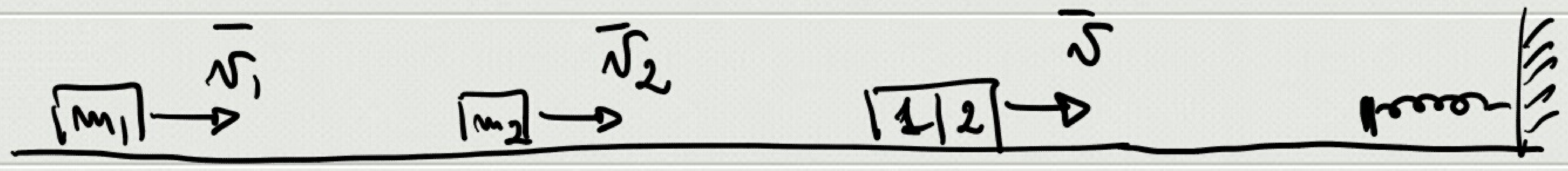


$v_1 = 7\ m/s \quad m_1 = 0.4\ kg \quad m_2 = 0.6\ kg$

urto compl. anel. $\quad v = 5.8\ m/s$

$k = 150\ N/m$

$v_{21} = ?, \quad A = ?$

$$\cancel{m_1 \bar{v}_1 + m_2 \bar{v}_2 = (m_1 + m_2)\bar{v}_{21}}$$

$$\cancel{m_1 v_1 + m_2 v_2 = (m_1 + m_2) v_{21}}$$

$$m_1 v_1 + m_2 v_2 = (m_1 + m_2) v \qquad v_{21} = v_2 - v_1 \quad *$$

$$m_1 \bar{v}_1 + m_2 \bar{v}_2 = (m_1 + m_2)\bar{v} \qquad \cancel{\bar{v}_{21} = \bar{v}_1 - \bar{v}_2}$$

$$v_2 = \frac{1}{m_2}\left((m_1 + m_2) v - m_1 v_1\right) = 5\ m/s$$

$$v_{21} = v_2 - v_1 = -2\ m/s$$

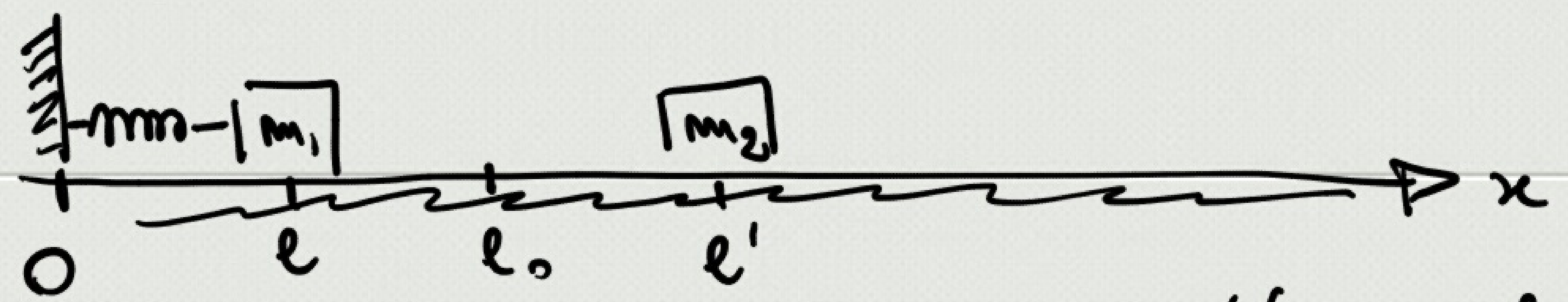
$$\cancel{\frac{1}{2}}(m_1+m_2)v^2=\cancel{\frac{1}{2}}k\Delta^2 \qquad *$$

$$\frac{1}{2}m_1v_1^2+\cancel{\frac{1}{2}m_2v_2^2=\frac{1}{2}}k\Delta^2$$

$$* \begin{cases} x(t)=A\sin(\omega t+\phi) & x(0)=0 \\ v(t)=A\omega\cos(\omega t+\phi) & v(0)=v \end{cases} \qquad \omega=\sqrt{\frac{k}{m_1+m_2}}$$

$$\begin{cases} x(t)=A\cos(\omega t+\phi) & x(0)=0 \\ v(t)=-A\omega\sin(\omega t+\phi) & v(0)=v \end{cases} \qquad \omega=\sqrt{\frac{k}{m_1+m_2}}$$

$$A=v\sqrt{\frac{m_1+m_2}{k}}=0.47\ m$$



$\mu_d = \mu_s = \mu = 0.3$ $\quad k = 400\ N/m \quad \ell_0 = 0.5\ m$

$|\Delta \ell| = 0.2\ m$

$m_1 = 2kg \quad v_{01} = 0$

$m_2 = 1kg \quad v_{02} = 0 \qquad \ell' - \ell = 0.3\ m$

urto compl. anel.

$V = ?$

$W_{nc} = \Delta E_m$

$$\Rightarrow -\mu m_1 g(\ell'-\ell) = \overbrace{\left(\frac{1}{2} m_1 v_1^2 + \frac{1}{2} k(\ell'-\ell_0)^2\right)}^{E_{m,f}} - \overbrace{\frac{1}{2} k(\ell-\ell_0)^2}^{E_{m,i}}$$

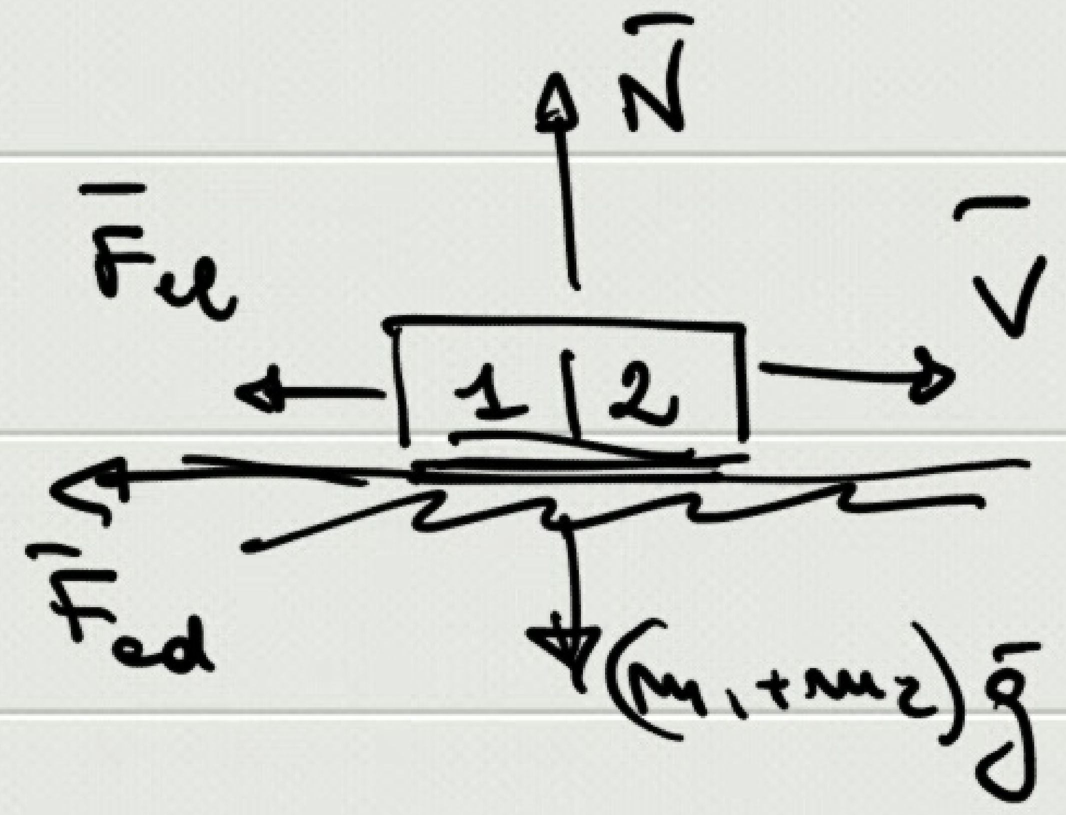
$$\Uparrow$$

$$v_1 = \sqrt{-2\mu g(\ell'-\ell) + \frac{k}{m_1}\left[(\ell-\ell_0)^2 - (\ell'-\ell_0)^2\right]} = 2.06\ m/s$$

$$\bar{P} = cost \Rightarrow m_1 v_1 = (m_1 + m_2) V$$

$$\Rightarrow V = \frac{m_1}{m_1 + m_2} v_1 = 1.37\ m/s$$

$a = ?$

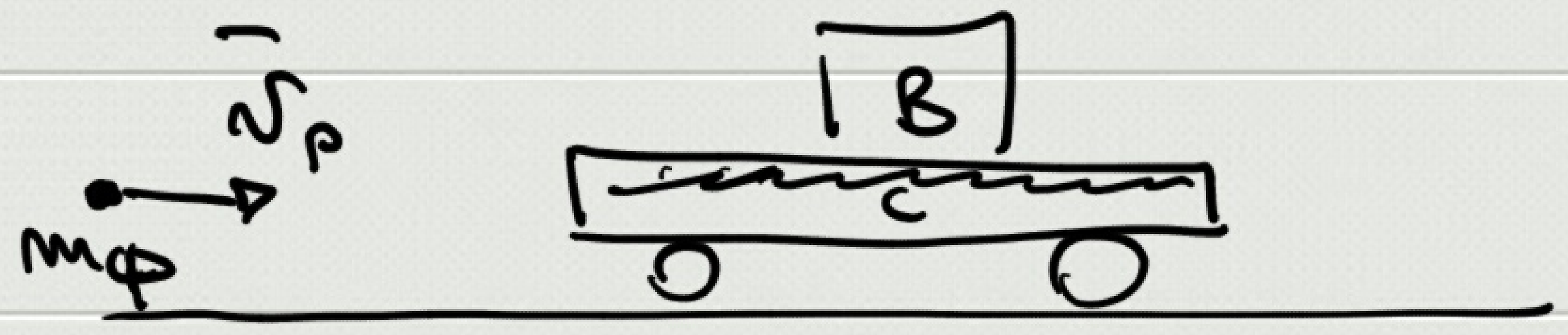


$$-\mu(m_1+m_2)g - k(\ell' - \ell_0) = (m_1+m_2)a \qquad (a \neq \text{cost})$$

$$\Rightarrow \quad a = -\mu g - k\frac{\ell' - \ell_0}{m_1+m_2} = -16.3 \ m/s^2$$

$\Delta \ell_{max} = ?$ $\qquad W_{nc} = \Delta E_m$

$= 0.148 \ m$



$m_C = 25\ kg$

$m_B = 10\ kg$

$v_{0C} = v_{0B} = 0$ $\quad v_p = 48\ m/s$ $\quad m_p = 5\ kg$

urto compl. anel.

$v'_C\ (\mu = 0) = ?$ $\qquad v'_C\ (\mu = 0.4) = ?$

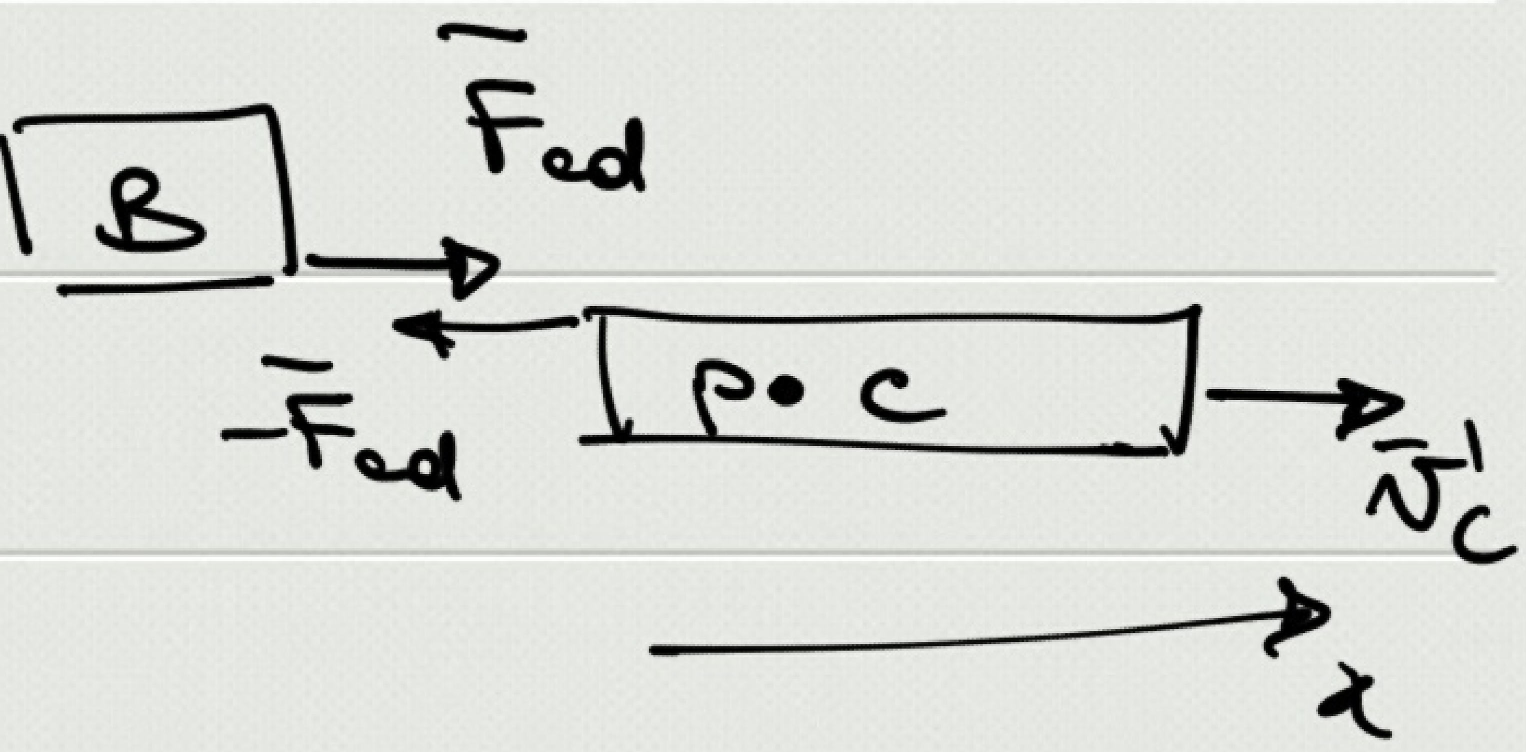
$$m_p v_p = (m_p + m_C)\, v'_C \Rightarrow v'_C = \frac{m_p}{m_p + m_C} v_p = 8\ m/s$$

$$m_p v_p = (m_p + m_C)\, v'_C \quad *$$

$$m_p v_p = (m_p + m_C + m_B)\, v'_C$$

$$m_p v_p = (m_p + m_C)\, v'_C + m_B v'_B \qquad v'_B = -v'_C$$

$$m_p v_p = (m_p + m_C)\, v'_C - m_B \mu_d g$$

$a'_c = ?$ 

$a'_c = 0$

$a'_c = -\mu g$

$(m_c + m_p)\, a'_c = -\mu m_B g$ *

$(m_c + m_p + m_B)\, a'_c = -\mu m_B g$

$$a'_c = -\mu g \frac{m_B}{m_c + m_p} = -1.3\ m/s^2$$

$v''_c\ (v_{Bc} = 0) = ?$

$-\mu m_B g d = 0 - \cancel{\frac{1}{2}(m_p + m_c + m_B)\, v''^2_c}$ $\quad 0 = v''^2_c - 2 a'_c d$

$m_p v_p = (m_p + m_c + m_B)\, v''_c$ *

$(m_p + m_c)\, v'_c = (m_p + m_c + m_B)\, v''_c$ *

$\cancel{v''_c = 0}$

$$v''_c = \frac{m_p}{m_p + m_c + m_B}\, v_p = 6\ m/s$$

$W_{att} = ?$

$$W_{att} \overset{!}{=} \underbrace{\frac{1}{2}(m_c + m_p + m_B) v_c''^2 - \frac{1}{2}(m_c + m_p) v_c'^2}_{\Delta E_m}$$

$$\begin{cases} W_{att} = \mu m_B g d' \\ 0 = v_c'^2 + 2a'd' \\ a' = a - a_c = \mu g + \mu g \dfrac{m_B}{m_c + m_p} \end{cases}$$

$$\Rightarrow W_{att} = -24 \text{ J}$$