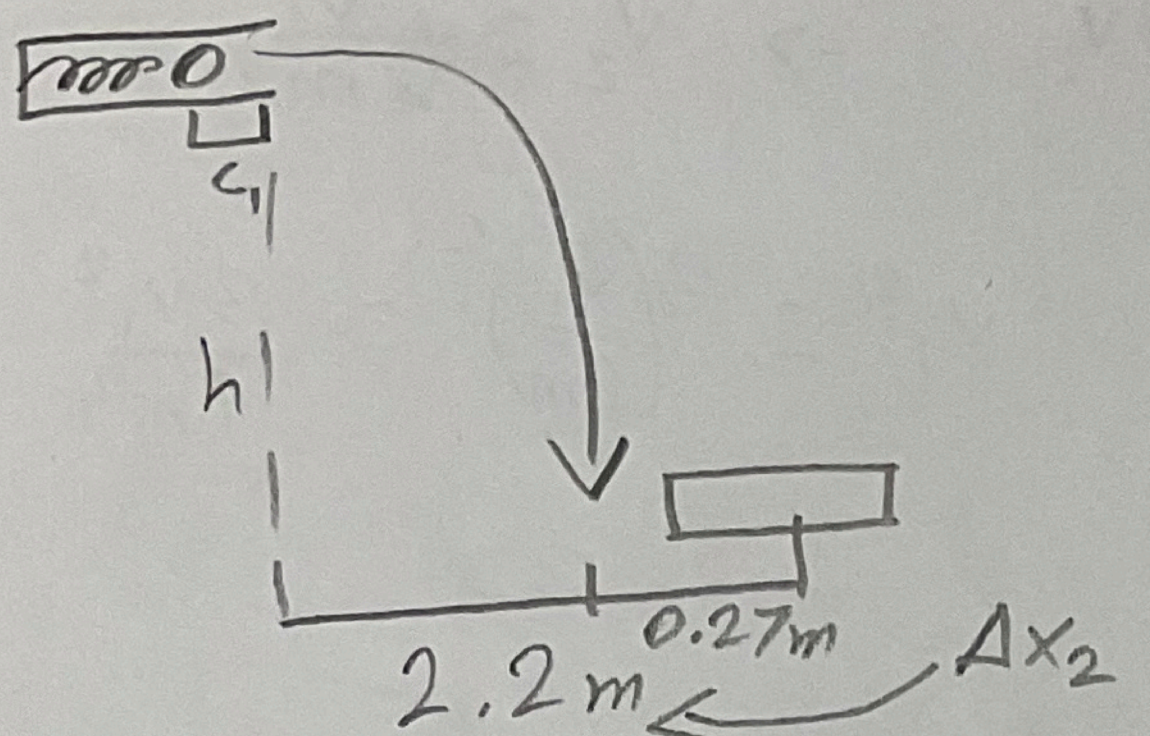
Q9



$\therefore \Delta x_1 = 2.2 - 0.27 = 1.93m$

Since h is constant, Δt is constant.

$$C_2 = \sqrt{\frac{\Delta x_2^2 C_1^2}{\Delta x_1^2}}$$

$$= \sqrt{\frac{2.2^2 \cdot 0.011^2}{1.93^2}}$$

$$= 0.01254m$$

$$\boxed{C_2 = 1.254cm}$$

$$\frac{KC_1^2}{2} = \frac{mv^2}{2} \qquad \Delta x = v\Delta t$$

$$\therefore \Delta x_1 = v_1 \Delta t \rightarrow v_1 = \frac{\Delta x_1}{\Delta t}$$

$$\Delta x_2 = v_2 \Delta t \rightarrow v_2 = \frac{\Delta x_2}{\Delta t}$$

$$\frac{KC_1^2}{\cancel{2}} = \frac{mv_1^2}{\cancel{2}} \rightarrow K = \frac{mv_1^2}{C_1^2}$$

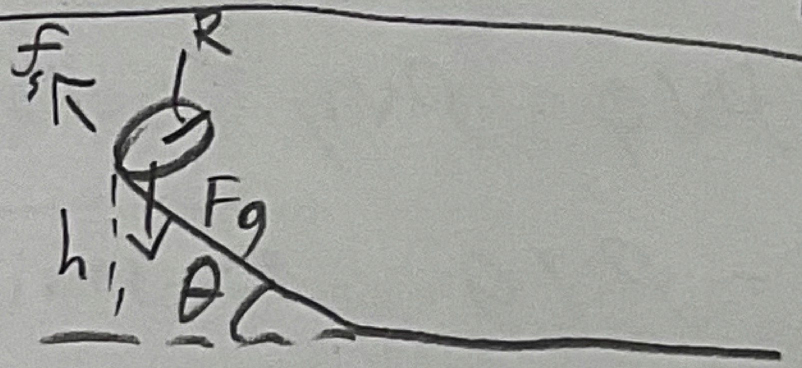
$$\frac{KC_2^2}{\cancel{2}} = \frac{mv_2^2}{\cancel{2}} \rightarrow K = \frac{mv_2^2}{C_2^2}$$

$$\therefore \frac{mv_1^2}{C_1^2} = \frac{\cancel{m}v_2^2}{C_2^2}$$

$$\frac{\left(\frac{\Delta x_1}{\Delta t}\right)^2}{C_1^2} = \frac{\left(\frac{\Delta x_2}{\Delta t}\right)^2}{C_2^2}$$

$$\frac{\Delta x_1^2}{C_1^2} = \frac{\Delta x_2^2}{C_2^2}$$

Q10



$R = 0.2m \quad m = 2kg \quad h = 3m \quad \theta = 30°$

$$I = \frac{m \cdot R^2}{2} = \frac{2 \cdot 0.2^2}{2} = 0.04$$

a.) $\sum F_x = ma = m\sin\theta g - f_s \qquad \alpha = \frac{a}{R}$

$\sum \Gamma = I\alpha = Rf_s$

$\hookrightarrow f_s = mg\sin\theta - ma = \frac{I\alpha}{R} = \frac{Ia}{R^2}$

$\hookrightarrow mg\sin\theta = \frac{Ia}{R^2} + ma$

$\hookrightarrow a = \frac{mg\sin\theta}{m + \frac{I}{R^2}} = \frac{2 \cdot 10 \cdot \sin(30)}{2 + \frac{0.04}{0.2^2}}$

A $\boxed{a = 3.\overline{33}\ \frac{m}{s^2}}$

b.) $mgh = \frac{mv^2}{2} + \frac{Iw^2}{2}$

3 $\triangle$ x θ $\quad \sin\theta = \frac{3}{x} \rightarrow x = \frac{3}{\sin\theta} = 6$

$\therefore v = \sqrt{2 \cdot 3.\overline{33} \cdot 6} = 6.3246\ \frac{m}{s}$

$\rightarrow \Delta t = \frac{6.3246}{3.\overline{33}} = 1.897s$ nevermind... ??

$\therefore \omega = \frac{3.\overline{33}}{0.2} \cdot 1.897 = 31.62278\ \frac{rad}{s}$

$\therefore 2 \cdot 3 \cdot 10 = \frac{2 \cdot 6.3246^2}{2} + K_{Rot}$

$\therefore \boxed{K_{Rot} = 19.999J}$ B