

State Examination Commission – Physics Higher Level, 2006

Question 1

In investigating the relationship between the period and the length of a simple pendulum, a pendulum was set up so that it could swing freely about a fixed point. The length l of the pendulum and the time t taken for 25 oscillations were recorded. This procedure was repeated for different values of the length.

The table shows the recorded data.

l/cm	40.0	50.0	60.0	70.0	80.0	90.0	100.0
t/s	31.3	35.4	39.1	43.0	45.5	48.2	50.1

The pendulum used consisted of a small heavy bob attached to a length of inextensible string.

Explain

(i) why a small heavy bob was used;

(ii) why the string was inextensible.

(9)

Describe how the pendulum was set up so that it swung freely about a fixed point.

Give one other precaution taken when allowing the pendulum to swing.

(7)

Draw a suitable graph to investigate the relationship between the period of the simple pendulum and its length. What is this relationship? Justify your answer.

(24)

Explain (i) why a small heavy bob was used;(ii) why the string was inextensible.

(9)

A heavy bob was used to reduce air resistance and inextensible string was used so that the length of the pendulum would not vary whilst oscillating.

Describe how the pendulum was set up so that it swung freely about a fixed point. Give one other precaution taken when allowing the pendulum to swing.

(7)

The string was placed between a split cork so that its point of suspension could be accurately determined and it was only allowed swing through a small angle, in one plane, to ensure more accurate results.

Draw a suitable graph to investigate the relationship between the period of the simple pendulum and its length. What is this relationship? Justify your answer.

(24)

l/cm	40.0	50.0	60.0	70.0	80.0	90.0	100.0
t/s (25 osc)	31.3	35.4	39.1	43.0	45.5	48.2	50.1
T/s	1.25	1.42	1.56	1.72	1.82	1.93	2.00
T^2/s^2	1.57	2.01	2.45	2.96	3.31	3.72	4.02

Our graph shows us that the period squared is proportional to the length of the pendulum, $T^2 \propto l$, as we have a straight line through the origin for these variables.

