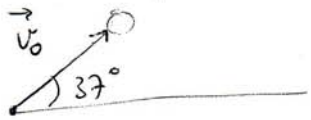
Es. 1

(a) $v_{x0} = v_0 \cos(37.0°) = 200\,m/s \cdot 0.799 = 160\,m/s$

$v_{y0} = v_0 \sin(37.0°) = 12.0\,m/s$



Alla massima altezza:

$v_y = 0$

$y = v_{y0} t - \frac{1}{2} g t^2 \quad (y_0 = 0)$

Poiché: $v_y = v_{y0} - gt$, alla massima altezza:

$v_{y0} = gt \Rightarrow t = \frac{v_{y0}}{g} = 1.22\,s$

$\Rightarrow y = v_{y0} t - \frac{1}{2} g t^2 = (12\,m/s)\cdot(1.22\,s) - \frac{1}{2}(9.80\,m/s^2)(1.22\,s)^2$

$= 7.35\,m$

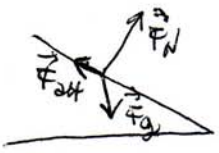
(b)

$y = y_0 + v_{y0} t - \frac{1}{2} g t^2 \Rightarrow$ (al suolo $y = 0$)

$\Rightarrow 0 = 0 + v_{y0} t - \frac{1}{2} g t^2 \Rightarrow t\left(v_{y0} - \frac{1}{2} g t\right) = 0$

$t = \frac{2 v_{y0}}{g} = \frac{2 \cdot 12.0\,m/s}{9.80\,m/s^2} = 2.45\,s$

Es. 2



$\vec{F}_{att} = \mu_s \vec{F}_N$

$\vec{F} = -m\vec{g}$

(a) $\sum F_x = m a_x \Rightarrow \begin{cases} mg\sin\vartheta - \mu F_N = m a_x \\ F_N - mg\cos\vartheta = m a_y = 0 \end{cases}$

$\sum F_y = m a_y \Rightarrow$

$\begin{cases} \dots \\ F_N = mg\cos\vartheta \end{cases} \quad \begin{cases} mg\sin\vartheta - \mu mg\cos\vartheta = m a_x \\ \dots \end{cases}$

$\Rightarrow a_x = g \sin 30° - \mu g \cos 30° = 0.41\, g = 4.0\ m/s^2$

(b) $v = v_0 + at \Rightarrow$

$\Rightarrow v = 0 + 4\ m/s^2 \cdot 4\ s = 16\ m/s$

Es. 3

v_2 veloc. al secondo piano

v_1 veloc. nel semitubo

$$v_2 = \frac{v_1 A_1}{A_2} = \frac{v_1 \pi r_1^2}{\pi r_2^2} = 1.2\ m/s$$

$$P_2 = P_1 + \rho g (y_1 - y_2) + \frac{1}{2}\rho (v_1^2 - v_2^2) = 2.5\ atm$$

Es. 4

$$Q = mL = 1.00\ kg \cdot (22.6 \cdot 10^5\ J/kg) = 22.6 \cdot 10^5\ J$$

Lavoro compiuto dall'acqua

$$W = P \Delta V = (1.01 \cdot 10^5\ N/m^2)\left[(1671 \cdot 10^{-3}\ m^3) - (1 \cdot 10^{-3}\ m^3)\right] = 1.69 \cdot 10^5\ J$$

$(1\ atm = 1.01 \cdot 10^5\ N/m^2,\ 1L = 10^{-3}\ m^3)$

$$\Rightarrow \Delta E = Q - W = 22.6 \cdot 10^5\ J - 1.7 \cdot 10^5\ J = 20.9 \cdot 10^5\ J$$

Es. 5

Corpi dotati a cariche puntiformi $\Rightarrow$

$\Rightarrow E = kQ/r^2$

$$E_{TOT} = k\frac{Q_1}{r_1^2} + k\frac{Q_2}{r_2^2} =$$

$$= 9.0 \cdot 10^9 \, N \cdot m^2/C^2 \cdot \left(\frac{25 \cdot 10^{-6} C}{(2.0 \cdot 10^{-2} m)^2} + \frac{50 \cdot 10^{-6} C}{(8.0 \cdot 10^{-2} m)^2} \right)$$

$$= 6.3 \cdot 10^8 \, N/C$$