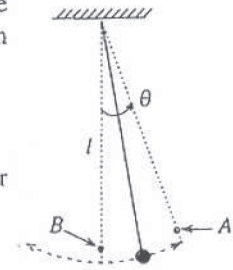


2006 A/L Structured Essay Question No (01)

1. A student plans to find the acceleration due to gravity in the laboratory using a simple pendulum.

(a) (i) Write down an expression for the period of oscillations T of the simple pendulum in terms of the length l of the pendulum and the acceleration due to gravity g .



(ii) Rearrange the above expression in the most suitable manner in order to obtain a value for g by plotting a graph.

(iii) When taking readings for T , the student keeps a reference pin directed at the point B as shown in the above diagram. State why the directing of this pin at B gives a better accuracy for the time measurement than directing it at A .

(b) (i) When the student measured the time for only one oscillation, his reading was 2.0 s. If the instrumental error in the time measurement is 0.1 s, determine the percentage error of the value of the period of oscillations.

(ii) Instead of measuring the time for one oscillation he measured the time for 25 oscillations, and the value obtained was 50.2 s. Determine the percentage error of the value of the time measurement. (Give your answer to the nearest first decimal place.)

(c) The student used a uniform metal sphere of radius r as the pendulum bob. The length L he used as the length of the pendulum is shown in the diagram. After plotting the T^2 versus L graph he found that the gradient was $4.0 \text{ s}^2 \text{ m}^{-1}$ and the intercept was 0.04 s^2 .



(i) Rewrite the expression in part (a) (ii) in terms of L , r and g .

(ii) Determine g . (Take π as 3.1)

(iii) Determine the radius r of the sphere.

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(d) The student observed that the amplitude of oscillations gradually decreases with time and the bob finally comes to rest due to air drag. He repeated the above experiment with a wooden sphere of the same radius. Which bob would take less time to come to rest? Give reasons for your answer.

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