A-Day: Due Mon., Feb 4 (Assigned: 1/31)
B-Day: Due Tues., Feb 5 (Assigned: 2/1)

2008 Harmonic Motion 1

Harmonic Motion: Yes or No?

Pendulum: _____

Ocean waves: _____

A child on a swing: _____

Jumping Jacks: _____

Bouncing spring: _____

A bouncing ball: _____

A ruler pulled from one side and released: _____

A person jumping up and down: _____

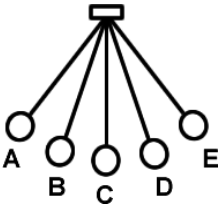
A spinning ball: _____

1. Period
2. Equilibrium position
3. Amplitude
4. Damping
5. Frequency
6. Cycle
7. Hertz

A. The number of cycles per second.
B. A unit of one cycle per second.
C. The size or strength of a cycle.
D. Time it takes to complete one cycle.
E. A part of motion that repeats over and over with a set series of events.
F. Halfway between the two sides and where the motion comes to rest.
G. The motion dying out over time.

Period, Frequency, or Amplitude?

_____Doesn't change period.
_____More of this means more energy.
_____Increases as a pendulum swings back and forth faster.
_____Measured in cycles per second.
_____Measured in meters or centimeters.
_____This decreases with a smaller swing.
_____If the frequency increases, this decreases.
_____Measured in Hertz.
_____Measured in seconds.
_____If it swings back and forth slower, this decreases.
_____As it dampens, this decreases.



Where is the equilibrium position for this pendulum?

If the pendulum starts at C going to the right, where does 1 cycle end?

From letter A to letter ____ would be the amplitude.

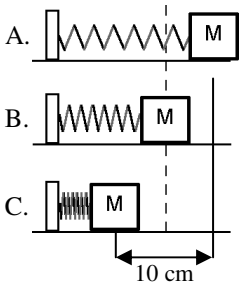
If the pendulum starts at A, how many times does it pass point C in 1 cycle?

An spring has a period of 4 seconds. What is its frequency?

A pendulum has a frequency of 3 Hz. What is its period?

A pendulum takes 10 seconds to complete 2 cycles.
A) What is its period?
B) What is its frequency?

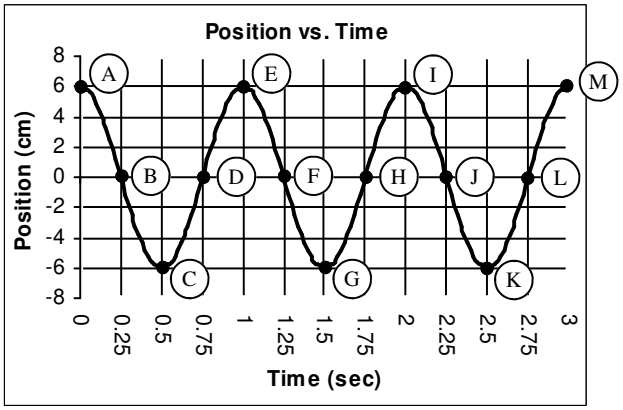
A moving spring



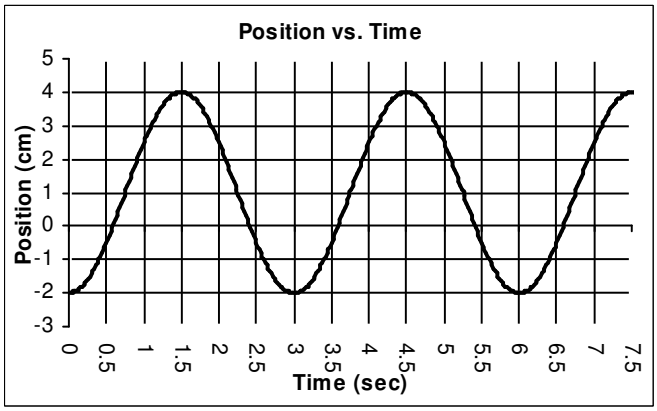
Where is its equilibrium position?

If the spring starts at position A, how much of a cycle does it complete from A to C?

If the spring moves 10 cm from C to A (side to side), how big is it's amplitude?



1 cycle after A is ____; 2 cycles after D is ____.
1/2 cycle after G is ____; 1/4 cycle before M is ____.
# of complete cycles shown is ____.
Period (T) = Frequency (f) =
Equilibrium position = Amplitude (A) =



Mark 1 cycle of the harmonic motion.
Starting at 1.5 secs, when does the 2nd cycle end:
Number of cycles shown is ____.
Period (T) = Frequency (f) =
Equilibrium position = Amplitude (A) =

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1. Give the variables and units for the following quantities:
   A. Period: _____; B. Amplitude: _____; C. Frequency: _____; D. Wavelength: _____

2. If the period of a pendulum is 4 seconds, find the frequency of the pendulum.

3. If the frequency of a wave is 1.35 Hz, find its period.

4. If the frequency of a wave is 0.02 Hz, find its period.

5. If the frequency gets bigger, the period gets _____.

   Example 1: Find the period of a pendulum that is 45 cm long.

$$T = 2\pi\sqrt{\frac{\ell}{g}}$$

$$T = 2\pi\sqrt{\frac{0.45}{10}}$$

The square root sign is the opposite of a square. $4^2 = 16$ *and* $\sqrt{16} = 4$

$$T = 2\pi\sqrt{0.045}$$

On your calculator push "2nd" then " x^2 *" or "INV" "*x^2*".*

$$T = 2\pi(.212)$$

$$T = 1.33\,\text{sec}$$

6. Find the period of a pendulum that is 80 inches long.

7. What is the period of a spring-mass system if the spring has a spring constant of 25 N/m with a 1.5 kg object on it. (*Make sure to use the spring-mass system equation—not the one for a pendulum.)*

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