Question #81155, Physics / Other

The formula for the period of a simple pendulum is T=2x√1/y. Such a pendulum is used to determine y. The functional error in the measurement of the period T=±x and that in the measurement of the length (l) is ±y. What is the functional error in the calculated value of y?

Solution

$$y = \frac{4x^2}{T^2}$$

$$\frac{\partial y}{\partial x} = \frac{8x}{T^2}, \frac{\partial y}{\partial T} = -\frac{8x^2}{T^3}$$

$$\Delta y = \sqrt{\left(\frac{8x}{T^2}\delta y\right)^2 + \left(-\frac{8x^2}{T^3}\delta x\right)^2}$$

The functional error in the calculated value of y:

$$\Delta y = \sqrt{\left(\frac{8x}{T^2}\delta y\right)^2 + \left(\frac{8x^2}{T^3}\delta x\right)^2}$$