Cambridge Assessment International Education

Cambridge IGCSE™ (9–1)

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

6037060975

CHEMISTRY **0971/61**

Paper 6 Alternative to Practical **May/June 2022**

1 hour

You must answer on the question paper.

No additional materials are needed.

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.

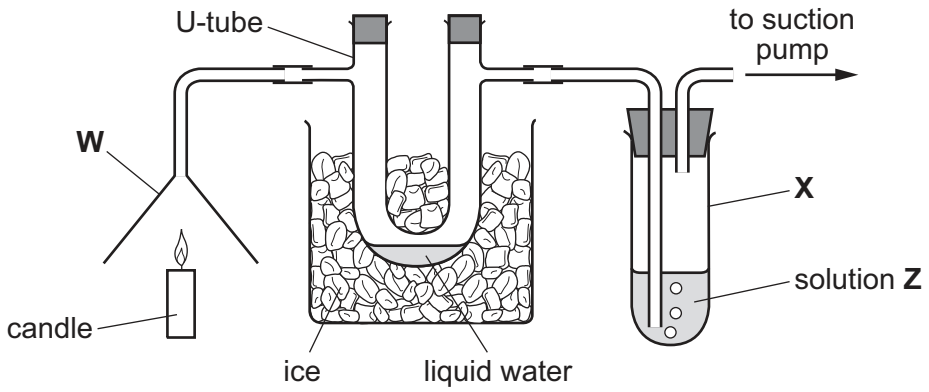
INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Any blank pages are indicated.

[Turn over

1 The apparatus in the diagram was used to show that when a candle is burned both water and carbon dioxide are formed. The gases produced when the candle burns are passed through the apparatus using a suction pump.



(a) Name the items of apparatus labelled **W** and **X**.

W .....

X .....
[2]

(b) Suggest why ice is placed around the U-tube.

.....

..... [1]

(c) Describe how to test the liquid collected in the U-tube to show it is water.

.....

..... [1]

(d) Solution **Z** is used to show that carbon dioxide is produced.

Identify solution **Z**.

..... [1]

(e) Both water and carbon dioxide were made.

Identify **one** element that must be in the compound that makes up the candle.

..... [1]

(f) Describe how the apparatus could be changed to see if sulfur dioxide is made.
Give the observations if sulfur dioxide is made.

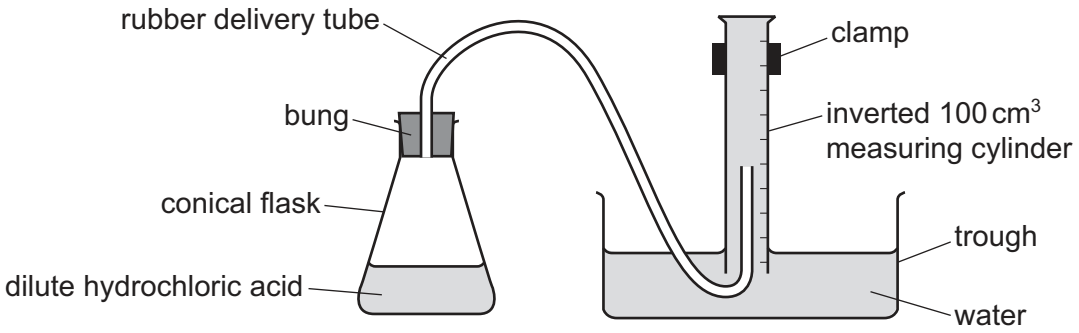
change .....

observation .....
[2]

[Total: 8]

2 A student investigated the rate at which hydrogen gas is made when magnesium reacts with two different solutions of dilute hydrochloric acid, **C** and **D**, with different concentrations. The dilute hydrochloric acid was in excess in both experiments.

Two experiments were done using the apparatus shown.

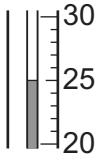
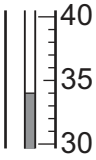


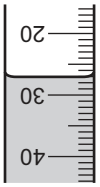
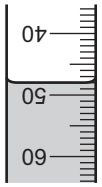
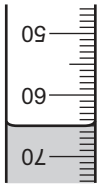
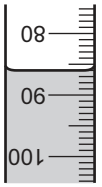
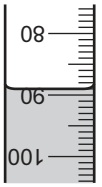
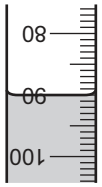
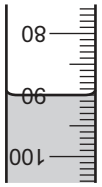
Experiment 1

- A measuring cylinder was used to pour 50 cm^3 of dilute hydrochloric acid **C** into a conical flask.
- The initial temperature of the dilute hydrochloric acid was measured using a thermometer.
- The apparatus was set up as shown in the diagram.
- The bung was removed from the conical flask and a coiled 5 cm length of magnesium ribbon was added to the flask. The bung was replaced immediately and a timer started.
- The volume of gas collected in the inverted measuring cylinder was recorded every 20 seconds for 160 seconds.
- The final temperature of the dilute hydrochloric acid in the flask was measured using a thermometer.

[Turn over

(a) Use the thermometer diagrams and the diagrams of inverted measuring cylinders to complete the tables.

initial		final	
thermometer diagram	temperature / °C	thermometer diagram	temperature / °C
			

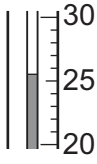
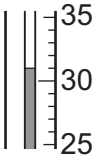
time / s	20	40	60	80	100	120	140	160
diagrams of inverted measuring cylinder								
volume of gas collected / cm^3								

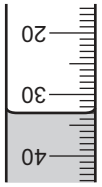
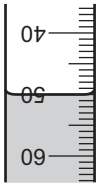
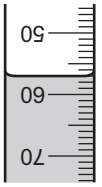
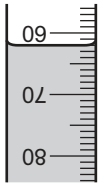
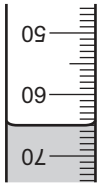
[2]

(b) *Experiment 2*

- Experiment 1 was repeated using 50 cm^3 of dilute hydrochloric acid **D** instead of dilute hydrochloric acid **C**.

Use the thermometer diagrams and the diagrams of inverted measuring cylinders to complete the tables.

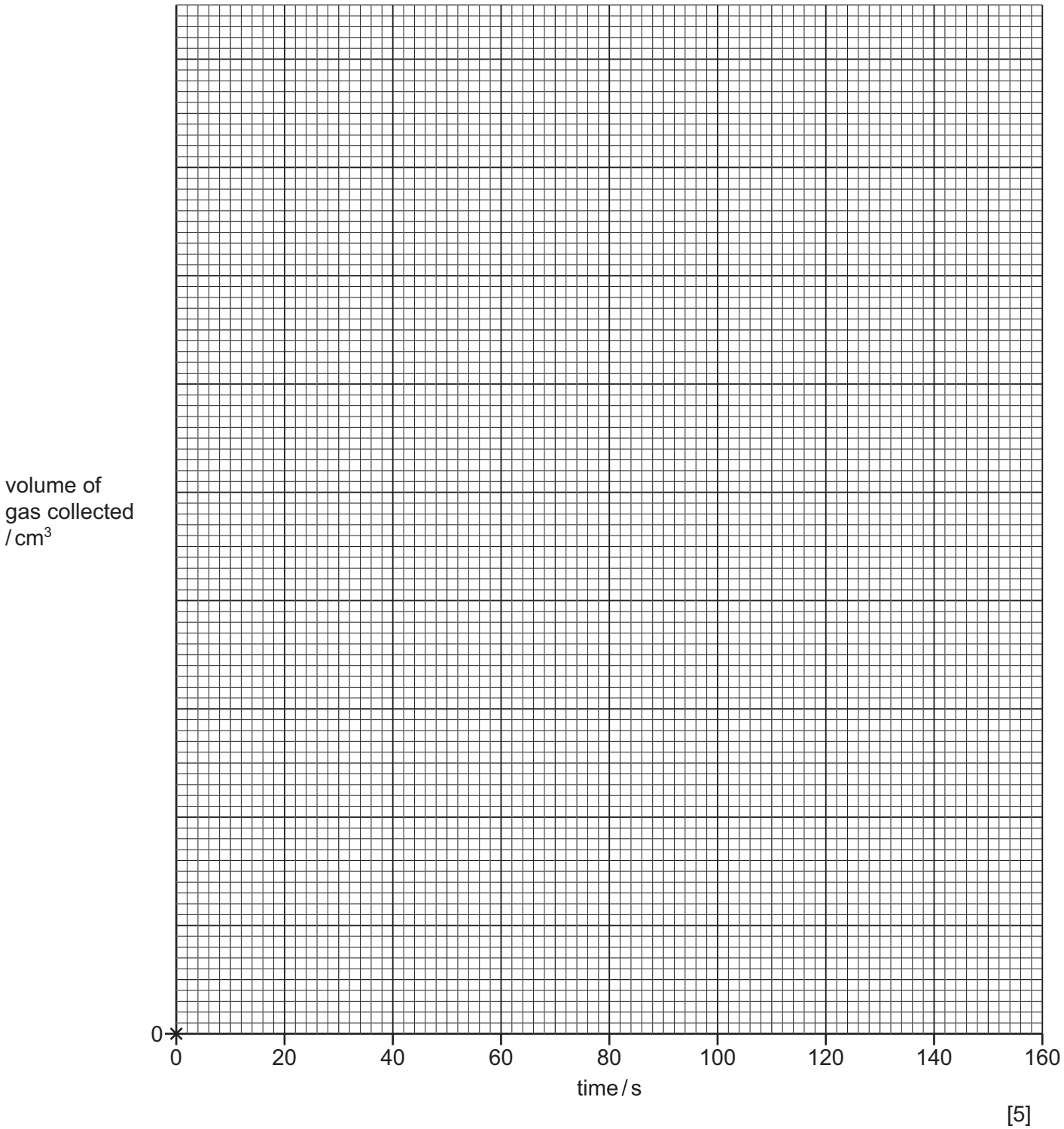
initial		final	
thermometer diagram	temperature / °C	thermometer diagram	temperature / °C
			

time / s	20	40	60	80	100	120	140	160
diagrams of inverted measuring cylinder								
volume of gas collected / cm^3								

[3]

(c) Complete a suitable scale on the *y*-axis and plot your results from Experiments 1 and 2 on the grid.

Draw **two** smooth line graphs. The lines must pass through (0,0). Clearly label your lines.



[5]

(d) **From your graph**, deduce the volume of gas that was collected after 50 seconds in Experiment 2.

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

volume of gas = ... [3]

(e) Explain what can be deduced about the concentrations of dilute hydrochloric acid **C** and dilute hydrochloric acid **D**.

.....

.....

.....

..... [2]

(f) **(i)** State what happens to the temperature of the dilute hydrochloric acid during Experiment 1.

..... [1]

(ii) State what effect this temperature change has on the total volume of gas made when the reaction has finished.

..... [1]

(iii) Describe a change that can be made to the apparatus or reagents to reduce the temperature change of the acid in Experiment 1.

..... [1]

(g) Suggest why it is important to replace the bung in the conical flask immediately after adding the magnesium ribbon.

.....

..... [1]

(h) State the advantage of measuring the volume of gas collected every 10 seconds rather than every 20 seconds.

..... [1]

[Total: 20]

3 Solid **E** and solution **F** were analysed. Solid **E** was ammonium sulfate.
Tests were done on each substance.

tests on solid E

Complete the expected observations.

Solid **E** was dissolved in water to form solution **E**. Solution **E** was divided into three approximately equal portions in one boiling tube and two test-tubes.

(a) Aqueous sodium hydroxide was added to the first portion of solution **E** in a boiling tube. The mixture formed was warmed. Any gas produced was tested.

observations .....

.....

identity of gas .....
[2]

(b) To the second portion of solution **E**, about 1 cm depth of dilute nitric acid followed by a few drops of aqueous silver nitrate were added.

observations ..... [1]

(c) To the third portion of solution **E**, about 1 cm depth of dilute nitric acid followed by a few drops of aqueous barium nitrate were added.

observations ..... [1]

[Turn over

tests on solution F

tests	observations
Solution **F** was divided into two equal portions in two test-tubes. **test 1** A strip of universal indicator paper was placed in the first portion of solution **F**.	the universal indicator paper turned orange
test 2 The second portion of solution **F** was added to solid sodium carbonate in a boiling tube. Any gas made was tested.	effervescence and the solid disappeared limewater turned milky

(d) Deduce the pH of solution **F**.

..... [1]

(e) Identify the positive ion in solution **F**.

..... [1]

[Total: 6]

4 A sample of muddy river water contains water, dissolved solids and insoluble solid mud.

Plan an investigation to find the concentration of dissolved solids, in g / dm^3, in the river water.

In your answer state how you will work out the concentration of the dissolved solids in g / dm^3.

You are provided with a small sample (less than 1 dm^3) of muddy river water and common laboratory apparatus.
(1 dm^3 = 1000 cm^3)

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..... [6]

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