

c) Using conservation of energy again

$$\frac{1}{2} I \omega_f^2 = (m+M)gh$$

$$h = \frac{\frac{1}{2} \left[\frac{1}{3} Ml^2 + ml^2 \right] (\omega_f^2)}{(m+M)g} = 0.00135 \text{ m}$$

$$h = \frac{l}{2} - \frac{l}{2} \cos \theta \Rightarrow \cos \theta = \frac{\frac{l}{2} - h}{\frac{l}{2}} \rightarrow \theta = 5.96^\circ$$