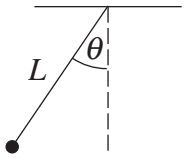
Question 16 (8 marks)

Two students, Kim and Ali, performed an experiment to determine the acceleration due to gravity (g) using a simple pendulum consisting of a small mass hanging from a light string.



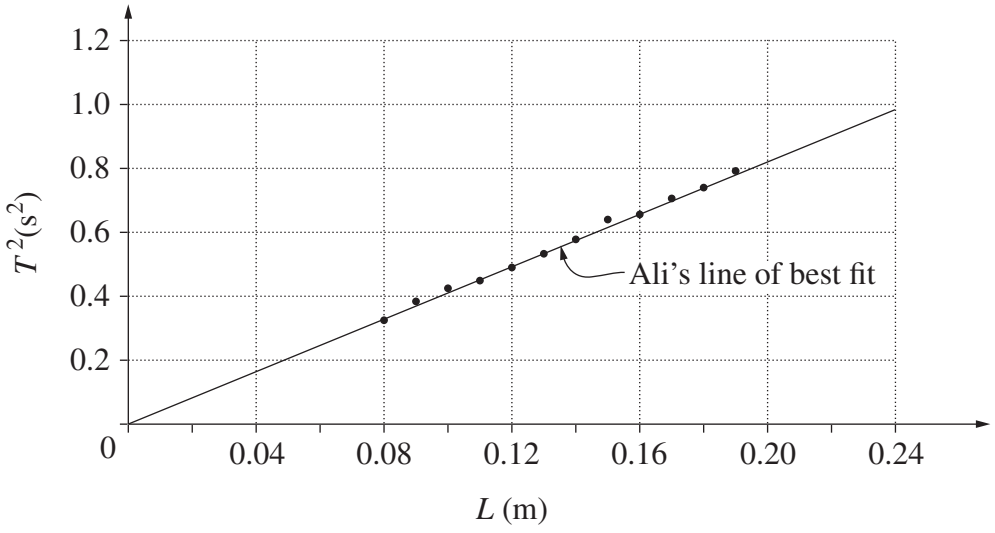
Their procedure was as follows:

1. Adjust the length of the string (L) to measure 0.08 m.
2. Hold the mass to the side to give a small angular displacement, θ.
3. Release the mass and measure the time for one period (T).
4. Record the result in a table.
5. Repeat using a string length (L) of 0.09 m and continue until the string length is 0.19 m (going up in 0.01 m increments, using the same initial angular displacement each time).
6. Calculate g using the relationship $T = 2\pi\sqrt{\frac{L}{g}}$.

The results are shown in the table:

L (m)	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19
T (s)	0.57	0.62	0.65	0.67	0.70	0.73	0.76	0.80	0.81	0.84	0.86	0.89

Kim used the data in the table to obtain a mean value for g. Kim's result was $g = 9.3\ \text{m s}^{-2}$. Ali used the results to produce the following graph. Ali's line of best fit was used to calculate g.



Question 16 continues on page 15

Marks

Question 16 (continued)

(a) Outline TWO changes that could be made to the experimental procedure that would improve its accuracy. **2**

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(b) Compare Kim's and Ali's methods of calculating g and identify the better approach. **3**

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(c) Calculate the value of g from the line of best fit on Ali's graph. **3**

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End of Question 16