Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

9397863487

CHEMISTRY **0620/52**

Paper 5 Practical Test **May/June 2019**

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.
Notes for use in qualitative analysis 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	
1	
2	
3	
Total	

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

This document consists of **10** printed pages and **2** blank pages.

1 You are going to investigate 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 is in excess in all experiments.

Read all the instructions carefully before starting the experiments.

Instructions
You are going to do five experiments.

Experiment 1
- Use the 50 cm^3 measuring cylinder to pour 30 cm^3 of solution **H** into the beaker.
- Add a 5.0 cm length of magnesium ribbon to solution **H** in the beaker and start the timer immediately. Stir the mixture constantly.
- Measure the time taken for all of the magnesium ribbon to react and to disappear completely.
- Record the time taken in the table.
- Rinse out the beaker with distilled water.

Experiment 2
- Repeat Experiment 1 but use solution **I** instead of solution **H**. Record the time taken in the table.

Experiment 3
- Repeat Experiment 1 but use solution **J** instead of solution **H**. Record the time taken in the table.

Experiment 4
- Repeat Experiment 1 but use solution **K** instead of solution **H**. Record the time taken in the table.

(a) Record your results from Experiments 1–4 in the table.

experiment	solution	concentration of hydrochloric acid in mol / dm^3	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]

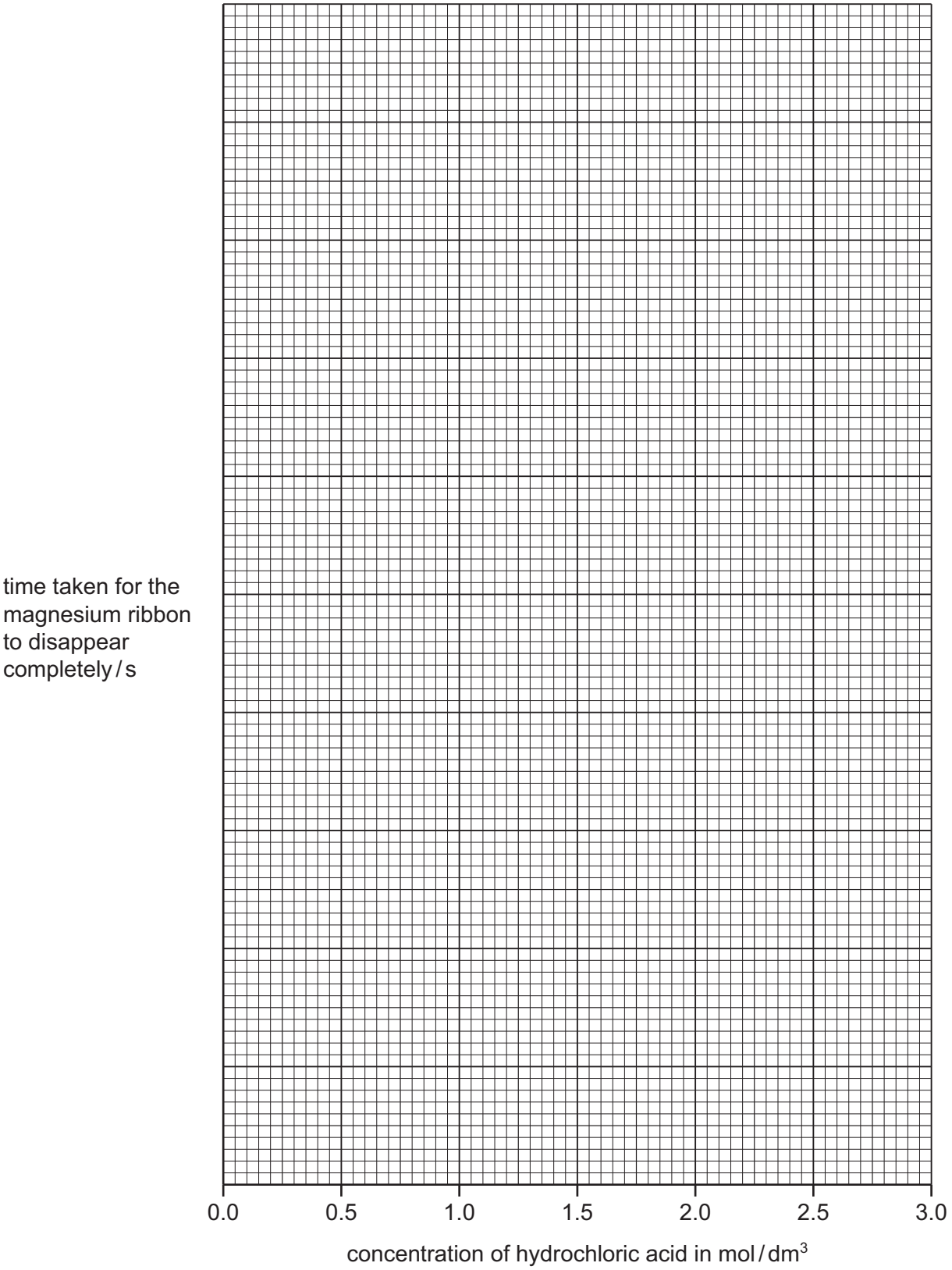
(b) *Experiment 5*
Add about 3 cm^3 of solution **J** to a 5.0 cm length of magnesium ribbon in a test-tube.
Test the gas produced with a lighted splint. Record your observations.

.....

.....

..... [3]

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



[3]

(d) **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]

(e) **(i)** Why was the same length of magnesium ribbon 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]

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

apparatus .....

.....

measurements .....

.....

.....

[3]

(g) Use your 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: 19]

Question 2 starts on the next page.

2 You are provided with solid **L**, which contains two cations and one anion.
Do the following tests on solid **L**, recording all of your observations at each stage.

tests on solid L

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

..... [1]

Use a spatula to divide solid **L** into two approximately equal portions.

(b) Heat the first portion of solid **L** in a hard-glass test-tube. Test any gas produced with blue cobalt(II) chloride paper.
Record your observations.

.....

..... [3]

Add the second portion of solid **L** to about 10 cm^3 of distilled water in a boiling tube. Stopper the boiling tube and shake the mixture to dissolve solid **L** and form solution **L**. Divide solution **L** into five approximately equal portions in five test-tubes.

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

pH = ... [1]

(d) (i) Transfer the second portion of solution **L** into a boiling tube. Add about 3 cm^3 of aqueous sodium hydroxide.
Record your observations.

..... [1]

(ii) Gently warm the mixture from **(d)(i)** and test the gas produced.
Record your observations.

.....

..... [2]

(e) Add an excess of aqueous ammonia to the third portion of solution **L**.
Record your observations.

..... [1]

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

..... [1]

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

..... [1]

(h) What does the test in **(b)** tell you about solid **L**?

..... [1]

(i) Identify the **three** ions in solid **L**.

..... [3]

[Total: 15]

[Turn over

3 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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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