

AP1 Practice From Notes

7.2

$$U_{s_{\max}} = K_{\max} \quad v = \sqrt{\frac{k}{m} A^2} = \boxed{4 \text{ m/s}}$$

$$\frac{1}{2} k A^2 = \frac{1}{2} m v^2$$

7.3

$$E_{\text{tot}} = U_s + K$$

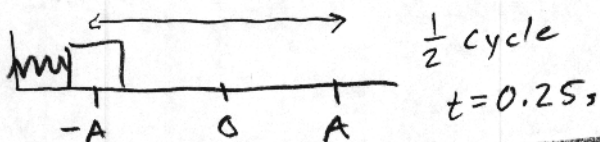
$$A = 8 \text{ cm} = 0.08 \text{ m}$$

$$x = 4 \text{ cm} = 0.04 \text{ m}$$

$$\frac{1}{2} k A^2 = \frac{1}{2} k x^2 + \frac{1}{2} m v^2$$

$$v = \sqrt{\frac{2(\frac{1}{2} k A^2 - \frac{1}{2} k x^2)}{m}} = \boxed{6.93 \text{ m/s}}$$

7.5



$\frac{1}{2}$ cycle
 $t = 0.25 \text{ s}$

$$\boxed{T = 0.5 \text{ s}}$$

$$\boxed{f = \frac{1}{T} = 2 \text{ Hz}}$$

$$\boxed{\omega = \frac{2\pi}{T} = 4\pi \text{ rad/s}}$$

7.7

$$T = 2\pi \sqrt{\frac{m}{k}} = 2\pi \sqrt{\frac{(2.0)}{(300)}} = \boxed{0.51 \text{ s}}$$

$$f = \frac{1}{T} = \boxed{1.96 \text{ Hz}}$$

7.8

$$T = 2\pi \sqrt{\frac{m}{k}}$$

$$f \propto \sqrt{\frac{1}{m}} \propto \sqrt{\frac{1}{\frac{1}{4}}} \propto \sqrt{4} \propto 2$$

$$f = \frac{1}{2\pi} \sqrt{\frac{k}{m}}$$

* doubles the frequency

7.9

$$A_1 = 3\text{cm} = 0.03\text{m}$$

$$A_2 = 6\text{cm} = 0.06\text{m}$$

$$T_s = 2\pi\sqrt{\frac{m}{k}} \text{ is the same}$$

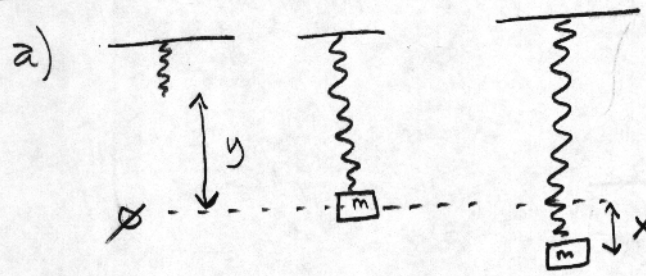
$$f = \frac{1}{2\pi}\sqrt{\frac{k}{m}} \text{ is the same}$$

The experiment (A_2) will have a greater max speed.

$$\frac{1}{2}kA^2 = \frac{1}{2}mv^2$$

$$v = \sqrt{\frac{k}{m}A^2}$$

7.11



$k = 300\text{N/m}$
 $m = 1.5\text{kg}$
 $x = 0.02\text{m}$

equilibrium

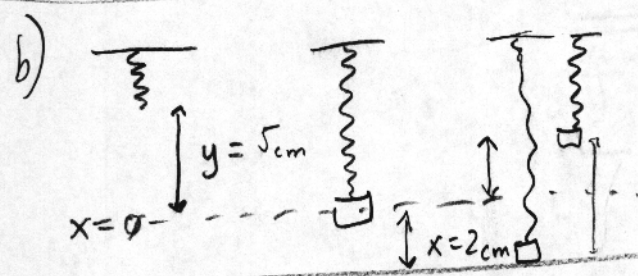
$$x = 0 \quad \Sigma F = 0$$

$$mg - ky = 0$$

$$y = \frac{mg}{k} = \frac{15}{300}$$

$$y = 0.05\text{m}$$

a) $f = \frac{1}{2\pi}\sqrt{\frac{k}{m}} = \frac{1}{2\pi}\sqrt{\frac{300}{1.5}} = 22.2\text{Hz}$



maximum = $y + x = 7\text{cm}$

minimum = $y - x = 3\text{cm}$

7.12 $T = 1\text{s}$ $g_m = \frac{1}{6}g_E$

$$T = 2\pi\sqrt{\frac{L}{g}}$$

$$T \propto \sqrt{6} \approx 2.45$$

$$T \propto \frac{1}{\sqrt{g}} \propto \frac{1}{\sqrt{\frac{1}{6}}}$$

$$T_{\text{moon}} = 2.45\text{s}$$