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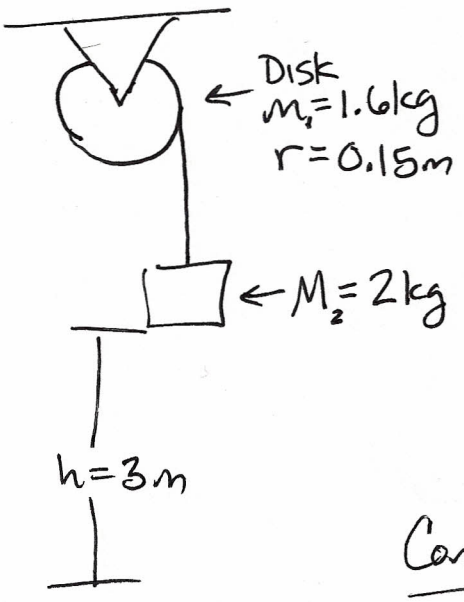

A light cord is wrapped around a disk as shown an released from rest. What is the speed of the block when it has fallen 3 meters? What was the blocks acceleration? What was the angular acceleration of the disk?

Cons. of energy

pt 1

$$\Sigma E_0 = \Sigma E$$

$$U = K_{Block} + K_{Rot\ DISK}$$

$$m_2 g h = \frac{1}{2} m_2 v^2 + \frac{1}{2} I \omega^2 \qquad I = \frac{1}{2} m r^2 \qquad \omega = \frac{v}{r}$$

$$m_2 g h = \frac{1}{2} m_2 v^2 + \frac{1}{2}\left(\frac{1}{2} m_1 r^2\right)\left(\frac{v}{r}\right)^2$$

radius cancels but NOT mass.

$$m_2 g h = \frac{1}{2} m_2 v^2 + \frac{1}{4} m_1 v^2 \qquad \text{multiply by 4}$$

$$4 m_2 g h = (2 m_2 + m_1) v^2$$

$$v = \sqrt{\frac{4 m_2 g h}{2 m_2 + m_1}} = \sqrt{\frac{4(2)(10)(3)}{2(2)+1.5}} = 6.5 \frac{m}{s}$$

pt 2

Remember

$$v^2 - v_0^2 = 2 a \Delta x$$

$$\left(6.5 \tfrac{m}{s}\right)^2 - (0)^2 = 2(a)(3m) \qquad a = 7.1 m/s^2$$

pt 3

$$\alpha_{DISK} = \frac{a}{r} = \frac{7.1 m/s^2}{0.15 m} = 47.6\ rad/s^2$$