$$
\begin{aligned}
x &= R\,\theta \\
v &= R\,\omega \\
a &= R\,\alpha
\end{aligned}
$$

$$\alpha = \frac{\tau}{I}$$

$$\alpha = \frac{R(Mg)\sin(\theta)}{\frac{2}{5}MR^2}$$

$$\text{Rot KE} = \frac{1}{2}I\omega^2$$

$$\text{Rot KE}_\text{f} = \text{Rot KE}_\text{i} + \text{Work}_\text{net}$$

$$\text{Rot KE}_\text{f} = \text{Rot KE}_\text{i} + \int \vec{\tau}\cdot\vec{d\theta}$$

$$\alpha = \frac{R(Mg)\sin(\theta)}{\frac{5}{3}MR^2} = \frac{3}{5}\,\frac{g\,\sin(\theta)}{R}$$

$$a = \alpha\,R = \frac{3}{5}\,g\,\sin(\theta)$$

$$v_f^2 = v_i^2 + 2aL = 0 + 2\,\frac{3}{5}\,g\sin(\theta)\,L = \frac{6}{5}\,g\,h$$

$$v_f = \sqrt{\frac{6}{5}gh}$$

$$L = \frac{1}{2}\,at^2 = \frac{1}{2}\,\frac{3}{5}\,g\sin(\theta)\,t^2 = \frac{3}{10}\,g\sin(\theta)\,t^2$$

$$L = \frac{3}{10}\,g\,\left(\frac{h}{L}\right)\,t^2$$

$$t = \sqrt{\frac{\frac{10}{3}L^2}{gh}}$$