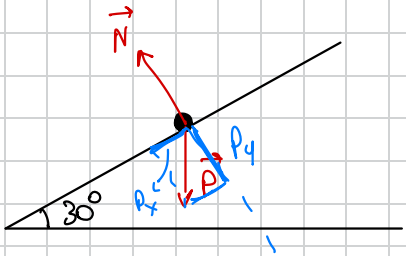
1



$P_x = mg\sin\theta$; $P_y = mg\cos\theta = N$

$\Sigma F_x = m \cdot a_x$

↑

solo forze in x: $P_x - F_A = m \cdot a_x$

$mg\sin\theta - \mu_D mg\cos\theta = m \cdot a_x$

$a_x = g\sin\theta - \mu_D g\cos\theta \cong 4\ m/s^2$

velocità dopo 4 s → $v = v_0 + a\Delta t$

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

(2) lavoro svolto da P nel trascinamento:

$P_x = mg\sin\theta = 64.53\,N$

$\sin\theta = \frac{2.5}{5.7} = 0.44$

$W_{P_x} = -mg\sin\theta \cdot d \cong -368\,J$

lavoro svolto dalla Tensione:

Teorema e. cinetica: $\Delta K = W_{TOT}$

$\Delta K = W_{P_x} + W_T$

$= 0$, perché la velocità non varia

$0 = W_{P_x} + W_T$

$W_{P_x} = -W_T$

$W_T = +368\,J$

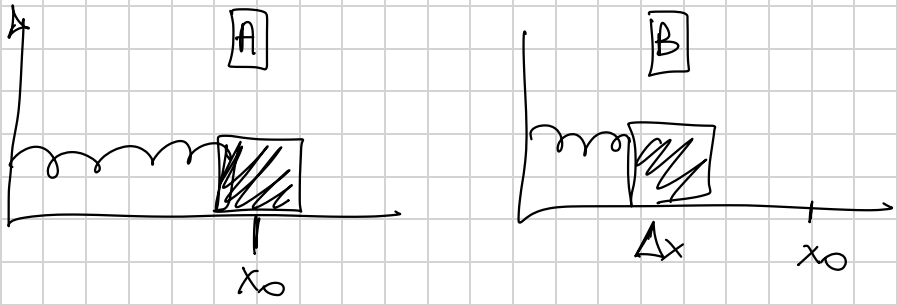
So che W_P sarebbe uguale se tirassi su il peso di h senza rampa:

$W_P = mgh \cong -368\,J \Rightarrow W_T = mgh = 368\,J = Td$

se cresce d, decresce T

se il risultato è sempre 368 J (mgh), allora il prodotto Td non cambia

3



conservazione e. meccanica =

$$U_A + K_A = U_B + K_B$$

$$\cancel{\frac{1}{2}kx_A^2} + \frac{1}{2}mv_A^2 = \frac{1}{2}kx_B^2 + \cancel{\frac{1}{2}mv_B^2}$$

$$\frac{1}{2}mv_A^2 = \frac{1}{2}kx_B^2$$

$$v_A = x_B\sqrt{\frac{k}{m}} = 0.12\ m/s$$

piano con attrito → teorema e. cinetica =

$$\Delta K = W_{F_A} \rightarrow K_f - K_i = W_{F_A}$$

$=0$, si ferma $\leftarrow$

$$\cancel{\frac{1}{2}mv_f^2} - \frac{1}{2}mv_i^2 = -\mu_D mgs$$

$$-\frac{1}{2}mv_i^2 = -\mu_D mgs \rightarrow s = \frac{v^2}{2\mu_D g} = 1\ mm$$

4) a) nello scivolo non c'è attrito →

$$K_A + U_A = K_B + U_B$$

$$\frac{1}{2}mv_A^2 + mgh_A = \frac{1}{2}mv_B^2 + mgh_B$$

$v_A = 0$; $\frac{1}{2}mv_B^2 = K_B$

$$K_B = 0.83\ J$$

$$v_B = \sqrt{\frac{2K_B}{m}} = 2.04\ m/s$$

Calcolo anche la v_C:

$$K_B + U_B = K_C + U_C$$

$$\frac{1}{2}mv_B^2 + mgh_B = \frac{1}{2}mv_C^2 + mgh_C \qquad h_C = 0$$

$$v_C = \sqrt{v_B^2 + 2gh_B} = 2.09\ m/s$$

[potevo anche usare A per conservazione C]

Tratto CD → attrito:

$$\Delta K = W_{F_A} \rightarrow K_D - K_C = -\mu_D mgl$$

$$v_D = \sqrt{-2\mu_D gl - v_C^2} = 1.79\ m/s$$

compressione molla → no attrito → conservazione e. meccanica

$$U_D + K_D = U_{MOLLA} + K_{MOLLA}$$

$$\cancel{\frac{1}{2}Kx_D^2} + \frac{1}{2}mv_D^2 = \frac{1}{2}Kx^2 + \cancel{\frac{1}{2}mv^2}$$

$x_D = 0$ $\qquad$ $v = 0$

$$\frac{1}{2}mv_D^2 = \frac{1}{2}Kx^2 \rightarrow x = \sqrt{\frac{m \cdot v_D^2}{k}} = 0.14\,m$$

$E_{mecc}\ A \rightarrow K_A + U_A = +1.23\,J$

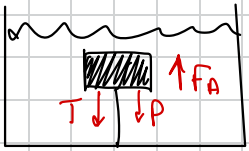
$E_{mecc}\ B \rightarrow K_B + U_B = +1.22\,J$

$E_{mecc}\ C \rightarrow K_C + \cancel{U_C}^{h=0} = +0.87\,J$

$E_{mecc}\ D \rightarrow K_D + \cancel{U_D}^{h=0,\,x=0} = +0.64\,J$

$E_{mecc\ molla} \rightarrow \cancel{K}^{v=0} + U = 0.003\,J$

5



A

$\Sigma F = m \cdot a = 0$

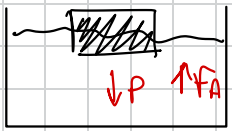
$F_A - T - P = 0$

$T = F_A - P$

$= \rho_{H_2O} g V_{IMM} - mg$

$= 73.1\ N$

$\frac{m}{V} = 62.5$



B

$\Sigma F = 0$

$F_A - P = 0$

$F_A = P$

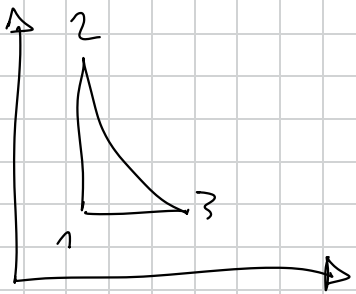
$\rho_{H_2O} g V_{IMM} = \rho_{CORPO} g V_{CORPO}$

$\rho_{H_2O} V_{IMM} = \rho_{CORPO} \cdot V_{CORPO}$

$\frac{\rho_{CORPO}}{\rho_{H_2O}} = \frac{V_{IMM}}{V_{CORPO}} = \frac{62.5}{1000}$

$6.25\ \%$

6



$T_1 = 300\ K$

$p_1 = 1\ atm$

$T_2 = 600\ K$

$L_{12} = 0$ (isocora)

$L_{23} = -\Delta U_{23} = -nC_v(T_3 - T_2) = nC_v(T_2 - T_3)$

$L_{31} = p(V_1 - V_3)$

$V_1 = \frac{nRT_1}{p_1} = 4.94 \cdot 10^{-3}\ m^3 = V_2$ (isocora)

$p_2 = \frac{nRT_2}{V_2} = 2.02 \cdot 10^5\ Pa$

$\gamma = \frac{7}{5}$

$V_3 \rightarrow p_2 V_2^{\gamma} = p_3 V_3^{\gamma}$

$V_3 = \left(\frac{p_2}{p_3}\right)^{\gamma} \cdot V_2 = 8.1 \cdot 10^{-3}\ m^3$

$$L_{23} = nC_V (T_2 - T_3) = +449\,J$$

$$L_{31} = p(V_1 - V_3) = -319\,J$$

$$L_{ciclo} = L_{12} + L_{23} + L_{31} = +130\,J$$

$$Q_{ASS} = Q_{12} = nC_V (T_2 - T_1) = +1247\,J$$

$$\eta = \frac{L_{ciclo}}{Q_{ASS}} = 0.10$$