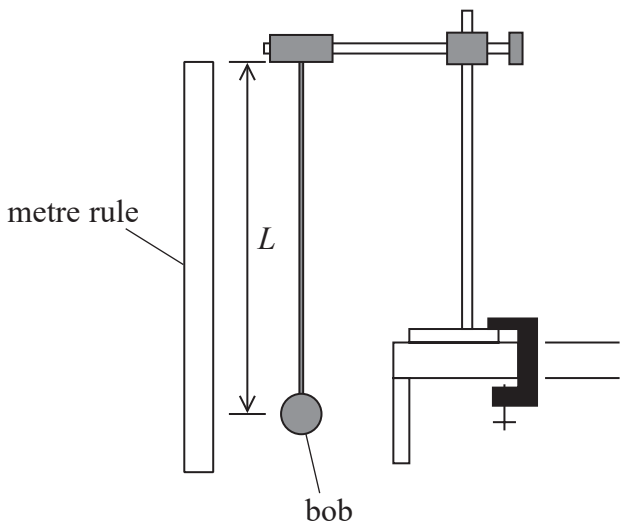
4 A student set up a "seconds pendulum". This is a simple pendulum for which the time taken to move from the bob's highest position on one side to its highest position on the opposite side is 1.00 s.



(a) Calculate the length L required for the pendulum to be a "seconds pendulum".

(2)

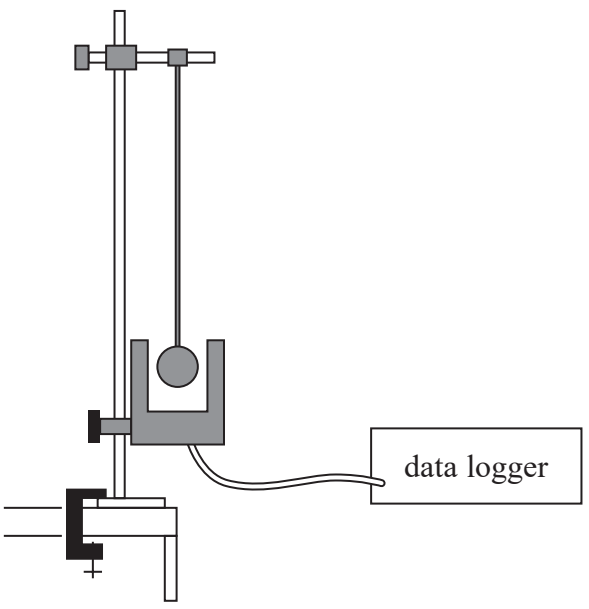
L = ...

(b) The student set the pendulum into oscillation. She used a stopwatch to check the accuracy of the pendulum's period T.

Describe the procedure the student should have used to obtain an accurate value for T.

(2)

(c) Another student suggested that the uncertainty in the measurement of the time period of the pendulum could be reduced by using a light gate and a data logger. The data logger would record the time between successive interruptions of the light beam. Both the data logger and the stopwatch have a resolution of 0.01 s.



Comment on the student's suggestion of using a data logger rather than a stopwatch.

(4)

(Total for Question 4 = 8 marks)