



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

CANDIDATE  
NAME

CENTRE  
NUMBER

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**CHEMISTRY**

**0620/52**

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.

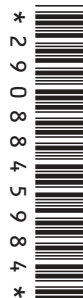
The number of marks is given in brackets [ ] at the end of each question or part question.

**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.



## 2

- 1 You are going to investigate what happens when two different solids, **S** and **T**, 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 first row of the table.
- Add the 2.0 g sample of solid **S** to the polystyrene cup and stir the solution with the thermometer.
- Measure and record the **maximum** temperature of the solution.
- Pour the solution away and rinse out the polystyrene cup with distilled water.
- Repeat the procedure using the 3.0 g sample of solid **S**. Record your results in the appropriate row of the table.
- Repeat the procedure using the 5.0 g sample of solid **S**. Record your results in the appropriate row of the table.

| mass of solid <b>S</b> / g | initial temperature of the water / °C | maximum temperature of the solution / °C |
|----------------------------|---------------------------------------|------------------------------------------|
| 2.0                        |                                       |                                          |
| 3.0                        |                                       |                                          |
| 5.0                        |                                       |                                          |

[2]

**(b) Experiment 2**

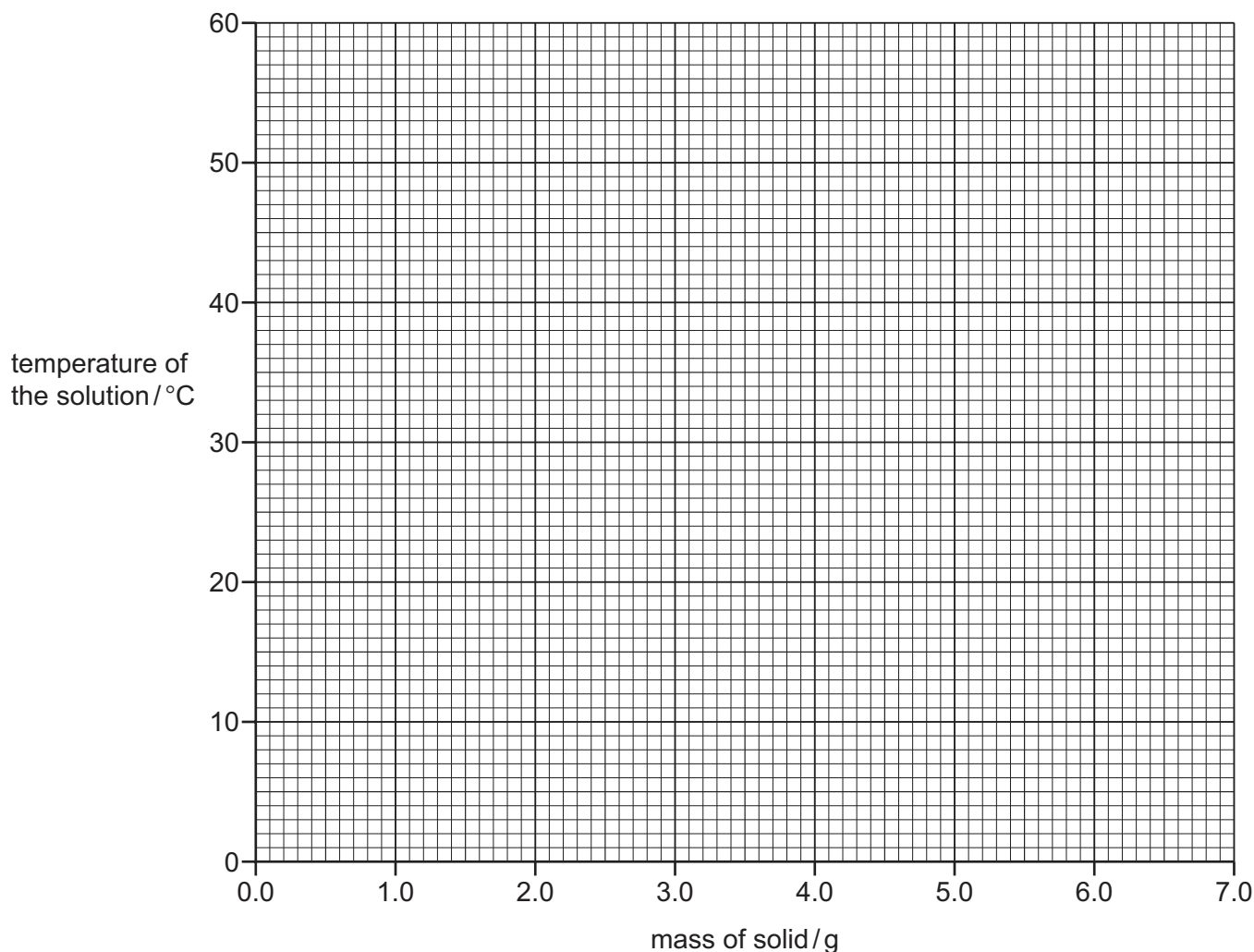
- Put the polystyrene cup into the 250 cm<sup>3</sup> beaker for support.
- Use the measuring cylinder to pour 30 cm<sup>3</sup> of distilled water into the polystyrene cup.
- Measure the initial temperature of the water and record it in the first row of the table.
- Add the 2.0 g sample of solid **T** to the polystyrene cup and stir the solution with the thermometer.
- Measure and record the **minimum** temperature of the solution.
- Pour the solution away and rinse out the polystyrene cup with distilled water.
- Repeat the procedure using the 3.0 g sample of solid **T**.
- Repeat the procedure using the 4.0 g sample of solid **T**.
- Repeat the procedure using the 6.0 g sample of solid **T**.
- Record your results in the appropriate rows of the table.

| mass of solid <b>T</b> / g | initial temperature of the water / °C | minimum temperature of the solution / °C |
|----------------------------|---------------------------------------|------------------------------------------|
| 2.0                        |                                       |                                          |
| 3.0                        |                                       |                                          |
| 4.0                        |                                       |                                          |
| 6.0                        |                                       |                                          |

[2]

3

- (c) Plot your results for Experiment 1 (maximum temperature) and Experiment 2 (minimum temperature) on the grid. Draw **two** straight lines of best fit. Clearly label your lines.



[4]

- (d) (i) **From your graph**, deduce the maximum temperature of the solution if 6.0 g of solid **S** were added to 30 cm<sup>3</sup> of distilled water.

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

..... °C [2]

- (ii) **From your graph**, deduce the minimum temperature of the solution if 4.5 g of solid **T** were added to 30 cm<sup>3</sup> of distilled water.

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

..... °C [2]

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

..... [1]

4

- (f) Suggest **one** change you could make to the experiments to obtain more accurate results. Explain how this change would make the results more accurate.

change .....

explanation .....

..... [2]

- (g) Suggest how the reliability of the results could be checked.

..... [1]

- (h) Explain how the temperatures measured would be different if Experiment 1 were repeated using 60 cm<sup>3</sup> of distilled water in each case.

.....

..... [2]

[Total: 18]

**Question 2 starts on the next page.**

## 6

- 2** You are provided with two solid salts, **U** and **W**.  
Carry out the following tests on solid **U** and solid **W**, recording all of your observations at each stage.

**tests on solid U**

- (a)** Describe the appearance of solid **U**.

..... [1]

Add about half of solid **U** to about 5 cm<sup>3</sup> of distilled water in a test-tube. Stopper the test-tube and shake it to dissolve solid **U** and form solution **U**.

Divide solution **U** into two equal portions in two test-tubes and carry out the following tests.

- (b)** To the first portion of solution **U**, add about 1 cm<sup>3</sup> of dilute hydrochloric acid.  
Test the gas produced.  
Record your observations.

.....  
..... [3]

Keep the second portion of solution **U** for the test in **(g)(i)**.

- (c)** Identify the gas produced in **(b)**.

..... [1]

- (d)** Carry out a flame test on solid **U**.  
Record your observations.

..... [1]

- (e)** Identify solid **U**.

..... [2]

**tests on solid W**

Add about half of solid **W** to about 5 cm<sup>3</sup> of distilled water in a test-tube. Stopper the test-tube and shake it to dissolve solid **W** and form solution **W**.

Divide solution **W** into two equal portions in two test-tubes and carry out the following tests.

- (f) To the first portion of solution **W**, add a few drops of dilute nitric acid and about 1 cm<sup>3</sup> of aqueous silver nitrate.  
Record your observations.

..... [2]

- (g) (i) To the second portion of solution **W**, add the second portion of solution **U**.  
Record your observations.

..... [2]

- (ii) Now add an excess of dilute hydrochloric acid to the mixture from (g)(i).  
Record your observations.

..... [2]

- (h) What conclusions can you draw about solid **W**?

.....  
..... [2]

[Total: 16]

**8**

- 3** When iron nails rust, the mass of the nails increases.  
Plan an experiment to investigate if iron nails rust more quickly in tap water or in distilled water.  
You are provided with new iron nails and common laboratory apparatus.

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

[Total: 6]

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**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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