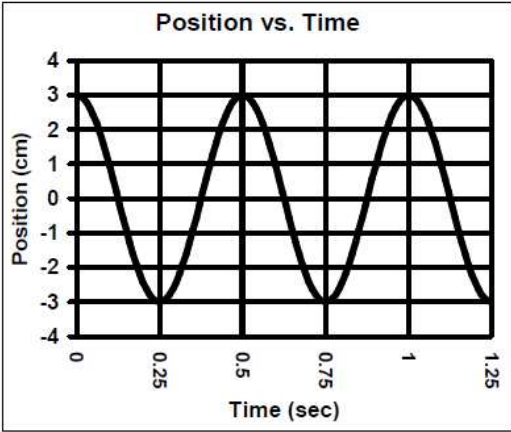
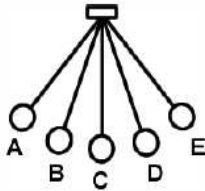


Harmonic Motion Basics

1. Period, Frequency, or Amplitude?
 - A. ____ This increases as it vibrates back and forth faster.
 - B. ____ A wider swing means more of this.
 - C. ____ Time for one complete cycle to occur.
 - D. ____ If a pendulum swings slower this increases.
 - E. ____ Measured from the center to the extreme.
 - F. ____ Will decrease over time.
 - G. ____ In seconds.
 - H. ____ Contains the energy.
 - I. ____ Decreases when it vibrates back and forth slower.
 - J. ____ In Hz.
 - K. ____ Could be measured in degrees, cm, or meters.



2. A. The pendulum's equilibrium position is:
 - B. If the cycle begins at C going to the left, where does one cycle end?
 - B. Where will the pendulum come to rest?

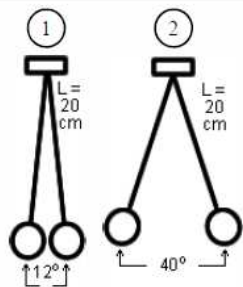


7. The graph above shows the position of a pendulum moving back and forth over time.
 - A. Mark one cycle on the above graph.
 - B. How many total cycles are on the graph?
 - C. The graph shows ____ cycles in ____ seconds.
 - D. Calculate the frequency of the motion.
 - E. What is the period of the graph?
 - F. What is the equilibrium position?
 - G. What is the amplitude of the graph?

3. A pendulum has a period of 0.25 seconds.
 - A. How many cycles will it undergo per second?
 - B. What is its frequency?
4. A pendulum has a frequency of 0.65 Hz. Calculate the period of the pendulum.

8. How many centimeters are in a meter?
9. 45 cm = ____ m
10. Calculate the period of a pendulum that has a length of 68 cm.

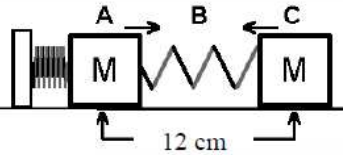
5. A. Amplitude of Pendulum 1:
 - B. Amplitude of Pendulum 2:
 - C. Which has the most energy?
 - D. Over time will the amplitude increase or decrease?
 - E. This is called d _____.



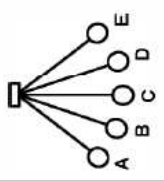
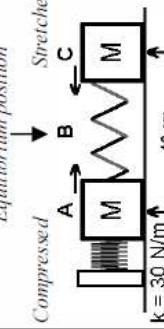
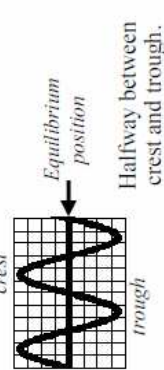
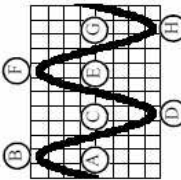
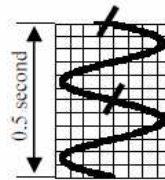
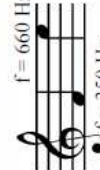
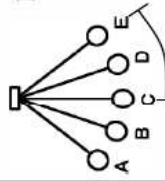
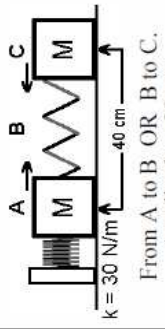
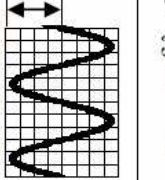

11. A pendulum is 125 cm long. Calculate its period.
12. A pendulum has a period of 1.4 seconds. How long is it?

6. Frequency is cycles per second, calculate the frequency of a pendulum that undergoes 35 cycles in 4.6 seconds.

13. A spring moves back and forth, turning at points A and C.
 - A. What is its amplitude?
 - B. What distance does the spring travel in one complete cycle?



Harmonic Motion Basics

Basic Definitions	Pendulums	Spring-Mass Systems	Waves	Sound (Special Longitudinal Wave)
<p>Where it comes to rest OR where it was before it was disturbed.</p>	 <p>At the bottom of the swing: point C.</p>	 <p>Equilibrium position Compressed Stretched k = 30 N/m 40 cm</p>	 <p>crest Equilibrium position trough Halfway between crest and trough.</p>	<p>Silence. 0 dB</p>
<p>Adding the initial energy OR moving the object away from equilibrium position; starts harmonic motion.</p>	<p>Move the pendulum away from the equilibrium position; give it potential energy.</p>	<p>Compress or stretch spring (move to one side and release).</p>	<p>Giving energy to the medium (pushing down on water; moving a long spring side to side; etc).</p>	<p>Any vibration of matter due to striking, rubbing, spinning, plucking, etc.</p>
<p>Amount of time it takes one cycle of the motion to repeat OR $T = \frac{1}{f} = \frac{\# \text{ sec}}{\# \text{ cycles}}$</p>	$T = 2\pi \sqrt{\frac{l}{g}}$ <p>l is length (in m); g is 9.8 m/s²</p>	$T = 2\pi \sqrt{\frac{m}{k}}$ <p>k - spring constant (in N/m); m - mass (in kg)</p>	 <p>Time between any two repeated points on the wave: A to E; B to F; etc. 0.5 second</p>	<p>Find frequency first, then calculate period.</p> $f = \frac{1}{T}$
<p>How many cycles occur in one second. $f = \frac{1}{T} = \frac{\# \text{ cycles}}{1 \text{ sec}}$</p>	<p>How many times it swings back and forth in one second.</p>	<p># of times it goes back and forth or up and down each second.</p>	 <p># of cycles in 1 sec. This graph shows: 2 cycles in 0.5 sec, so the frequency = 2 cycles / 0.5 sec = 4 Hz</p>	<p>Higher frequency = higher note or pitch.</p>  <p>f = 660 Hz soprano f = 350 Hz alto</p>
<p>Amount of energy; strength of the motion; A = 1/2(side-to-side) 4A during 1 cycle. Does not affect T or f. Dampens (see below)</p>	<p>From A to C OR C to E. In degrees or radians. Amplitude</p> 	 <p>k = 30 N/m 40 cm Amplitude = 20 cm From A to B OR B to C.</p>	<p>From equilibrium to maximum displacement (crest or trough)</p>  <p>Amplitude = 1/2 (side-to-side)</p>	<p>How loud a sound is; measured in decibels (dB). +10dB = twice as loud. +20 dB = 4 times as loud, etc. More Ampl. = more pressure.</p>
<p>Damping: gradual reduction of amplitude (loss of energy) over time.</p>	<p>Amplitude does not affect period if < 15°.</p>	<p>F_{spring} = -kx x - distance from equilibrium position (in meters). More mass = lower equilibrium position (hanging springs only).</p>	<p>V_{wave} = fλ λ (lambda) is wavelength (in m) Wave speed depends <i>only</i> on medium it travels thru (water, air, etc). If medium changes (temperature; pressure; substance), v changes, too.</p>	<p>compression (High pressure) rarefaction (Low pressure)</p> 
<p>Other</p>				