P20 Unit D UA — Sabrina Fox

19/19

1. 1.92 times/hectosecond = 0.0192 times/second

$T = \frac{1}{f}$

1 $T = \frac{1}{(0.0192^{-1})}$

$T = 52.1\,s$

2. a) $\vec{F}_g = \vec{F}_s$

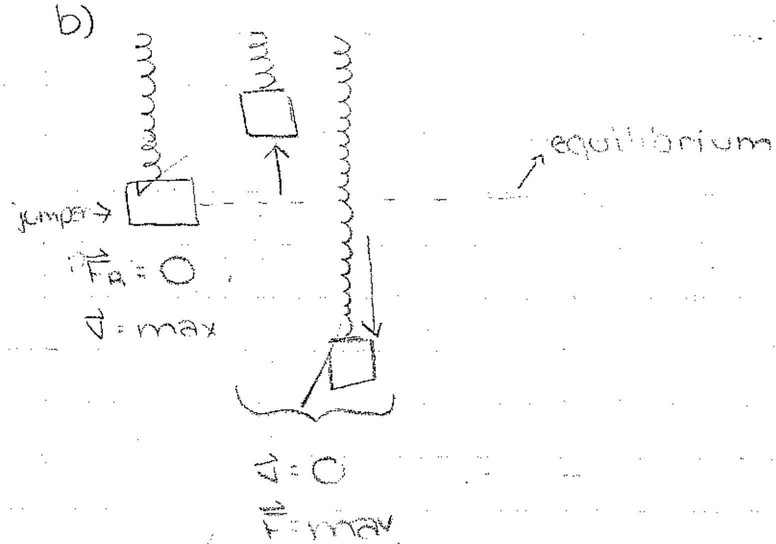
$m\vec{g} = -kx$

$\frac{m\vec{g}}{x} = -k$

1 $\frac{(5.60kg + 1.5kg)(9.81m/s^2)}{(1.3m)} = k$

54 N/m = k

b)



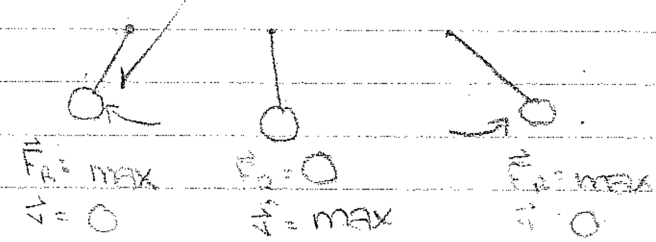
1

3. a) yes, because a pendulum has a restoring force acting on it, has a maximum restoring force at its maximum displacement, and at equilibrium, the pendulum's restoring force is zero and its velocity is at a maximum.

1

b)

2



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$$\frac{(70.0\,kg)(9.81\,m/s^2)}{(72\,m)} = k$$

$9.5\ N/m = k$

5\. a) $E_k = E_p$

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

$v^2 = \frac{\frac{1}{2}kx^2}{\frac{1}{2}m}$

$v^2 \propto \frac{(1)(1)(2)^2}{(1)(1)}$

$\sqrt{v^2} \propto \sqrt{(2)^2}$

$v \propto 2$ (doubled)

b) $E_k = E_p$

2

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

$v = \sqrt{\frac{\frac{1}{2}kx^2}{\frac{1}{2}m}}$

$v \propto \sqrt{\frac{(1)(\frac{1}{4})(1)^2}{(1)(1)}}$

$v \propto \sqrt{(\frac{1}{4})}$

$v \propto 0.5$ (halved)

6\. LD could attach the mass to the end of the spring and stretch the spring past its equilibrium point. He can then take the stopwatch and record the amount of time that it takes for the spring to make one oscillation (Go all the way up and down once). The can then use the formula sheet to obtain the equation $T = 2\pi\sqrt{\frac{m}{k}}$. He will then rearrange the formula to get $k = \frac{4\pi^2 m}{T^2}$, and then he will plug the values in for T and m and use the graphing calculator to calculate k.

3

7\. $\vec{E}_k = \vec{E}_p$

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

$m = \frac{kx^2}{v^2}$

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

$$T = 2\pi\sqrt{\frac{(0.125\text{kg})}{(39.5\text{N/m})}}$$

$$T = 0.34\text{s}$$