



# Cambridge IGCSE™

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## 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	
<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 six experiments.

(a) *Experiment 1*

- Use a measuring cylinder to pour 30 cm<sup>3</sup> of distilled water into a 100 cm<sup>3</sup> beaker.
- Use a thermometer to measure the initial temperature of the water. Record the initial temperature in the table.
- Add the 1.0g 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 1.5g sample of anhydrous lithium chloride instead of the 1.0g sample of anhydrous lithium chloride.

*Experiment 3*

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

*Experiment 4*

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

*Experiment 5*

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

*Experiment 6*

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

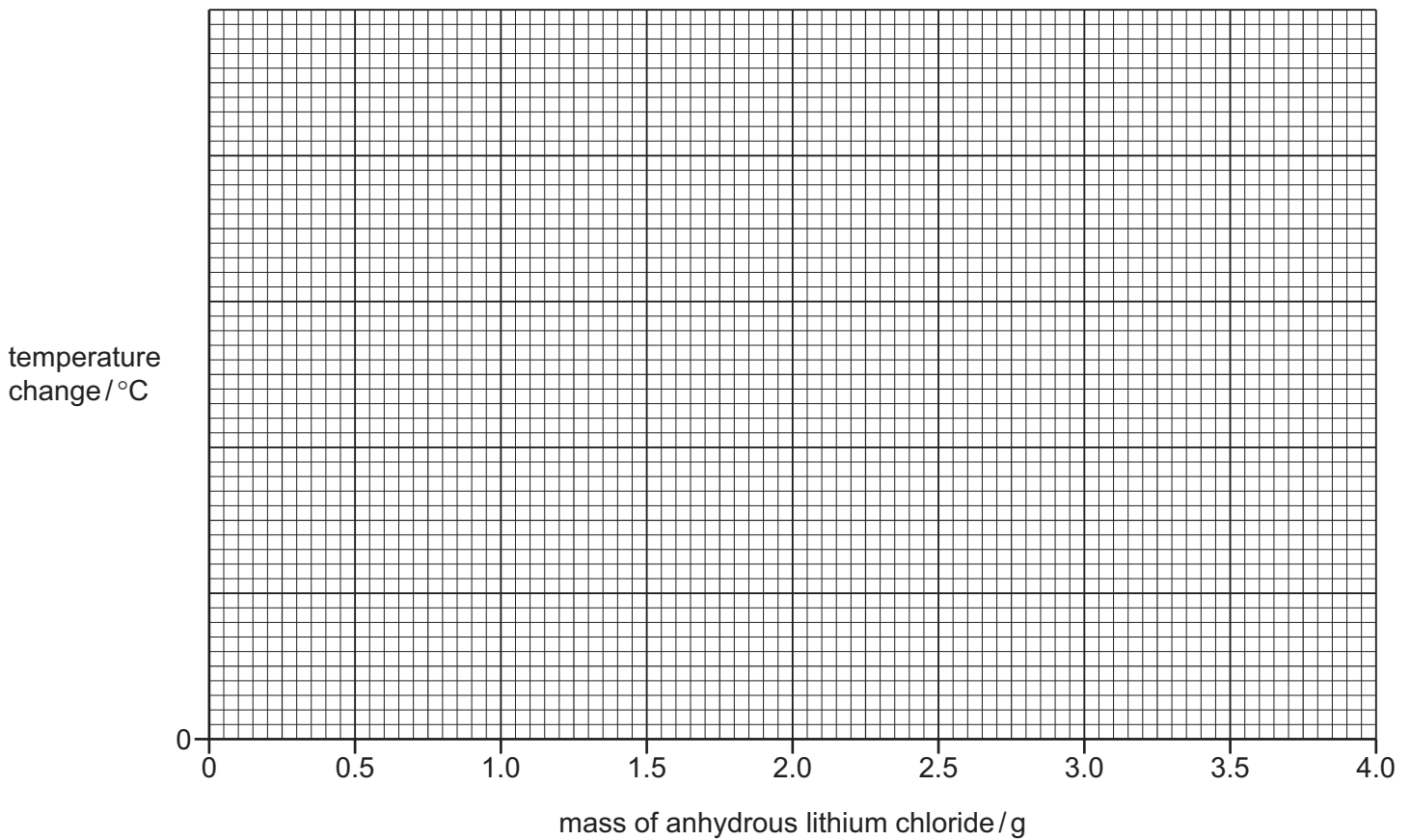
Complete the table.

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<sup>3</sup> 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<sup>3</sup> of water instead of 30 cm<sup>3</sup> 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]

- 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]

**tests on solid B**

Add about 15 cm<sup>3</sup> 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]











## 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 ( $\text{Cl}^-$ ) [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, 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 result
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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