Side Button for Rabbit Holes!

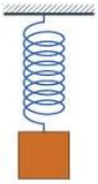
6.1 Harmonic Motion

Giant Pendulum!

Ruben's Tube Rabbit Hole - Show how it works

Demo: Object on a Spring.

Watch this!
Time the oscillations with different masses and different springs.



1. Your Experiences:

Where have you seen examples of repeated motion?

Discuss this with a table partner and be ready to share.

Examples Could Include:

The Seasons,
Electromagnetic Waves,
Car's Exhaust,
Waves on the ocean,
Vibrations on a string,
Seismic occurrences,
Audible signals (sound),
Etc.

Ruben's Tube
http://www.youtube.com/watch?v=gpCquUWqaYw

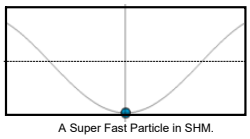
Simple Harmonic Motion (SHM)

The periodic movement of objects.

Objects return to their original position after a complete cycle by a restoring force.

Gravity is the restoring force for a pendulum, the force of a spring's compression or elongation restores a mass/spring system.

A graph of SHM makes a sinusoidal curve.



A Super Fast Particle in SHM.

Demo: Let's Make a wave!

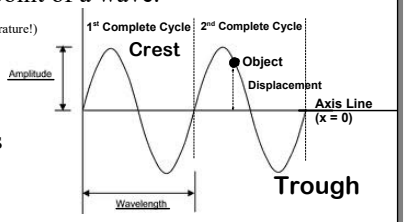
Car dragging paper demo.

This demonstration is analogous to when toilet paper is stuck to one's foot after leaving a public restroom.

Contraption (Use sugar)

2. Graph the Terms Used in SHM:

Displacement - Position change from equilibrium.
Amplitude (A) - Magnitude of max. displacement.
Wavelength (λ)- Distance (m) between equivalent points on a waveform.
Crest: Highest point of a wave.
Trough: Lowest point of a wave.
Period (T): (Not temperature!) Time (s) of a complete cycle.
Frequency (f): Number of cycles per second (Hz).



Harmonic Relations

Review: period and frequency are inversely related:

$f = \frac{1}{T}$	$T = \frac{1}{f}$	**f = frequency (Hz = s^{-1} = cycles/second)** **T = period (s)**

Wave speed, wavelength, and frequency are related in the wave equation:

$v = \lambda \bullet f$	v = wave speed (m/s) λ = wavelength (m) f = frequency (Hz = s^{-1} = cycles/second)

3. Frequency vs. Period Review

How many cycles per second does an oscillator have (in Hz), if there are 15 seconds between maxima?

$$f = \frac{1}{T} = \frac{1}{15s} = 0.067Hz$$

4. Speed Example

The speed of sound in air is 331 m/s at room temperature. If a student measures the distance between pressure maxima (wavelength) to be 1.74 m, what is the frequency of the sound wave?

$$v = \lambda \bullet f$$

$$f = \frac{v}{\lambda} = \frac{331m/s}{1.74m} = 190\,Hz$$

Homework

Field Assignment: Find any object that has a spring of any sort, and determine how that spring is used.

6.1 Problems
Due: Next Class