



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

CANDIDATE  
NAME

CENTRE  
NUMBER

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CANDIDATE  
NUMBER

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**CHEMISTRY**

**0620/51**

Paper 5 Practical Test

**May/June 2010**

**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 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.

Practical notes are provided on page 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	
1	
2	
<b>Total</b>	

This document consists of **8** printed pages.



- 1 You are going to investigate what happens when aqueous sodium hydroxide reacts with two different acids **C** and **D**.

**Read all the instructions below carefully before starting the experiments.**

**Instructions**

You are going to carry out two experiments.

*Experiment 1*

Using a measuring cylinder, pour 20 cm<sup>3</sup> of aqueous sodium hydroxide into the conical flask. Measure the temperature of the solution and record it in the table below.

Add 6 drops of the indicator phenolphthalein to the flask.

Fill the burette with acid **C** to the 0.0 cm<sup>3</sup> mark.

Add 5 cm<sup>3</sup> of acid **C** to the sodium hydroxide, stirring with the thermometer. Measure the temperature of the mixture and record your result in the table below.

Continue to add 5 cm<sup>3</sup> portions of acid **C** to the flask, stirring with the thermometer until a total volume of 30 cm<sup>3</sup> of acid **C** has been added. Measure and record the temperatures after each 5 cm<sup>3</sup> portion has been added.

Record the volume of acid **C** added when the indicator changes colour.

Volume of acid **C** added to change the indicator colour ..... cm<sup>3</sup> [1]

*Table of results*

volume of acid <b>C</b> added / cm <sup>3</sup>	temperature / °C
0	
5	
10	
15	
20	
25	
30	

[3]

*Experiment 2*

Empty the burette and rinse it with water. Add a small volume of acid **D** to the burette and use it to rinse out the burette. Fill the burette with acid **D** to the 0.0 cm<sup>3</sup> mark.

Using a measuring cylinder, pour 20 cm<sup>3</sup> of aqueous sodium hydroxide into a clean conical flask. Measure the temperature of the solution and record it in the table.

Add 6 drops of the indicator phenolphthalein to the flask.

Add 5 cm<sup>3</sup> of acid **D** to the sodium hydroxide, stirring with the thermometer. Measure the temperature of the mixture and record your result in the table below.

Continue to add 5 cm<sup>3</sup> portions of acid **D** to the flask, stirring with the thermometer until a total volume of 30 cm<sup>3</sup> of acid **D** has been added. Measure and record the temperatures after each 5 cm<sup>3</sup> portion has been added.

Record the volume of acid **D** added when the indicator changes colour.

Volume of acid **D** added to change the indicator colour ..... cm<sup>3</sup> [1]

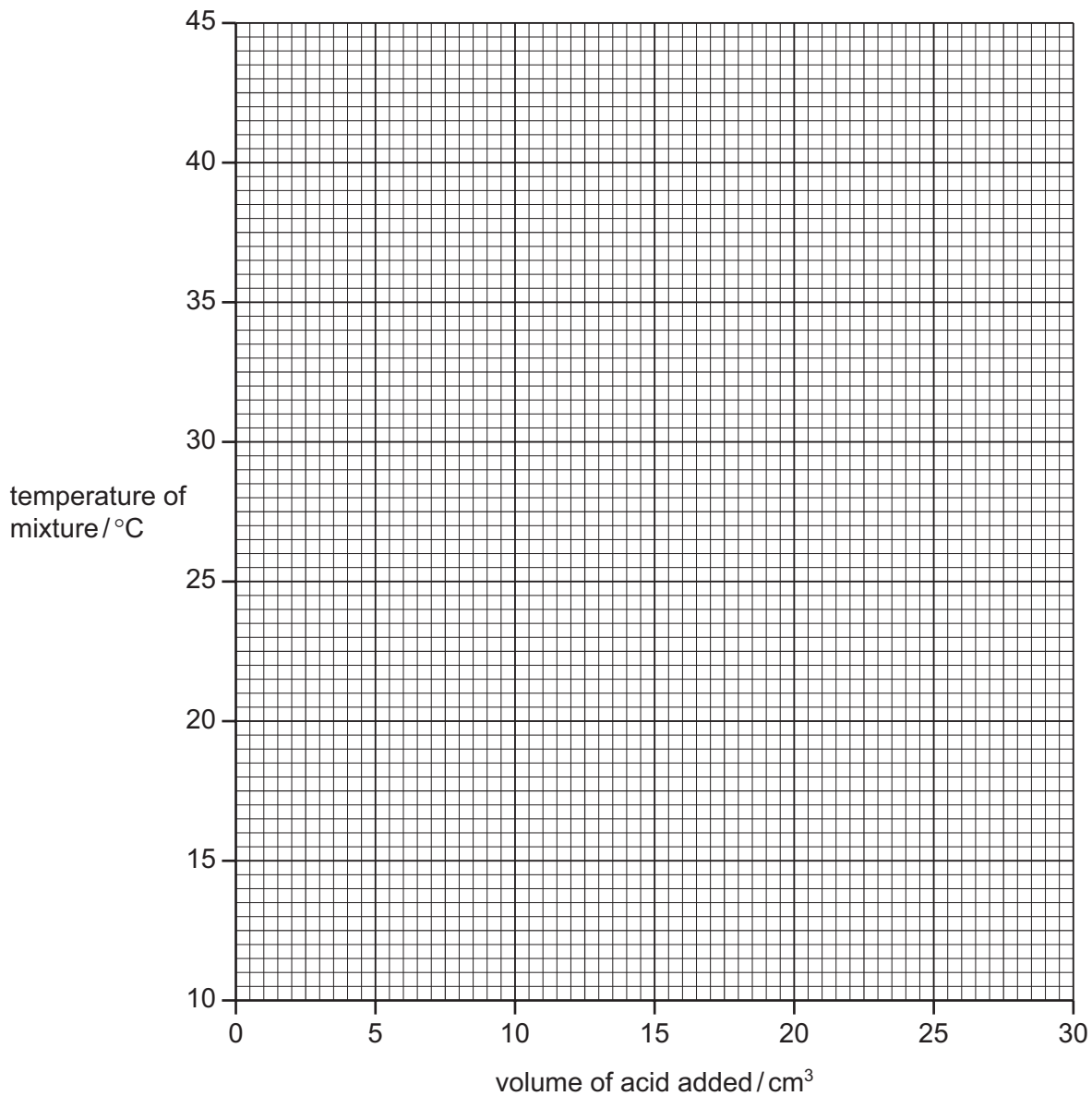
*Table of results*

volume of acid <b>D</b> added / cm <sup>3</sup>	temperature / °C
0	
5	
10	
15	
20	
25	
30	

[3]

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

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[6]

- (b) From your graph, deduce the temperature of the mixture when 3 cm<sup>3</sup> of acid **C** reacts with sodium hydroxide in Experiment 1.

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

..... °C [2]

- (c) When phenolphthalein indicator is used in these experiments, the colour changes

from ..... to ..... [1]

(d) (i) In which experiment is the temperature change greater?

..... [1]

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

.....  
.....  
..... [2]

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

.....  
..... [2]

[Total: 22]

- 2 You are provided with solid **E**.  
Carry out the following tests on **E**, recording all of your observations in the table.  
Conclusions must **not** be written in the table.

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tests	observations
(a) Describe the appearance of solid <b>E</b> .	..... [1]
(b) Place half of solid <b>E</b> in a test-tube. Heat the test-tube gently. Test any gas given off with damp pH indicator paper.	..... ..... [2]
<p>(c) Add the rest of solid <b>E</b> to about 8 cm<sup>3</sup> of distilled water in a test-tube.</p> <p>Cork the test-tube and shake the contents until dissolved.</p> <p>Divide the solution into 4 equal portions in test-tubes and carry out the following.</p> <p>(i) Add several drops of aqueous sodium hydroxide to the first portion of the solution and shake the test-tube. Now add excess sodium hydroxide to the test-tube.</p> <p>(ii) Repeat test (i) using aqueous ammonia solution instead of aqueous sodium hydroxide.</p> <p>(iii) Test the pH of the third portion of the solution with indicator paper. Now add to the solution about 1 cm<sup>3</sup> of dilute hydrochloric acid followed by about 1 cm<sup>3</sup> of barium chloride solution.</p> <p>(iv) To the fourth portion of the solution add an equal volume of aqueous sodium hydroxide. Now add a small spatula measure of aluminium powder and warm the mixture <b>carefully</b>. Test any gases given off.</p>	<p>..... [3]</p> <p>..... [2]</p> <p>pH ..... [1]</p> <p>..... [1]</p> <p>..... [2]</p>

(d) What does test (c)(iii) tell you about **E**?

.....  
..... [2]

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

..... [1]

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

.....  
.....  
..... [3]

[Total: 18]

## NOTES FOR USE IN QUALITATIVE ANALYSIS

## Test for anions

<i>anion</i>	<i>test</i>	<i>test result</i>
carbonate ( $\text{CO}_3^{2-}$ )	add dilute acid	effervescence, carbon dioxide produced
chloride ( $\text{Cl}^-$ ) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
iodide ( $\text{I}^-$ ) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	yellow ppt.
nitrate ( $\text{NO}_3^-$ ) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulfate ( $\text{SO}_4^{2-}$ ) [in solution]	acidify with dilute nitric acid, then aqueous barium nitrate	white ppt.

## Test for aqueous cations

<i>cation</i>	<i>effect of aqueous sodium hydroxide</i>	<i>effect of aqueous ammonia</i>
aluminium ( $\text{Al}^{3+}$ )	white ppt., soluble in excess giving a colourless solution	white ppt., insoluble in excess
ammonium ( $\text{NH}_4^+$ )	ammonia produced on warming	–
calcium ( $\text{Ca}^{2+}$ )	white ppt., insoluble in excess	no ppt., or very slight white ppt.
copper ( $\text{Cu}^{2+}$ )	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) ( $\text{Fe}^{2+}$ )	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) ( $\text{Fe}^{3+}$ )	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc ( $\text{Zn}^{2+}$ )	white ppt., soluble in excess giving a colourless solution	white ppt., soluble in excess giving a colourless solution

## Test for gases

<i>gas</i>	<i>test and test results</i>
ammonia ( $\text{NH}_3$ )	turns damp red litmus paper blue
carbon dioxide ( $\text{CO}_2$ )	turns limewater milky
chlorine ( $\text{Cl}_2$ )	bleaches damp litmus paper
hydrogen ( $\text{H}_2$ )	'pops' with a lighted splint
oxygen ( $\text{O}_2$ )	relights a glowing splint

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