$$\Rightarrow \frac{2m}{3}\ddot{x} = -k(x-L_0) \iff \ddot{x} + \underbrace{\frac{3k}{2m}}_{\omega^2} x = \frac{3kL_0}{2m}$$

$\Rightarrow$ El período de oscilación es $\boxed{T = 2\pi\sqrt{\frac{2m}{3k}}}$

c) $\ddot{x} + \frac{3k}{2m}x = \frac{3kL_0}{2m}$ $\qquad \ddot{x} = \dot{x}\frac{d\dot{x}}{dx}$

$\dot{x}\,d\dot{x} = \left(\frac{3kL_0}{2m} - \frac{3k}{2m}x\right)dx \quad / \int$

En $t=0$ $\quad x=0$

$\dot{x} = \cancel{\dot{x}_1} - \dot{x}_2 = -\frac{V_0}{3}$

porque $\dot{x}_{CM} = \frac{2m\dot{x}_2}{3m} = \frac{V_0}{3}$

$$\int_{-\frac{V_0}{3}}^{0} \dot{x}\,d\dot{x} = \int_0^{x_M}\left(\frac{3kL_0}{2m} - \frac{3k}{2m}x\right)dx$$

$$\Rightarrow -\frac{V_0^2}{\cancel{2}\cdot 3^2} = \frac{3kL_0x_M}{\cancel{2m}} - \frac{3k}{2m}\frac{x_M^2}{\cancel{2}} \iff x_M^2 - 2L_0x_M - \frac{2m}{3k}\frac{V_0^2}{9} = 0$$

$$\Rightarrow x_M = 2L_0 \pm \sqrt{4L_0^2 + \cancel{4}\frac{2m}{3k}\frac{V_0^2}{9}}$$

$\cancel{2}$

$\longrightarrow + \rightarrow$ máximo

$\longrightarrow - \rightarrow$ mínimo