$$E_m = U_g + U_e + K$$

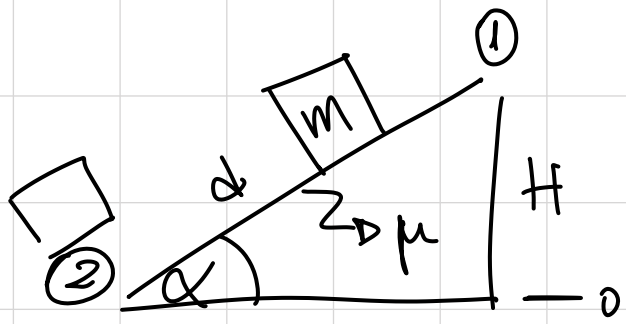
$$U_g = mgh$$

$$U_e = \frac{1}{2} k f^2$$

$$K = \frac{1}{2} m v^2$$

$$\Delta E = W$$

$$\Delta K = W_{fNC.}$$



$$E_1 = U_g + \cancel{K}^{\,0}$$

$$E_1 = mgH$$

$$E_2 = \cancel{U_{g_2}}^{\,0} + K_2$$

$$E_2 = \frac{1}{2} m v^2 \rightarrow v?$$

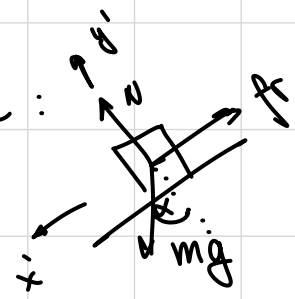
$$v_f^2 - \cancel{v_0^2}^{\,0} = 2ad$$

$$v_f^2 = 2ad$$

$$\operatorname{sen}\alpha = \frac{H}{d}$$

$$d = \frac{H}{\operatorname{sen}\alpha}$$

DCL:



$$\sum F_{x'}: \quad mg\operatorname{sen}\alpha - fr = m\vec{a}$$

$$mg\operatorname{sen}\alpha - N\mu = m\vec{a}$$

$$\sum F_{y'}: \quad N - mg\cos\alpha = 0$$

$$N = mg\cos\alpha \quad \square$$

$$V_2^2 = 2ad$$

$$d = \frac{H}{\operatorname{sen}\alpha} \qquad N = mg\cos\alpha$$

$$\sum F_x \quad mg\operatorname{sen}\alpha - N\mu = m\vec{a}$$

$$a = g\operatorname{sen}\alpha - \frac{\cancel{m}g\cos\alpha}{\cancel{m}}\mu$$

$$a = g\operatorname{sen}\alpha - \mu g\cos\alpha$$

$$V_f^2 = 2\left(g\operatorname{sen}\alpha - \mu g\cos\alpha\right)\frac{H}{\operatorname{sen}\alpha}$$

$$V_f^2 = 2gH\left(1 - \mu\cot\alpha\right) \quad / \cdot \frac{1}{2}m$$

$$K_2 = \frac{1}{2}mv^2 = mgH\left(/.\right).$$

$$E_1 = mgH$$

$$E_2 = mgH\left(1 - \mu\cot\alpha\right).$$

$$\boxed{\Delta E = W_{fr}} \;/$$

$$= \cancel{mgH} - mgH\mu\cot\alpha - \cancel{mgH}$$

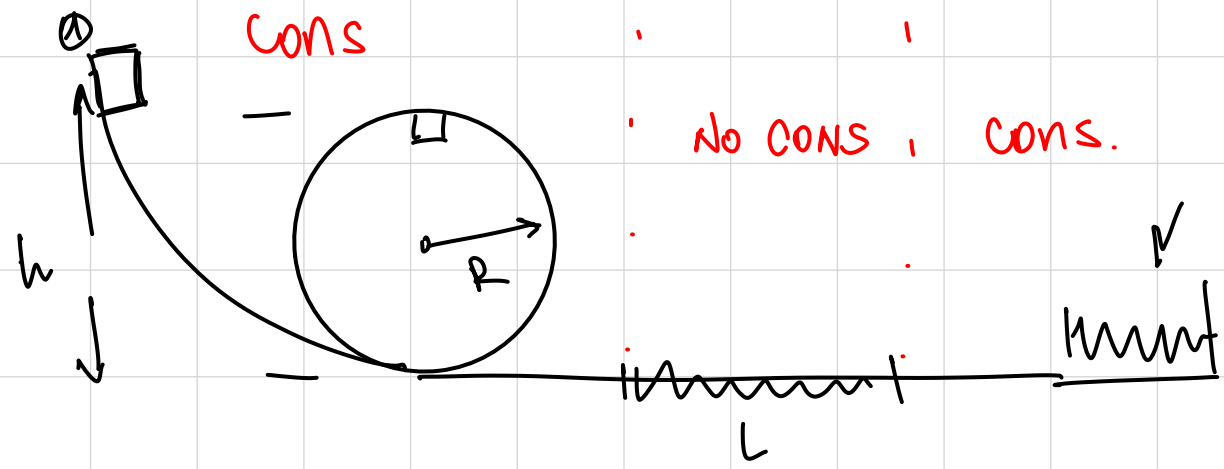
$$W_{fr} = -mgH\mu\cot\alpha \;\blacksquare$$

i) V_B

ii) h

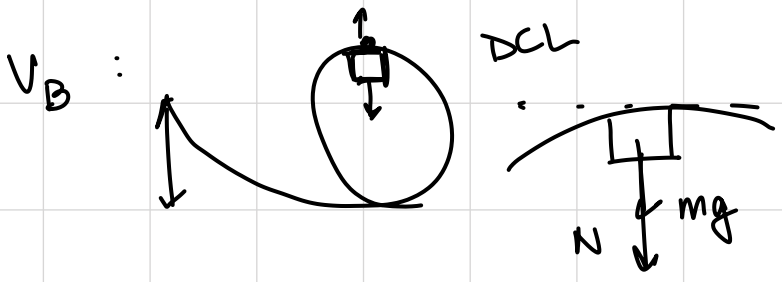
iii) L

iv) f_{max}



$E_A = mgh \longrightarrow ?$

V_B :



$N = 0$

$mg = m\vec{a}_c$

$\vec{a}_c = g$ $\quad a_c = \frac{V^2}{R}$

$V^2 = gR$ i) ✓

ii)

$E_B = U_{g_B} + K_B$

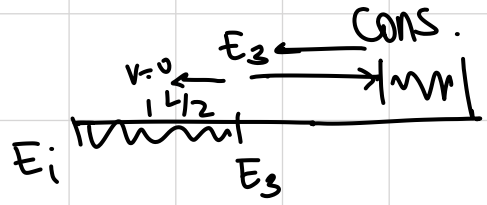
$= 2mgR + \frac{1}{2}mgR$

$E_B = \frac{5}{2}mgR$

$E_A = mgh$

$\Big\} \; h = \frac{5}{2}R$

iii) $E_{Li} = \frac{5}{2}mgR$



$\Delta E = W_{fr}$

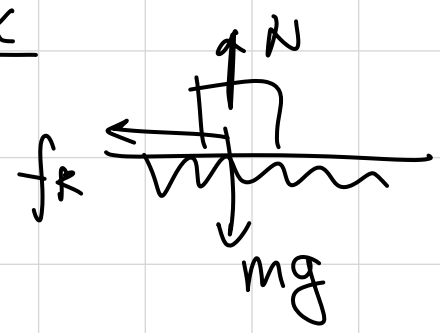
$E_3 - E_{Li} = W_{fr}$

$E_3 = W_{fr} + E$

$W_{fr} = |fr||\Delta x| \underbrace{\cos\alpha}_{-1}$

$= -|N\mu| L$

$= -mg\mu L$



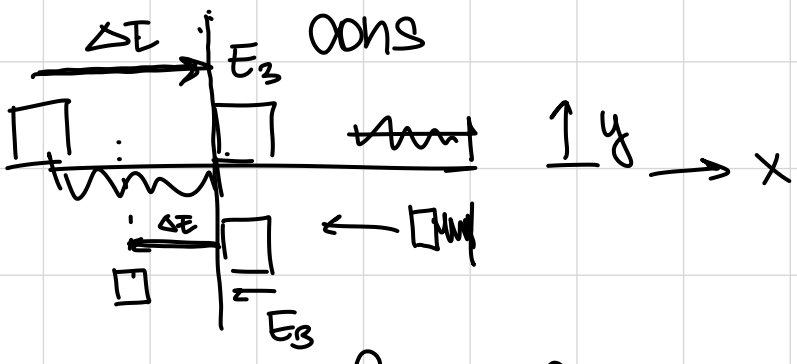
$\boxed{N = mg}$

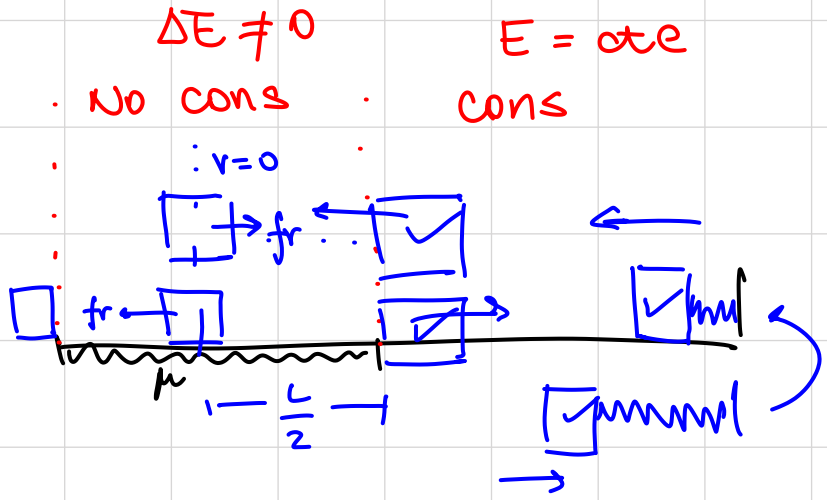
$$E_3 = W_{fr} + E_{ci} \qquad \Delta E = W_{fr}$$

$$= E_{ci} + W_{fr} \qquad E_3 - E_{ci} = W$$

$$= \frac{5}{2} mgR - mg\mu L$$

$$= mg\left(\frac{5}{2}R - \mu L\right).$$



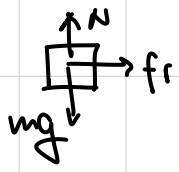


$$E_d = \cancel{U_g} + \cancel{K_d}^{0}$$

$$E_d = 0 \quad \square$$

$$\Delta E = \cancel{E_d}^{0} - E_3 = W_{fr\ vuelta}$$

$$= |fr||\Delta x| \cos\alpha$$



$$W_{fr} = -mg\mu\frac{L}{2}$$

$$-E_3 = W_{fr}$$

$$-\frac{5}{2}mgR + mg\mu L = -mg\mu\frac{L}{2}$$

$$mg\mu L + mg\mu\frac{L}{2} = \frac{5}{2}mgR$$

$$\frac{3}{\cancel{2}}\cancel{mg}\mu L = \frac{5}{\cancel{2}}\cancel{mg}R$$

$$L = \frac{5R}{3\mu} \quad \square$$