UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

**CHEMISTRY**

Paper 5 Practical Test

**0620/05**

October/November 2006

Candidates answer on the Question Paper.
Additional Materials: As listed in Instructions to Supervisors

**1 hour 15 minutes**

Candidate Name

Centre Number

Candidate Number

**READ THESE INSTRUCTIONS FIRST**

Write your name, Centre number and candidate number on all the work you hand in.

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.

DO **NOT** WRITE IN THE BARCODE.

DO **NOT** WRITE IN THE GREY AREAS BETWEEN THE PAGES.

Answer **all** questions.

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

Practical notes are provided on page 8.

| FOR EXAMINER'S USE | |
|---|---|
| 1 | |
| 2 | |
| Total | |

This document consists of **7** printed pages and **1** blank page.

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*For Examiner's Use*

**1** You are going to investigate the reactions of three different metals.
Magnesium, iron and zinc will be used.
Read all the **instructions** below carefully before starting the experiments.

**Instructions**

Experiment 1

By using a measuring cylinder, pour 5 $cm^3$ of the aqueous copper(II) sulphate into the test-tube provided. Measure the initial temperature of the solution and record it in the table below. Add the 1 g sample of zinc powder to the solution in the test-tube and stir the mixture with the thermometer. Record the maximum temperature reached and any observations in the table.
Remove the thermometer and rinse with water.

Experiment 2

Repeat Experiment 1, using 1 g of iron filings instead of zinc. Record the maximum temperature reached and any observations in the table.

Experiment 3

Repeat Experiment 1, using the 0.5 g sample of magnesium. Test the gas given off with a lighted splint.

Table of results

| experiment | metal | temperature of solution/°C | | observations |
|---|---|---|---|---|
| | | initial | maximum | |
| 1 | zinc | | | |
| 2 | iron | | | |
| 3 | magnesium | | | |

[9]

*For Examiner's Use*

**(a)** 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)** Name the gas given off in Experiment 3.

..... [1]

You are now going to investigate the reaction between two of the metals and aqueous copper(II) sulphate in more detail.

Experiment 4

Rinse the thermometer with water at room temperature. By using a measuring cylinder pour 10 $cm^3$ of aqueous copper(II) sulphate into a polystyrene cup. Measure the initial temperature of the solution and record it in the table below.
Add the 1 g sample of magnesium powder to the cup and record the temperature every 10 seconds for 1 minute. Record all of your results in the table.

Experiment 5

Repeat Experiment 4 using the 2 g sample of zinc powder instead of magnesium.

Record all of your results in the table.

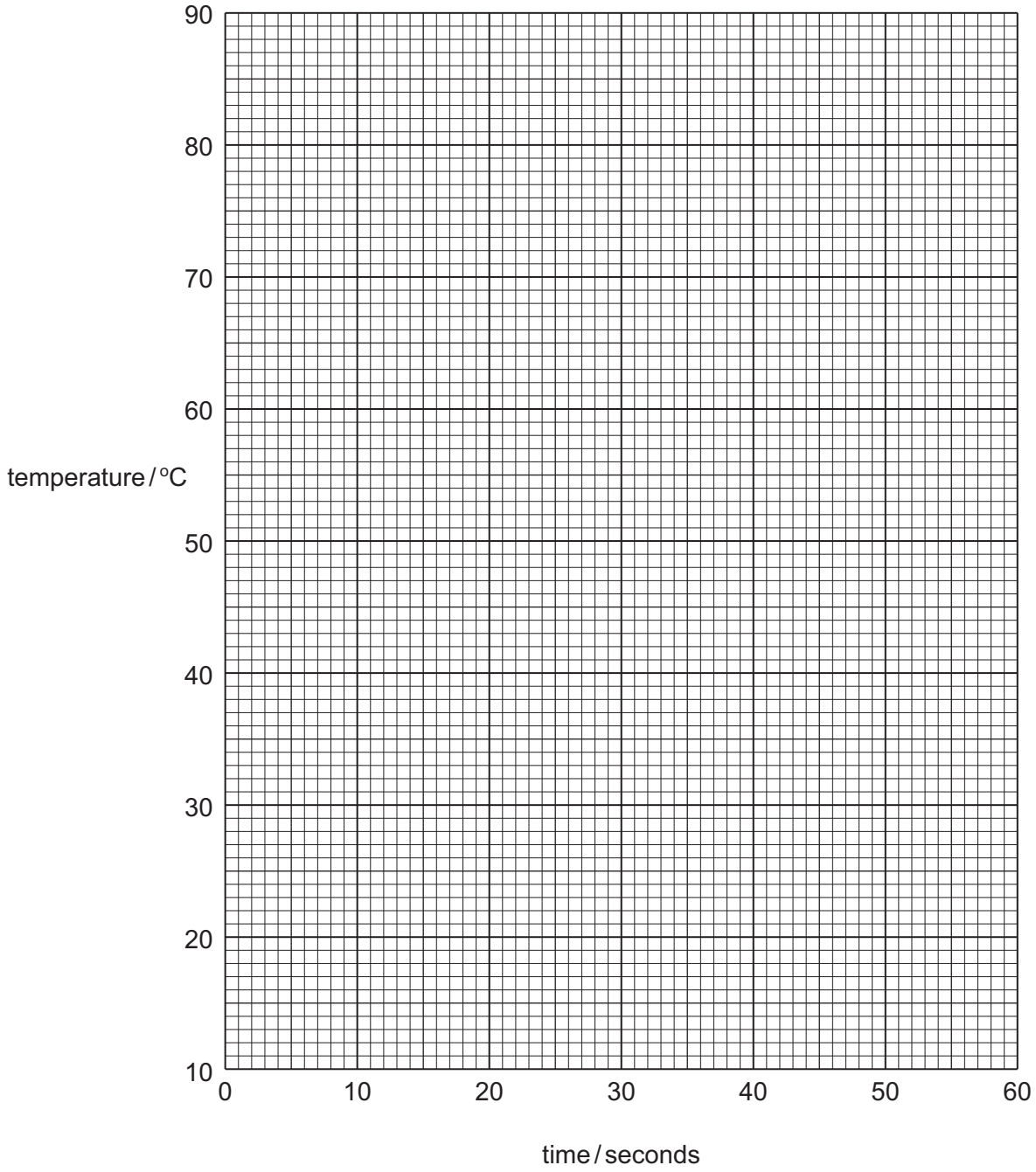
Table of results

| time/seconds | temperature/°C | |
|---|---|---|
| | Experiment 4 | Experiment 5 |
| 0 | | |
| 10 | | |
| 20 | | |
| 30 | | |
| 40 | | |
| 50 | | |
| 60 | | |

[3]

**(b)** Plot the results of Experiments 4 and 5 on the grid below. Draw two smooth line graphs. Clearly label the graphs.

*For Examiner's Use*




[4]

**(c)** **Use your graph** to estimate the temperature of the reaction mixture in Experiment 4 after 5 seconds. Indicate **clearly** on the graph how you obtained your answer.

.....

[2]

*For Examiner's Use*

**2** You are provided with solid **F** and solid **G**.

Carry out the following tests on **F** and **G**, recording all of your observations in the table.

Conclusions must not be written in the table.

| tests | observations |
|---|---|
| **(a)** Place a little of solid **F** in a hard glass test-tube. Insert a damp piece of pH paper in the mouth of the tube. Heat the solid gently, then more strongly. | ..... ..... .....[3] |
| **(b)** Place the rest of solid **F** in a boiling-tube. Add 10 $cm^3$ of distilled water and shake to dissolve. Divide the solution into 4 equal portions in test-tubes. | |
| **(c) (i)** Test the pH of the first portion of the solution using Universal Indicator solution. | colour ..... pH .....[2] |
| **(ii)** To the second portion, add about 1 $cm^3$ of aqueous sodium hydroxide. Heat **gently** and test the gas given off with damp litmus paper. | ..... .....[2] |
| **(c) (iii)** To the third portion of solution, add a few drops of dilute nitric acid and then aqueous lead(II) nitrate. | ..... .....[2] |

| tests | observations |
|---|---|
| **(c) (iv)** To the fourth portion of solution, add a few drops of dilute nitric acid followed by aqueous silver nitrate. | .....<br>.....<br>.....[1] |
| **(d) (i)** Dissolve solid **G** in about 5 $cm^3$ of distilled water in a test-tube. Divide the solution into two equal portions in two test-tubes.<br><br>**(ii)** Repeat **(c)(iii)** using the first portion of the solution.<br><br>**(iii)** Repeat **(c)(iv)** using the second portion of the solution. | .....<br>.....[2]<br><br>.....<br>.....[2] |

*For Examiner's Use*

**(e)** Name the gas given off in **(c)(ii)**.

..... [1]

**(f)** Identify solid **F**.

..... [2]

**(g)** Name the anion in solid **G**.

..... [1]

## NOTES FOR USE IN QUALITATIVE ANALYSIS

### Test for anions

| *anion* | *test* | *test result* |
|---|---|---|
| carbonate ($CO_3^{2-}$) | add dilute acid | effervescence, carbon dioxide produced |
| chloride ($Cl^-$) [in solution] | acidify with dilute nitric acid, then add aqueous silver nitrate | white ppt. |
| iodide ($I^-$) [in solution] | acidify with dilute nitric acid, then aqueous lead(II) nitrate | yellow ppt. |
| nitrate ($NO_3^-$) [in solution] | add aqueous sodium hydroxide then aluminium foil; warm carefully | ammonia produced |
| sulphate ($SO_4^{2-}$) [in solution] | acidify with dilute nitric acid, then add aqueous barium nitrate | white ppt. |

### Test for aqueous cations

| *cation* | *effect of aqueous sodium hydroxide* | *effect of aqueous ammonia* |
|---|---|---|
| aluminium ($Al^{3+}$) | white ppt., soluble in excess giving a colourless solution | white ppt., insoluble in excess |
| ammonium ($NH_4^+$) | ammonia produced on warming | - |
| calcium ($Ca^{2+}$) | white., insoluble in excess | no ppt., or very slight white ppt. |
| copper($Cu^{2+}$) | light blue ppt., insoluble in excess | light blue ppt., soluble in excess giving a dark blue solution |
| iron(II) ($Fe^{2+}$) | green ppt., insoluble in excess | green ppt., insoluble in excess |
| iron(III) ($Fe^{3+}$) | red-brown ppt., insoluble in excess | red-brown ppt., insoluble in excess |
| zinc ($Zn^{2+}$) | white ppt., soluble in excess giving a colourless solution | white ppt., soluble in excess giving a colourless solution |

### Test for gases

| *gas* | *test and test results* |
|---|---|
| ammonia ($NH_3$) | turns damp red litmus paper blue |
| carbon dioxide ($CO_2$) | turns limewater milky |
| chlorine ($Cl_2$) | bleaches damp litmus paper |
| hydrogen ($H_2$) | “pops” with a lighted splint |
| oxygen ($O_2$) | relights a glowing splint |