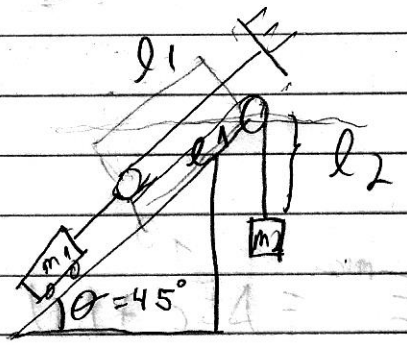
3° Lista

1. a)



$2l_1 + l_2 = Cte$

$2\Delta l_1 + \Delta l_2 = 0 \Rightarrow \boxed{2\Delta l_1 = -\Delta l_2}$

$\Rightarrow \boxed{2v_1 = -v_2}$

b) $W_{atrito} = \Delta E_{mecânica} = \Delta E_c + \Delta U$

$\Delta E_c = \frac{m_1 V_1^{f\,2}}{2} + \frac{m_2 V_1^{f\,2}}{2} - \frac{m_1 V_1^{i\,2}}{2} - \frac{m_2 V_1^{i\,2}}{2}$; $2v_1 = -v_2 = v$

$\Rightarrow \Delta E_c = \frac{1}{2}(m_1 + 2m_2)v^2$

$\Delta U = -m_1 g h_1^f + m_2 g h_2^f + m_1 g h_1^i + m_2 g h_2^i$; $2s_1 = -s_2 = s$

$h_1^f = (l_1 + s_1)\sin\theta$; $h_1^i = l_1 \sin\theta$; $h_2^f = l_2 + s_2$; $h_2^i = l_2$

$h_1^f = (l_1 + s)\sin\theta$; $h_1^i = l_1 \sin\theta$; $h_2^f = l_2 - 2s$; $h_2 = l_2$

$\Delta U = -m_1 g(l_1 + s)\sin\theta - m_2 g(l_2 - 2s) + m_1 g l_1 \sin\theta + m_2 g l_2$
$- m_1 g s \sin\theta + 2m_2 g s$

$W_{atrito} = -\mu \cdot m \cdot g \cdot s\cos\theta = -m_1 g s \sin 45° + 2m_2 g s + \frac{1}{2}(m_1 + 2m_2)v^2$

$\Rightarrow s = \frac{(m_1 + 4m_2)v^2}{2(m_1 g \sin 45 - 2m_2 g - \mu m_1 g \cos 45)}$

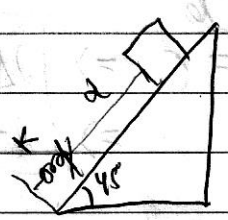
$v = 4,5\ km/h = 1,25\ m/s$

$m_1 = 4000$

$m_2 = 0,5$

$S = 0,22m$

2.



$W = \Delta E^{mec} = \cancel{\Delta E_c}^{0} + \Delta U$

$\Delta U = mgh_f - mgh_i + \frac{1}{2} Ks^2$

$h_i = (d+s)\ sen45°$; $h_f = 0$

$W = -mg(d+s)\ sen45 + \frac{Ks^2}{2} = -mg\ cos45 \cdot \mu\ (d+s)$

$\Rightarrow S = 0,46m$

b) $|W| = \mu g m (d+s) cos45 = 85\ J$

$\Delta U = mg(d+s)\ sen45 = 170$

$\frac{|W|}{|\Delta U|} = \frac{1}{2} = 50\%$

c) $F_{res} = F_{mola} - F_{at} = Ks - \mu mg\ cos45 = 31,2\ N$

Portanto a força da mola é maior, então o corpo volta a subir.