Cambridge Assessment International Education

# Cambridge IGCSE™

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**CHEMISTRY** **0620/52**

Paper 5 Practical Test **May/June 2020**

**1 hour 15 minutes**

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

**INSTRUCTIONS**

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

**INFORMATION**

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].
- Notes for use in qualitative analysis are provided in the question paper.

| For Examiner's Use | |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| Total | |

This document has **12** pages. Blank pages are indicated.

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**1** You are going to investigate the temperature change when magnesium ribbon reacts with dilute sulfuric acid.

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

**Instructions**
You are going to do five experiments.

*Experiment 1*
- Use a measuring cylinder to pour 20 $cm^3$ of dilute sulfuric acid into a boiling tube.
- Use a thermometer to measure the initial temperature of the acid. Record the initial temperature in the table in **(a)**.
- Place a 1 cm length of magnesium ribbon into the boiling tube.
- Continually stir the acid and magnesium ribbon in the boiling tube using a thermometer. Make sure the magnesium ribbon remains in the acid.
- Measure the **highest** temperature reached by the mixture. Record the highest temperature of the mixture in the table in **(a)**.
- Rinse out the boiling tube with distilled water.

*Experiment 2*
- Repeat Experiment 1 using a 2 cm length of magnesium ribbon instead of the 1 cm length.

*Experiment 3*
- Repeat Experiment 1 using a 3 cm length of magnesium ribbon instead of the 1 cm length.

*Experiment 4*
- Repeat Experiment 1 using a 5 cm length of magnesium ribbon instead of the 1 cm length.

*Experiment 5*
- Repeat Experiment 1 using a 6 cm length of magnesium ribbon instead of the 1 cm length.

View solution

**(a)** Complete the table.

| experiment | length of magnesium ribbon / cm | initial temperature / °C | highest temperature / °C | temperature increase / °C |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |

[4]

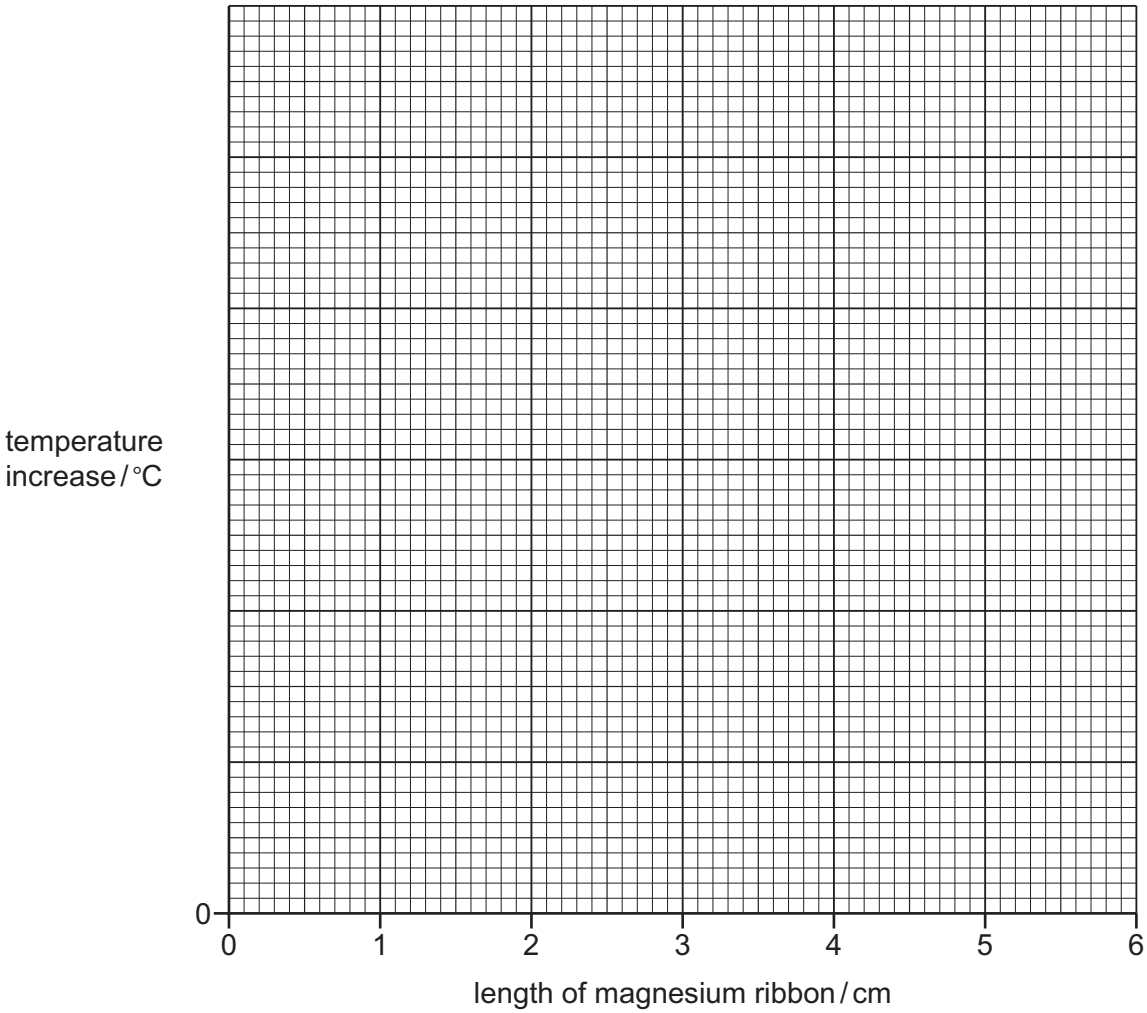
**(b)** In which experiment, 1, 2, 3, 4 or 5, was the temperature increase the largest?

View solution

..... [1]

**(c)** Add a suitable scale to the *y*-axis and plot your results from Experiments 1 to 5 on the grid. Draw a line of best fit, making sure that your line passes through (0,0).

View solution




[5]

**(d)** Explain why the graph line must pass through (0,0).

View solution

.....

..... [1]

**(e)** **From your graph**, deduce the temperature increase if Experiment 1 is repeated using a 4 cm length of magnesium ribbon.

Show clearly **on the grid** how you worked out your answer.

View solution

..... °C

[2]

**(f) (i)** Why would carrying out the experiment in a polystyrene cup rather than a boiling tube improve the accuracy of the results?

.....

..... [1]

**(ii)** Sketch **on the grid** the graph you would expect if the experiment was repeated using a polystyrene cup instead of a boiling tube. [1]

View solution

**(g)** The volume of dilute sulfuric acid could be measured with a 20 $cm^3$ pipette.

View solution

**(i)** State **one** advantage of using a pipette rather than a measuring cylinder.

.....

..... [1]

**(ii)** State **one** disadvantage of using a pipette rather than a measuring cylinder.

View solution

.....

..... [1]

[Total: 17]

**2** You are provided with two substances, solid **L** and solid **M**.
Do the following tests on solid **L** and solid **M**, recording all of your observations at each stage.

**tests on solid L**

**(a)** Describe the appearance of solid **L**.

..... [1]

Place solid **L** in a boiling tube. Add about 20 $cm^3$ of distilled water to the boiling tube. Place a stopper in the boiling tube and shake the tube to dissolve solid **L** and form solution **L**.

View solution

Divide solution **L** into five approximately equal portions in five test-tubes.

View solution

**(b)** Test the pH of the first portion of solution **L**.

pH = ..... [1]

**(c)** To the second portion of solution **L** add about 1 cm depth of dilute nitric acid followed by about 1 cm depth of aqueous silver nitrate. Leave the test-tube to stand for at least five minutes. Continue with the rest of the experiment while the test-tube is left to stand.

View solution

Record your observations after the test-tube has been left to stand.

.....

..... [1]

**(d)** To the third portion of solution **L** add approximately 5 $cm^3$ of aqueous sodium carbonate. Record your observations.

View solution

.....

.....

..... [2]

**(e)** To the fourth portion of solution **L** add aqueous sodium hydroxide slowly until it is in excess and no further changes are seen.
Record your observations.

View solution

.....

.....

..... [2]

**(f)** To the fifth portion of solution **L** add aqueous ammonia slowly until it is in excess and no further changes are seen.
Record your observations.

View solution

.....

..... [2]

**(g)** Identify solid **L**.

View solution

.....

..... [2]

**tests on solid M**

**(h)** Carry out a flame test on solid **M**.
Record your observations.

View solution

..... [1]

**(i)** Place the remaining solid **M** into a boiling tube.

View solution

Add about 10 $cm^3$ of dilute nitric acid to solid **M** in the boiling tube.
Test any gas produced.
Record your observations.

**Keep the solution formed for (j).**

.....

.....

..... [2]

**(j)** To the solution formed in **(i)** add about 1 cm depth of aqueous barium nitrate.
Record your observations.

View solution

..... [1]

**(k)** Identify solid **M**.

View solution

..... [2]

[Total: 17]

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**3** Many window-cleaning products contain aqueous ammonia. Aqueous ammonia is an alkali that reacts with dilute acids.

Plan an investigation to find which of two window-cleaning products contains the more concentrated aqueous ammonia. Include in your plan:

- the method you will use
- how your results will be used to determine which window-cleaning product contains the most concentrated aqueous ammonia.

You are provided with an aqueous solution of the two window-cleaning products, dilute hydrochloric acid of known concentration and common laboratory apparatus.

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..... [6]

View solution

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**Notes for use in qualitative analysis**
**Tests 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 |

**Tests 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(II) ($Cu^{2+}$) | 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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**Tests for gases**

| gas | test and test result |
|---|---|
| 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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