1 • Measurements Needed

Rod mass ($m_r = 0.028kg$) Measured with scale.

Rod length ($L = 0.382m$) Measured with ruler.

Mass masses ($m_1 = m_2 = 0.082kg$) Measured with scale.

Mass positions ($r_1 = 0.28m, r_2 = 0.33m$) Measured with ruler.

Rod with masses center of mass ($d = 0.28m$) Measured by finding balancing point of rod with masses.

2 • Data Collected

The only data collected was the period of oscillation, which was collected by letting the pendulum oscillate 5 times, then dividing the total amount of time for 5 oscillations by 5 to obtain the average period of oscillation.

5 oscillations took 6.50 s, therefore:

$$T = \frac{6.50}{5} = 1.30s$$

3 • Theoretical I

$$I_{theoretical} = I_{rod} + I_{m_1} + I_{m_2}$$
$$I_{theoretical} = (I_{cm} + m_r d^2) + I_{m_1} + I_{m_2}$$
$$I_{theoretical} = (\frac{1}{12} m_r L^2 + m_r d^2) + m_1 r_1^2 + m_2 r_2^2$$
$$I_{theoretical} = 0.0167kg \cdot m^2$$

4 • Experimental I

$$T = \tau \sqrt{\frac{I}{mgd}}$$
$$\frac{T}{\tau} = \sqrt{\frac{I}{(m_r + m_1 + m_2)gd}}$$
$$\frac{T^2}{\tau^2} = \frac{I}{(m_r + m_1 + m_2)gd}$$
$$I = \frac{T^2 (m_r + m_1 + m_2)gd}{\tau^2}$$
$$I_{experimental} = 0.0226kg \cdot m^2$$

5 • Error

$$\frac{I_{experimental} - I_{theoretical}}{I_{theoretical}} = 35.3\%$$