UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CANDIDATE NAME | | | | | | | | | |
| CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | | |

*0445039008*

**CHEMISTRY** **0620/61**

Paper 6 Alternative to Practical **May/June 2010**

**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 a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

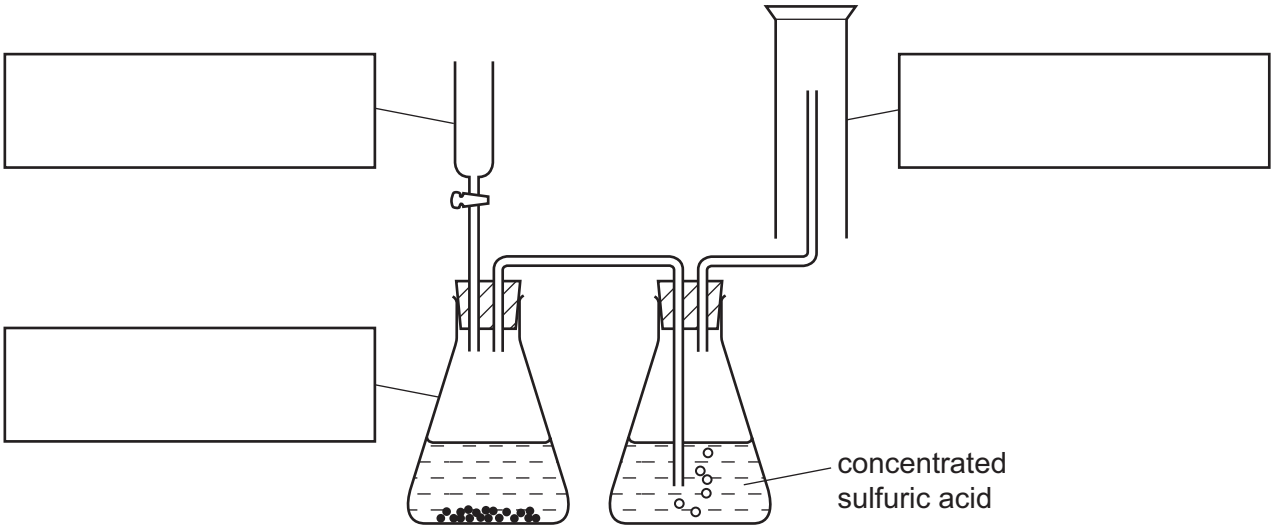
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

| For Examiner's Use | |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| Total | |

This document consists of **14** printed pages and **2** blank pages.

For Examiner's Use

**1** The diagram shows the apparatus used to prepare a gas. The gas is more dense than air.




**(a)** Complete the boxes to name the apparatus. [3]

**(b)** Identify **one** mistake in the diagram.

..... [1]

**(c)** Suggest a reason why the gas is passed through concentrated sulfuric acid.

..... [1]

[Total: 5]

*For Examiner's Use*

**2** Three bottles of liquids have lost their labels.

The liquids are known to be:

aqueous sodium iodide,

hexene,

dilute nitric acid.

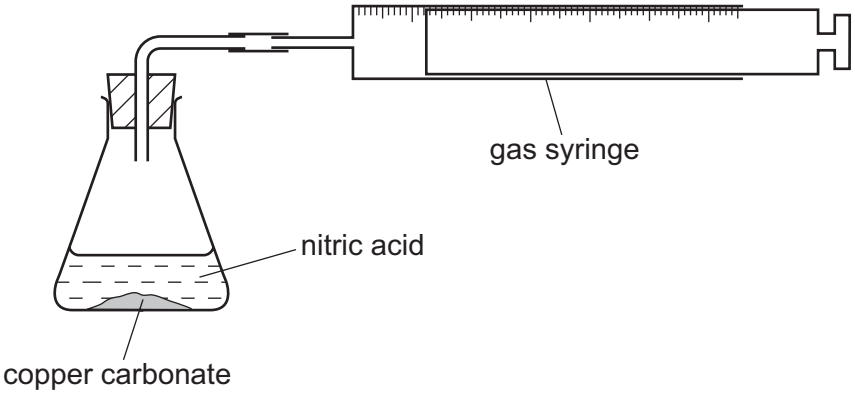
Outline chemical tests you could use to distinguish between the liquids in the three bottles.

| liquid | test | result |
|---|---|---|
| aqueous sodium iodide | ..... ..... | ..... ..... |
| hexene | ..... ..... | ..... ..... |
| dilute nitric acid | ..... ..... | ..... ..... |

[6]

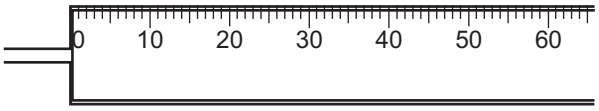
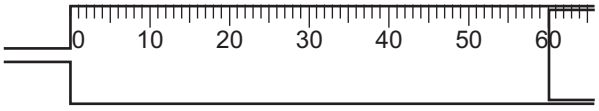
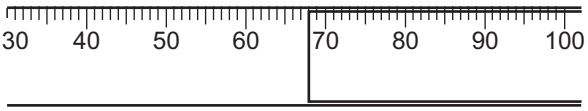
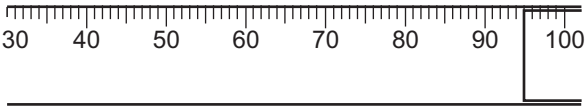
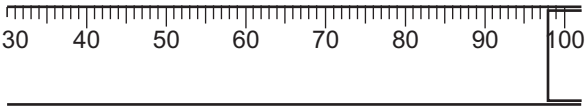
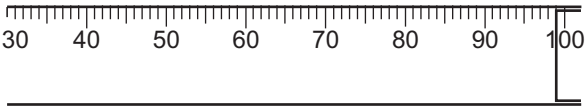
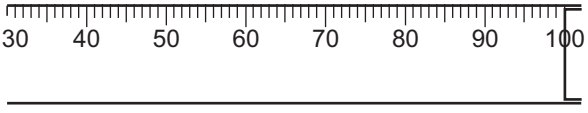
[Total: 6]

**3** The speed of reaction between excess copper carbonate and dilute nitric acid was investigated using the apparatus below.
The temperature of the nitric acid was 20 °C.




The volume of carbon dioxide produced was measured every minute for six minutes.

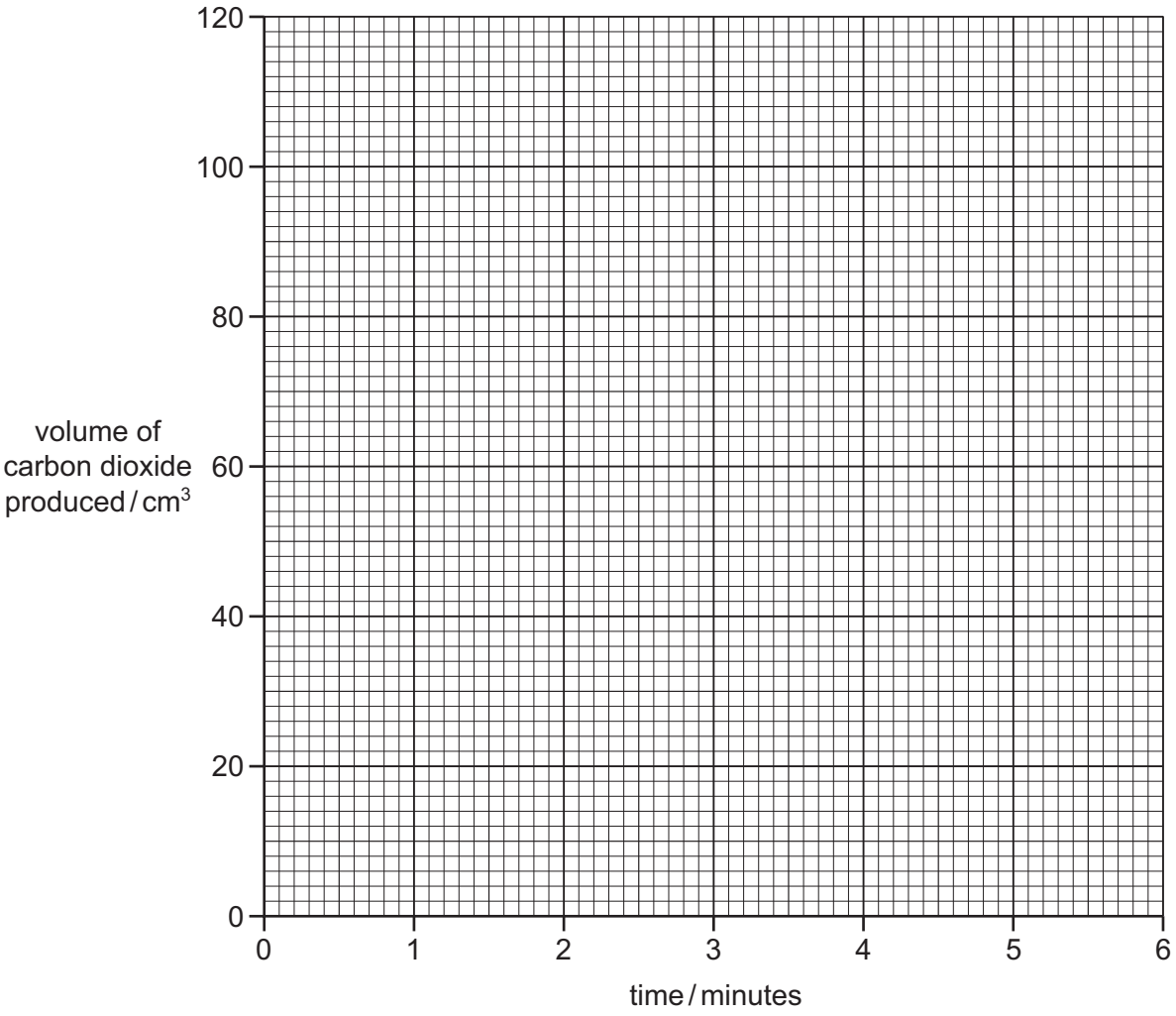
**(a)** Use the gas syringe diagrams to complete the table of results.

| time / minutes | gas syringe diagram | total volume of carbon dioxide produced / $cm^3$ |
|---|---|---|
| 0 |  | |
| 1 |  | |
| 2 |  | |
| 3 |  | |
| 4 |  | |
| 5 |  | |
| 6 |  | |

[4]

*For Examiner's Use*

**(b)** Plot the results on the grid below and draw a smooth line graph.




[4]

**(c)** Which point appears to be inaccurate? Explain why.

.....

..... [2]

**(d)** Sketch on the grid, the graph you would expect if the experiment was repeated using nitric acid at a temperature of 60 °C. [2]

[Total: 12]

**4** A student investigated the reaction of aqueous sodium hydroxide with two different acids, acid **C** and acid **D**.

Two experiments were carried out.

*Experiment 1*

By using a measuring cylinder, 20 $cm^3$ of aqueous sodium hydroxide was poured into a conical flask and the initial temperature of the solution was measured.

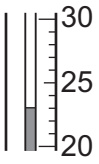
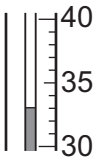
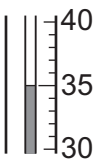
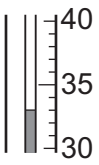
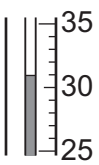
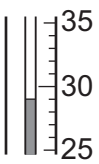
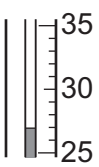
A burette was filled with acid **C** up to the 0.0 $cm^3$ mark.

5 $cm^3$ of acid **C** was added to the sodium hydroxide in the flask. The temperature of the mixture was measured.

Further 5 $cm^3$ portions of acid **C** were added to the mixture in the flask, stirring with the thermometer until a total volume of 30 $cm^3$ of acid **C** had been added. The temperatures after each 5 $cm^3$ portion had been added were measured.

**(a)** Use the thermometer diagrams to record the temperatures in the table of results.

**Table of results**

| volume of acid **C** added / $cm^3$ | thermometer diagrams | temperature / °C |
|---|---|---|
| 0 |   | |
| 5 |   | |
| 10 |   | |
| 15 |   | |
| 20 |   | |
| 25 |   | |
| 30 |   | |

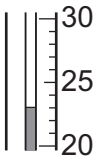
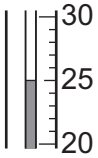
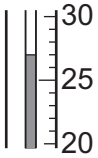
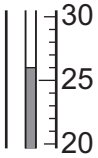
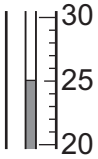
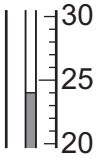
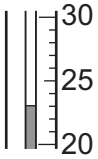
[2]

*Experiment 2*

The burette was emptied and rinsed with water. Experiment 1 was repeated using acid **D**.

**(b)** Use the thermometer diagrams to record the temperatures in the table of results.

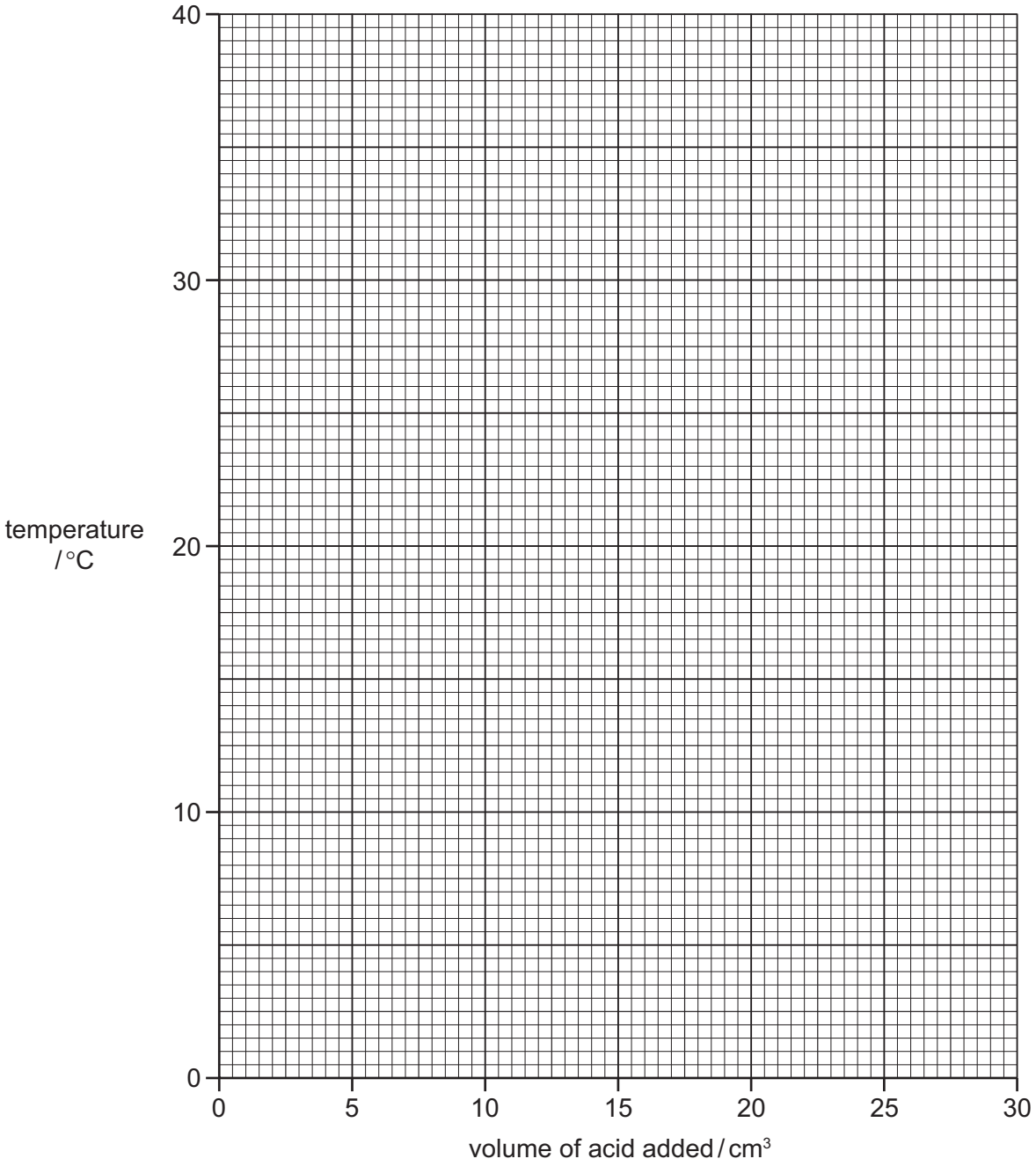
**Table of results**

| volume of acid **D** added / $cm^3$ | thermometer diagrams | temperature / °C |
|---|---|---|
| 0 |   | |
| 5 |   | |
| 10 |   | |
| 15 |   | |
| 20 |   | |
| 25 |   | |
| 30 |   | |

[2]

*For Examiner's Use*

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




[6]

**(d)** From your graph, deduce the temperature of the mixture when 3 $cm^3$ of acid **C** reacted with sodium hydroxide in Experiment 1.

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

..... °C [2]

**(e) (i)** Which experiment produced the larger temperature change?

..... [1]

**(ii)** Suggest why the temperature change is greater in this experiment.

.....

.....

..... [2]

**(f)** Why was the burette rinsed with water in Experiment 2?

.....

..... [1]

**(g)** Predict the temperature of the reaction mixture in Experiment 2 after 1 hour. Explain your answer.

.....

.....

..... [2]

[Total: 18]

**5** Solid **E** was analysed. **E** was an aluminium salt.
The tests on the solid and some of the observations are in the following table.
Complete the observations in the table.

| tests | observations |
|---|---|
| tests on solid **E**<br><br>**(a)** Appearance of solid **E**. | white crystalline solid |
| **(b)** A little of solid **E** was heated in a test-tube. | colourless drops of liquid formed at the top of the tube |
| **(c)** A little of solid **E** was dissolved in distilled water.<br><br>The solution was divided into four test-tubes and the following tests were carried out. | |
| **(i)** To the first test-tube of solution, drops of aqueous sodium hydroxide were added.<br>Excess sodium hydroxide was then added to the test-tube. | .....<br>.....<br>..... [3] |
| **(ii)** Test **(i)** was repeated using aqueous ammonia solution instead of aqueous sodium hydroxide. | .....<br>..... [2] |
| **(iii)** To the third test-tube of solution, dilute hydrochloric acid was added, followed by barium chloride solution. | no reaction |
| **(iv)** To the fourth test-tube of solution, aqueous sodium hydroxide and aluminium powder were added.<br>The mixture was heated. | effervescence<br>pungent gas given off<br>turned damp litmus paper blue |

**(d)** What does test **(b)** tell you about solid **E**.

.....

..... [1]

**(e)** Identify the gas given off in test **(c)(iv)**.

..... [1]

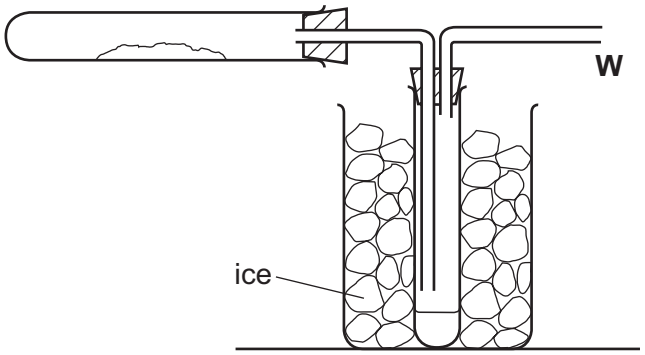
**(f)** What conclusions can you draw about solid **E**?

.....

..... [2]

[Total: 9]

**6** Hydrated cobalt chloride crystals, $CoCl_2.6H_2O$, were heated in the apparatus shown below.




**(a)** Indicate on the diagram, using an arrow, where heat is applied. [1]

**(b)** The crystals change colour from ..... to ..... . [1]

**(c)** What is the purpose of the ice?

.....

..... [1]

**(d)** Why is the tube open at point **W**?

..... [1]

[Total: 4]

*For Examiner's Use*

**7** Malachite is a naturally occurring form of copper carbonate. Outline how a sample of copper metal could be obtained from large lumps of malachite in the laboratory.
Copper is one of the least reactive metals.
Your answer should include any chemicals used and conditions.

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

[Total: 6]

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