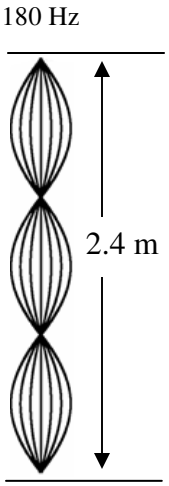
A-Day: Due Tues., Feb 19 (Assigned: 2/14)
B-Day: Due Wed., Feb 20 (Assigned: 2/15)

2008 Harmonic Motion 6

1. Use the graphic on the right to answer the following:
   A. How many antinodes does it have? B. How many nodes does it have?
   C. Which harmonic is it?
   D. If it's frequency = 180 Hz, find the frequency of the fundamental (H_1).



   E. How many wavelengths long is this harmonic? #λ = _____

   F. How long is this string? L = _____

   G. Set E = F above and find the wavelength of this harmonic.

   H. Find the wave speed on this string.

   I. What would be the wavelength for the natural frequency of this string?

   J. 80 Hz will be the same frequency we hear in the air. Can we hear this frequency?

   K. What would be the speed of this frequency in air?

   L. What would be its wavelength in air?

2. For sound:
   A. Increase in volume is an increase in what?
   B. A higher pitched sound = an increase in what?
   C. A lower pitched sound = an increase in what?

3. Can we hear 10 Hz? Can we hear 12,000 Hz? Can we hear 25,000 Hz?
4. Amplitude (A) or Frequency (f)?

   A. ____ Pitch C._____Decibels E. ____ Energy of sound
   B. ____ Loudness D._____Different musical notes F. ____ A longer pipe changes

5. High or low frequency: low notes? high notes?

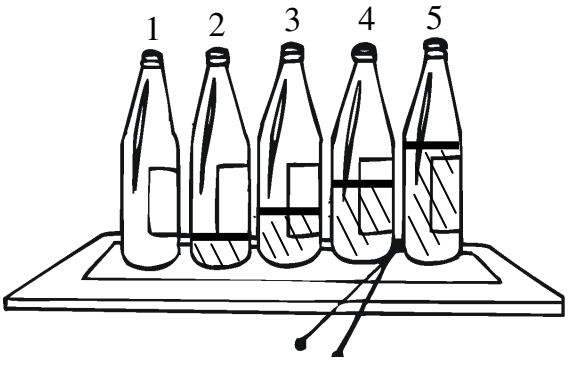
6. Long or short wavelength: low notes? high notes?

7. A. What is the speed of sound in air?
   B. What is the wavelength of a sound with a frequency of 550 Hz?

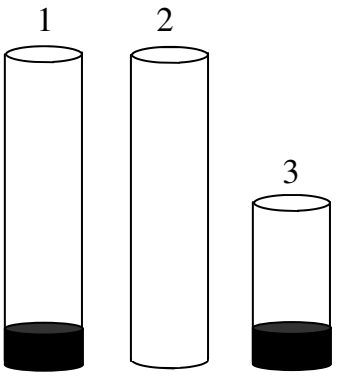
   C. What is the wavelength of a 30 Hz sound?

   D. As wavelength goes up, the frequency goes _____, but the speed _____?

8. You see lightening and 3 seconds later you hear the thunder. How far away is the storm?



9. A. ___ Which bottle will have the lowest note when I blow in it?
   B. ___ Which bottle will have the highest note when I hit it with a mallet?
   C. ___ When you blow in the bottle, which has the shortest wavelength?
   D. ___ When you hit the bottle, which has the longest wavelength?
   E. When you blow in the bottle what is vibrating: air or water?
   F. When you hit the bottle, what is vibrating: air or water?
   G. When you blow in the bottle, is the opening a node or antinode?



10. Give two ways I changed the cello's frequency.

11. Pipes 1 and 2 are exactly twice the length of pipe 3. Pipe 2 is open at both ends.
    A. ___ Which pipe has a higher notes 1 or 2?
    B. ___ Which pipe has a lower note 1 or 3?
    C. ___ Which pipe has a lower note 2 or 3?
    D. ___ Is the open end of a pipe a node or antinode?
    E. ___ How many antinodes does pipe 1 have?
    F. ___ How many antinodes does pipe 2 have?
    G. ___ How many nodes does pipe 2 have?
    H. ___ Label the location of the nodes (N) and antinodes (A) for pipe3.
    I. ___ How many wavelengths long is pipe 3?

12. Twice as loud as 70 dB would be:

13. How can you prove that sound is a longitudinal wave (*think about the demo with the speaker*)?

14. When we were listening to the sound generator (speaker), were all notes of equal volume? What does this tell us?

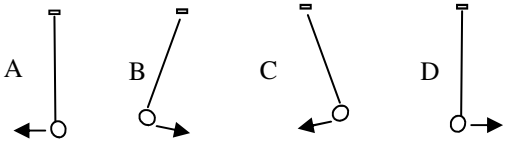
15. When we were testing the auditory range of the students, why did I have them turn around and close there eyes?

Using the notes: "Wave Interactions"

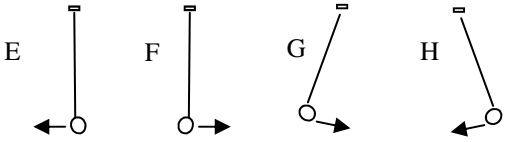
16. When a wave hits a hard boundary it:
17. When a wave bends around a corner it:
18. Light bends in eyeglasses by:
19. How is it that you can hear someone around the corner?
20. When you stop a spring or pendulum from swinging you are _____ it.

21. A. For pendulum 1—Give me the correct sequence for one complete cycle: B ___ ___ ___
    B. Which one is 180° out-of-phase with E? A, B, C, or D?
    C. Which one is 180° out-of-phase with H? A, B, C, or D?
    D. Which one is 90° out-of phase with F? A, B, C, or D?
    E. Which one is 90° out-of phase with G? A, B, C, or D?
    F. Which one is in-phase with E? A, B, C, or D?
    G. Which one is in-phase with H? A, B, C, or D?

Pendulum 1



Pendulum 2



22. Of the graphs below:
    A. Are they in-phase or out-of-phase?
    B. Will they constructively or destructively interfere?
    C. What will be the amplitude of the combined wave?