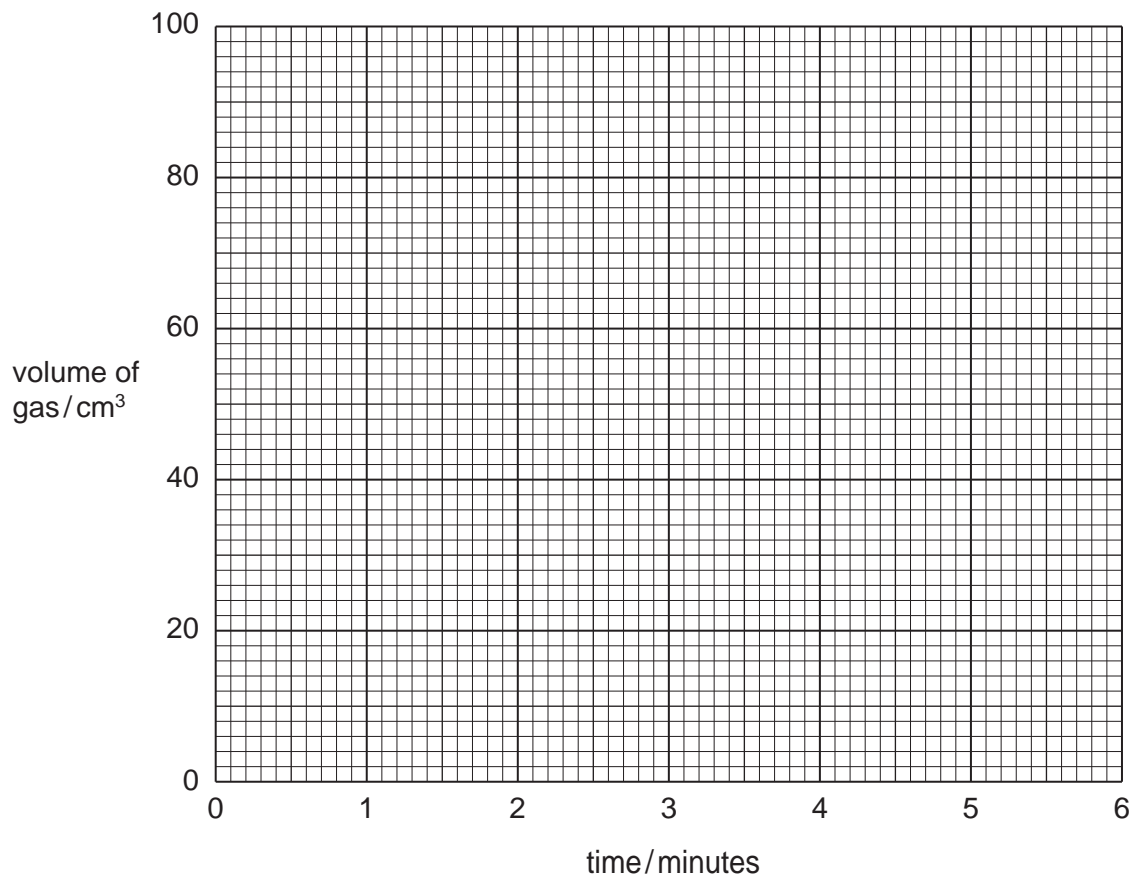


The volume of hydrogen collected at one minute intervals was measured. Use the diagrams to record the volumes in the table.

| time / minutes | syringe diagram | volume of gas / cm <sup>3</sup> |
|----------------|-----------------|---------------------------------|
| 0              |                 |                                 |
| 1              |                 |                                 |
| 2              |                 |                                 |
| 3              |                 |                                 |
| 4              |                 |                                 |
| 5              |                 |                                 |
| 6              |                 |                                 |

[2]

- (a) Plot the results on the grid. Join **all** of the results with a smooth curve.



[3]

- (b) What type of chemical reaction occurs when calcium reacts with cold water?

..... [1]

- (c) (i) Use the graph to describe how the speed of this reaction changes during the six minutes.

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

- (ii) Explain possible reasons for the changes in (c)(i).

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

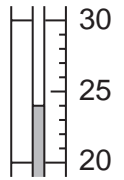
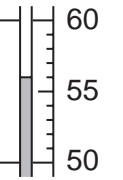
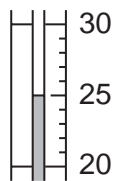
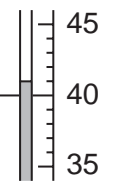
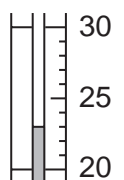
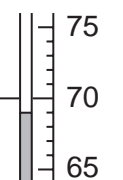
- 4 An investigation was carried out into the reactions of aqueous copper(II) sulphate with magnesium, iron and zinc.

### Experiment 1

By using a measuring cylinder, 5 cm<sup>3</sup> of aqueous copper(II) sulphate was added to each of three test-tubes. The initial temperature of the solution was measured. Zinc powder was added to the first test-tube, iron powder to the second tube and magnesium powder to the third tube. The mixtures were stirred with the thermometer. All the observations were recorded and the maximum temperature reached measured.

- (a) Use the thermometer diagrams to complete the results table.

### Table of results

| metal added | temperature of solution/°C   |  | temperature difference/°C | observations  |
|-------------|--|--|---------------------------|---|
|             | initial  | maximum  |                           |   |
| zinc        |  25   |  55   |                           | moderate effervescence, solution paler, brown solid.        |
| iron        |  25 |  40 |                           | little effervescence, brown solid.                          |
| magnesium   |  25 |  70 |                           | rapid effervescence, pops with lighted splint, brown solid. |

[4]

- (b) Use your results and observations to answer the following questions.

- (i) Which metal is most reactive with aqueous copper(II) sulphate?

..... [1]

- (ii) Give two reasons why you chose this metal.

1 .....

2 ..... [2]

- (iii) Identify the gas given off when magnesium reacts with aqueous copper(II) sulphate.

..... [1]

- (c) The reactions of magnesium and zinc with aqueous copper(II) sulphate were investigated in more detail.

Experiment 2

By using a measuring cylinder  $10\text{ cm}^3$  of aqueous copper(II) sulphate was poured into a polystyrene cup. The initial temperature of the solution was measured.

A 1 g sample of magnesium powder was added to the cup and the temperature measured every 10 seconds for 1 minute.

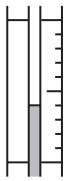
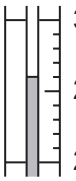
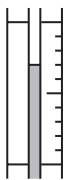
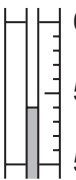
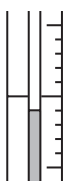
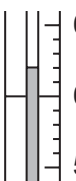
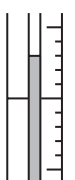
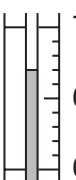
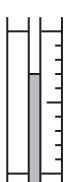

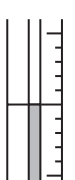
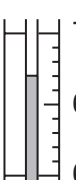

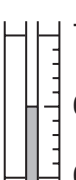
Use the thermometer diagrams on **page 8** to complete the results table.

Experiment 3

Experiment 2 was repeated using zinc powder instead of magnesium.

Use the thermometer diagrams on **page 8** to complete the results table.

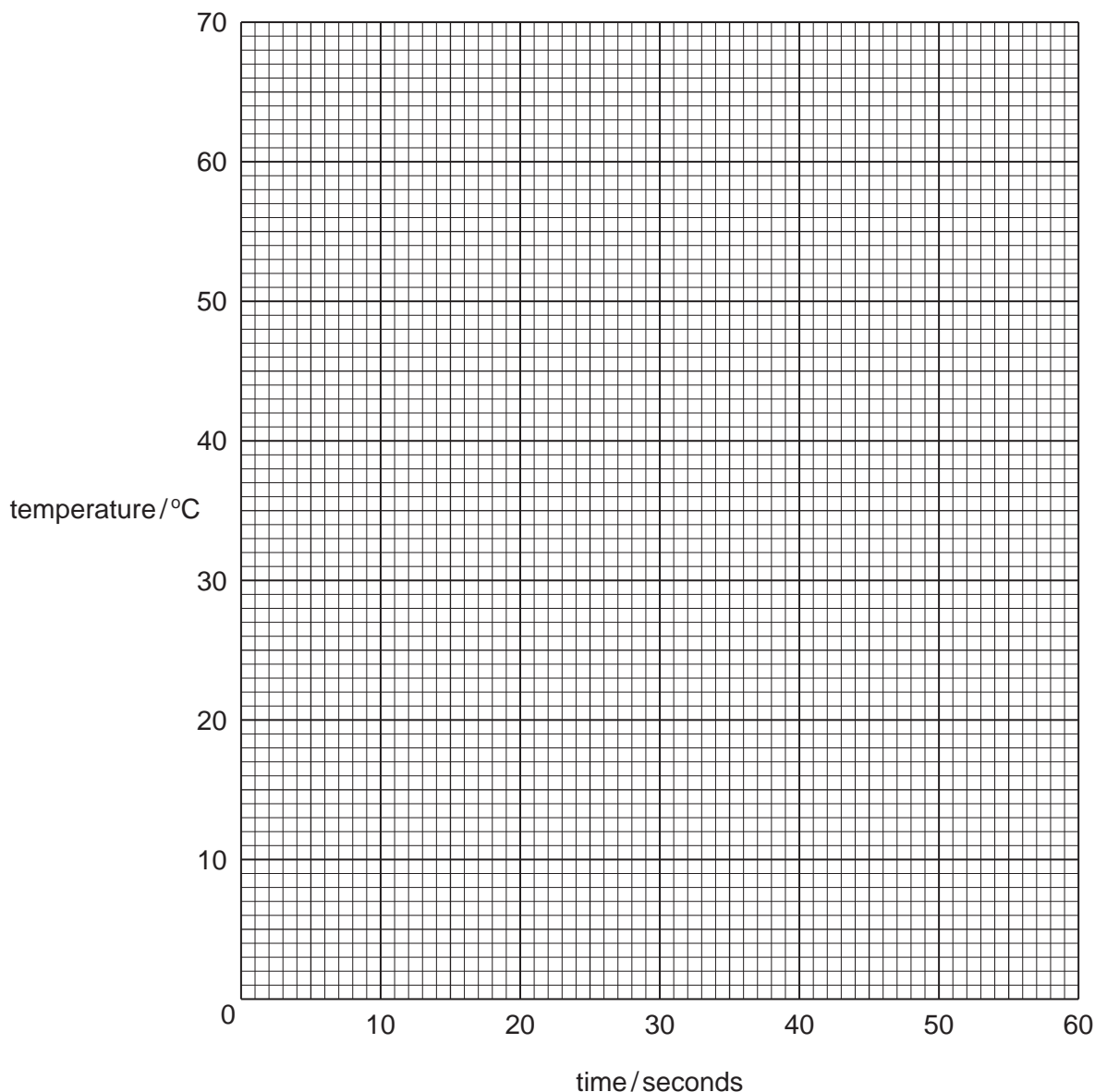
Table of results

| time / seconds | temperature / °C  |       |   |       |
|----------------|---|-------|---|-------|
|                | Experiment 2  |       | Experiment 3  |       |
| 0              |    | ..... |    | ..... |
| 10             |    | ..... |    | ..... |
| 20             |    | ..... |    | ..... |
| 30             |  | ..... |  | ..... |
| 40             |  | ..... |  | ..... |
| 50             |  | ..... |  | ..... |
| 60             |  | ..... |  | ..... |

[6]



- (d) Plot the results of both Experiments on the grid below. Draw two smooth line graphs. Clearly label the graphs.



[4]

- (e) Use your graph to estimate the temperature of the reaction mixture in Experiment 2 after 5 seconds. Indicate **clearly** on the graph how you obtained your answer.

..... [2]

- (f) Sketch lines on the grid to show the predicted results if Experiment 2 were repeated using:

(i) larger pieces of magnesium;

(ii) iron powder.

Clearly label the lines.

[2]

(g) Why is a polystyrene cup used instead of a glass container?

..... [1]

(h) Suggest one improvement to the method in Experiment 2.

..... [1]

- 5 Two solids, **F** and **G**, were analysed. Solid **F** was an ammonium salt and solid **G** was a potassium salt.

The tests on **F** and **G** and some of the observations are in the following table.

Complete the observations in the table.

| tests   | observations   |
|---|--|
| Solid <b>F</b> was added to distilled water and shaken to dissolve. The solution was divided into 4 equal portions in test-tubes.   |  |
| <p><b>(a) (i)</b> The pH of the first portion of the solution was tested using Universal Indicator solution.</p> <p><b>(ii)</b> Aqueous sodium hydroxide was added to the second portion and heated gently. The gas given off was tested with damp litmus paper.</p> <p><b>(iii)</b> To the third portion of solution, was added dilute nitric acid and then aqueous lead(II) nitrate.</p> <p><b>(iv)</b> To the fourth portion of solution, was added dilute nitric acid followed by aqueous silver nitrate.</p> | <p style="text-align: center;">colour      orange</p> <p style="text-align: center;">pH          5</p> <p>.....</p> <p>..... [2]</p> <p style="text-align: center;">white precipitate</p> <p style="text-align: center;">white precipitate</p> |
| <p><b>(b) (i)</b> Solid <b>G</b> was dissolved in distilled water. The solution was divided into two test-tubes.</p> <p><b>(ii) (a)(iii)</b> was repeated using the first portion of the solution.</p> <p><b>(iii) (a)(iv)</b> was repeated using the second portion of the solution.</p>   | <p style="text-align: center;">bright yellow precipitate</p> <p style="text-align: center;">pale yellow precipitate</p>  |

(c) What conclusion can be drawn from test (a)(i)?

..... [2]

(d) Name the gas given off in (a)(ii).

..... [1]

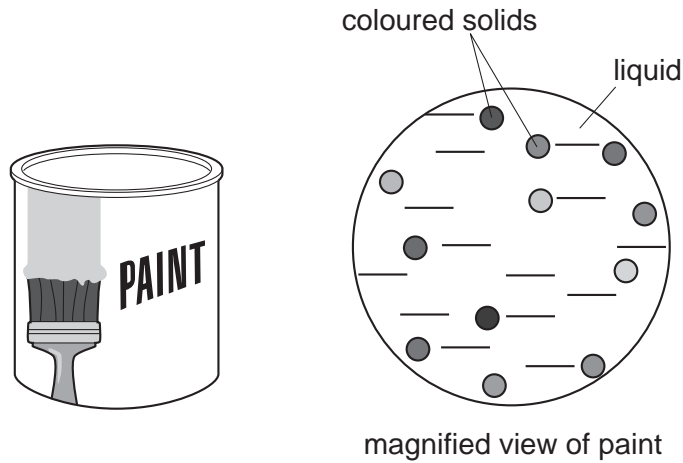
(e) Identify solid F.

..... [1]

(f) Identify solid G.

..... [1]

6 You are provided with a pot of paint as shown below.



The paint is a mixture of a liquid and a solid.  
The liquid can be dissolved in water. The solids are insoluble in water but soluble in organic solvents.

(a) How can a sample of the solid be separated from the rest of the paint?

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

(b) How would you determine the number of coloured substances contained in the solid you separated in (a)?

.....  
 .....  
 .....  
 ..... [4]

(c) The label on the paint tin states

"Touch-dry in three hours"

(i) How could you check this value?

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

(ii) Suggest how you could speed up this drying process.

..... [1]





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