

A Level Physics A
H556/01 Modelling physics

Question Set 7

1

This question is about a simple pendulum made from a length of string attached to a mass (bob). For oscillations of small amplitude, the acceleration a of the pendulum bob is related to its displacement x by the expression

$$a = -\left(\frac{g}{L}\right)x$$

where g is the acceleration of free fall and L is the length of the pendulum. The pendulum bob oscillates with simple harmonic motion.

- (a) (i) Show that the period T of the oscillations is given by the expression

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

[3]

- (ii) A student notices that the amplitude of each oscillation decreases over time. Explain this observation and state what effect this may have on T .

[2]

- (b)* Describe with the aid of a labelled diagram how an experiment can be conducted and how the data can be analysed to test the validity of the equation

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

for oscillations of small amplitude.

[6]

- (c) Another student conducts a similar experiment in the laboratory to investigate the small amplitude oscillations of a pendulum of a mechanical clock. Each 'tick' of the clock corresponds to **half** a period.

- (i) Show that the length of the pendulum required for a tick of 1.0s is about 1 m.

[2]

- (ii) If the pendulum clock were to be used on the Moon, explain whether this clock would run on time compared with an identical clock on the Earth.

[2]

Total Marks for Question Set 7: 15

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