Oscillator Summary

An oscillator is an object that moves back and forth with a regular rhythm and can act as a source of other waves.

You can recognize a Simple Harmonic Oscillator by recognizing that the period (or frequency) is independent of the amplitude. SHOs conserve total mechanical energy.

The net force acting on an oscillator undergoing SHM must be directed back toward equilibrium (opposite of displacement) and proportional to displacement.

Types of oscillators: spring-mass, pendulum, standing waves, many others

Spring mass oscillators: period affected by spring constant and mass of object; pay attention to energy during the cycle; know where maximum speed, acceleration, and force occur.

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

Pendulum oscillators: only approximately SHM; period effected by length of pendulum (distance from pivot of center of mass of the bob…which ideally is a point mass) and on acceleration of gravity; pay attention to energy during the cycle; know where maximum speed, acceleration, and force occur.

$T = 2\pi\sqrt{\frac{l}{g}}$ for small angles.

Standing wave oscillators: often the source of other waves (such as sound from a musical instrument), wave forms determine frequency

For springs, F = -kx (Hooke's Law) determines force, and EPE = 1/2 kx^2 determines spring energy

A simple harmonic oscillator would generate a sine-shaped curve if its position is plotted versus time. The shadow of an object moving uniformly around a circle moves in SHM.

Vocabulary to understand: period, frequency, amplitude, cycle, Hertz, rpm, sine curve, SHM, SHO, spring constant, wave form, fundamental, first (etc.) harmonic

Some useful links:
http://hyperphysics.phy-astr.gsu.edu/hbase/shm2.html (angular frequency, which they mention, is frequency (in Hertz) multiplied by 2π, since there are 2π radians in a cycle)

http://www.physics.uoguelph.ca/tutorials/shm/Q.shm.html videos and simulations of oscillators