Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

3649515752

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.

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.

(a) Complete the table.

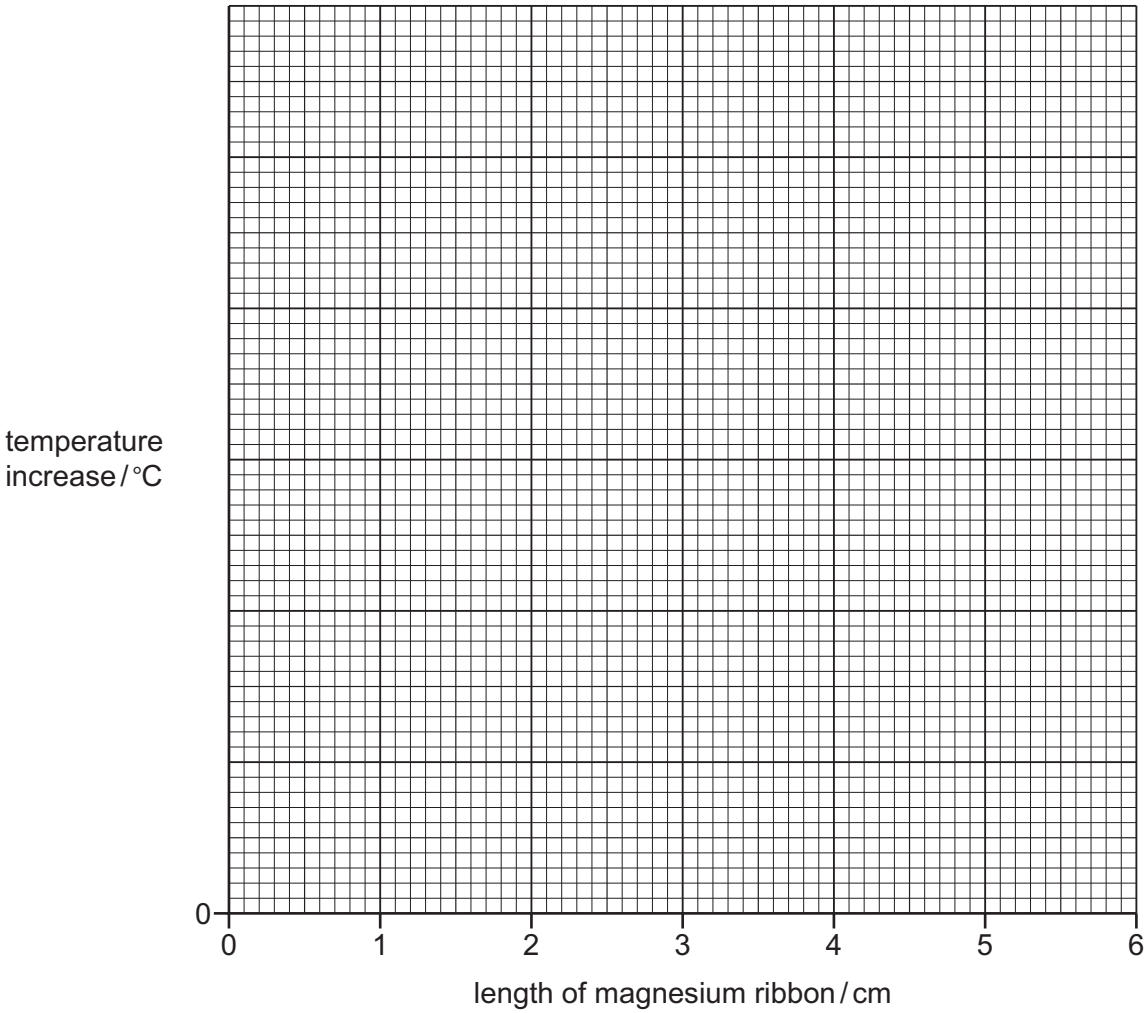
experiment	length of magnesium ribbon / cm	initial temperature / °C	highest temperature / °C	temperature increase / °C
1				
2				
3				
4				
5				

[4]

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

..... [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).



[5]

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

.....

..... [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.

..... °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]

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

(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.

.....

..... [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**.

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

(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.

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.

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..... [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.

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..... [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.

.....

..... [2]

(g) Identify solid **L**.

.....

..... [2]

tests on solid M

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

..... [1]

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

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).

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.....

..... [2]

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

..... [1]

(k) Identify solid **M**.

..... [2]

[Total: 17]

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]

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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

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