① DATI

$F_1 = 268\,N$

$\Delta x_1 = 2.33 \times 10^{-2}\,m$

$m = 3.18\,kg$

$v_0 = 0\,m/s$

$\theta = 32°$

$\Delta x_2 = 5.98 \times 10^{-2}\,m$

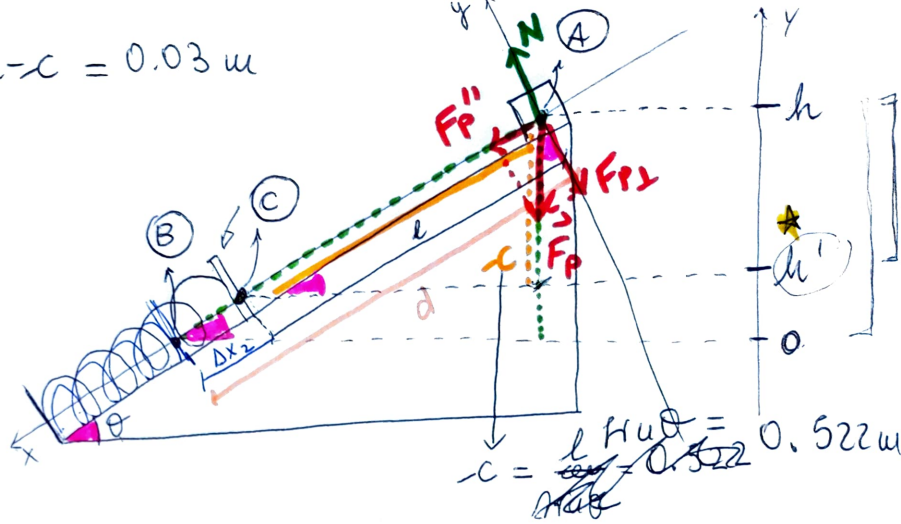
$v_f = 0\,m/s$

RICHIESTE

$d = ?$

$v_2 = ?$

$h' = h - c = 0.03\,m$



$c = l \sin\theta = 0.522\,m$

RISOLUZIONE

$F_{el} = k\Delta x \rightarrow F_1 = k\Delta x_1 \rightarrow k = \frac{F_1}{\Delta x_1} = \frac{268\,N}{2.33 \times 10^{-2}\,m} = 11\,502\,N/m$

$E_A = E_K^A + E_P^A = mgh$

$E_B = E_K^B + E_P^B = E_{P,g}^B + E_{P,el}^B = \frac{1}{2} k \Delta x_2^2$

$E_{P,g}^B = mgy(B)$

$E_A = E_B \rightarrow mgh = \frac{1}{2} k \Delta x_2^2$

$h = \frac{k \Delta x_2^2}{2mg} = [\dots] = 0.552\,m$

$d = \frac{h}{\sin\theta} = 1.04\,m$

$\sum \vec{F} = m\vec{a}$ → asse x : $\vec{F}_p'' = m\vec{a}$ ▷ $+ F_p'' = ma_x$ $\quad (F_p'' = |\vec{F}_p| \sin\theta)$

→ asse y : $F_p^{\perp} = N$

$$F_p'' = ma_x \triangleright \quad a_x = \frac{F_p''}{m} = \frac{m \cdot g \sin\theta}{m} = 5.20 \ m/s^2$$

(I) $v(t) = v_0 + a \cdot t$

(II) $x(t) = x_0 + v_0 t + \frac{1}{2} a t^2$ ▷ $\frac{1}{2} a t^2 = l$ ▷ $t = \sqrt{\frac{2l}{a}} =$

$$\Delta x = \frac{1}{2} a t^2$$

$$l = d - \Delta x_2 = 0.98 m$$

→ (I) $v = a\sqrt{\frac{2l}{a}} = 3.2 \ m/s$

$E_C = E_k^C + E_p^C = \frac{1}{2} m v^2 + mgh'$

$(E_A = mgh)$

$E_A = E_C \triangleright mgh = \frac{1}{2} m v^2 + mgh'$

$\frac{1}{2} v^2 = gh - gh'$

$\frac{1}{2} g(h - h')$

$v = \sqrt{2g(h-h')} = 3.2 \, m/s$

(2) DATI

$L = 125\ cm$

$v_0 = 8\ m/s$

$\vartheta_0 = 40°$

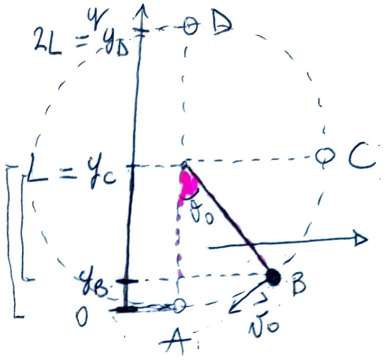
RICHIESTE

$v_A = ?$

$v_0^{min}(C) = ? \rightarrow v_0^{(1)}$

$v_0^{min}(D) = ? \rightarrow v_0^{(2)}$

$T(\theta) = ?$



$c = L\cos\vartheta_0$

$y_B = L - c$

$= L - L\cos\vartheta_0$

$= L(1-\cos\vartheta_0)$

SOLUZIONE

$E_A = E_{P,A} + E_{K,A} = \frac{1}{2} m v_A^2$

$E_B = E_{P,B} + E_{K,B} = mgy_B + \frac{1}{2} m v_B^2$

$E_A = E_B$

$\frac{1}{2} m v_A^2 = mgL(1-\cos\vartheta_0) + \frac{1}{2} m v_0^2$

$v_A = \sqrt{2gL(1-\cos\vartheta_0) + v_0^2} = 8.035\ \frac{m}{s}$

$E_C = E_{P,C} + E_{K,C} = mgy_C = mgL$

$E_B = E_C \rightarrow mgL(1-\cos\vartheta_0) + \frac{1}{2} m (v_0^{(1)})^2 = mgL$

$gL - gL\cos\vartheta_0 + \frac{1}{2}(v_0^{(1)})^2 = gL \rightarrow \frac{1}{2}(v_0^{(1)})^2 = gL\cos\vartheta_0$

$v_0^{(1)} = \sqrt{2gL\cos\vartheta_0} = 4.3\ m/s$

$$E_D = E_k^D + E_p^D = m g y_D = m g (2L)$$

$$E_B = E_D \quad \triangleright \quad m g L (1 - \cos\theta_0) + \frac{1}{2} m (v_0^{(2)})^2 = 2 m g L$$

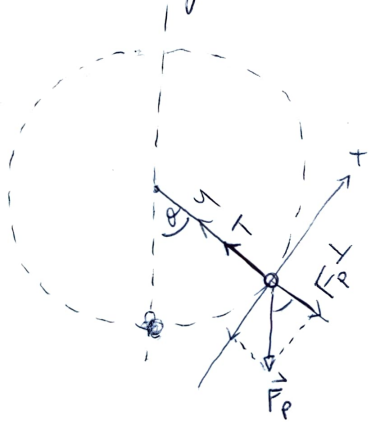
$$g L - g L \cos\theta_0 + \frac{1}{2} (v_0^{(2)})^2 = 2 g L$$

$$\frac{1}{2} (v_0^{(2)})^2 = g L + g L \cos\theta_0$$

$$\frac{1}{2} (v_0^{(2)})^2 = g L (1 + \cos\theta_0)$$

$$v_0^{(2)} = \sqrt{2 g L (1 + \cos\theta_0)}$$

$$\doteq 6.58 \text{ m/s}$$



$$\vec{T} + \vec{F}_p^{\perp} = m a_c$$

$$T - F_p^{\perp} = m \frac{v^2}{L}$$

$$T = m \frac{v^2}{L} + F_p^{\perp} = m \frac{v^2}{L} + m g \cos\theta$$

$$T = F_c + F_p \cos\theta$$