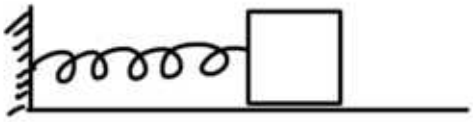
EJERCICIO F2BE3420:

"achimagec.com"

$m_1 = 40g = 0'04kg$

$T_1 = 2s$



a) $f_2 = 2f_1 \Rightarrow m_2 = ?$

$$f = \frac{1}{T} = \frac{1}{\frac{2\pi}{\omega}} = \frac{\omega}{2\pi}$$

de $F = m \cdot a$

$-kx = m \cdot (-\omega^2 x)$

$\boxed{k = m\omega^2} \Rightarrow \omega = \sqrt{\frac{k}{m}}$

$$f = \frac{\sqrt{\frac{k}{m}}}{2\pi} = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$$

$\omega = \frac{2\pi}{T} \Rightarrow T = \frac{2\pi}{\omega}$

$$\boxed{f_1 = \frac{1}{2\pi}\sqrt{\frac{k}{m_1}}} \qquad \boxed{f_2 = \frac{1}{2\pi}\sqrt{\frac{k}{m_2}}}$$

$$f_2 = 2 \cdot f_1$$

$$\frac{1}{2\pi}\sqrt{\frac{k}{m_2}} = 2 \cdot \frac{1}{2\pi}\sqrt{\frac{k}{m_1}}$$

$$\frac{1}{2\pi}\frac{\sqrt{k}}{\sqrt{m_2}} = \frac{1}{\pi}\frac{\sqrt{k}}{\sqrt{m_1}}$$

$$\frac{1}{2\sqrt{m_2}} = \frac{1}{\sqrt{m_1}} \Rightarrow (\sqrt{m_1})^2 = (2\sqrt{m_2})^2$$

$$m_1 = 4m_2$$

$$m_2 = \frac{1}{4}m_1 = \frac{1}{4}0{,}04kg = \boxed{0{,}01\ kg = m_2}$$

b) $E_{p\,máx}$ si $A_1 = A_2 = 10\,cm = 0'1\,m$

$$E_{p1\,máx} = \frac{1}{2} k_1 A_1^2 \qquad k = m \cdot \omega^2$$

$$k_1 = m_1 \cdot \omega_1^2 = 0{,}04 \cdot \left(\frac{2\pi}{T_1}\right)^2 = 0{,}04 \cdot \frac{4\pi^2}{2^2}$$

$$k_1 = 0{,}04 \cdot \pi^2 \simeq 0{,}395 \frac{N}{m}$$

$k_1 = k_2 \Rightarrow$ es el mismo resorte.

$$E_{p1\,máx} = \frac{1}{2} k_1 \cdot A_1^2 = \frac{1}{2} 0{,}395 \cdot 0{,}1^2 = 1{,}98 \cdot 10^{-3}\,J$$

$$\boxed{E_{p1\,máx} = E_{p2\,máx} = 1{,}98 \cdot 10^{-3}\,J.}$$

misma k, misma A

c) Velocidad máx para cada masa:

$E = E_{c\,máx} = E_{p\,máx} \Rightarrow$ Relat. Conservativa

Para $m_1 = 0'04\,kg$:

$$\frac{1}{2} m_1 v_{1\,máx}^2 = 1{,}98 \cdot 10^{-3}\,J = E_{p\,máx}$$

$$v_{1\,máx} = \sqrt{\frac{2 \cdot 1{,}98 \cdot 10^{-3}}{m_1 \leftarrow 0{,}04}} \simeq \boxed{0{,}315\ m/s} \qquad v_1\,(máx)$$

Para $m_2 = 0'01\,kg$:

$$v_{2\,máx} = \sqrt{\frac{2 \cdot 1{,}98 \cdot 10^{-3}}{m_2 \leftarrow 0.01}} \simeq \boxed{0{,}629\ m/s} \qquad v_2\,(máx)$$