Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

CHEMISTRY **0620/51**

Paper 5 Practical Test **May/June 2015**

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.
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	
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 what happens when aqueous sodium hydroxide reacts with aqueous solutions of two different acids, **A** and **B**.

Read all the instructions below carefully before starting the experiments.

Instructions
You are going to carry out two experiments.

View solution

(a) *Experiment 1*

Use a measuring cylinder to pour 50 cm^3 of aqueous sodium hydroxide into the polystyrene cup provided. Put the cup into a 250 cm^3 beaker for support. Measure the initial temperature of the solution and record it in the table below.

Fill the burette with the solution of acid **A** provided to the 0.0 cm^3 mark.
Add 5.0 cm^3 of acid **A** to the aqueous sodium hydroxide in the cup and stir the mixture.
Measure and record the maximum temperature of the solution in the table below. Add a further 5.0 cm^3 of acid **A** to the cup and stir the mixture. Measure and record the temperature of the mixture in the table below.
Continue to add 5.0 cm^3 portions of acid **A** to the cup, until a total volume of 40 cm^3 of acid has been added. Stir after each addition and measure and record the temperatures in the table.

At the end of this experiment, pour the solution away and rinse the polystyrene cup.

volume of acid **A** added / cm^3	temperature of solution in polystyrene cup / °C
0.0	
5.0	
10.0	
15.0	
20.0	
25.0	
30.0	
35.0	
40.0	

[3]

(b) *Experiment 2*

Empty the burette and rinse it with distilled water. Half fill the burette with the solution of acid **B** and swirl the contents. Discard this acid.
Now fill the burette to the 0.0 cm^3 mark with the solution of acid **B**.

View solution

Repeat Experiment 1 using acid **B** instead of acid **A**.
Record your results in the table below.

volume of acid **B** added / cm^3	temperature of solution in polystyrene cup / °C
0.0	
5.0	
10.0	
15.0	
20.0	
25.0	
30.0	
35.0	
40.0	

[3]

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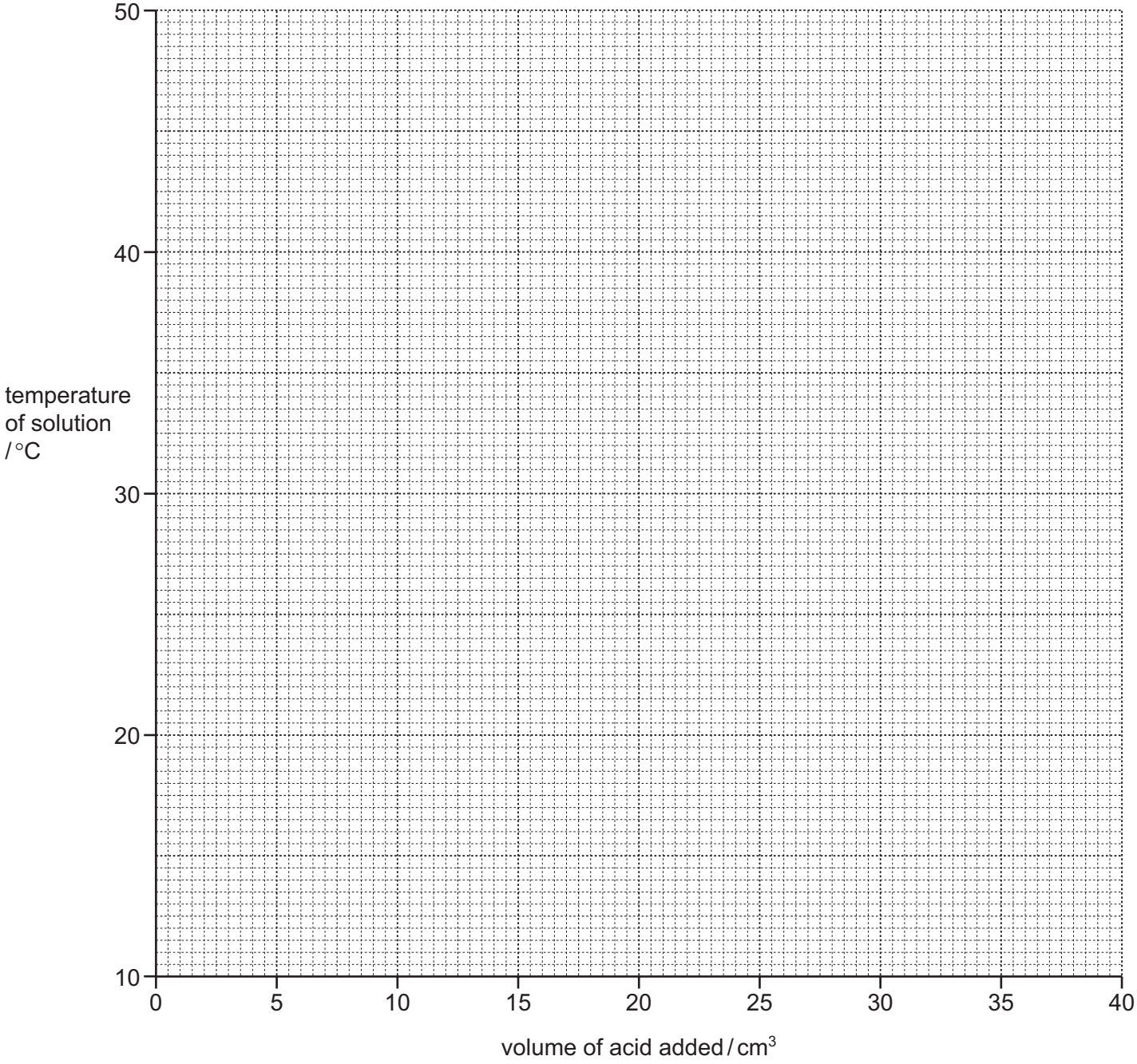
(c) Plot the results for Experiments 1 and 2 on the grid and draw a smooth line graph for each experiment.
Clearly label your graphs.

View solution



[5]

(d) **Use your graph** to estimate the temperature of the reaction mixture when 8 cm^3 of acid **B** were added to 50 cm^3 of aqueous sodium hydroxide.

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

View solution

..... [2]

(e) What type of chemical reaction, other than neutralisation, occurs when acid **A** reacts with sodium hydroxide?

..... [1]

(f) Why was the burette rinsed firstly with distilled water and then with acid **B** before starting Experiment 2?

.....

..... [2]

(g) The solutions of acids **A** and **B** are the same concentration.

View solution

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

..... [1]

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

View solution

.....

..... [1]

(h) Describe **one** source of error in Experiment 2. Suggest an improvement to reduce this source of error.

source of error .....

improvement ..... [2]

[Total: 20]

View solution

2 You are provided with solid **C**, which is a salt containing two cations and one anion.
Carry out the following tests on solid **C** recording all of your observations in the table.
Conclusions must **not** be written in the table.

View solution

tests	observations
<u>tests on solid **C**</u> **(a)** Describe the appearance of solid **C**.	..... [1]
(b) Use a spatula to put a little of solid **C** into a hard-glass test-tube. Heat the solid gently and then strongly. Test any gases given off with damp pH indicator paper.	.... [3]
<u>tests on a solution of **C**</u> Add about 10 cm^3 of distilled water to the rest of solid **C**, stopper and shake to dissolve. Divide the solution into four equal portions in four test-tubes. Carry out the following tests. **(c)** To the first portion of the solution, add aqueous sodium hydroxide using a teat pipette. Now add excess aqueous sodium hydroxide to the mixture. Heat the mixture gently and test any gases given off.	View solution View solution ..... [2] ..... [1] .... [2]
(d) To the second portion of the solution, add excess aqueous ammonia. View solution	.... [2]
(e) To the third portion of the solution, add a few drops of dilute nitric acid and about 1 cm^3 of aqueous silver nitrate.	View solution ..... [1]
(f) To the fourth portion of the solution, add a few drops of dilute nitric acid and about 1 cm^3 of barium nitrate solution.	.... [2]

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(g) What does test **(b)** tell you about the nature of solid **C**?

.....

.....

..... [2]

(h) What does test **(e)** tell you about the nature of solid **C**?

View solution

..... [1]

(i) What conclusions can you draw about the identity of solid **C**?

View solution

.....

..... [3]

[Total: 20]

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

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