Name: _____

Date: _____

MCHS Honors Physics 2013-2014

Simple Harmonic Motion 1

Remember: $T = 1/f$. That is, the PERIOD (T) is the inverse of FREQUENCY (f).

Remember: $F_{elastic} = -k \cdot x$ for a mass-spring system in simple harmonic motion. That is, the FORCE required to stretch or compress a spring ($F_{elastic}$) equals the negative of the SPRING CONSTANT (k) of the spring times the displacement of the spring (x).

Remember: $T = 2\pi\sqrt{\frac{m}{k}}$ for a mass-spring system in simple harmonic motion. That is, the PERIOD (T) equals 2π time the square root of the MASS (m) of the weight divided by the SPRING CONSTANT (k) of the spring.

Remember: $T = 2\pi\sqrt{\frac{L}{g}}$ for a simple pendulun in simple harmonic motion. That is, the PERIOD (T) equals 2π time the square root of the LENGTH (L) of the pendulum divided by the ACCELERATION OF GRAVITY (g).

PROBLEMS:

1. A $125\ N$ object vibrates with a period of $3.56\ s$ when hanging from a spring. What is the spring constant of the spring?

2. A spring with a spring constant of $30.0\ \frac{N}{m}$ is attached to different masses, and the system is set in motion. Find the period and frequency of vibration for masses of the following magnitude.
    a. $2.3\ kg$
    b. $15\ g$
    c. $1.9\ kg$

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3. You are designing a pendulum clock to have a period of $1.0\ s$. How long should the pendulum be?

4. Calculate the period and frequency of a $3.500\ m$ long pendulum at the following locations.
    a. The North Pole, where $a_g = 9.832\ m/s^2$
    b. Chicago, Illinois, where $a_g = 9.803\ m/s^2$
    c. Jakarta, Indonesia, where $a_g = 9.782\ m/s^2$