Cambridge IGCSE

**Cambridge International Examinations**
Cambridge International General Certificate of Secondary Education

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|---|---|
| CANDIDATE NAME | |
| CENTRE NUMBER | |
| CANDIDATE NUMBER | |

*6748383641*

**CHEMISTRY** **0620/53**

Paper 5 Practical Test **October/November 2016**

**1 hour 15 minutes**

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Practical notes are provided on pages 11 and 12.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

| For Examiner's Use | |
|---|---|
| Total | |

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **9** printed pages and **3** blank pages.


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CAMBRIDGE International Examinations

**1** You are going to investigate what happens when two different metals, iron and magnesium, react with aqueous copper(II) sulfate.

**Read all the instructions carefully before starting the experiments.**

**Instructions**
You are going to carry out two experiments.

**(a)** *Experiment 1*

Use a measuring cylinder to pour 25 $cm^3$ of aqueous copper(II) sulfate into the polystyrene cup provided. Put the polystyrene cup into a 250 $cm^3$ beaker for support. Measure the initial temperature of the solution and then the temperature after 30 seconds and 60 seconds. Record your results in the table.

At 60 seconds add all of the iron to the aqueous copper(II) sulfate and stir the mixture continuously with the thermometer.

Measure the temperature of the mixture every 30 seconds for 300 seconds (5 minutes). Record your results in the table.

| time / s | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| temperature / °C | | | | | | | | | | | |

[2]

**(b)** *Experiment 2*

Empty the polystyrene cup and rinse it with water.

Use a measuring cylinder to pour 25 $cm^3$ of aqueous copper(II) sulfate into the polystyrene cup. Put the polystyrene cup into a 250 $cm^3$ beaker for support. Measure the initial temperature of the solution and then the temperature after 30 seconds and 60 seconds. Record your results in the table.

At 60 seconds add all of the magnesium to the aqueous copper(II) sulfate and stir the mixture continuously with the thermometer.

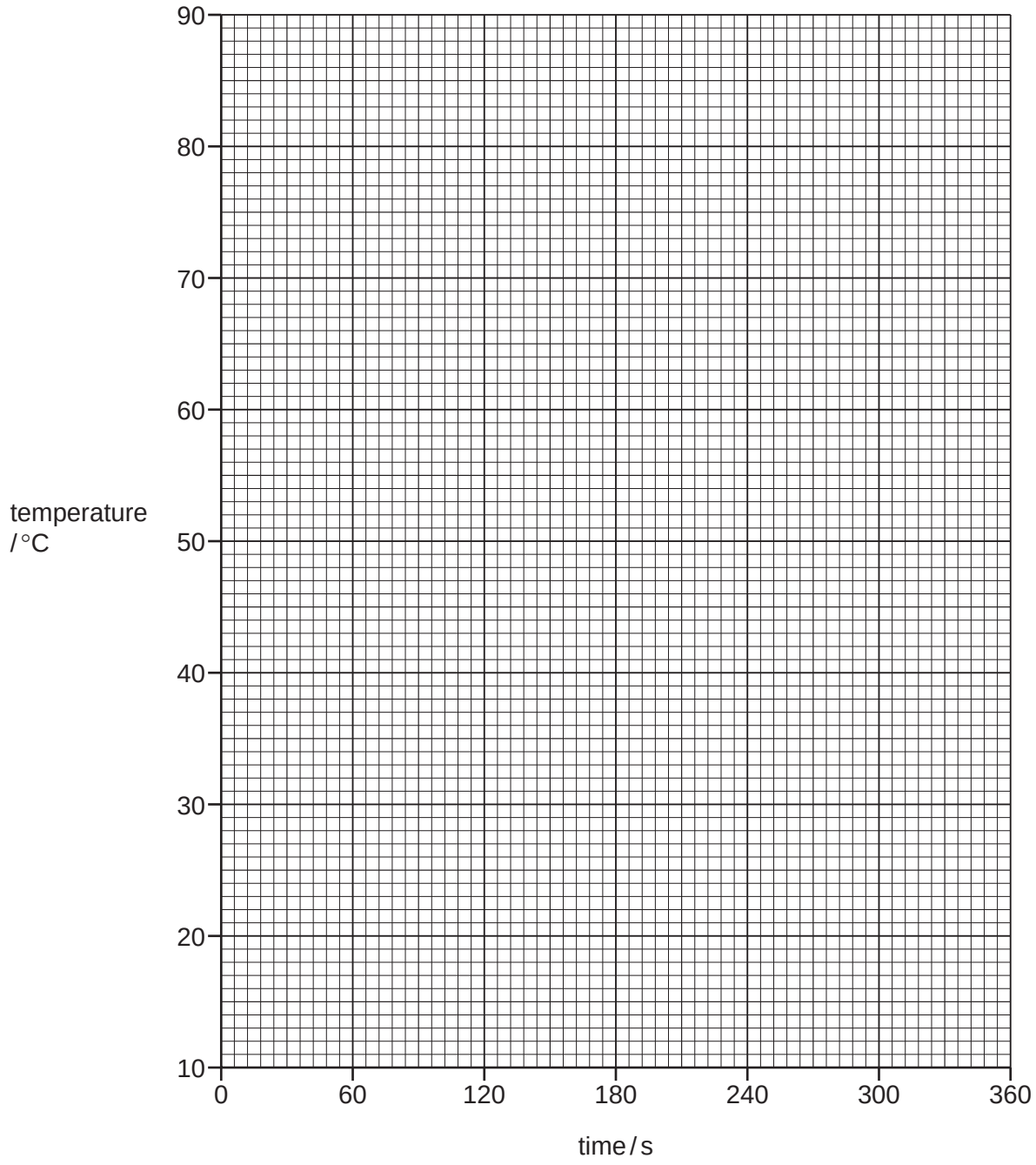
Measure the temperature of the mixture every 30 seconds for 300 seconds (5 minutes). Record your results in the table.

| time / s | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| temperature / °C | | | | | | | | | | | |

[2]

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**(c)** Plot the results for Experiments 1 and 2 on the grid and draw **two** smooth line graphs. Clearly label the graphs.




[4]

**(d) (i)** **From your graph**, deduce the temperature of the mixture in Experiment 1 after 135 seconds.
Show clearly **on the grid** how you worked out your answer.

..... °C [2]

**(ii)** **From your graph**, deduce the time taken for the temperature of the mixture in Experiment 2 to change by 30 °C **after the magnesium was added**.
Show clearly **on the grid** how you worked out your answer.

..... s [2]

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**[Turn over**

**(e)** Predict the temperature of the mixture in Experiment 2 after one hour. Explain your answer.

.....

..... [2]

**(f)** Suggest an advantage of taking the temperature readings every 15 seconds.

.....

..... [2]

**(g)** Explain why a polystyrene cup is used in the experiments and **not** a copper can.

.....

..... [2]

[Total: 18]

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**2** You are provided with two solutions, solution **Q** and solution **R**.
Carry out the following tests on solution **Q** and solution **R**, recording all of your observations at each stage.

**tests on solution Q**

**(a)** Divide solution **Q** into four equal portions in four test-tubes. Carry out the following tests.

**(i)** Use pH indicator paper to measure the pH of the first portion of solution **Q**.

pH ..... [1]

**(ii)** Add a 2 cm strip of magnesium ribbon to the second portion of solution **Q**. Test the gas given off.
Record your observations.

.....

..... [2]

**(iii)** Add a spatula measure of sodium carbonate to the third portion of solution **Q**. Test the gas given off.
Record your observations.

.....

..... [2]

**(iv)** Add a few drops of dilute nitric acid and about 1 $cm^3$ of aqueous barium nitrate to the fourth portion of solution **Q**.
Record your observations.

..... [1]

**tests on solution R**

**(b)** Divide solution **R** into four equal portions in four test-tubes. Carry out the following tests.

**(i)** Measure the pH of the first portion of solution **R**.

pH ..... [1]

**(ii)** Add several drops of aqueous sodium hydroxide to the second portion of solution **R** and shake the test-tube.
Then add excess aqueous sodium hydroxide to the test-tube.
Record your observations.

.....

..... [2]

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**[Turn over**

**(iii)** Add aqueous silver nitrate to the third portion of solution **R** and leave to stand for about 5 minutes.
Record your observations.

.....

..... [2]

**(iv)** Add a spatula measure of iron(II) sulfate crystals to the fourth portion of solution **R** and shake the mixture.
Record your observations.

..... [1]

**(c)** Identify solution **Q**.

..... [2]

**(d)** Identify solution **R**.

..... [2]

[Total: 16]

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**3** A liquid cleaner is a mixture of three substances. These substances are shown in the table.

| name of substance | properties of substance |
|---|---|
| water | liquid, boiling point 100 °C |
| sodium carbonate | solid, soluble in water |
| silica | solid, insoluble in water |

Plan experiments to obtain separate pure samples of each substance from the mixture in the liquid cleaner. You are provided with common laboratory apparatus.

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..... [6]

[Total: 6]

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**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. |
| bromide ($Br^-$) [in solution] | acidify with dilute nitric acid, then add aqueous silver nitrate | cream ppt. |
| iodide ($I^-$) [in solution] | acidify with dilute nitric acid, then add aqueous silver nitrate | yellow ppt. |
| nitrate ($NO_3^-$) [in solution] | add aqueous sodium hydroxide then aluminium foil; warm carefully | ammonia produced |
| sulfate ($SO_4^{2-}$) [in solution] | acidify, then add aqueous barium nitrate | white ppt. |
| sulfite ($SO_3^{2-}$) | add dilute hydrochloric acid, warm gently and test for the presence of sulfur dioxide | sulfur dioxide produced will turn acidified aqueous potassium manganate(VII) from purple to colourless |

**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 ppt., insoluble in excess | no ppt. or very slight white ppt. |
| chromium(III) ($Cr^{3+}$) | green ppt., soluble in excess | grey-green ppt., insoluble in excess |
| 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 |

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**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 |
| sulfur dioxide ($SO_2$) | turns acidified aqueous potassium manganate(VII) from purple to colourless |

**Flame tests for metal ions**

| metal ion | flame colour |
|---|---|
| lithium ($Li^+$) | red |
| sodium ($Na^+$) | yellow |
| potassium ($K^+$) | lilac |
| copper(II) ($Cu^{2+}$) | blue-green |

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