UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

6086340837

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	
Total	

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

For Examiner's Use

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^3 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^3 mark.

Add 5 cm^3 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^3 portions of acid **C** to the flask, stirring with the thermometer until a total volume of 30 cm^3 of acid **C** has been added. Measure and record the temperatures after each 5 cm^3 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^3 [1]

Table of results

volume of acid **C** added / cm^3	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^3 mark.

Using a measuring cylinder, pour 20 cm^3 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^3 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^3 portions of acid **D** to the flask, stirring with the thermometer until a total volume of 30 cm^3 of acid **D** has been added. Measure and record the temperatures after each 5 cm^3 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^3 [1]

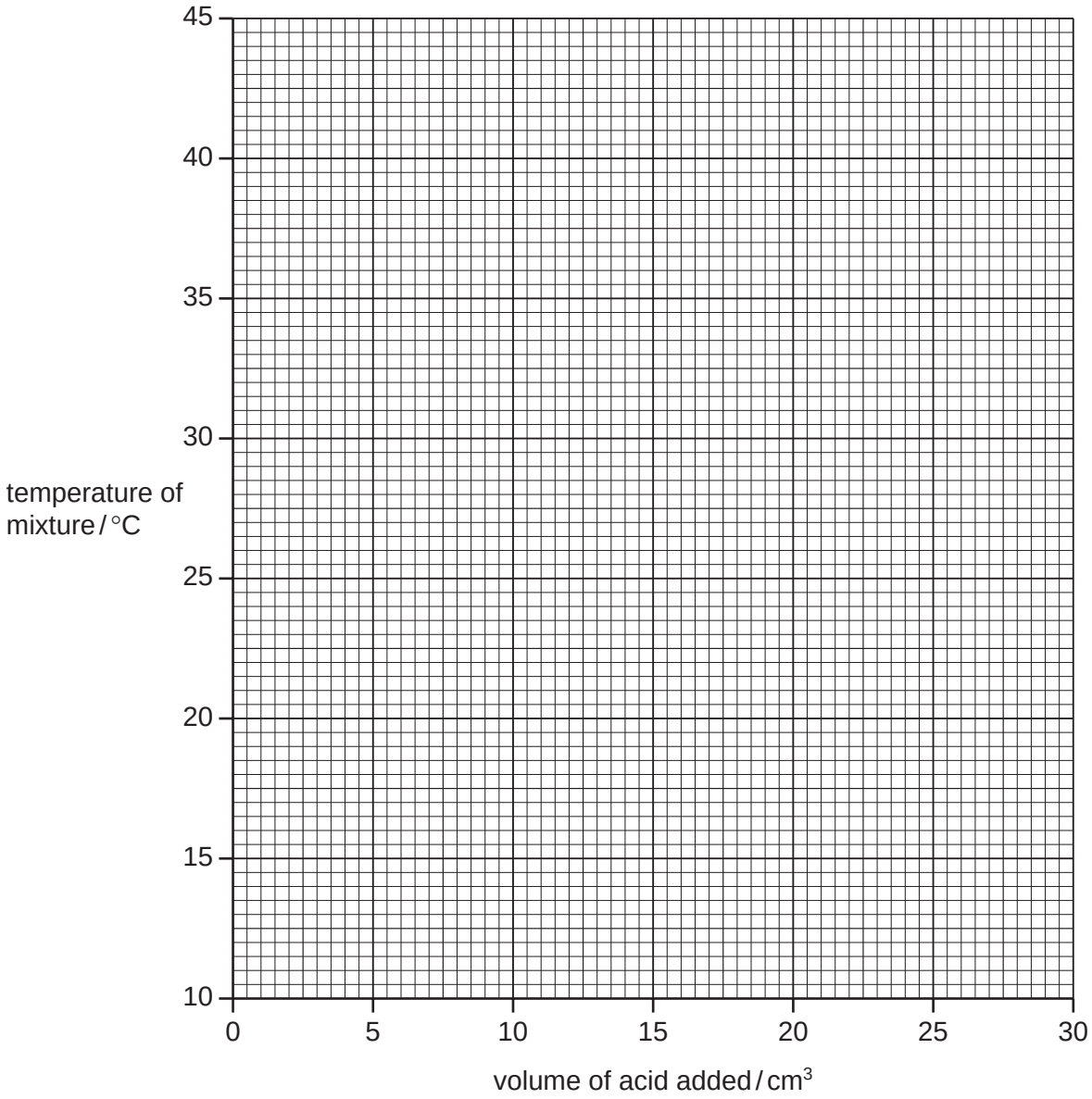
Table of results

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

[3]

For Examiner's Use

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



[6]

(b) From your graph, deduce the temperature of the mixture when 3 cm^3 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]

For Examiner's Use

(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.

tests	observations
(a) Describe the appearance of solid **E**.	..... [1]
(b) Place half of solid **E** in a test-tube. Heat the test-tube gently. Test any gas given off with damp pH indicator paper.	.... [2]
(c) Add the rest of solid **E** to about 8 cm^3 of distilled water in a test-tube. Cork the test-tube and shake the contents until dissolved. Divide the solution into 4 equal portions in test-tubes and carry out the following. **(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. **(ii)** Repeat test **(i)** using aqueous ammonia solution instead of aqueous sodium hydroxide. **(iii)** Test the pH of the third portion of the solution with indicator paper. Now add to the solution about 1 cm^3 of dilute hydrochloric acid followed by about 1 cm^3 of barium chloride solution. **(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 **carefully**. Test any gases given off.	.... [3] .... [2] pH ..... [1] ..... [1] .... [2]

(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

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.
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 with dilute nitric acid, then aqueous barium nitrate	white ppt.

Test 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.
copper (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

Test 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