Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education (9–1)

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5340169958

CHEMISTRY **0971/62**

Paper 6 Alternative to Practical **May/June 2019**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

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.

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.

This document consists of **8** printed pages and **4** blank pages.

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1 A student did the following steps to make zinc chloride crystals from solid zinc oxide.

step 1 Pour 40 cm^3 of dilute hydrochloric acid into a beaker. Add a small amount of zinc oxide. Warm the mixture and stir it.
step 2 Continue to add zinc oxide to the beaker until all of the dilute hydrochloric acid has reacted.
step 3 Remove the excess zinc oxide.
step 4 Obtain crystals of zinc chloride from the solution.

(a) Name the apparatus used in **step 1** to:

(i) add the zinc oxide

..... [1]

(ii) warm the mixture.

..... [1]

(b) How did the student know that all of the dilute hydrochloric acid had reacted in **step 2**?

.....

..... [1]

(c) (i) What is meant by the term *excess* in **step 3**?

..... [1]

(ii) How is the excess zinc oxide removed in **step 3**?

..... [1]

(d) Describe how the crystals are obtained in **step 4**.

.....

.....

..... [3]

(e) Suggest how the method would differ if zinc carbonate were used instead of zinc oxide.

..... [1]

[Total: 9]

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2 A student investigated the rate of reaction between magnesium ribbon and solutions of dilute hydrochloric acid of different concentrations, solutions **H**, **I**, **J** and **K**. The dilute hydrochloric acid was in excess in all experiments.

Five experiments were done.

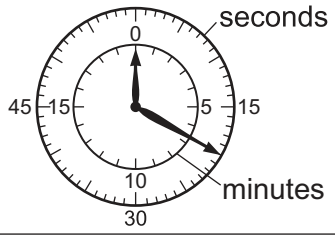
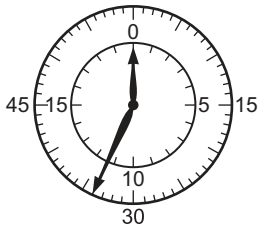
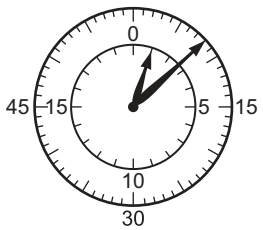
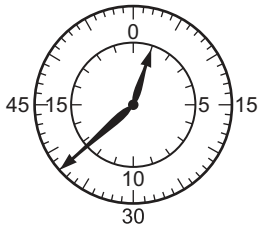
Experiment 1
- A measuring cylinder was used to pour 30 cm^3 of solution **H** into a beaker.
- A 5.0 cm length of magnesium ribbon was then added to the beaker.
- A timer was started immediately.
- The time taken for all of the magnesium ribbon to react and to disappear completely was measured.

Experiment 2
- Experiment 1 was repeated but using solution **I** instead of solution **H**.

Experiment 3
- Experiment 1 was repeated but using solution **J** instead of solution **H**.

Experiment 4
- Experiment 1 was repeated but using solution **K** instead of solution **H**.

(a) Use the stop-clock diagrams to record the time taken for each experiment in the table.

experiment	solution	concentration of hydrochloric acid in mol / dm^3	stop-clock diagram	time taken for the magnesium ribbon to disappear completely / s
1	**H**	2.0		
2	**I**	1.5		
3	**J**	1.0		
4	**K**	0.8		

[3]

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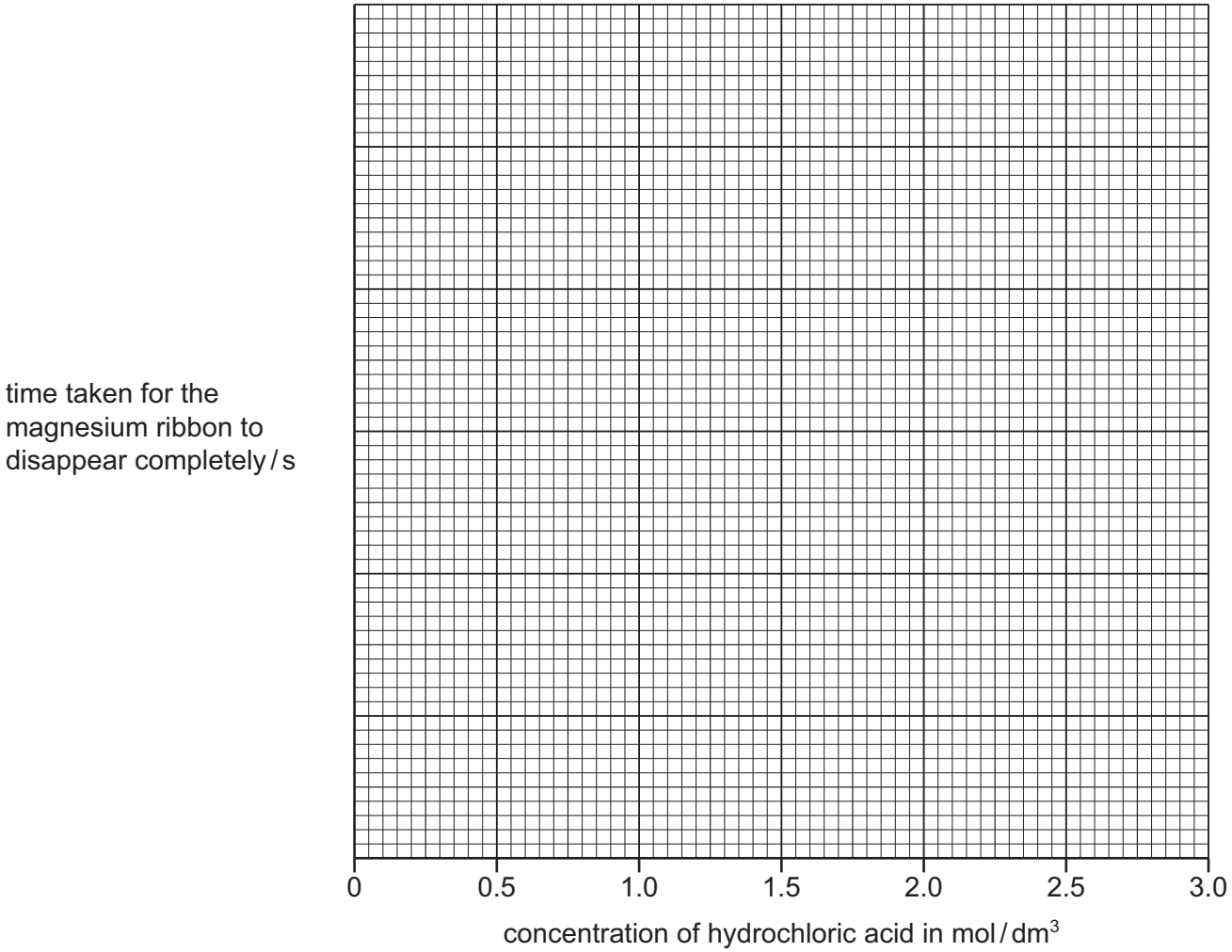
Experiment 5

Solution **J** was added to some magnesium ribbon in a test-tube. The gas produced was tested. The observations were recorded in the table.

observations	rapid effervescence and the test-tube felt hot lighted splint 'popped'

(b) Plot the results for Experiments 1–4 on the grid. Draw a smooth line graph.



[3]

(c) **From your graph**, deduce the time taken for the magnesium ribbon to disappear completely if a solution of hydrochloric acid of concentration 2.5 mol / dm^3 were used.

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

..... [3]

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(d) (i) Why was the same length of magnesium used in Experiments 1–4?

..... [1]

(ii) Suggest the effect on the results if Experiments 1–4 were repeated using 2.5 cm lengths of magnesium ribbon instead of 5.0 cm lengths of magnesium ribbon. Explain your answer.

.....

..... [1]

(e) Suggest a **different** method which a student could use to investigate the rate of reaction between magnesium ribbon and dilute hydrochloric acid. State the apparatus the student would use and the measurements the student would take.

apparatus .....

.....

measurements .....

.....

.....

[3]

(f) Use the observations from Experiment 5 to answer these questions.

(i) What type of chemical reaction occurs when magnesium ribbon reacts with dilute hydrochloric acid?

..... [1]

(ii) Identify the gas produced.

..... [1]

[Total: 16]

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3 Two substances, solid **L** and solid **M**, were analysed. Solid **L** was hydrated ammonium sulfate. Tests were done on solid **L** and solid **M**.

tests on solid L

Complete the expected observations.

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

..... [1]

Solid **L** was divided into two portions.

(b) The first portion of solid **L** was heated in a hard-glass test-tube. Any gas produced was tested with cobalt(II) chloride paper.

observations .....

..... [3]

The second portion of solid **L** was added to distilled water. The mixture was shaken to dissolve solid **L** and form solution **L**. The solution of **L** was divided into two equal portions in two test-tubes.

(c) An excess of aqueous sodium hydroxide was added to the first portion of solution **L**. The mixture was heated and the gas produced was tested.

observations .....

..... [2]

(d) Dilute nitric acid and aqueous barium nitrate were added to the second portion of solution **L**.

observation ..... [1]

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tests on solid M

Some of the tests and observations are shown.

tests on solid **M**	observations
Solid **M** was dissolved in water. The solution was divided into three portions. **test 1** An excess of aqueous sodium hydroxide was added to the first portion of the solution.	red-brown precipitate formed
test 2 An excess of aqueous ammonia was added to the second portion of the solution.	red-brown precipitate formed
test 3 Dilute nitric acid and aqueous silver nitrate were added to the third portion of the solution.	white precipitate formed

(e) Identify solid **M**.

..... [2]

[Total: 9]

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4 Azurite is an ore of copper which contains copper(II) carbonate. Azurite contains no other metal ions.

Plan an experiment to show how a sample of copper could be obtained from large lumps of azurite.

Your answer should include:

- descriptions of the reactions involved
- the expected observations.

You are provided with a large lump of azurite and common laboratory chemicals and apparatus.

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..... [6]

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