Student:_____

How Things Work

Homework 6 – Due Sunday, July 22, in class

1) Read the introduction to Chapter 9 and Section 9.1 in the Textbook (Pages 263-273) and write a summary of what you have learned, including discussions on the concepts of *oscillations* and *natural resonance*. Your summary should also include the principles of operation of *Pendulum Clocks*, *Balance Clocks*, and *Electronic Clocks.*

2) Answer the following "Check your understanding" questions from the textbook.

(IMPORTANT LEARNING OPPORTUNITY: For your benefit, **FIRST** answer the question, and **THEN** check answers in book. If your answer does not agree with the book's answer, re-think your answer and repeat the process until you understand the concept. This is a great way to really learn. If you simply copy the answer from the book, there will be no learning benefit.)

a. Check Your Understanding #1: The Ultimate Moon-Bounce (**Textbook p. 266**)

b. Check Your Understanding #3: Swing Time (**Textbook p. 269**)

c. Check Your Understanding #4: Swing High, Swing Low (**Textbook p. 270**)

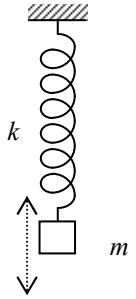
Complete the following “Exercises” from the textbook p. 300.

3) Exercise #4

4) Exercise #7

5) Exercise #8

6) An harmonic oscillator is made by combining a mass of 0.1 kg with a spring with elastic constant of 2000 N/m.



(a) Determine the period of oscillation of this system in seconds.

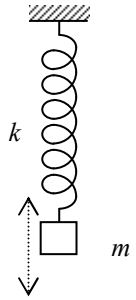
(b) Determine the frequency of oscillation of this system in cycles per second (i.e., Hz).

7) Explain the difference between the period and the frequency of an oscillation.

8) You're standing at the end of a springboard, bouncing gently up and down without leaving the board's surface. If you bounce harder, what will happen to the time it takes for each bounce? Explain why.

9) Explain how clocks can be made using the repetitive motion found in harmonic oscillators such as pendulums.

10) The harmonic oscillator below has a period of oscillation of 2 seconds. The elastic constant of the spring is 10 N/m.



(a) Determine the mass m of the oscillating object.

(b) What would happen to the period of oscillation if you quadrupled the mass m of the oscillating object?