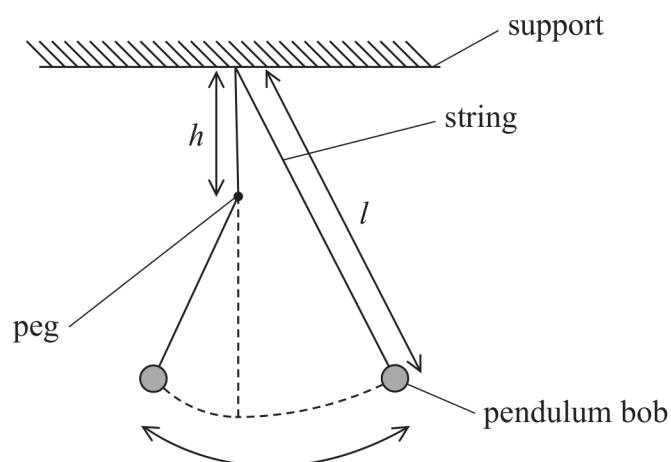2   A pendulum of length l swings in a vertical plane. The string hits a peg placed at a distance h vertically below the point of suspension as shown. This makes the pendulum shorter for part of its motion.

(a) Determine the time period T for the whole oscillation when $h = 0.25\,\text{m}$.

$l = 1.00\,\text{m}$

(3)

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....

$T =$ ....

(b) A student suggests that an approximate relationship between T and h is given by

$$T^2 = \frac{\pi^2}{g}(2l - h)$$

Devise a plan to test the validity of the relationship using a graphical method. Include the use of a stopwatch and any additional apparatus as required.

(6)

(c) Another student suggests determining T by setting up a light gate attached to a data logger.

Discuss whether this modification would improve the investigation.

(3)

(Total for Question 2 = 12 marks)