

2 A student investigates the temperature change when anhydrous lithium chloride dissolves in water.

The student does five experiments.

Experiment 1

- Use a 50 cm³ measuring cylinder to pour 40 cm³ of distilled water into a 100 cm³ beaker.
- Use a thermometer to measure the initial temperature of the water.
- Add a 2.0 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.
- Empty the beaker and rinse the beaker with distilled water.

Experiment 2

- Repeat Experiment 1 using 30 cm³ of distilled water instead of 40 cm³.

Experiment 3

- Repeat Experiment 1 using 25 cm³ of distilled water instead of 40 cm³.

Experiment 4

- Repeat Experiment 1 using 20 cm³ of distilled water instead of 40 cm³.

Experiment 5

- Repeat Experiment 1 using 15 cm³ of distilled water instead of 40 cm³.

(a) Use the information in the description of the experiments and the thermometer diagrams to complete Table 2.1.

Table 2.1

experiment	mass of anhydrous lithium chloride /g	volume of distilled water /cm ³	initial temperature /°C	thermometer diagram for highest temperature reached /°C	highest temperature reached /°C	temperature change /°C
1	2.0	40	22.5			
2		30	22.5			
3		25	22.5			
4		20	22.0			
5		15	22.0			

[4]

(b) Complete a suitable scale on the y-axis and plot your results from Experiments 1 to 5 on Fig. 2.1.

Draw a line of best fit.

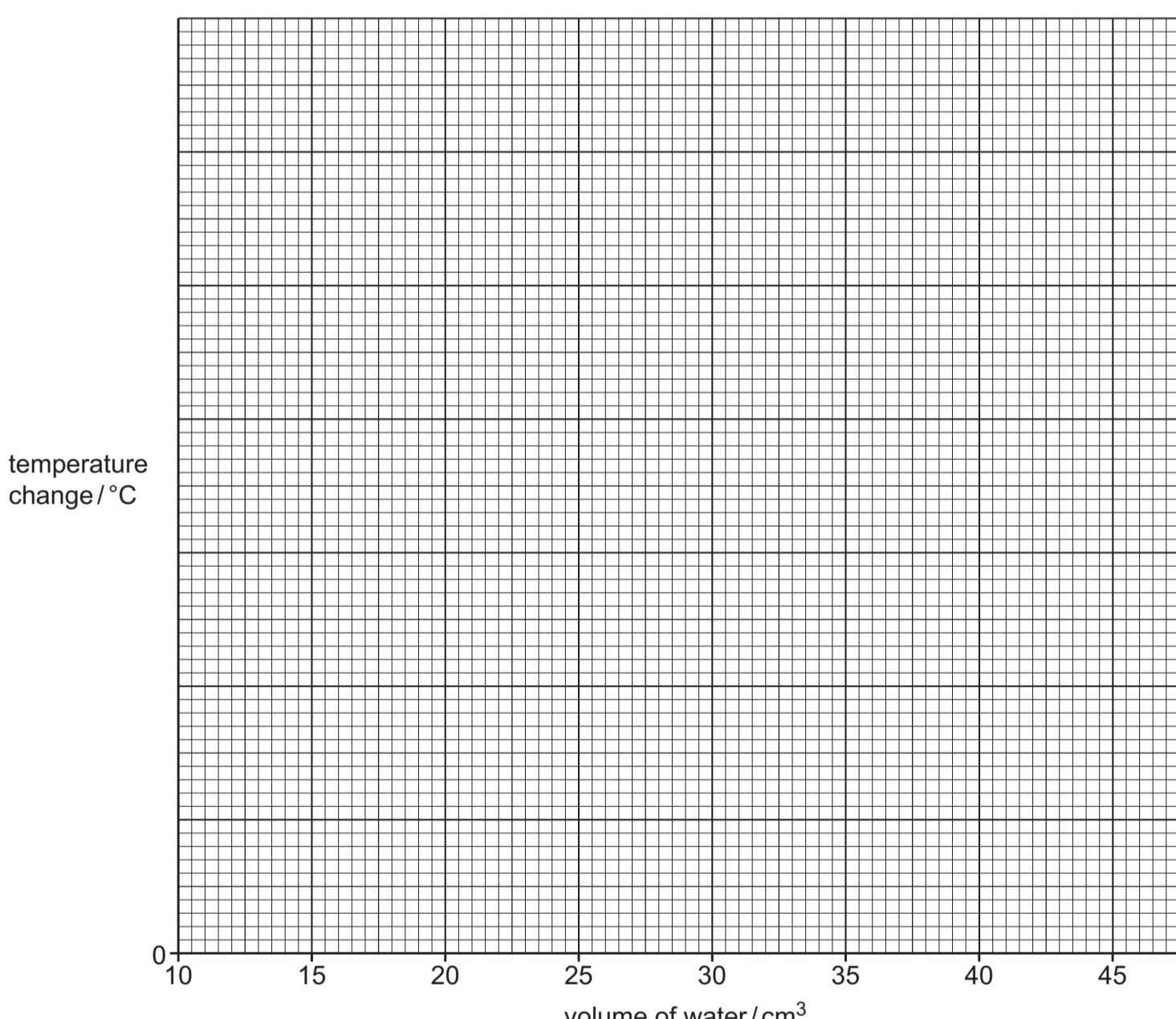


Fig. 2.1

[4]

(c) Extrapolate the line on your graph in Fig. 2.1 to deduce the temperature change when Experiment 1 is repeated with 45 cm³ of water instead of 40 cm³ of water.

Show clearly on Fig. 2.1 how you worked out your answer.

temperature change = [3]

(d) The energy, in J, given out when 2.0 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 g of anhydrous lithium chloride dissolves in Experiment 5.

energy given out = 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: 18]