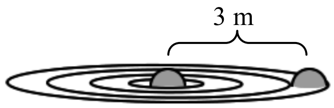
PreAP Harmonic Motion 13



1. Two beach balls are floating in water with a separation distance of 3 m. The center ball is pushed down 5 cm into the water and vibrates up and down 6 times per second. The second ball starts to bounce 0.2 seconds later.

   A. What is the amplitude of the first ball?

   B. Calculate the speed of the wave.

   C. Calculate the wavelength of the wave.

   D. What will be the frequency of the second ball?

   This is exactly how cell phones, radios, etc work, The cell tower or radio station is the middle ball, the other ball is your phone or radio, and it goes thru air.

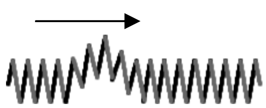
2. Longitudinal or Transverse wave?

   A. ____ A standing wave on a string.

   B. ____ Sound

   C. ___ * A pendulum

   D. ___ The pulse on the slinky shown below.



3. The pulse wave shown at the right is sent down a slinky from the left side.
   A. If the other end is fixed, what will happen?
   B. If the other end is not fixed (free), what will happen?

4. Words that we use for greater loudness include: more d_________; more a____________; greater i____________.

5. An orchestra is playing over a radio. Let's consider just two of the instruments: the flute (which is very small) and the tuba (which is very big).

   A. Which instrument probably has a higher pitch?

   B. Which has a longer wavelength?

   C. * Which can plays higher frequency notes?

   D. If they play together, which notes gets to your ear first?

   E. Which instrument's notes have a faster speed?

   F. So, how does frequency affect the speed of sound?

   G. If the tuba plays a very high note and the flute plays a very low note, they could play the same pitch (same f______________ f__________, but would sound different because they have different: * t __________.
   (*The two notes have different amounts [intensities] of the harmonics above the pitch*.)

   And, by the way: frequency is something we can measure with scientific instruments; pitch is how humans perceive frequency. Just saying….

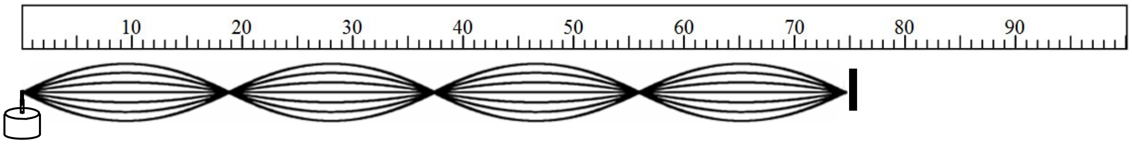
6. Two notes play at the same time, 3 beats per second are heard. One note is 345Hz
   A. Give the two possible frequencies of the other note.
   B. The second note can be adjusted. To make the notes more in-tune, the number of beats per second should increase or decrease?
   C. * What beat frequency is heard?

Intensity (W/m^2)	dB
1.0×10^{-12}	0
1.0×10^{-11}	10
1.0×10^{-10}	20
1.0×10^{-9}	30
1.0×10^{-8}	40
1.0×10^{-7}	50
1.0×10^{-6}	60
1.0×10^{-5}	70
1.0×10^{-4}	80
1.0×10^{-3}	90
1.0×10^{-2}	100
1.0×10^{-1}	110
1.0×10^{0}	120

7. A speaker pushes air pulses into the room.
   A. * What is it producing?
   B. When is it audible (two ways)?
   C. What is the same between the speaker and the air?
   D. Which is compression when it pushes or pulls?
   E. What is the opposite of compression (*see your "Harmonic Motion Table*")?

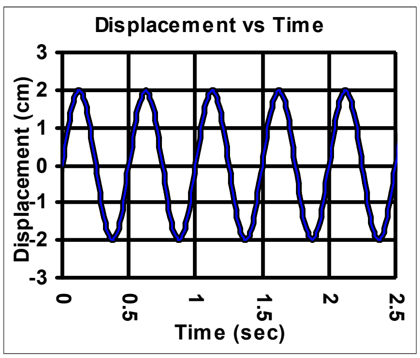
8. A sound increases from by 1.0×10^{-4} W/m^2 to 1.0×10^{-3} W/m^2.
   A. What fundamental part of the sound changed?
   B. By how many decibels did the sound change?
   C. Divide the large intensity by the smaller intensity and you get:
   D. So, 10 more dB = how much more intensity?
   E. Divide the intensity of 90 dB by the intensity of 60 dB and you get:

   F. So, + 30 dB = how much more intensity?

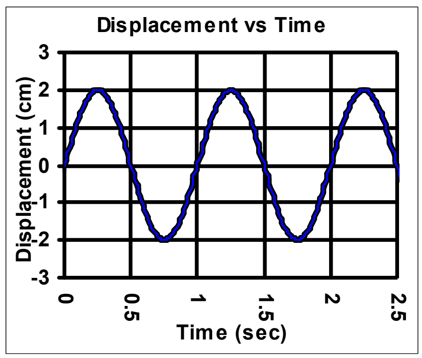


9. A string is vibrated on the left side by an adjustable mechanical vibrator. The right side is fixed.
   A. The above shape is known as a (starts with an "s"):
   B. Will this type of shape (and the others) happen at every frequency of vibration?
   C. These shapes occur only when the driving frequency matches the r__________ frequency (or frequencies) of the string.
   D. As the number of antinodes increases, the amplitude of each antinode:
   E. So (for sound) the LOUDEST possible harmonic is always the:
   F. Give the three longest possible wavelengths for this length string.

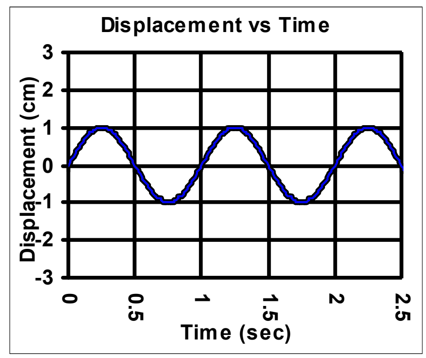
10. Match the pendulums, springs, and graphs below. Put A, B, or C in the blanks below. Use the similarities and differences between the pendulums, springs, and graphs to choose.



The above graph is for spring ____ and pendulum ____.

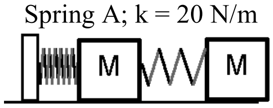


The above graph is for spring ____ and pendulum ____.

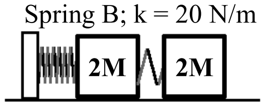


The above graph is for spring ____ and pendulum ____.

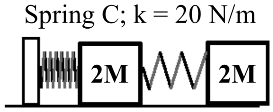
Spring A; k = 20 N/m

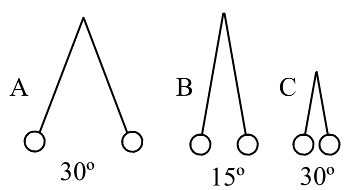


Spring B; k = 20 N/m



Spring C; k = 20 N/m





1A) 5cm; 1B) you have the distance between them and the time.
2C) neither. Says in one place.
5A) Short pipes make for shorter λ and higher freq.
5G) timbre
6C) 3 beats/sec = 3 Hz, which IS the beat frequency.
7A) sound