Cambridge Assessment International Education

# Cambridge IGCSE™

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*6396159486*

**CHEMISTRY** **0620/52**

Paper 5 Practical Test **February/March 2022**

**1 hour 15 minutes**

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

**INSTRUCTIONS**

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

**INFORMATION**

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].
- Notes for use in qualitative analysis are provided in the question paper.

| For Examiner's Use | |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| Total | |

This document has **12** pages. Any blank pages are indicated.


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**1** You are going to investigate the temperature change when anhydrous lithium chloride dissolves in water.

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

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

**(a)** *Experiment 1*

- Use a measuring cylinder to pour 30 $cm^3$ of distilled water into a 100 $cm^3$ beaker.
- Use a thermometer to measure the initial temperature of the water. Record the initial temperature in the table.
- Add the 1.0 g sample of anhydrous lithium chloride to the water in the beaker. At the same time start a timer.
- Continually stir the mixture in the beaker using the thermometer.
- Measure the temperature reached by the mixture after 30 seconds. Record the temperature of the mixture in the table.
- Calculate and record the temperature change in the table.
- Empty and rinse the beaker with distilled water.

*Experiment 2*

- Repeat Experiment 1 using the 1.5 g sample of anhydrous lithium chloride instead of the 1.0 g sample of anhydrous lithium chloride.

*Experiment 3*

- Repeat Experiment 1 using the 2.0 g sample of anhydrous lithium chloride instead of the 1.0 g sample of anhydrous lithium chloride.

*Experiment 4*

- Repeat Experiment 1 using the 2.5 g sample of anhydrous lithium chloride instead of the 1.0 g sample of anhydrous lithium chloride.

*Experiment 5*

- Repeat Experiment 1 using the 3.0 g sample of anhydrous lithium chloride instead of the 1.0 g sample of anhydrous lithium chloride.

*Experiment 6*

- Repeat Experiment 1 using the 4.0 g sample of anhydrous lithium chloride instead of the 1.0 g sample of anhydrous lithium chloride.

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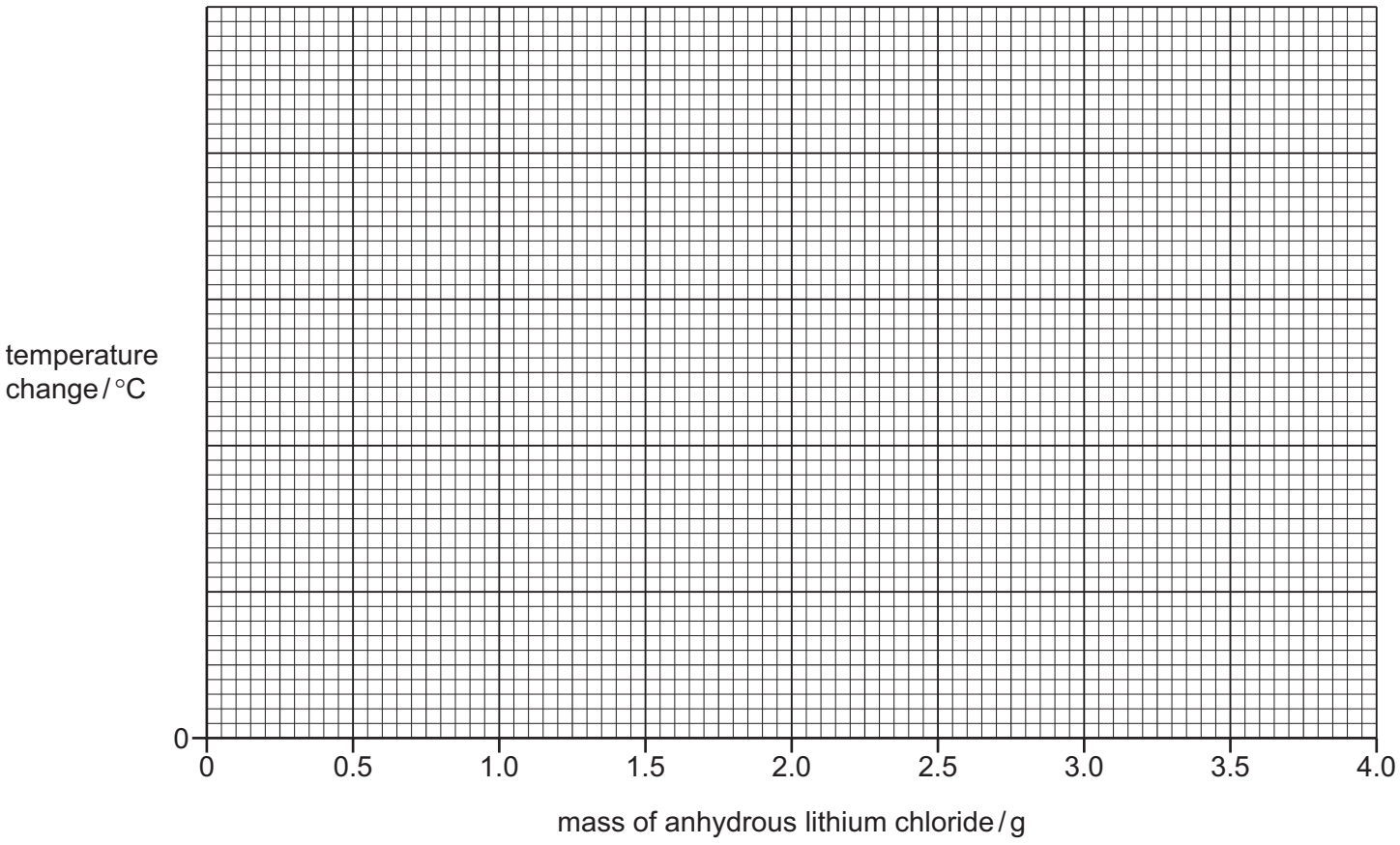
Complete the table.

| experiment | mass of anhydrous lithium chloride / g | initial temperature / °C | temperature after 30 seconds / °C | temperature change / °C |
|---|---|---|---|---|
| 1 | 1.0 | | | |
| 2 | 1.5 | | | |
| 3 | 2.0 | | | |
| 4 | 2.5 | | | |
| 5 | 3.0 | | | |
| 6 | 4.0 | | | |

[5]

**(b)** Complete a suitable scale on the *y*-axis and plot your results from Experiments 1 to 6 on the grid.

Draw a straight line of best fit through your points. The straight line must pass through (0,0).




[5]

**(c)** **From your graph**, deduce the temperature change when 3.2 g of anhydrous lithium chloride is dissolved in 30 $cm^3$ of distilled water.

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

temperature change = ..... °C [2]

**(d)** Estimate the temperature change if Experiment 6 is repeated using 60 $cm^3$ of water instead of 30 $cm^3$ of water. Give a reason for your answer.

.....

..... [2]

**(e)** Suggest **two** changes that could be made to the apparatus to improve the accuracy of the results. For each change explain why it improves the accuracy of the results.

change 1 .....

explanation 1 .....

.....

change 2 .....

explanation 2 .....

.....
[4]

[Total: 18]

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**2** You are provided with solution **A** and solid **B**.
Do the following tests on the substances, recording all of your observations at each stage.

**tests on solution A**

**(a)** Carry out a flame test on solution **A**.
Record your observations.

..... [1]

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

**(b)** To the first portion of solution **A** in a boiling tube add aqueous ammonia dropwise until it is in excess.
Record your observations.

.....

.....

..... [3]

**(c)** To the second portion of solution **A** add about 1 cm depth of dilute nitric acid followed by a few drops of aqueous silver nitrate.
Record your observations.

.....

..... [1]

**(d)** Add the third portion of solution **A** to the test-tube containing aqueous chlorine.
Record your observations.

.....

..... [1]

**(e)** To the fourth portion of solution **A** add the magnesium ribbon.
Record your observations.

.....

..... [1]

**(f)** Identify the **three** ions contained in solution **A**.

.....

.....

..... [3]

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**[Turn over**

**tests on solid B**

Add about 15 $cm^3$ of distilled water to the boiling tube containing solid **B**. Replace the stopper in the boiling tube and shake the boiling tube to dissolve as much solid **B** as possible and form solution **B**.

Filter the mixture formed and collect solution **B** as the filtrate. Divide solution **B** into three approximately equal portions in three test-tubes.

**(g)** Test the pH of the first portion of solution **B**.

pH = ..... [1]

**(h)** To the second portion of solution **B** add aqueous sodium hydroxide dropwise and then in excess.
Record your observations.

.....

..... [2]

**(i)** To the third portion of solution **B** add aqueous ammonia dropwise and then in excess.
Record your observations.

.....

..... [1]

**(j)** Identify solid **B**.

.....

..... [2]

[Total: 16]

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**3** Fizzy drinks contain carbon dioxide gas dissolved in a liquid. The carbon dioxide gas can be removed from the fizzy drink by heating.

Plan an investigation to find the volume of carbon dioxide gas in 1 $dm^3$ of a fizzy drink.
Include in your answer how you will calculate the volume of carbon dioxide gas dissolved in 1 $dm^3$ of a fizzy drink.

You are provided with a small sample (less than 1 $dm^3$) of the fizzy drink and common laboratory apparatus.
(1 $dm^3$ = 1000 $cm^3$)

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..... [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 result |
|---|---|
| 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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