



# Cambridge IGCSE™

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

Paper 5 Practical Test

**May/June 2025**
**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	
<b>Total</b>	

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



- 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 five experiments.

**Experiment 1**

- Use the  $50\text{ cm}^3$  measuring cylinder to pour  $40\text{ cm}^3$  of distilled water into the  $100\text{ cm}^3$  beaker.
- Use the thermometer to measure the initial temperature of the water. Record this initial temperature in Table 1.1.
- Add a  $2.0\text{ g}$  sample of anhydrous lithium chloride to the water in the beaker.
- Continually stir the mixture in the beaker using the thermometer.
- Measure the highest temperature reached by the mixture in the beaker. Record this highest temperature of the mixture in Table 1.1.
- Empty the beaker and rinse the beaker with distilled water.

**Experiment 2**

- Repeat Experiment 1 using  $30\text{ cm}^3$  of distilled water instead of  $40\text{ cm}^3$ .

**Experiment 3**

- Repeat Experiment 1 using  $25\text{ cm}^3$  of distilled water instead of  $40\text{ cm}^3$ .

**Experiment 4**

- Repeat Experiment 1 using  $20\text{ cm}^3$  of distilled water instead of  $40\text{ cm}^3$ .

**Experiment 5**

- Repeat Experiment 1 using  $15\text{ cm}^3$  of distilled water instead of  $40\text{ cm}^3$ .

**(a) Complete Table 1.1.**

**Table 1.1**

experiment	mass of anhydrous lithium chloride /g	volume of water/ $\text{cm}^3$	initial temperature / $^\circ\text{C}$	highest temperature reached/ $^\circ\text{C}$	temperature change/ $^\circ\text{C}$
1	2.0	40			
2		30			
3		25			
4		20			
5		15			

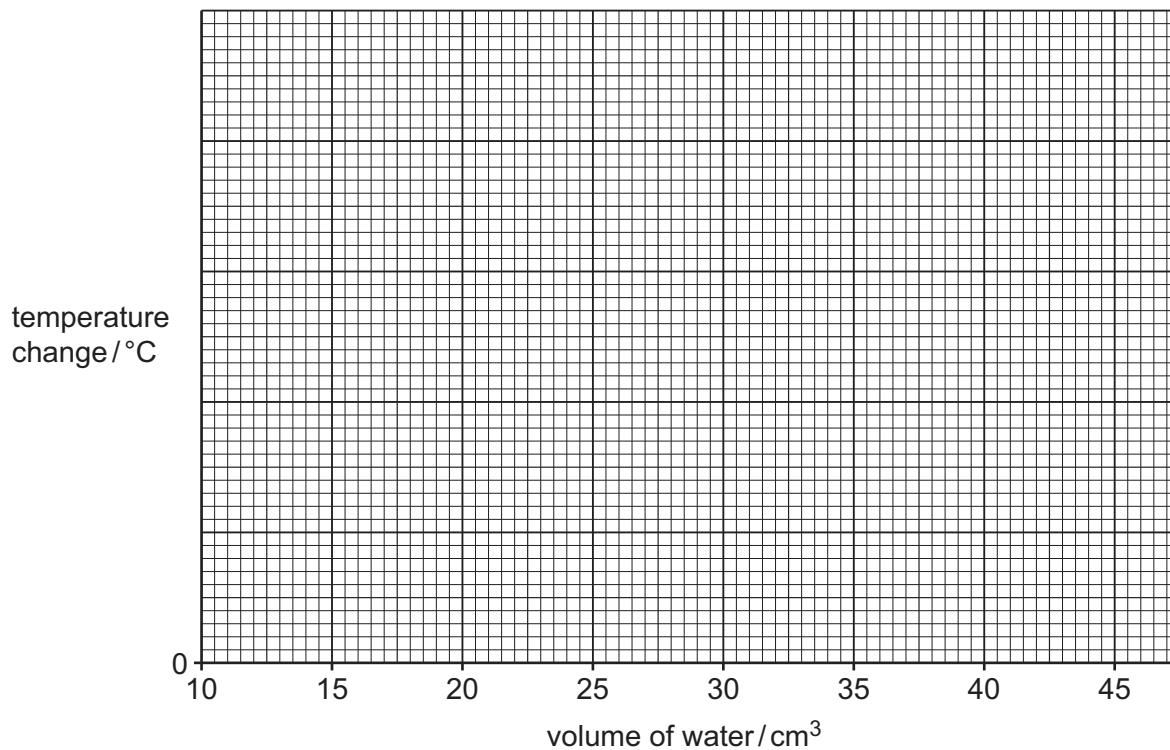
[5]





- (b) Complete a suitable scale on the  $y$ -axis and plot your results from Experiments 1 to 5 on Fig. 1.1.

Draw a line of best fit.



**Fig. 1.1**

[4]

- (c) Extrapolate the line on your graph in Fig. 1.1 to deduce the temperature change when Experiment 1 is repeated with  $45\text{ cm}^3$  of water instead of  $40\text{ cm}^3$  of water.

Show clearly on Fig. 1.1 how you worked out your answer.

temperature change = ..... [3]

- (d) The energy, in J, given out when  $2.0\text{ g}$  of anhydrous lithium chloride dissolves is calculated using the equation shown.

$$\text{energy given out} = \text{temperature change} \times 4.2 \times \text{volume of water}$$

Calculate the energy given out when  $2.0\text{ g}$  of anhydrous lithium chloride dissolves in Experiment 5.

$$\text{energy given out} = ..... \text{J} [1]$$





- (e) Estimate the temperature change when Experiment 1 is repeated using 4.0 g of anhydrous lithium chloride instead of 2.0 g.

Give a reason for your answer.

temperature change .....

reason .....

.....

[2]

- (f) Explain why the results obtained would be more accurate if the beaker used in each experiment was replaced by a polystyrene cup.

.....

.....

..... [2]

- (g) (i) Explain why using a burette instead of a measuring cylinder is an improvement.

.....

..... [1]

- (ii) Explain why standing the beaker in a water-bath is **not** an improvement.

.....

[1]

[Total: 19]





- 2 You are provided with two solids: solid **J** and solid **K**.

Do the following tests on solid **J** and solid **K**. Record all of your observations at each stage.

**Tests on solid J**

Add about 5 cm depth of distilled water to the boiling tube containing solid **J**. Replace the stopper in the boiling tube and shake the boiling tube to dissolve solid **J** and form solution **J**. Divide solution **J** into four approximately equal portions in four test-tubes.

- (a) To the first portion of solution **J**, add aqueous sodium hydroxide dropwise and then in excess.

Record your observations.

dropwise .....

in excess .....

[2]

- (b) To the second portion of solution **J**, add the sample of aqueous chlorine followed by the sample of starch solution.

Record your observations.

.....  
.....  
.....  
.....

[2]

- (c) To the third portion of solution **J**, add about 1 cm depth of dilute nitric acid followed by a few drops of aqueous silver nitrate.

Record your observations.

.....  
.....

[1]

- (d) To the fourth portion of solution **J**, add about 1 cm depth of aqueous sodium carbonate.

Record your observations.

.....  
.....

[1]

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

.....  
.....

[2]




**Tests on solid K**

- (f) Carry out a flame test on solid K.

Record your observations.

..... [1]

- (g) Put the remaining solid K into a boiling tube. Add about 3 cm depth of distilled water to the boiling tube. Put a stopper in the boiling tube and shake the boiling tube to dissolve solid K and form solution K. Divide solution K into two approximately equal portions in two boiling tubes.

- (i) To the first portion of solution K in a boiling tube, add about 1 cm depth of aqueous sodium hydroxide. Warm the mixture and hold damp red litmus paper at the mouth of the boiling tube.

Record your observations.

.....

..... [1]

- (ii) State the conclusion that can be made from the result of the test in (g)(i).

..... [1]

- (iii) To the second portion of solution K in a boiling tube, add about 1 cm depth of aqueous sodium hydroxide and a piece of aluminium foil. Warm the mixture and test any gas given off.

Record your observations.

.....

..... [2]

- (h) Identify solid K.

.....

[Total: 15]





- 3 Magnesium sulfate is a salt. Magnesium sulfate is soluble in water.

The solubility of a salt is the mass of the salt, in g, that dissolves in  $100\text{cm}^3$  of water at a specified temperature.

Plan an investigation to determine the solubility of magnesium sulfate in water at 50 °C. Your plan must include how the solubility of magnesium sulfate, in g per 100 cm<sup>3</sup> of water, can be found.

You are provided with solid magnesium sulfate, distilled water and common laboratory apparatus.



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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, then test for carbon dioxide gas	effervescence, carbon dioxide produced
chloride, $\text{Cl}^-$ [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
bromide, $\text{Br}^-$ [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	cream ppt.
iodide, $\text{I}^-$ [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	yellow ppt.
nitrate, $\text{NO}_3^-$ [in solution]	add aqueous sodium hydroxide, then aluminium foil; warm carefully	ammonia produced
sulfate, $\text{SO}_4^{2-}$ [in solution]	acidify with dilute nitric acid, then add aqueous barium nitrate	white ppt.
sulfite, $\text{SO}_3^{2-}$	add a small volume of acidified aqueous potassium manganate(VII)	the acidified aqueous potassium manganate(VII) changes colour 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	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, ppt. turns brown near surface on standing	green ppt., insoluble in excess, ppt. turns brown near surface on standing
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 result
ammonia, $\text{NH}_3$	turns damp red litmus paper blue
carbon dioxide, $\text{CO}_2$	turns limewater milky
chlorine, $\text{Cl}_2$	bleaches damp litmus paper
hydrogen, $\text{H}_2$	'pops' with a lighted splint
oxygen, $\text{O}_2$	relights a glowing splint
sulfur dioxide, $\text{SO}_2$	turns acidified aqueous potassium manganate(VII) from purple to colourless

## Flame tests for metal ions

metal ion	flame colour
lithium, $\text{Li}^+$	red
sodium, $\text{Na}^+$	yellow
potassium, $\text{K}^+$	lilac
calcium, $\text{Ca}^{2+}$	orange-red
barium, $\text{Ba}^{2+}$	light green
copper(II), $\text{Cu}^{2+}$	blue-green

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