**Basic Wave Concepts:**

A **wave** is a disturbance that transmits ENERGY through matter or space.

There are two types of waves (recall the video):

**Transverse wave:** the disturbance moves at right angles to the direction of the wave; for example, a wave on the surface of water.

**Longitudinal wave:** the disturbance moves parallel to the direction of the wave; for example, a sound wave.

Wave vocabulary:

**Amplitude:** The displacement from the equilibrium position

Symbol: A

Units: m (meters)

**Wavelength**: distance over which a wave repeats

Symbol: λ (Greek letter lambda)

Units: m (meters)

**Frequency** is the number of vibrations, oscillations or events per second. For waves, frequency is the number of waves that pass a given point in one second.

Symbol: f (lower case)

Units: Hz – Hertz (1 Hz = 1/second)

**Period** is the length of time between vibrations, or the length of time for one complete cycle. For waves, the period is the time for one wave to pass a given point.

Symbol: T (upper case). P is also used

Units: s – seconds

***The relation between Period and Frequency:***

f=1/T, or T=1/f (they are inverses of each other)

***Example #1***What is the period and frequency of the Hour Hand of a clock?

***Solution:***

The period (time for one complete cycle, which is one time around the clock) is 12 hours. How many seconds is this?

12 x 3600(the number of seconds in one hour) = 43,200 seconds

The frequency is the inverse of this: f=1/T = 1/43200 = 2.3x 10-5Hz

Now you try: (see the solution sheet in the project)

**Problem #1:**

1. What is the period and frequency of the minute hand of a clock?

**Problem #2:**

1. New York’s 300-m high Citicorp Tower oscillates in the wind with a period of 6.80 s. Calculate its frequency of vibration.

**Wave Speed (velocity) equation and problems:**

A simple speed equation is distance/time. A wave travels a distance λ in a period of time T.

v = distance/time = λ/T

Frequency, f, can also be written 1/T, so we can rewrite the equation for the speed of a wave as: v = λf,  
In words:

velocity = wavelength x frequency

***Example #2:***  
Sound waves travel at approximately 340 m/s. What is the wavelength of a sound with a frequency of 25 Hz (this is at the lower end of our range of hearing)?

***Solution:***  
Using our equation v=λf, rearranging to λ=v/f, plugging in the numbers given for v and f:  
 λ=340/25 = 13.6meters

Your turn (see the solution sheet in the project):  
**Problem #3:**  
3. The speed of light is 3.00 x 108 m/s. What is the wavelength for an FM radio signal broadcast at 105.3 MHz? (Note, radio waves all travel at the speed of light – we will discuss when you return to the project)