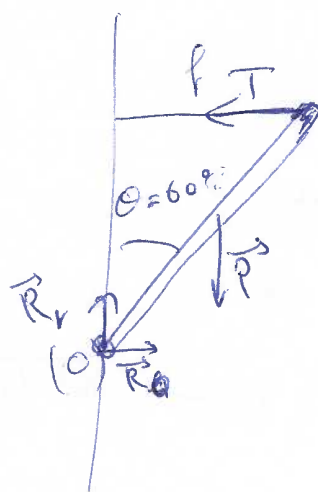


I. Meccanica

$$L = 1 \text{ m}$$

$$m = 2 \text{ kg}$$

1. momento rispetto ad un
asse che passa per la
cuncea = 0:

$$TL \cos \theta - mg \frac{L}{2} \sin \theta = 0$$

$$T = \frac{mg}{2} \tan \theta \approx 17 \text{ N}$$

2. $\sum \vec{F} = 0$

$$R_v - P = 0$$

$$R_h - T = 0$$

$$|R| = \sqrt{P^2 + T^2} \approx 26 \text{ N}$$

3. $\Delta E_c + \Delta E_p = 0$

$$E_{cf} = E_{pi} - E_{pf} = mg \left(\frac{L}{2} + \frac{L}{2} \cos \theta \right)$$

$$= mg \frac{L}{2} (1 + \cos \theta) = 14.7 \text{ J}$$

4. Velocità tangenziale:

$$E_{cf} = \frac{1}{2} I \omega^2$$

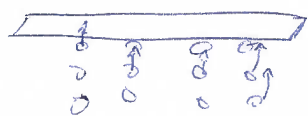
$$I = \frac{mL^2}{12} + \frac{mL^2}{4} = \frac{mL^2}{3}$$

$$v = \omega L$$

$$= \frac{1}{2} \frac{mL^2}{3} \frac{v^2}{L^2}$$

$$\rightarrow v = \sqrt{\frac{6 E_{cf}}{m}} = 6.6 \text{ m/s.}$$

II. Vnto.



1. momento trasferita da una pallina alla lamina $\Delta p = 2 \text{ mV}$

$$F = \frac{\Delta p}{\Delta t}$$

20 palline/secondo $\rightarrow F = 40 \text{ mV}$

Velocità della pallina alla quota h :

$$v^2 = v_0^2 - 2gh \rightarrow F = 40 \text{ mV} \cdot \sqrt{v_0^2 - 2gh}$$

2. equilibrio per la quota h tale che

$$mg = F$$

$$h = \left[v_0^2 - \left(\frac{mg}{40 \text{ mV}} \right)^2 \right] \cdot \frac{1}{2g}$$

$$\underline{h = 0.77 \text{ m.}}$$

III. Termodinamica



punto A:

$$T_A = 18^\circ \text{C} = 291 \text{ K}$$

$$p_A = 2 \cdot 10^5 \text{ Pa}$$

$$V_A = \frac{nRT_A}{p_A} = 0.024 \text{ m}^3$$

Punto B:

$$P_B = P_A = 2 \cdot 10^5 \text{ Pa}$$

$$V_B = 2V_A = 0.048 \text{ m}^3$$

$$T_B = \frac{P_B V_B}{nR} = 2T_A = 582 \text{ K}$$

Punto C:

$$T_C = T_A = 291 \text{ K}$$

$$P_B V_B^\gamma = P_C V_C^\gamma \quad \text{or} \quad T_B V_B^{\gamma-1} = T_C V_C^{\gamma-1}$$

$$V_C^{\gamma-1} = \frac{T_B}{T_C} V_B^{\gamma-1}, \quad V_C = (2)^{\frac{1}{\gamma-1}} V_B$$

$$\gamma = \frac{5}{3}, \quad V_C = 0.14 \text{ m}^3$$

$$P_C = \frac{nRT_C}{V_C} = 0.35 \cdot 10^5 \text{ Pa}$$

$$2. \quad Q_{BC} = 0, \quad \int Q_{AB} = n C_p dT - V dP$$

$$Q_{AB} = n C_p (T_B - T_A) = 2 \times \frac{5}{2} R \times T_A$$

$$= 12091 \text{ J}$$