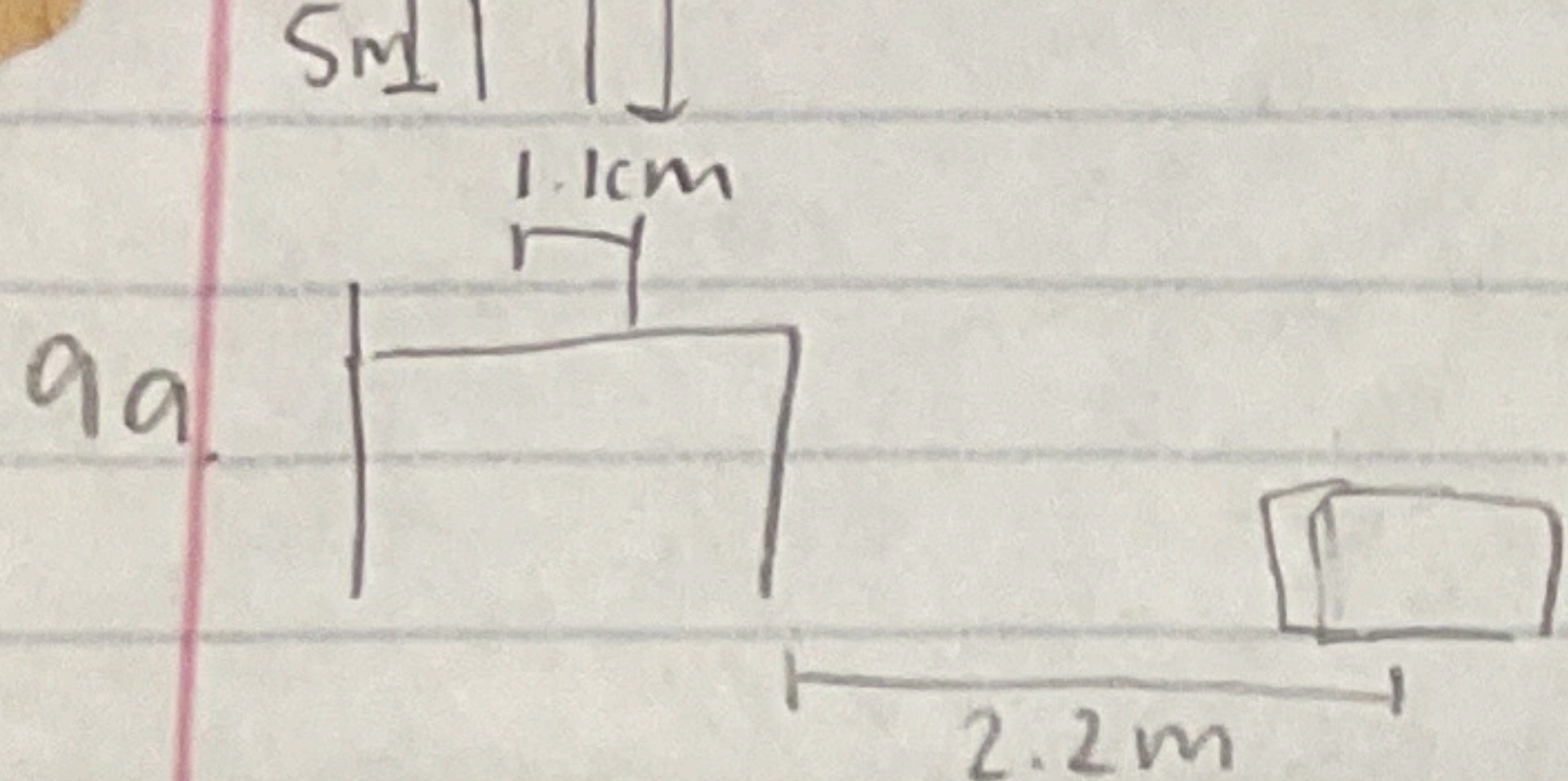


$$2 \text{ kg} \quad 150,000 \text{ J}$$

$$203 \text{ K} \quad C = \frac{Q}{m \Delta T} \quad \Delta T = \frac{Q}{cm} \quad L = 0.3 \text{ m}$$

$$\Sigma F = ma \quad \text{constant } a$$



$$F = -kx \quad ma = -kx$$

$$mg = -kx \quad -k = mg/x$$

$$v_i = 0$$

$$v_f = ?$$

$$ay = ?$$

$$d \frac{1}{2} k_B N T$$

$$W = |F||d|$$

$$p = mv$$

$$\frac{1}{2} m v_i^2 = \frac{1}{2} m v_f^2$$

$$1 \text{ atm} \quad 2 \text{ m} \quad 0.3 \text{ atm}$$

$$P = P_0 + \rho gh$$

$$W = 5 \text{ N} + \frac{m}{2} g \quad mg = 5 \text{ N} + \frac{m}{2} g$$

$$m_1 v_i = (m_1 + m_2) v_f$$

$$m_1 v_i = m_1 v_i + 3 m v_f \quad v_f = \frac{v_i}{4}$$

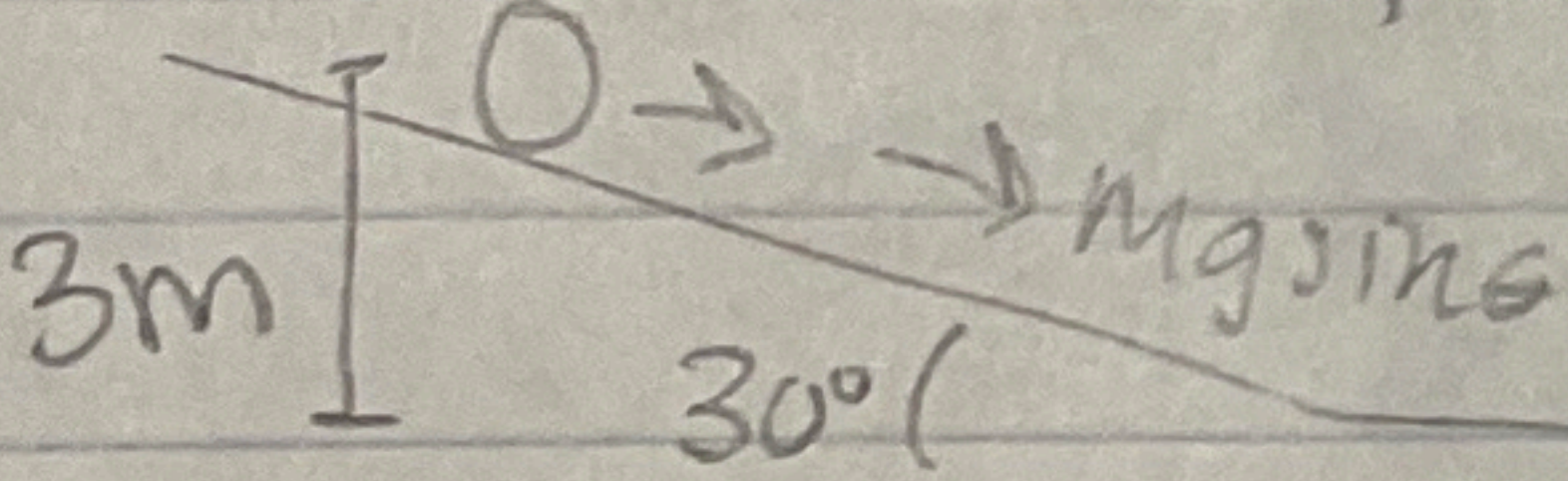
$$0.011 \text{ m comp} \rightarrow 1.93 \text{ m} \quad \Delta x \Delta y \Delta z + \Delta KE = \Delta U + \Delta KE + \Delta U$$

$$mgh + \frac{1}{2} k x^2 = \frac{1}{2} m v_f^2 + mgh$$

$$v = \sqrt{gh}$$

$$y: \quad x: \quad a = 9.8 \quad v_i = ? \quad t = ? \quad \Delta x = 1.93 \text{ m}$$

$$R = 0.2 \text{ m} \quad 2 \text{ kg} \quad a_t = R \alpha \quad a_t = ? \quad k_{total} = k_T + k_R = U_i$$



$$mgh = \frac{1}{2} m v_{cm}^2 + \frac{1}{2} I \omega^2$$

$$mgh = \frac{1}{2} m v_{cm}^2 + \frac{1}{2} (\frac{1}{2} M R^2) (\frac{v}{R})^2$$

$$\sqrt{\frac{2mgh}{m + \frac{1}{2} m}} = v = \sqrt{\frac{2(2 \text{ kg})(9.8 \text{ m/s}^2)(3 \text{ m})}{2 \text{ kg} + \frac{1}{2}(2 \text{ kg})}} = v$$

$$a_c = v^2/r \quad F_c = ma$$

$$mg \sin \theta = m r a_c \quad a_c = (9.8 \text{ m/s}^2)(\sin 30) = 4.9 \text{ rad/s}^2$$

$$mg \cos \theta - mg = m r a_{cy} \quad a_{cy} = ((9.8 \text{ m/s}^2)(\cos 30) - 9.8 \text{ m/s}^2) = -1.314 \text{ rad/s}^2$$

$$a_c = \sqrt{(4.9 \text{ rad/s}^2)^2 + (-1.314)^2} = 5.073 \text{ rad/s}^2 \quad a_t = (0.2 \text{ m})(5.073)$$

$$a_t = 1.015 \text{ m/s}^2$$

$$b. k_{total} = k_T + k_R = U_i$$

$$mgh = \frac{1}{2} m v_{cm}^2 + \frac{1}{2} I \omega^2 = \frac{1}{2} m v_{cm}^2 + \frac{1}{2} I \omega^2$$

$$mgh = \frac{1}{2} m v_{cm}^2 + \frac{1}{2} (\frac{1}{2} M R^2) (\frac{v}{R})^2$$

$$\sqrt{\frac{2mgh}{m + \frac{1}{2} m}} = v = \sqrt{\frac{2(2 \text{ kg})(9.8 \text{ m/s}^2)(3 \text{ m})}{2 \text{ kg} + \frac{1}{2}(2 \text{ kg})}} = v$$

$$v_f = 6.26 \text{ m/s}$$