Cambridge IGCSE

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

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

*6726715019*

**CHEMISTRY** **0620/53**

Paper 5 Practical Test **May/June 2018**

**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.
Notes for use in qualitative analysis are provided on pages 11 and 12.

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 **11** printed pages and **1** blank page.




CAMBRIDGE International Examinations

**1** You are going to investigate how the temperature changes when aqueous sodium hydroxide reacts with solutions of two different acids, acid **R** and acid **S**.

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

**Instructions**
You are going to do two experiments.

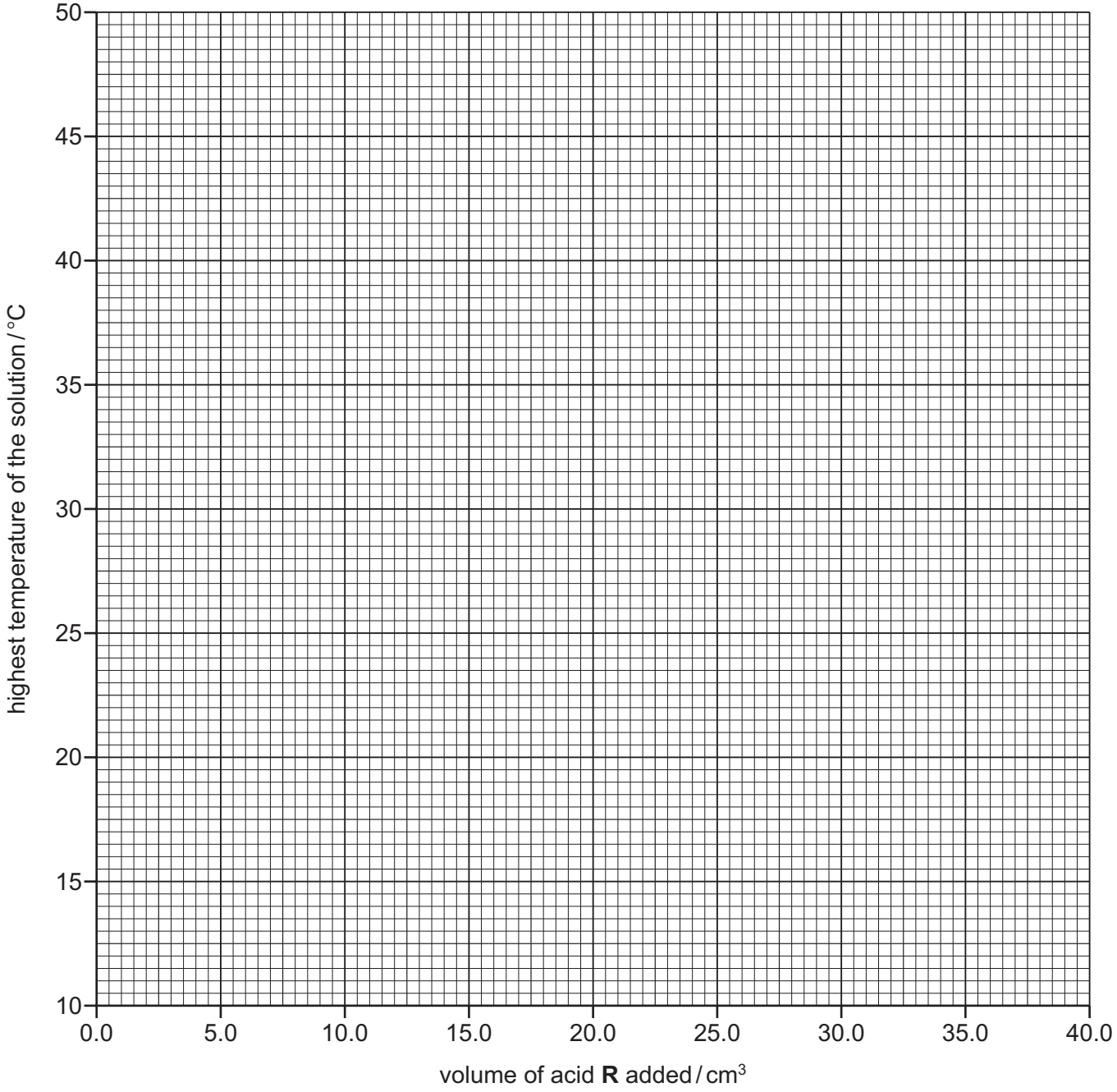
**(a)** *Experiment 1*

- Put the polystyrene cup into the 250 $cm^3$ beaker for support.
- Use the measuring cylinder to pour 50 $cm^3$ of aqueous sodium hydroxide into the polystyrene cup.
- Measure the temperature of the solution and record it in the table.
- Fill the burette up to the 0.0 $cm^3$ mark with acid **R**.
- Add 5.0 $cm^3$ of acid **R** to the aqueous sodium hydroxide in the polystyrene cup and stir the solution with the thermometer.
- Measure and record the highest temperature of the solution in the table.
- Add a further 5.0 $cm^3$ of acid **R** to the polystyrene cup and stir the solution with the thermometer.
- Measure and record the highest temperature of the solution in the table.
- Continue to add 5.0 $cm^3$ portions of acid **R** to the polystyrene cup until a total volume of 40.0 $cm^3$ of acid **R** has been added. Stir after each addition and measure and record the highest temperature of the solution in the table in each case.
- Pour the solution away and rinse the polystyrene cup.

| volume of acid **R** added / $cm^3$ | highest temperature of the solution / °C |
|---|---|
| 0.0 | |
| 5.0 | |
| 10.0 | |
| 15.0 | |
| 20.0 | |
| 25.0 | |
| 30.0 | |
| 35.0 | |
| 40.0 | |

[2]

**(b)** Plot your results for Experiment 1 on the grid and draw **two** intersecting straight line graphs.




[2]

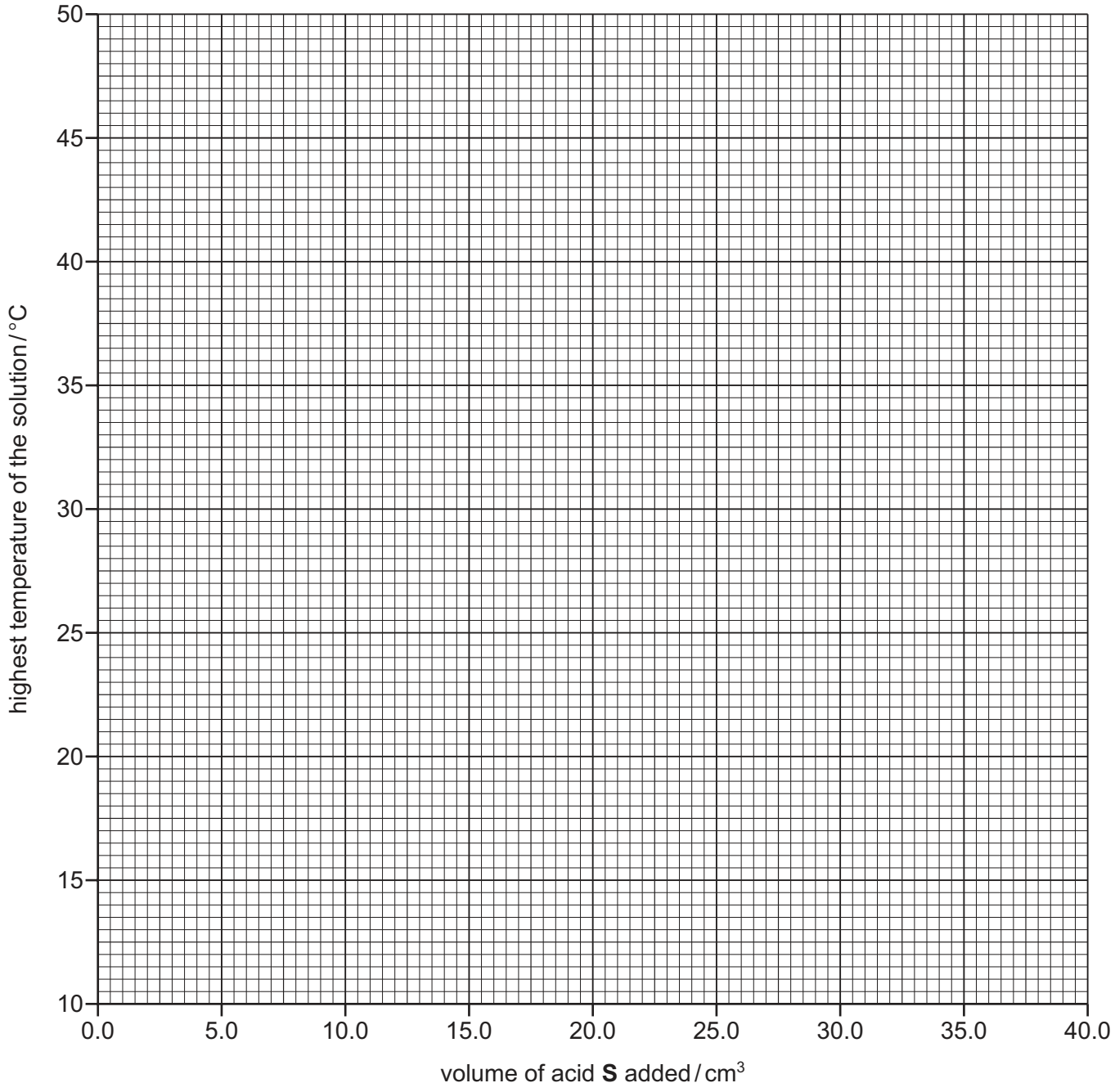
**(c)** *Experiment 2*

- Empty the burette and rinse it with distilled water. Discard this liquid.
- Rinse the burette with some of acid **S**. Discard this acid.
- Repeat Experiment 1 but using acid **S** instead of acid **R**.
- Record your results in the table.

| volume of acid **S** added / $cm^3$ | highest temperature of the solution / °C |
|---|---|
| 0.0 | |
| 5.0 | |
| 10.0 | |
| 15.0 | |
| 20.0 | |
| 25.0 | |
| 30.0 | |
| 35.0 | |
| 40.0 | |

[2]

**(d)** Plot your results for Experiment 2 on the grid and draw **two** intersecting straight line graphs.




[2]

**(e) (i)** **Use your graph** to estimate the volume of acid **S** which must be added to neutralise 50 $cm^3$ of aqueous sodium hydroxide.

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

..... $cm^3$ [2]

**(ii)** Suggest how the volume in **(e)(i)** would differ if the experiment were repeated using 25 $cm^3$ instead of 50 $cm^3$ of aqueous sodium hydroxide.
Explain your answer.

.....

..... [2]

**(f)** What type of energy change occurs when acid **S** reacts with aqueous sodium hydroxide?

..... [1]

**(g)** **(i)** In Experiment 2, why was the burette rinsed with distilled water?

..... [1]

**(ii)** Why was the burette then rinsed with acid **S**?

..... [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: 17]

**2** You are provided with two substances, solution **T** and liquid **U**.
Do the following tests on the substances, recording all of your observations at each stage.

**tests on solution T**

Divide solution **T** into four approximately equal portions in three test-tubes and one boiling tube.

**(a) (i)** Do a flame test on the first portion of solution **T**.
Record your observations.

..... [1]

**(ii)** Test the pH of the first portion of solution **T**.

pH = ..... [1]

**(b)** ● Add a few drops of aqueous zinc sulfate to the second portion of solution **T** in a test-tube.
Shake the test-tube to mix the solutions.
Record your observations.

.....

● Add an excess of aqueous zinc sulfate to the mixture.
Record your observations.

.....
[3]

**(c)** Add a small spatula measure of ammonium chloride to the third portion of solution **T** in a boiling tube. Warm the mixture carefully. Test the gas produced.
Record your observations.

.....

..... [2]

**(d)** ● Add a few drops of aqueous chromium(III) chloride to the fourth portion of solution **T** in a test-tube.
Record your observations.

.....

● Add an excess of aqueous chromium(III) chloride to the mixture.
Record your observations.

.....
[3]

**(e)** Identify solution **T**.

..... [2]

**tests on liquid U**

**(f)** Describe the appearance of liquid **U**.

..... [1]

**(g)** Add about 10 $cm^3$ of aqueous iodine to about 1 $cm^3$ of liquid **U** in a boiling tube. Add drops of aqueous sodium hydroxide until the brown colour of the aqueous iodine is removed.
Record your observations.

.....

..... [2]

**(h)** Use a teat pipette to place a few drops of liquid **U** on to a watch glass. Use a lighted splint to touch the surface of the liquid carefully.

..... [1]

**(i)** What conclusion can you draw about liquid **U**?

..... [1]

[Total: 17]

**3** Some trees have purple leaves. The purple colour is a mixture of coloured pigments.

Plan an experiment to extract and separate the coloured pigments present in the purple leaves.

You are provided with some purple leaves, sand, ethanol and common laboratory apparatus.
You may draw a diagram to help you answer the question.

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

[Total: 6]

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**Notes for use in qualitative analysis**
**Tests 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. |
| bromide ($Br^-$) [in solution] | acidify with dilute nitric acid, then add aqueous silver nitrate | cream 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, then add aqueous barium nitrate | white ppt. |
| sulfite ($SO_3^{2-}$) | add dilute hydrochloric acid, warm gently and test for the presence of sulfur dioxide | sulfur dioxide produced will turn acidified aqueous potassium manganate(VII) from purple to colourless |

**Tests 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. |
| chromium(III) ($Cr^{3+}$) | green ppt., soluble in excess | grey-green ppt., insoluble in excess |
| copper(II) ($Cu^{2+}$) | 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 |

**Tests 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 |
| sulfur dioxide ($SO_2$) | turns acidified aqueous potassium manganate(VII) from purple to colourless |

**Flame tests for metal ions**

| metal ion | flame colour |
|---|---|
| lithium ($Li^+$) | red |
| sodium ($Na^+$) | yellow |
| potassium ($K^+$) | lilac |
| copper(II) ($Cu^{2+}$) | blue-green |