Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

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.

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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*

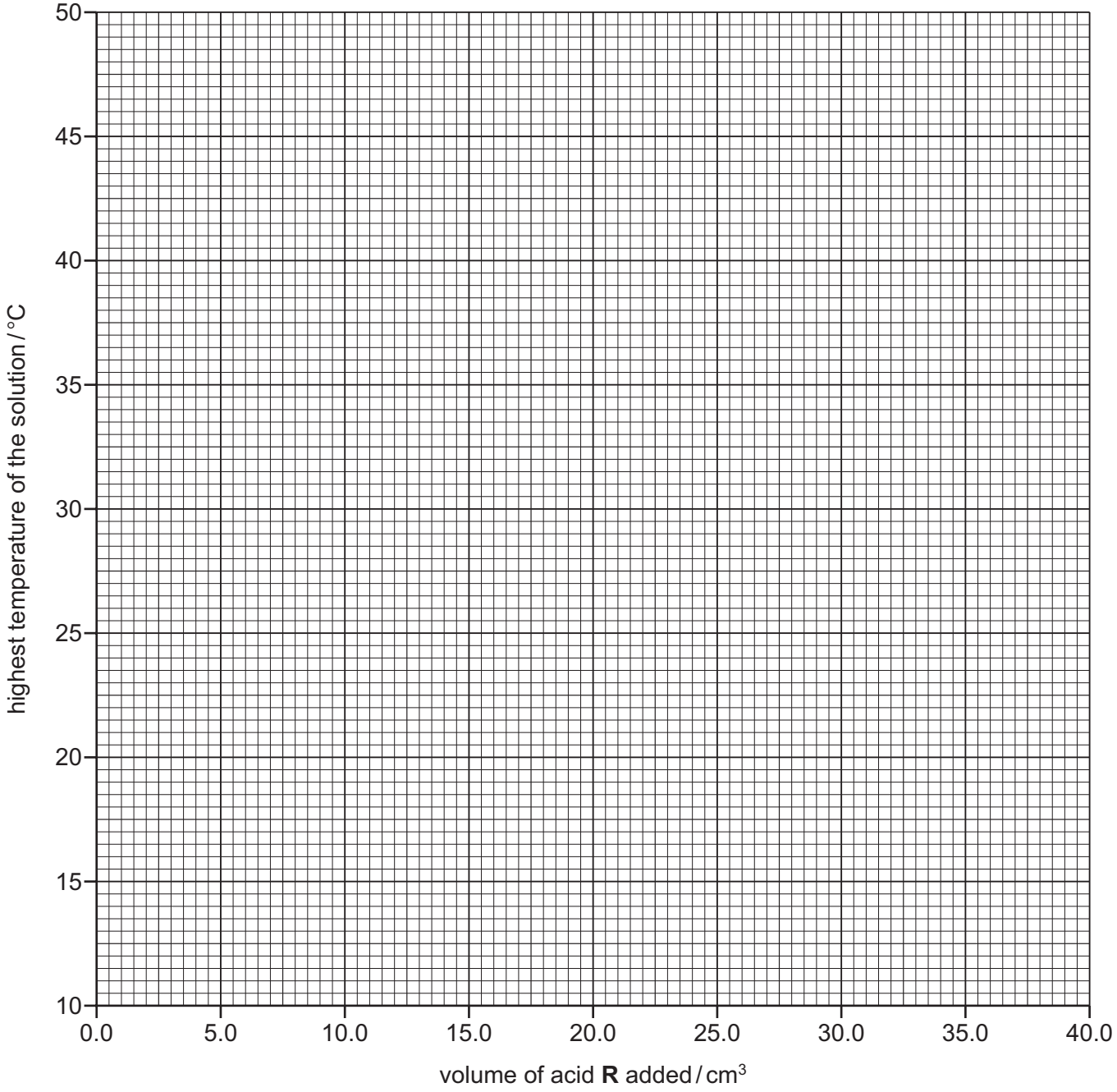
View solution

- 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]

View solution

(c) *Experiment 2*

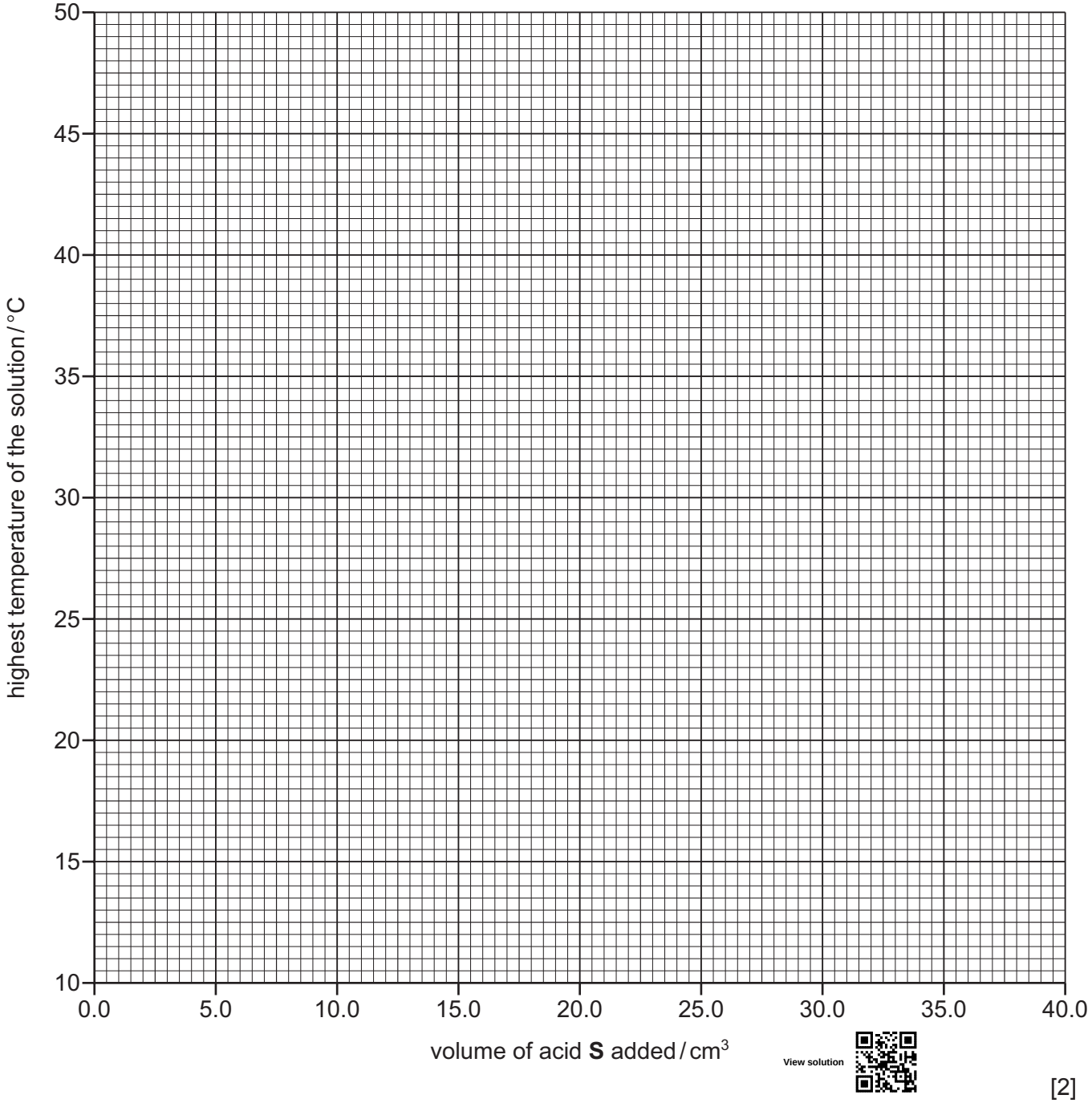
View solution

- 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.

View solution

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.

View solution

.....

..... [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?

View solution

..... [1]

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

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: 17]

View solution

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.

View solution

..... [1]

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

View solution

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.

View solution

.....

● 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.

View solution

.....

..... [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.

View solution

.....

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

.....
[3]

(e) Identify solution **T**.

View solution

..... [2]

tests on liquid U

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

View solution

..... [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.

View solution

.....

..... [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**?

View solution

..... [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.

View solution

.....

.....

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.....

.....

..... [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

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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

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