1 Fig. 1.1 shows a simple pendulum consisting of a mass m attached to a light inextensible string of length L. The pendulum is secured to a fixed point and made to undergo oscillations when displaced sideways by a small angle θ.

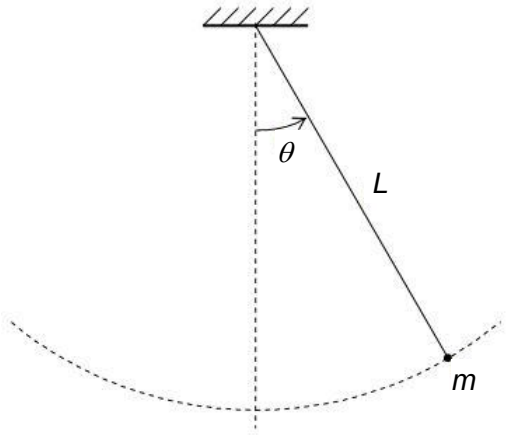

Fig. 1.1 (not to scale)

The following equation describes the period T of the oscillation:

$$T^2 = 4\pi^2 \frac{L}{g}$$

where g is the acceleration of free fall.

(a) Given $L = 50.0 \pm 0.2$ cm and $g = 9.8 \pm 0.1$ m s^{-2}, find T with its associated uncertainty.

T = ... ± ..... s [4]

(b) A student measures the period of an oscillation using two methods.

In the first method, he measures the period of one oscillation directly.

In the second method, he measures the total time for 20 oscillations, and then divides the total time by 20 to obtain the period for one oscillation.

(i) The student took three readings each using the two methods.

Using suitable calculation, predict which set of data will be more precise.

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(ii) In reality, the student mistook the time for half an oscillation to be one period.

Explain whether calculating the period by dividing the total time taken for multiple oscillations by the number of oscillations will reduce this type of error committed.

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…… [1]

[Total: 7]