Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

4303303595

CHEMISTRY **0620/53**

Paper 5 Practical Test **October/November 2017**

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 **10** printed pages and **2** blank pages.

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CAMBRIDGE International Examinations

[Turn over

1 You are going to investigate what happens to the temperature when two different solids, **W** and **X**, dissolve in water.

Read all the instructions carefully before starting the experiments.

Instructions
You are going to carry out two experiments.

(a) *Experiment 1*

- Put the polystyrene cup into the 250 cm^3 beaker for support.
- Use the measuring cylinder to pour 30 cm^3 of distilled water into the polystyrene cup.
- Measure the initial temperature of the water and record it in the table at time = 0 seconds.
- Add all of solid **W** to the water, start the timer and stir the solution continuously with the thermometer.
- Measure the temperature of the solution every 10 seconds for 90 seconds.
- Record your results in the table.

time / s	0	10	20	30	40	50	60	70	80	90
temperature of the solution / °C										

[2]

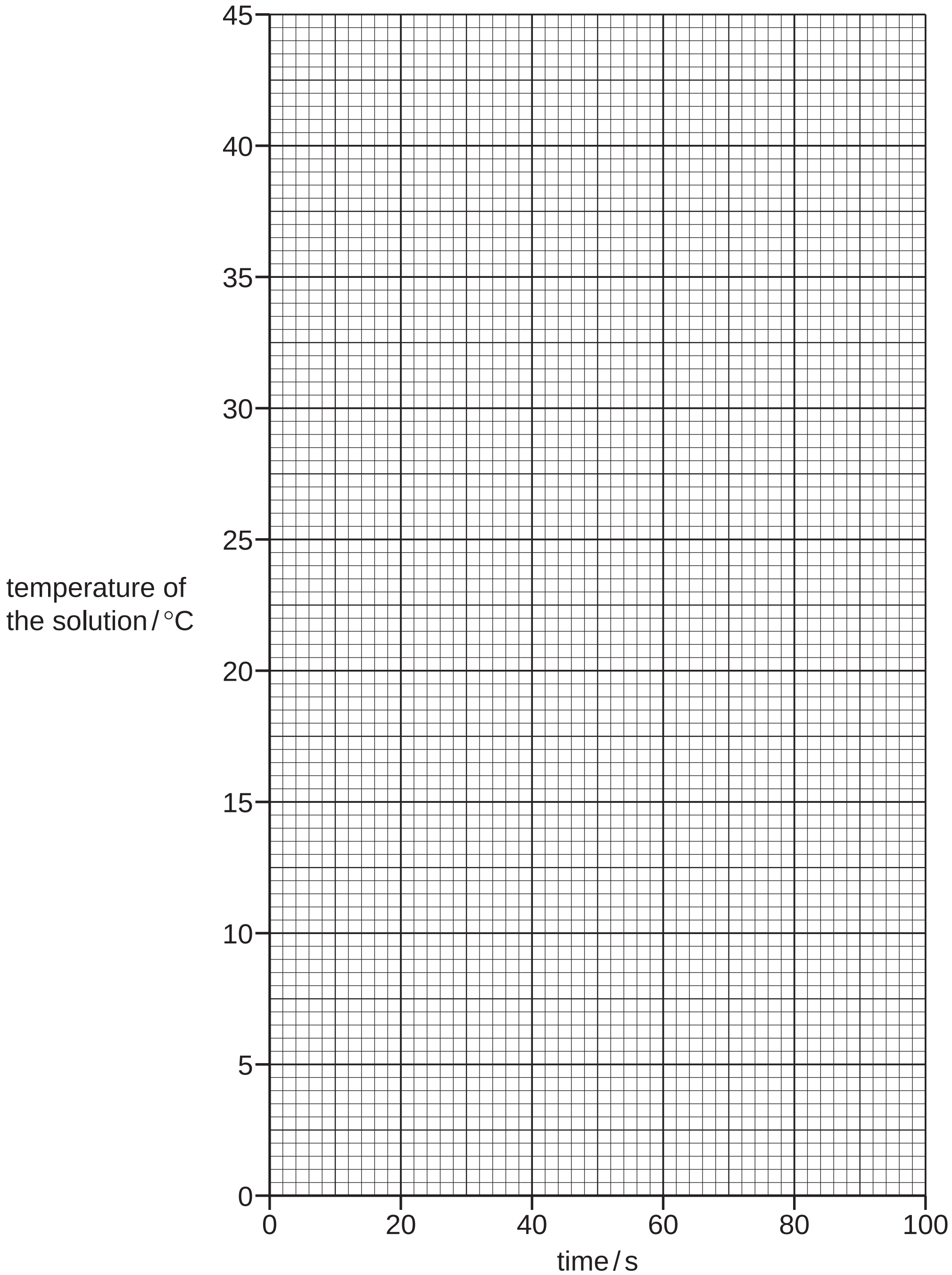
(b) *Experiment 2*

- Empty the polystyrene cup and rinse it with water. Put the polystyrene cup back into the 250 cm^3 beaker.
- Use a measuring cylinder to pour 30 cm^3 of distilled water into the polystyrene cup.
- Measure the initial temperature of the water and record it in the table at time = 0 seconds.
- Add all of solid **X** to the water, start the timer and stir the solution continuously with the thermometer.
- Measure the temperature of the solution every 10 seconds for 90 seconds.
- Record your results in the table.

time / s	0	10	20	30	40	50	60	70	80	90
temperature of the solution / °C										

[2]

(c) Plot your results for Experiments 1 and 2 on the grid. Draw **two** smooth line graphs.
Clearly label your lines.



[4]

(d) (i) **From your graph**, deduce the temperature of the solution in Experiment 1 after 15 seconds.
Show clearly **on the grid** how you worked out your answer.

.... °C [2]

(ii) **From your graph**, deduce the time taken for the temperature of the solution in Experiment 2 to change by 6 °C from the initial temperature.
Show clearly **on the grid** how you worked out your answer.

.... s [2]

(e) Use your results to identify the type of energy change that occurs when solid **X** dissolves in water.

.... [1]

(f) Predict the temperature of the solution in Experiment 2 after 1 hour. Explain your answer.

....

.... [1]

(g) State **two** sources of error in these experiments. Give **one** improvement to reduce each of these sources of error.

source of error 1 ....

improvement 1 ....

source of error 2 ....

improvement 2 ....
[4]

(h) When carrying out the experiments, what would be a disadvantage of taking the temperature readings only every 30 seconds?

....

.... [1]

[Total: 19]

Question 2 starts on the next page.

2 You are provided with two solutions, **Y** and **Z**.
Carry out the following tests on the solutions, recording all of your observations at each stage.

tests on solution Y

Divide the solution into two equal portions in two test-tubes.

(a) Describe the appearance of solution **Y**.

.... [1]

(b) **(i)** Add a few drops of aqueous sodium hydroxide to the first portion of solution **Y** and shake the test-tube to mix the solutions.
Record your observations.

.... [2]

(ii) Now add an excess of aqueous sodium hydroxide to the mixture.
Record your observations.

.... [1]

(iii) Pour the mixture from **(b)(ii)** into a boiling tube and add a small piece of aluminium foil. Heat the mixture carefully. Test the gas produced with indicator paper.
Record your observations.

....

.... [2]

Keep the second portion of solution **Y** for the test in **(e)**.

tests on solution Z

Divide the solution into three equal portions in three test-tubes.

(c) Test the pH of the first portion of solution **Z**.
Record your observations.

.... [1]

(d) **(i)** Add a few drops of aqueous copper(II) sulfate to the second portion of solution **Z**.
Record your observations.

.... [1]

(ii) Now add an excess of aqueous copper(II) sulfate to the mixture.
Record your observations.

.... [2]

(e) To the third portion of solution **Z**, add the second portion of solution **Y**.
Record your observations.

.... [2]

(f) Identify solution **Y**.

.... [2]

(g) Identify solution **Z**.

.... [1]

[Total: 15]

3 Washing soda crystals are crystals of hydrated sodium carbonate, $Na_2CO_3.10H_2O$. When exposed to the air, some of the water is lost from the crystals and a new substance is formed. This process occurs faster in hotter climates.

Plan an experiment to determine the percentage of water by mass present in the new substance.

You are provided with common laboratory apparatus.

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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

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