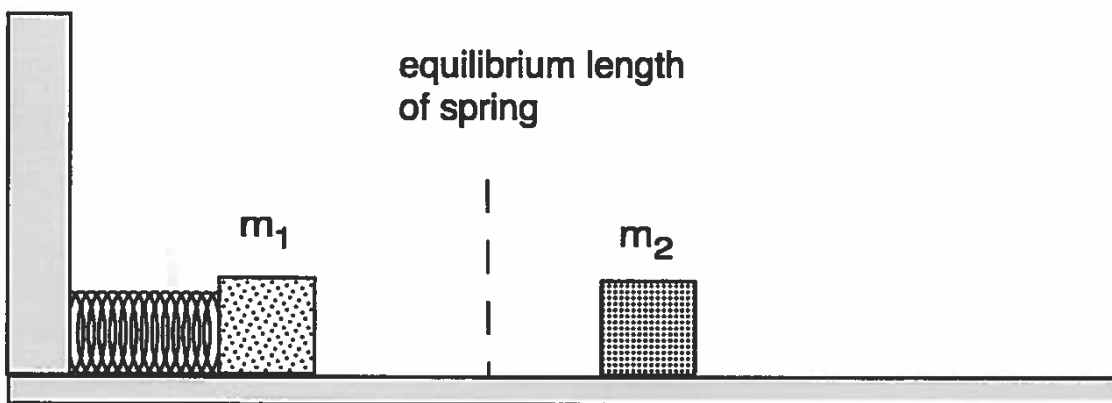


Physics 10154 - Quiz 10D

A mass ($m_1 = 1.20$ kg) is initially at rest against a compressed spring ($k_s = 327$ N/m) that is compressed by 14.5 cm from its equilibrium position on a frictionless, horizontal surface. The system is released from rest, and the mass (m_1) goes on to have an elastic collision with mass m_2 ($m_2 = 2.40$ kg).

- What is the final speed of m_2 after the collision?
- What is the final speed of m_1 after the collision?
- To what maximum compression does the spring reach after m_1 rebounds from the collision?



Before collision: $\Sigma W_F = W_{spr} = \Delta K$

$$\frac{1}{2}kx^2 = \frac{1}{2}m_1 v^2$$

$$v = \sqrt{\frac{k}{m_1}} x = 2.3936 \text{ m/s}$$

Collision: $v_{1i} = 2.3936 \text{ m/s}$ $v_{2i} = 0$

a) $v_{2f} = \frac{2m_1}{m_1 + m_2} v_{1i} = \frac{2(1.2)}{1.2 + 2.4} (2.3936) = \boxed{1.60 \text{ m/s}}$

b) $v_{1f} = \frac{m_1 - m_2}{m_1 + m_2} v_{1i} = \frac{-1.2}{1.2 + 2.4} (2.3936) = \boxed{-0.798 \text{ m/s}}$

c) $\Sigma W_F = W_{spr} = \Delta K$
 $-\frac{1}{2}kx^2 = 0 - \frac{1}{2}mv_0^2 \rightarrow x = \sqrt{\frac{mv_0^2}{k_s}} = 0.0483 \text{ m}$
or $\boxed{4.83 \text{ cm}}$