Chapter 8

The Periodic Table

8.1 The Periodic Table

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

The student did six experiments.

(a) *Experiment 1*

- Using a measuring cylinder, 30 cm^3 of distilled water was poured into a 100 cm^3 beaker.
- The initial temperature of the water was measured using a thermometer.
- 1.0 g of anhydrous lithium chloride was added to the water in the beaker. At the same time a timer was started.
- The water and lithium chloride mixture was continually stirred using a thermometer.
- The temperature of the mixture was measured after 30 seconds.
- The beaker was rinsed with distilled water.

Experiment 2

- Experiment 1 was repeated using 1.5 g of anhydrous lithium chloride instead of the 1.0 g of anhydrous lithium chloride.

Experiment 3

- Experiment 1 was repeated using 2.0 g of anhydrous lithium chloride instead of the 1.0 g of anhydrous lithium chloride.

Experiment 4

- Experiment 1 was repeated using 2.5 g of anhydrous lithium chloride instead of the 1.0 g of anhydrous lithium chloride.

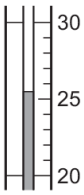
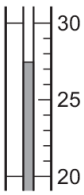
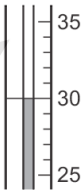
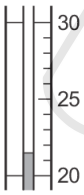
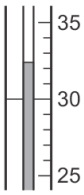
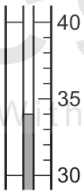
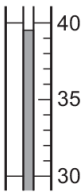
Experiment 5

- Experiment 1 was repeated using 3.0 g of anhydrous lithium chloride instead of the 1.0 g of anhydrous lithium chloride.

Experiment 6

- Experiment 1 was repeated using 4.0 g of anhydrous lithium chloride instead of the 1.0 g of anhydrous lithium chloride.

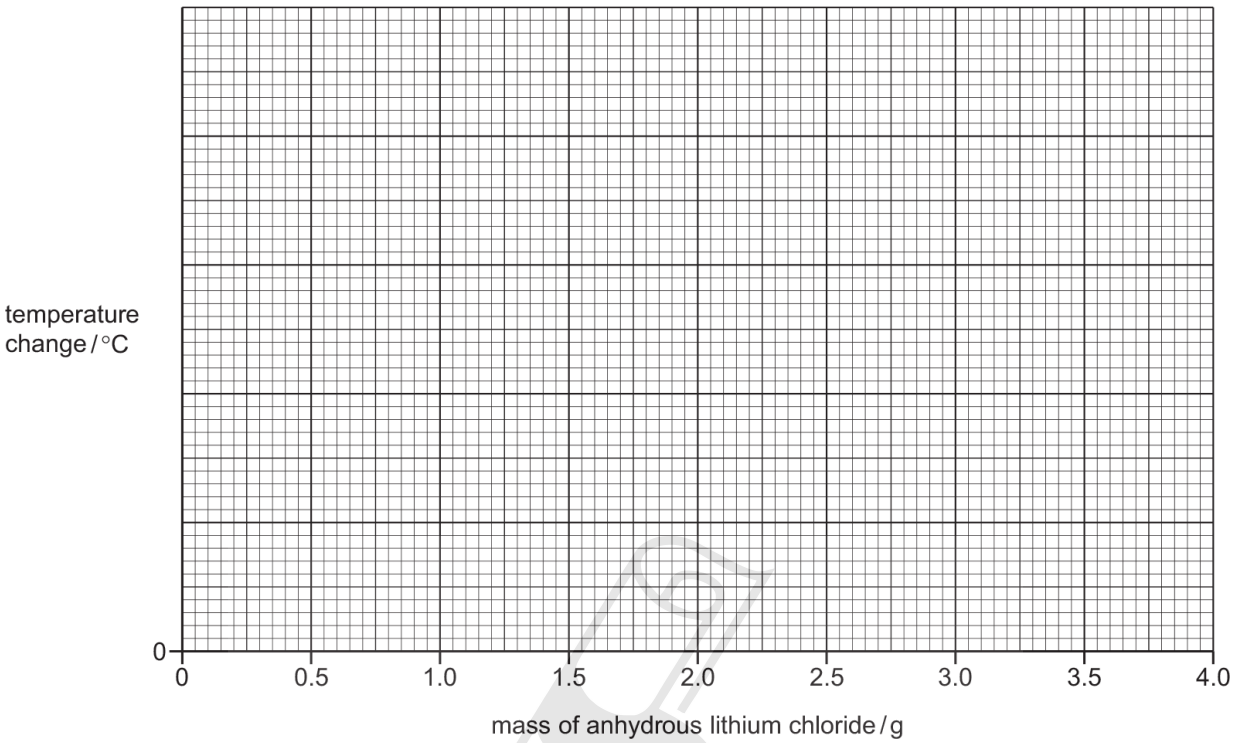
Use the thermometer diagrams to complete the table and calculate the temperature changes.

experiment	mass of anhydrous lithium chloride / g	initial		after 30 seconds		temperature change / °C
		thermometer diagram	temperature / °C	thermometer diagram	temperature / °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 the 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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Question	Answer	Marks
(a)	all initial temperatures correct (21.0, 21.0, 21.0, 21.5, 21.5, 21.5)	1
	all final temperatures correct (25.5, 27.5, 30.0, 32.5, 34.0, 39.5)	2
	all temperature changes in calculated correctly (4.5, 6.5, 9.0, 11.0, 12.5, 18.0)	1
	all temperature readings and calculated temperature changes are show to 1 dp	1
(b)	*y*-axis scale is linear and points extend over halfway up scale	1
	all points plotted correctly	2
	best fit straight line	1
	line extended to (0,0)	1

Question	Answer	Marks
(c)	correct working shown on graph	1
	correct reading from their working shown on graph	1
(d)	9 °C / halved	1
	double the volume of water (to be heated)	1
(e)	change: use a polystyrene cup / insulation / lid	1
	explanation: reduce / less heat lost	1
	change: use a burette (for the water)	1
	explanation: (more) accurate (than a measuring cylinder)	1