Cambridge IGCSE

**Cambridge International Examinations**
Cambridge International General Certificate of Secondary Education

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

*7727926786*

**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.




CAMBRIDGE International Examinations

**[Turn over**

**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.

**(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**.

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

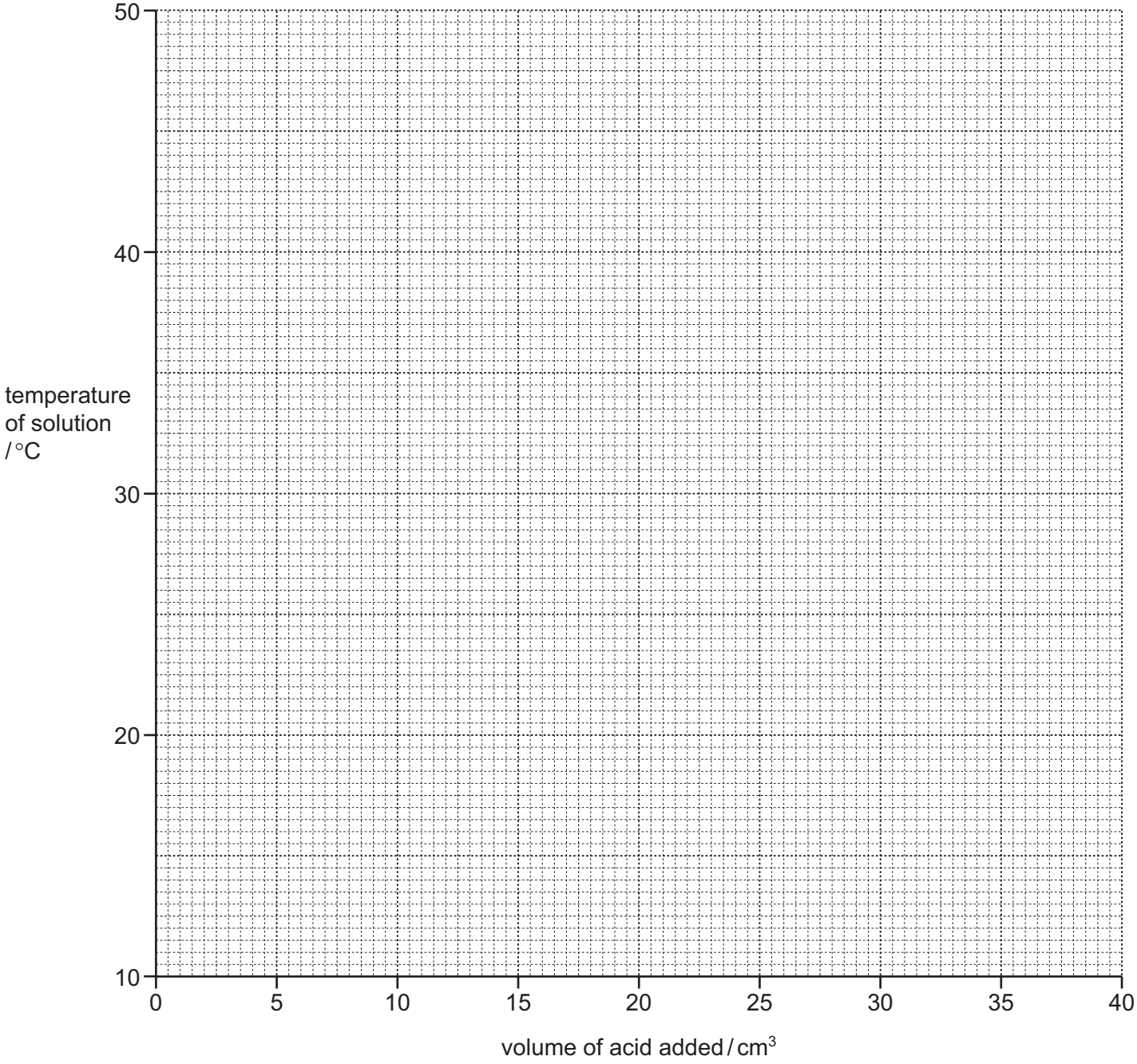
| volume of acid **B** added / $cm^3$ | temperature of solution in polystyrene cup / °C |
|---|---|
| 0.0 | |
| 5.0 | |
| 10.0 | |
| 15.0 | |
| 20.0 | |
| 25.0 | |
| 30.0 | |
| 35.0 | |
| 40.0 | |

[3]



**[Turn over**

**(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.




[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.

..... [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.

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

..... [1]

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

.....

..... [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]



**[Turn over**

**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.

| tests | observations |
|---|---|
| tests on solid **C**<br><br>**(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.<br><br>Test any gases given off with damp pH indicator paper. | .....<br>.....<br>..... [3] |
| tests on a solution of **C**<br><br>Add about 10 $cm^3$ of distilled water to the rest of solid **C**, stopper and shake to dissolve.<br>Divide the solution into four equal portions in four test-tubes. Carry out the following tests.<br><br>**(c)** To the first portion of the solution, add aqueous sodium hydroxide using a teat pipette.<br><br>Now add excess aqueous sodium hydroxide to the mixture.<br><br>Heat the mixture gently and test any gases given off. | ..... [2]<br><br>..... [1]<br><br>.....<br>..... [2] |
| **(d)** To the second portion of the solution, add excess aqueous ammonia. | .....<br>..... [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. | ..... [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. | .....<br>..... [2] |

**(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**?

..... [1]

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

.....

..... [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 |