

$$m = 0.100 \text{ kg} \quad k = 9.60 \text{ N/m}$$

a)  $\Delta x = ?$       $\Delta x = \frac{F}{k} = \frac{mg}{k}$

$$\Delta x = \frac{(0.100 \text{ kg})(9.8 \text{ m/s}^2)}{9.60 \text{ N/m}}$$

$$\boxed{\Delta x = 0.102 \text{ m}}$$

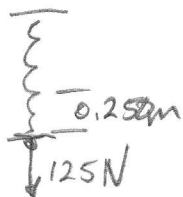
b)

$$E_e = \frac{1}{2} k \Delta x^2 = \frac{1}{2} (9.60 \text{ N/m})(0.102 \text{ m})^2$$

$$\text{N} \cdot \text{m} = \text{J}$$

$$\boxed{E_e = 0.0500 \text{ J}}$$

2.



$$\Delta x = 0.250 \text{ m} \quad F = 125 \text{ N}$$

a)  $k = \frac{F}{\Delta x} = \frac{125 \text{ N}}{0.250 \text{ m}} = 500 \text{ N/m}$

$$E_e = \frac{1}{2} k \Delta x^2 = \frac{1}{2} (500 \text{ N/m})(0.250 \text{ m})^2$$

$$\boxed{E_e = 15.6 \text{ J}}$$

b)  $\Delta x = 0.150 \text{ m}$

$$E_e = \frac{1}{2} (500 \text{ N/m})(0.150 \text{ m})^2$$

$$E_e = 5.625 \text{ J}$$

$$\Delta E_e = 15.625 \text{ J} - 5.625 \text{ J}$$

$$\boxed{\Delta E_e = 10.0 \text{ J}}$$

$$3. \quad k = 4.40 \times 10^4 \text{ N/m} \quad E_e = \frac{1}{2} k \Delta x^2$$

$$\Delta x_1 = 0.125 \text{ m} \quad \Delta x_2 = 0.15 \text{ m}$$

$$\Delta E_e = \frac{1}{2} k (\Delta x_2^2 - \Delta x_1^2)$$

$$= \frac{1}{2} (4.40 \times 10^4) ((0.15 \text{ m})^2 - (0.125)^2)$$

$$\boxed{\Delta E_e = 151 \text{ J}}$$

$$4. \quad k = 750 \text{ N/m}$$

$$E_e = \frac{1}{2} k \Delta x^2$$

$$\Delta x^2 = \frac{2 E_e}{k}$$

$$\Delta x = \sqrt{\frac{2 E_e}{k}} = \sqrt{\frac{2(45 \text{ J})}{750 \text{ N/m}}}$$

$$\boxed{\Delta x = 0.346 \text{ m}}$$

$$\text{Units: } \frac{\text{J}}{\text{N/m}} = \frac{\text{kg m}^2/\text{s}^2}{(\text{kg m}/\text{s}^2) \text{ m}^{-1}}$$

$$\frac{\text{J}}{\text{N/m}} = \text{m}^2; \quad \sqrt{\frac{\text{J}}{\text{N/m}}} = \text{m}$$

$$5. \quad \Delta x = 0.400 \text{ m}$$

$$E_e = 500 \text{ J}$$

$$E_e = \frac{1}{2} k \Delta x^2$$

$$k = \frac{2 E_e}{\Delta x^2} = \frac{2(500 \text{ J})}{(0.400 \text{ m})^2}$$

$$k = 6250 \text{ N/m}$$

$$a) \quad F = k \Delta x = (6250 \text{ N/m})(0.400 \text{ m})$$

$$\boxed{F = 2500 \text{ N}}$$

$$b) \quad \Delta x = \frac{F}{k} = \frac{1000 \text{ N}}{6250 \text{ N/m}} = 0.16 \text{ m} \quad E_e = \frac{1}{2} (6250 \text{ N/m})(0.16 \text{ m})^2$$

$$E_e = 80 \text{ J}$$

(If doesn't increase, it)  
Decreases to 1000 N)

$$\Delta E_e = 80 \text{ J} - 500 \text{ J}$$

$$\boxed{\Delta E_e = -420 \text{ J}}$$