A-Day Due Wed., Apr 12
B-Day: Due Thurs., Apr 13

2009-10 PreAP Harmonic Motion 6

1. 30 ping pong balls are floating in water with a separation distance of 0.5m. Water waves are moving at a speed of 35m/s and a frequency of 7 Hz.
   A. What is the wavelength of the wave?

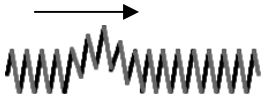
   B. How long does it take for the 3rd ping pong to be moved 3 m?

2. A pendulum is moved to planet Pidronium where the acceleration due to gravity is 1/8 the strength of the earth's. (Careful!) What is the change in frequency of the pendulum?

3. An open pipe has a third harmonic of 520 Hz. What is the length of the pipe if the speed of sound on this day is 352 m/s (*Boy, is it hot!).*

4. A closed pipe is 18 cm long. If the second possible harmonic is 1400 Hz, what is the speed of sound that day? (*And is it a hot day?)*

5. The fourth harmonic of a string has a frequency of *"f "*. What is the frequency of the third harmonic?



6. The pulse wave shown above is sent down a slinky.
   A. What kind of wave is it?
   B. Is this the same kind of wave as a sound wave?
   C. If the other end is fixed, what happens?

   D. If the other end is not fixed (free), what happens?

7. An orchestra is playing over a radio. Let's consider just two of the instruments: the flute and the tuba.
   A. Which instrument has a higher pitch?
   B. Which has a longer wavelength?
   C. Which plays higher frequency notes?
   D. If they play together, which notes gets to your ear first?
   E. Which instrument's notes has 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, but would sound different (different characteristics) because they have different: _____.

8. While two notes play at the same time 3 beats are heard. If one note is 345Hz and the other is higher, what is the second frequency?

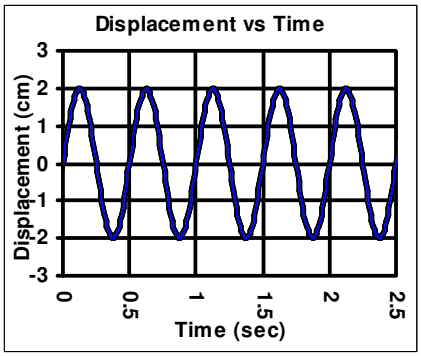
9. A speaker pushes air pulses into the room.
   A. What is it producing?
   B. When is it audible (two ways)?
   C. What is the same between the speaker and the air?
   D. Which is compression when it pushes or pulls?
   E. What is the opposite of compression?

For the next two problems you will need to do some calculating.

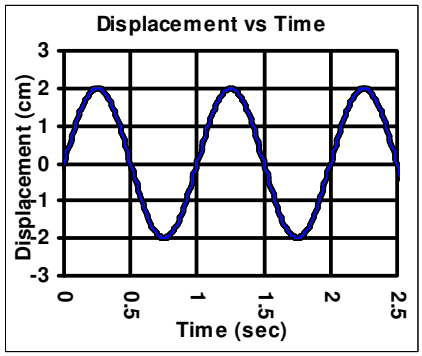
10. Two notes play together: 340 Hz and 510 Hz.
    A. Do they sound good together (do they harmonize)?
    B. Why?

11. Two other notes play together: 550 Hz and 830 Hz.
    A. Do they sound good together?
    B. Why?

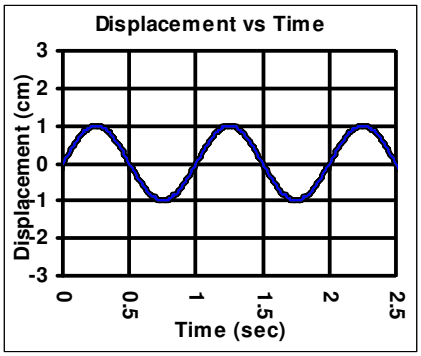
12. A sound increases by 30 dB.
    A. What fundamental part of the sound changed?
    B. By how much did the intensity of the sound change?



Spring ____ Pendulum ____



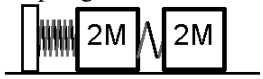
Spring ____ Pendulum ____



Spring ____ Pendulum ____

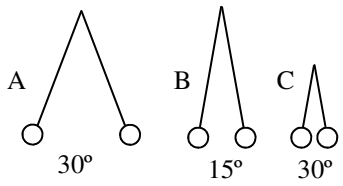
Spring A; k = 20 N/m

Spring B; k = 20 N/m



Spring C; k = 20 N/m

13. Match the pendulums, springs, and graphs.



And do TAKS

A-Day Due Wed., Apr 12
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2009-10 PreAP Harmonic Motion 6

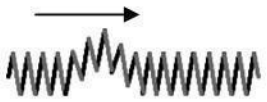
1. 30 ping pong balls are floating in water with a separation distance of 0.5m. Water waves are moving at a speed of 35m/s and a frequency of 7 Hz.
   A. What is the wavelength of the wave? $V = f\lambda$ $\lambda = 35/7 = 5\ m$ -2w -units -4b1
   B. How long does it take for the 3rd ping pong to be moved 3 m? never - the energy moves, not the particles -2w of the medium. Basic wave property.

2. A pendulum is moved to planet Pidronium where the acceleration due to gravity is 1/8 the strength of the earth's. (Careful!) What is the change in frequency of the pendulum?
   $T = \sqrt{\frac{1}{1/8}} = \sqrt{8} = 2.28$ so $f = \frac{1}{\sqrt{8}} =$ by .35

3. An open pipe has a third harmonic of 520 Hz. What is the length of the pipe if the speed of sound on this day is 352 m/s (*Boy, is it hot!*). $n = 3$
   for open pipe use 2L
   $f = \frac{nV}{2L}$ $L = \frac{nV}{2f} = \frac{3(352)}{2(520)} = 1.02\ m$ -2w -4b1.

4. A closed pipe is 18 cm long. If the second possible harmonic is ~~464~~ 1400 Hz, what is the speed of sound that day? (*And is it a hot day?*)
   $f = \frac{nV}{4L}$ $\frac{4Lf}{n} = V = \frac{4(.18)(1400)}{3} = 336\ m/s$ 2, 4, 6 are not poss. -2w -4b1.

5. The fourth harmonic of a string has a frequency of "*f*". What is the frequency of the third harmonic?
   $H_1 = \frac{F}{4}$ ↙ #of AN for H_4 Then $H_3 = 3\left(\frac{F}{4}\right)$ -2w -4b1.



6. The pulse wave shown above is sent down a slinky.
   A. What kind of wave is it? transverse B. Is this the same kind of wave as a sound wave? No
   C. If the other end is fixed, what happens? reflects, but inverts (underneath)
   D. If the other end is not fixed (free), what happens? does not invert (same side)

7. An orchestra is playing over a radio. Let's consider just two of the instruments: the flute and the tuba.
   A. Which instrument has a higher pitch? Flute
   B. Which has a longer wavelength? tuba
   C. Which plays higher frequency notes? Flute
   D. If they play together, which notes gets to your ear first? same time
   E. Which instrument's notes has a faster speed? same
   F. So, how does frequency affect the speed of sound? does not
   G. If the tuba plays a very high note and the flute plays a very low note, they could play the same pitch, but would sound different (different characteristics) because they have different: timbres. (# of harmonics above fund.)

8. While two notes play at the same time 3 beats are heard. If one note is 345Hz and the other is higher, what is the second frequency? 348Hz

9. A speaker pushes air pulses into the room.
   A. What is it producing? sound waves
   B. When is it audible (two ways)? loud enough or high enough freq.
   C. What is the same between the speaker and the air? freq.
   D. Which is compression when it pushes or pulls?
   E. What is the opposite of compression? rarefaction

For the next two problems you will need to do some calculating. 510 − 340 = 170

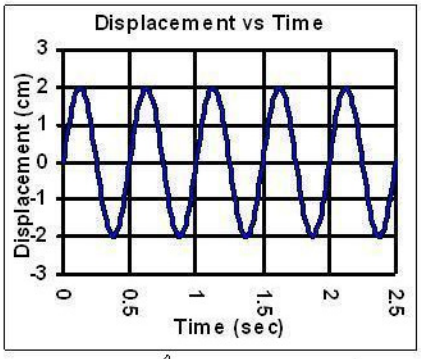
10. Two notes play together: 340 Hz and 510 Hz.
    A. Do they sound good together (do they harmonize)? yes
    B. Why? harmonics of 170 Hz

170(2) = 340
170(3) = 510

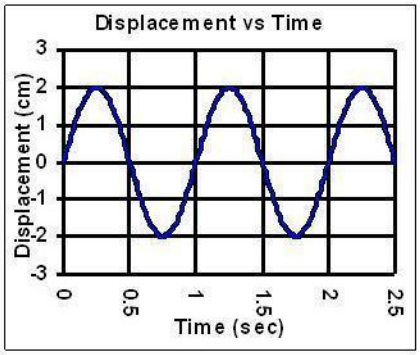
11. Two other notes play together: 550 Hz and 830 Hz. 830 − 550 = 280 Hz
    A. Do they sound good together? No
    B. Why? not harmonics

12. A sound increases by 30 dB.
    A. What fundamental part of the sound changed? amplitude
    B. By how much did the intensity of the sound change?

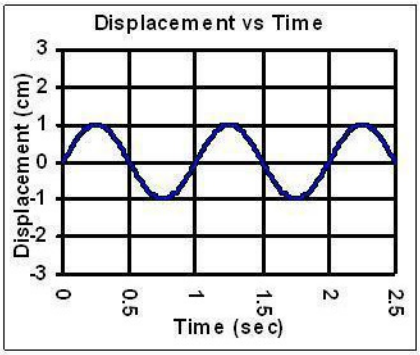
    × 1000



Spring A Pendulum C
fast, big A



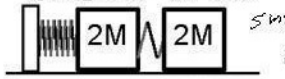
Spring C Pendulum A
slow



Spring B Pendulum B

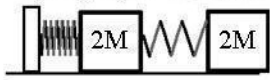
Spring A; k = 20 N/m

Spring B; k = 20 N/m



small A

Spring C; k = 20 N/m



13. Match the pendulums, springs, and graphs.

And do TAKS

small A