Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

1598429303

CHEMISTRY **0620/53**

Paper 5 Practical Test **May/June 2017**

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 7 and 8.

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 **8** printed pages.

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CAMBRIDGE
International Examinations

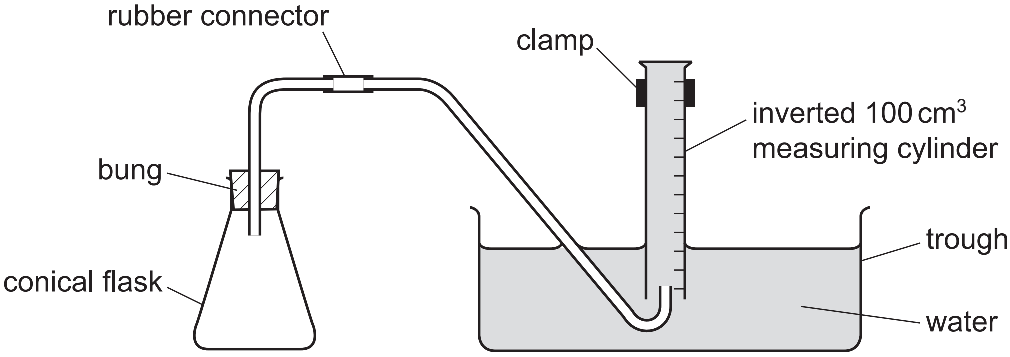
1 You are going to investigate the rate of reaction between magnesium ribbon and two different solutions of dilute sulfuric acid, solution **G** and solution **H**. The acid is in excess in both experiments.

Read all the instructions carefully before starting the experiments.

Instructions
You are going to carry out two experiments.

(a) *Experiment 1*

- Set up the apparatus as shown in the diagram.



- Remove the bung from the conical flask and place **one** piece of magnesium ribbon into the conical flask.
- Use another measuring cylinder to measure 50 cm^3 of solution **G**. Pour solution **G** into the flask and replace the bung firmly. Immediately start the timer. Measure the total volume of gas collected in the measuring cylinder every 20 seconds for 180 seconds (3 minutes) or until 100 cm^3 of gas have been collected. Record your results in the table.

time / s	0	20	40	60	80	100	120	140	160	180
volume of gas / cm^3										

[2]

- Empty the flask and rinse it with distilled water.

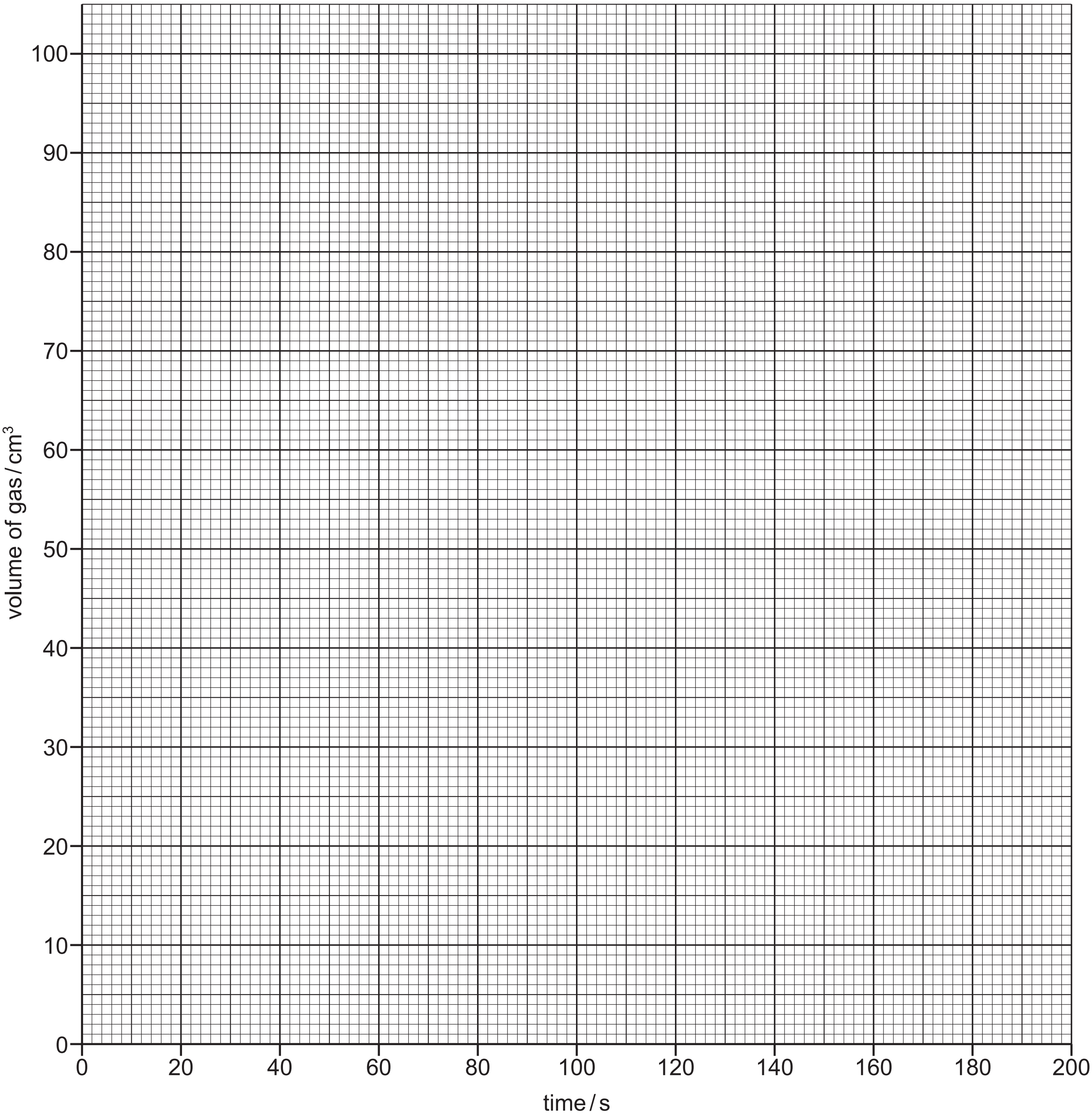
(b) *Experiment 2*

- Repeat Experiment 1 using 50 cm^3 of solution **H** instead of solution **G**.
- Measure the total volume of gas collected in the measuring cylinder every 20 seconds for 180 seconds (3 minutes) or until 100 cm^3 of gas have been collected. Record your results in the table.

time / s	0	20	40	60	80	100	120	140	160	180
volume of gas / cm^3										

[2]

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



[4]

(d) Which experiment had the faster rate of reaction? Suggest a reason why the rate was faster in this experiment.

....

.... [2]

(e) The average rate of this reaction can be calculated using the equation shown.

$$\text{average rate} = \frac{\text{volume of gas / cm}^3}{\text{time taken / s}}$$

For Experiment 1, calculate the average rate of reaction for the first 30 seconds of the reaction. Include the units.

rate = ...

units = ...
[3]

(f) Why, eventually, will no more gas be produced?

.... [1]

(g) Suggest the effect on the rate of reaction of using the same mass of magnesium powder instead of magnesium ribbon. Explain your answer.

....

....

.... [2]

(h) Give **one** advantage and **one** disadvantage of using a measuring cylinder to measure the volumes of solution **G** and solution **H**.

advantage ....

disadvantage ....
[2]

(i) Suggest **one** improvement to these experiments.

....

.... [1]

[Total: 19]

2 You are provided with two substances, solid **J** and solution **K**.
Carry out the following tests on each substance, recording all of your observations at each stage.

tests on solid J

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

.... [1]

(b) **(i)** Use a spatula to place half of solid **J** into a boiling tube.
Add about 2 cm^3 of dilute hydrochloric acid to solid **J**. Heat the mixture.
Test the gas given off with damp litmus paper.
Record your observations.

.... [1]

(ii) Allow the mixture to settle, pour off the liquid and add an excess of aqueous sodium hydroxide to the liquid.
Record your observations.

.... [2]

(c) Name the gas given off in **(b)(i)**.

.... [1]

Keep the rest of solid **J** for the test in **(g)**.

tests on solution K

Divide solution **K** into four equal portions in four test-tubes.

(d) Add a small spatula measure of iron(II) sulfate crystals to the first portion of the solution. Shake the mixture and add aqueous sodium hydroxide to the mixture.
Record your observations.

....

.... [3]

(e) Add a few drops of dilute sulfuric acid to the second portion of the solution followed by about 1 cm^3 of aqueous potassium iodide. Shake the mixture. Add a few drops of starch solution to the mixture.
Record your observations.

....

.... [2]

(f) Add a few drops of dilute sulfuric acid to the third portion of the solution. Then add a few drops of potassium manganate(VII) solution.
Record your observations.

.... [1]

(g) Add the rest of solid **J** to the fourth portion of the solution. Test the gas given off with a splint.
Record your observations.

....

.... [3]

(h) Name the gas given off in **(g)**.

.... [1]

[Total: 15]

3 Cassiterite is a naturally occurring form of tin oxide.

Describe how you would
- obtain a sample of tin from a large lump of cassiterite in the laboratory,
- determine the percentage by mass of tin present in cassiterite.

Tin is similar in reactivity to iron.

Your answer should include any apparatus and chemicals used and the conditions required.

....

....

....

....

....

....

....

....

.... [6]

[Total: 6]

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 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