Spring Energy Problems - Basic

Name: SOLUTIONS Date: _____

$E_s = \frac{kx^2}{2}$ $F_s = kx$

1. A spring with a spring constant of 400 N/m is stretched 40 cm. Calculate the energy stored in the spring.

$$E_s = \frac{K\Delta x^2}{2} = \frac{(400)(0.4)^2}{2}$$

$$\boxed{E_s = 32\ J}$$

2. A spring is compressed by 20 cm storing 1000 J of energy in the spring. Calculate the k (spring constant) value of the spring.

$$E_s = \frac{K\Delta x^2}{2} \quad \text{so} \quad K = \sqrt{\frac{2E_s}{\Delta x^2}} = \sqrt{\frac{2(1000)}{(0.2)^2}}$$

$$\boxed{K = 224\ N/m}$$

3. A rubber band (which obeys Hooke's law) has a spring constant of 5 N/m and is stretched so that 89 J of energy is stored in it. Calculate the amount of stretch.

$$E_s = \frac{K\Delta x^2}{2} \Rightarrow \Delta x = \sqrt{\frac{2E_s}{K}}$$

$$= \sqrt{\frac{2(89)}{5}} = \boxed{5.97\ m}$$

4. A spring requires 20 N of force to compress it by 3 cm.

a) Calculate the spring constant.

$$F_s = K\Delta x \Rightarrow K = \frac{F_s}{\Delta x} = \frac{20}{0.03} = \boxed{667\ N/m}$$

b) Calculate the amount of energy stored in the spring if the spring it stretched by 11 cm.

$$E_s = \frac{K\Delta x^2}{2} = \frac{(667)(0.11)^2}{2} = \boxed{4\ J}$$