

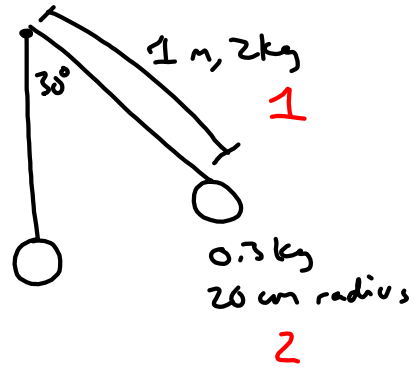
PRACTICE

6)

$$X_{cm} = \frac{m_1 x_1 + m_2 x_2}{m_1 + m_2}$$

$$= \frac{(2 \text{ kg})(0.5 \text{ m}) + (0.3 \text{ kg})(1.2 \text{ m})}{2 \text{ kg} + 0.3 \text{ kg}}$$

$$= 0.591 \text{ m}$$



$$I_{\text{pendulum}} = I_{\text{rod}} + I_{\text{sphere}} + \underbrace{Md^2}_{\text{sphere}}$$

$$= \frac{1}{3} ML^2 + \frac{2}{5} MR^2 + Md^2 \quad d = 1.2 \text{ m}$$

$$= \frac{1}{3} (2 \text{ kg})(1 \text{ m})^2 + \frac{2}{5} (0.3 \text{ kg})(0.2 \text{ m})^2 + (0.3 \text{ kg})(1.2 \text{ m})^2$$

$$= 1.103 \text{ kg} \cdot \text{m}^2$$

Conservation of Energy

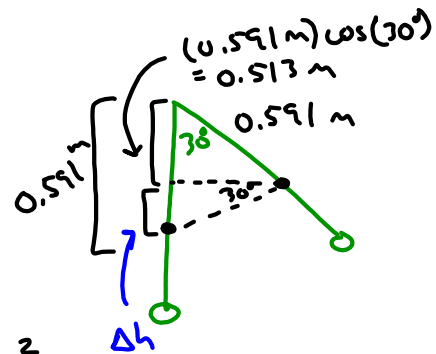
$$U_{i-cm} = K_{rot}$$

$$m a_g \Delta h = \frac{1}{2} I \omega^2$$

$$\omega = \sqrt{\frac{2 m a_g \Delta h}{I}}$$

$$= \sqrt{\frac{2 (2.3 \text{ kg})(0.079 \text{ m})}{1.103 \text{ kg} \cdot \text{m}^2}}$$

$$= 1.71 \text{ rad/s}$$



$$h_{cm} = 0.079 \text{ m}$$