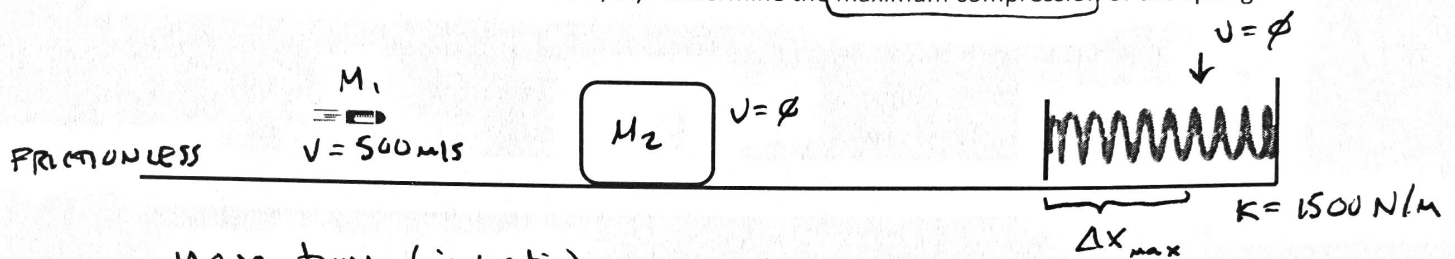


Spring Energy & Momentum Problem

Name: _____ Date: _____

A 0.05 kg bullet travelling at 500 m/s [right] strikes a 5kg block moving at 1.0 m/s [left]. After the inelastic collision (bullet embeds in the block) the two travel along the frictionless surface where they hit an ideal spring (spring constant of 1500 N/m). Determine the maximum compression of the spring.



Momentum: (inelastic)

$$M_1 v_{1x} + M_2 v_{2x} = v_f (M_1 + M_2)$$

$$v_f = \frac{M_1 v_{1x} + M_2 v_{2x}}{M_1 + M_2}$$

$$v_f = \frac{(0.05)(500) + 0}{(5.05)} = 4.9505 \text{ m/s}$$

Spring:

@ max compression all of the E_k is stored in the spring.

$$E_k = E_s$$

$$\frac{(M_1 + M_2) v_f^2}{2} = \frac{K \Delta x_{\text{max}}^2}{2}$$

$$\Delta x_{\text{max}} = \sqrt{\frac{(M_1 + M_2) v_f^2}{K}}$$

$$= \sqrt{\frac{(5.05)(4.9505)^2}{1500}}$$

$$\Delta x_{\text{max}} = 0.29 \text{ m} = 29 \text{ cm}$$