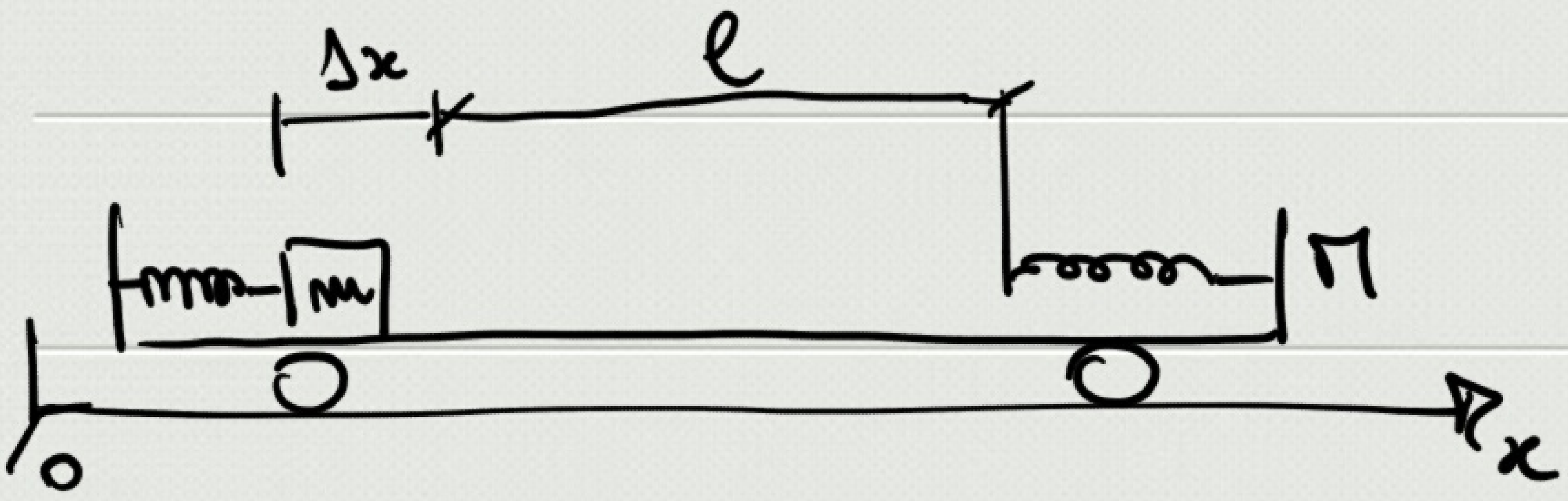

$M = 2\ \text{kg}$

$k = 10\ \text{N/m}$

$\Delta x = 0.2\ \text{m}$

$m = 0.2\ \text{kg}$

$l = 1\ \text{m}$

$v_{0,m} = v_{0,M} = 0$

v_m, v_M al distacco dalla molla ; $t(l) = ?$

$$\begin{cases} m v_m + M v_M = 0 \\ v_m = v'_m + v_M \\ \frac{1}{2} k \Delta x^2 = \frac{1}{2} m v'^2 \end{cases} \qquad \begin{cases} m v_m + M v_M = 0 \\ \cancel{v_m = v'_m + v_M} \\ \cancel{v'^2_m = 2\left(\frac{k\Delta x}{m}\right)\Delta x} \end{cases}$$

$$* \begin{cases} m v_m + M v_M = 0 \\ \frac{1}{2} m v_m^2 + \frac{1}{2} M v_M^2 = \frac{1}{2} k \Delta x^2 \end{cases} \qquad \begin{cases} \cancel{m v_m + M v_M = 0} \\ \cancel{v_m^2 = 2\left(\frac{k\Delta x}{m}\right)\Delta x} \end{cases}$$

$$v_m = -\frac{M}{m} v_M$$

$$\cancel{m} \frac{M^2}{m^{\cancel{2}}} v_M^2 + M v_M^2 = k \Delta x^2 \Rightarrow v_M = -\Delta x \sqrt{\frac{mk}{M(m+M)}} =$$

$$= -0.135\ \text{m/s}$$

$$\Rightarrow v_m = \Delta x \sqrt{\frac{Mk}{m(m+M)}} = 1.35\ \text{m/s}$$

$$\cancel{\ell = v_m t}$$

$$\ell = v'_m t \quad *$$

$$\begin{cases} m v_m + M v_M = 0 \quad \Rightarrow \quad v_M = -\dfrac{m}{M} v_m \\ v_m = v'_m + v_M \quad \Rightarrow \end{cases}$$

$$\Rightarrow v_m = v'_m - \frac{m}{M} v_m \Rightarrow v'_m = \frac{m+M}{M} v_m = 1.48 \text{ m/s}$$

$$t = \frac{\ell}{v'_m} = 0.67 \text{ s}$$

$$v_{M,1} = ? \qquad \Delta x_1 = 0.1 \text{ m}$$

$$\begin{cases} m v_{m,1} + M v_{M,1} = 0 \\ \dfrac{1}{2} k \Delta x^2 = \dfrac{1}{2} m v_{m,1}^2 + \dfrac{1}{2} M v_{M,1}^2 + \dfrac{1}{2} k \Delta x_1^2 \end{cases}$$

$$\Rightarrow v_{M,1} = \sqrt{\frac{m k (\Delta x^2 - \Delta x_1^2)}{M (m+M)}} = 0.117 \text{ m/s}$$

$$\underset{\overset{!}{=}\,\Delta x}{\Delta x_{2,max} = ?} \quad : \quad v_{m2} = v_{M2} = 0 \Rightarrow \frac{1}{2} k \Delta x^2 = \frac{1}{2} k \Delta x_2^2$$

$$\begin{cases} m v_m + M v_M = 0 \\ v_m = v'_m + v_M \\ \boxed{\Delta E'_k = W'_{TOT}} \end{cases}$$

$$\Delta E'_k = \frac{1}{2} m v'^2_m$$

$$W'_{TOT} = W_{vere} + W_{app}$$

$$a_m = a'_m + a_M \Rightarrow a'_m = a_m - a_M$$

$$F' = \begin{cases} m a_m - m a_M \\ \downarrow \\ F = -kx \end{cases} \Rightarrow W_{el} = -\Delta E_{p,el} = -\left(\cancel{0} - \frac{1}{2} k \Delta x^2\right) = \frac{1}{2} k \Delta x^2$$

$$W_{app} = \int_0^{\Delta x} + m a_M \, dx \quad *$$

$$m a_m + M a_M = 0 \Rightarrow a_M = -\frac{m}{M} a_m = \frac{k}{M} x$$

$$* \Rightarrow W_{app} = \int_0^{\Delta x} m \frac{k}{M} x \, dx = \frac{1}{2} \frac{m}{M} k \Delta x^2$$

$$\Delta E'_k = W'_{TOT} \Rightarrow \cancel{\frac{1}{2}} m v'^2_m = \cancel{\frac{1}{2}} k \Delta x^2 + \cancel{\frac{1}{2}} k \frac{m}{M} \Delta x^2$$

$$m v'^2_m = \left(1 + \frac{m}{M}\right) k \Delta x^2 \Rightarrow \underbrace{v'_m = \Delta x \sqrt{\frac{m+M}{mM} k}}$$