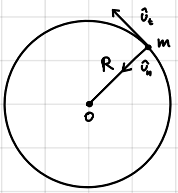
ESERCITAZIONE

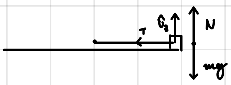
ESERCIZIO 1



$R = 1m$ $\quad$ $\mu_D = ?$

$n = 3$ $\quad$ $L = ?$

$v_0 = 1\ m/s$



$$L = \int_0^{n\theta} \vec{F_A}\, d\vec{s} = \int_0^{6\pi} -\mu_D N R\, d\theta = -\mu_D N R \int_0^{6\pi} d\theta = -\mu_D m g \underbrace{6\pi}_{2\pi n} R$$

$$L = \Delta E_K = \frac{1}{2} m(\cancel{v_f^2} - v_0^2) \rightarrow \quad \mu_D \cancel{m} g\, 6\pi R = \frac{1}{2} \cancel{m} v_0^2$$

$$\mu_D = \frac{v_0^2}{12\pi g R}$$

ESERCIZIO 2

$\alpha = 30°$ $\quad$ $\mu_D \neq 0\ ?$

$h = 5m$ $\quad$ $\Delta t_{TOT} = ?$

$v_0 = 0\ m/s$

$v_f = 8\ m/s$

$\Delta E = L_{NC} \rightarrow \quad ?\ \frac{1}{2} m v_f^2 - mgh = 0 \qquad \Delta E < 0 \rightarrow \quad \mu_D \neq 0$: il piano è scabro.

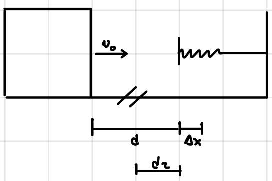
$$\Delta E = \frac{1}{2} m(v_f^2 - 2gh) = \int_0^{sf} \vec{F_A}\, d\vec{s} = \int_0^{sf} \mu_D mg \cos\alpha\, ds = \mu_D mg\cos\alpha \int_0^{\frac{h}{\sin\alpha}} ds = \mu_D mgh \tan\alpha = \sqrt{3}\mu_D mgh.$$

$$\hookrightarrow \mu_D = \frac{\Delta E}{-\sqrt{3} mgh} = \frac{\cancel{m}(v_f^2 - 2gh)}{2\sqrt{3}\cancel{m}gh} \cong 0,2$$

$F_{P_\parallel} - F_A = ma \rightarrow \quad \cancel{m}a = \cancel{m}g \sin\alpha - \mu_D \cancel{m}g\cos\alpha \qquad a = (\sin\alpha - \mu_D\cos\alpha) g \cong 3,21\ m/s^2$

$x(t) = \frac{h}{\sin\alpha} \qquad \frac{1}{2} a t^2 = \frac{h}{\sin\alpha} \qquad t = \sqrt{\frac{2h}{a \sin\alpha}} \cong 2,50\ s$

ESERCIZIO 4



$m = 3\ Kg$ $\quad$ $v_d = ?$

$v_0 = 10\ m/s$ $\quad$ $\Delta x = ?$

$d = 10m$ $\quad$ $d_c = ?$

$K = 3 \cdot 10^4\ N/m$

$\mu_D = 0,1$

$\Delta E = L_{NC} \rightarrow \quad \frac{1}{2}\cancel{m}(v_d^2 - v_0^2) = -\mu_D \cancel{m} g d \rightarrow \dots \rightarrow \quad v_D = \sqrt{v_0^2 - 2\mu_D g d} \cong 8,96\ m/s$

$\Delta E = L_{NC} \rightarrow \quad \frac{1}{2} K\Delta x^2 - \frac{1}{2} m v_0^2 = -\mu_D mg(d + \Delta x) \rightarrow \dots \rightarrow \quad \Delta x = \frac{\mu_D mg + \sqrt{(\mu_D mg)^2 + K mg}}{K} = 0,09m$

$\Delta E = L_{NC} \rightarrow \quad \frac{1}{2} K\Delta x^2 = \mu_D m g(\Delta + d') \rightarrow \dots \rightarrow \quad d' = \frac{1}{2}\frac{K\Delta x^2}{\mu_D mg} - \Delta x \cong 41m$