

Answer on Question #42586, Physics, Mechanics | Kinematics | Dynamics

A student wanted to make a pendulum whose period would be one second. He used a string of length "L" and found that the period was 1/2 sec. To get the desired period he should use a string whose length equal?

Solution:

Given:

$$T_1 = 0.5 \text{ s},$$

$$L_1 = L,$$

$$T_2 = 1 \text{ s},$$

$$L_2 = ?$$

For small amplitudes, the period of such a pendulum can be approximated by:

$$T = 2\pi \sqrt{\frac{L}{g}}$$

Thus,

$$T_1 = 2\pi \sqrt{\frac{L_1}{g}}$$

$$T_2 = 2\pi \sqrt{\frac{L_2}{g}}$$

$$T_2 = 2T_1$$

$$2\pi \sqrt{\frac{L_2}{g}} = 4\pi \sqrt{\frac{L_1}{g}}$$

Thus,

$$\sqrt{L_2} = 2\sqrt{L_1}$$

$$L_2 = 4L_1 = 4L$$

Answer. $L_2 = 4L$.