



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

CANDIDATE  
NAME

CENTRE  
NUMBER

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**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.

- 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<sup>3</sup> beaker for support.
- Use the measuring cylinder to pour 30 cm<sup>3</sup> 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]

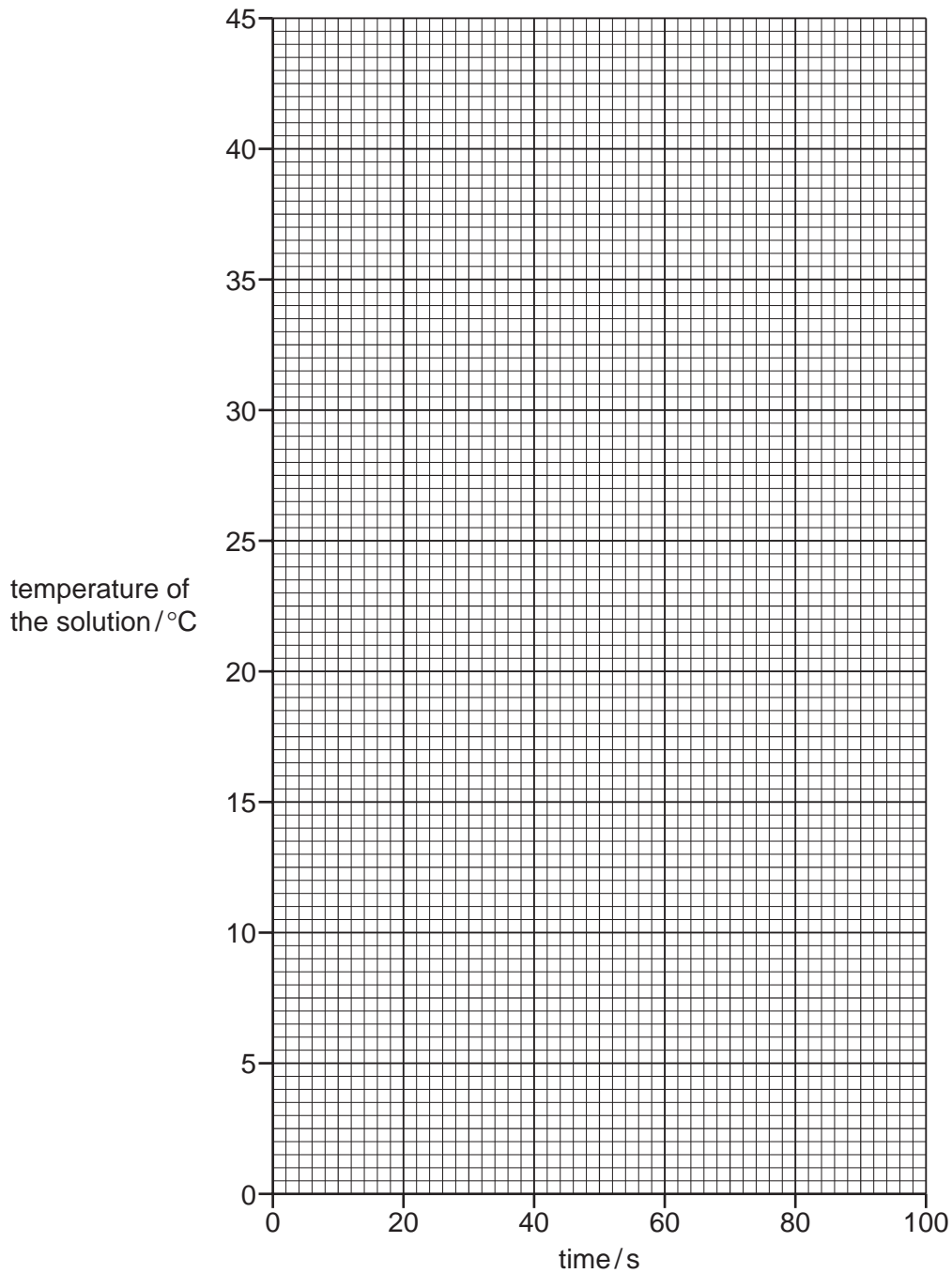
**(b) Experiment 2**

- Empty the polystyrene cup and rinse it with water. Put the polystyrene cup back into the 250 cm<sup>3</sup> beaker.
- Use a measuring cylinder to pour 30 cm<sup>3</sup> 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]









**Notes for use in qualitative analysis****Tests for anions**

| anion   | test  | test result  |
|---|---|--|
| carbonate ( $\text{CO}_3^{2-}$ )                | add dilute acid   | effervescence, carbon dioxide produced   |
| chloride ( $\text{Cl}^-$ )<br>[in solution]     | acidify with dilute nitric acid, then add aqueous silver nitrate                      | white ppt.   |
| bromide ( $\text{Br}^-$ )<br>[in solution]      | acidify with dilute nitric acid, then add aqueous silver nitrate                      | cream ppt.   |
| iodide ( $\text{I}^-$ )<br>[in solution]        | acidify with dilute nitric acid, then add aqueous silver nitrate                      | yellow ppt.  |
| nitrate ( $\text{NO}_3^-$ )<br>[in solution]    | add aqueous sodium hydroxide, then aluminium foil; warm carefully                     | ammonia produced   |
| sulfate ( $\text{SO}_4^{2-}$ )<br>[in solution] | acidify, then add aqueous barium nitrate  | white ppt.   |
| sulfite ( $\text{SO}_3^{2-}$ )                  | 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 ( $\text{Al}^{3+}$ )     | white ppt., soluble in excess, giving a colourless solution | white ppt., insoluble in excess                                 |
| ammonium ( $\text{NH}_4^+$ )       | ammonia produced on warming                                 | –   |
| calcium ( $\text{Ca}^{2+}$ )       | white ppt., insoluble in excess                             | no ppt., or very slight white ppt.                              |
| chromium(III) ( $\text{Cr}^{3+}$ ) | green ppt., soluble in excess                               | grey-green ppt., insoluble in excess                            |
| copper(II) ( $\text{Cu}^{2+}$ )    | light blue ppt., insoluble in excess                        | light blue ppt., soluble in excess, giving a dark blue solution |
| iron(II) ( $\text{Fe}^{2+}$ )      | green ppt., insoluble in excess                             | green ppt., insoluble in excess                                 |
| iron(III) ( $\text{Fe}^{3+}$ )     | red-brown ppt., insoluble in excess                         | red-brown ppt., insoluble in excess                             |
| zinc ( $\text{Zn}^{2+}$ )          | 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 <sub>3</sub> )        | turns damp red litmus paper blue   |
| carbon dioxide (CO <sub>2</sub> ) | turns limewater milky  |
| chlorine (Cl <sub>2</sub> )       | bleaches damp litmus paper   |
| hydrogen (H <sub>2</sub> )        | 'pops' with a lighted splint   |
| oxygen (O <sub>2</sub> )          | relights a glowing splint  |
| sulfur dioxide (SO <sub>2</sub> ) | turns acidified aqueous potassium manganate(VII) from purple to colourless |

**Flame tests for metal ions**

| metal ion                      | flame colour |
|--------------------------------|--------------|
| lithium (Li <sup>+</sup> )     | red          |
| sodium (Na <sup>+</sup> )      | yellow       |
| potassium (K <sup>+</sup> )    | lilac        |
| copper(II) (Cu <sup>2+</sup> ) | blue-green   |

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