

Chapter 14 Worksheet 1

① $m = .55 \text{ kg}$ $F = -kx$
 $x = 2.0 \text{ cm}$

$$k = \frac{F}{x} = \frac{(1.55)(9.80)}{0.02} = \boxed{270 \text{ N/m}}$$

② a) $k = \frac{F}{x} = \frac{(1.55)(9.80)}{0.36} = \boxed{15 \text{ N/m}}$

b) less stiff

③ $F = 32 \text{ N}$
 $x = .012 \text{ m}$

a) $F = -kx$

$$k = \frac{F}{x} = \frac{32}{.012 \text{ m}} = \boxed{2.7 \times 10^3 \text{ N/m}}$$

b)

$$F = -kx \quad F = (2.7 \times 10^3)(.030)$$

$$\boxed{81 \text{ N}}$$

④ double

⑤ $F = -kx$ c) $k = \frac{F}{-x} = \frac{(200)(9.80)}{-.03}$

$$\boxed{6.5 \times 10^4 \text{ N/m}}$$

⑥ $PE_{sp} = \frac{1}{2} kx^2$

$$k = 51.0 \text{ N/m}$$

$$x = .150 - .115 = .035 \text{ m}$$

$$PE_{sp} = \frac{1}{2} (51.0)(.035)^2$$

$$\boxed{.031 \text{ J}}$$

b) $x = \frac{(300)(9.80)}{6.5 \times 10^4}$

$$\boxed{.0452 \text{ m}}$$

⑦ $k = 5.2 \text{ N/m}$

$$x = 3.57 - 2.45 = 1.12 \text{ m} \quad PE_{sp} = \frac{1}{2} kx^2$$

$$= \frac{1}{2} (5.2)(1.12)^2$$

$$\boxed{3.26 \text{ J}}$$

⑧ $k = 550 \text{ N/m}$ $PE_{sp} = \frac{1}{2} (550)(.012)^2$

$$x = .012 \text{ m}$$

$$\boxed{.040 \text{ J}}$$

⑨ $k = 256 \text{ N/m}$

$$PE_{sp} = 48 \text{ J}$$

$$PE_{sp} = \frac{1}{2} kx^2$$

$$x = \sqrt{\frac{2PE_{sp}}{k}}$$

$$= \sqrt{\frac{2(48)}{256}} = \boxed{.61 \text{ m}}$$

⑩

$$x = .30 \text{ m}$$

$$\left\{ \begin{array}{l} 2.44 - 1.98 - .30 = .16 \text{ m} \end{array} \right.$$

$$F = -kx$$

$$k = \frac{F}{-x} = \frac{102}{-.16}$$

$$\boxed{640 \text{ N/m}}$$

$$2.44 \text{ m}$$

$$\left\{ \begin{array}{l} 1.98 \text{ m} \end{array} \right.$$

⑪

a) $PE_{sp} = \frac{1}{2} kx^2$

$$= \frac{1}{2} (425)(.470)^2$$

$$\boxed{46.9 \text{ J}}$$

b)

$$\frac{1}{2} mv_i^2 + \frac{1}{2} kx_i^2 = \frac{1}{2} mv_f^2 + \frac{1}{2} kx_f^2$$

$$v = \sqrt{\frac{kx_i^2}{m}} = \sqrt{\frac{(425)(.470)^2}{.03}}$$

$$\boxed{56 \text{ m/s}}$$