*From "Wave Action" notes:*

1. Use the four waves shown at the right for the following.
    A. Which pair of waves are in-phase: I and II OR III or IV?
    B. Which pair of waves will produce destructive interference?
   C. Below each pair of waves, sketch the result of the interference that will result.

I

III

II

IV

I + II:

III + IV:

2. A small music box organ plays when the handle is turned, but it is not very loud when held in your hand.
    A. How can you make it louder?

    B. What is this called?
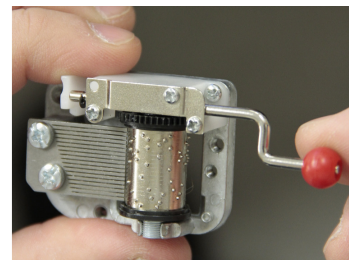
    This is true ANY time that one object (one force) causes another object to vibrate a lot (like a loud sound). A forced vibration can cause an object to vibrate at any frequency, but it will not be a large vibration because it doesn't "fit".

3. So, why are guitar strings attached to a wood frame (the guitar's body)?

4. Give the other two names for the first harmonic.

80 dB 200 Hz

B

70 dB
400 Hz

A

C

50 dB
840 Hz
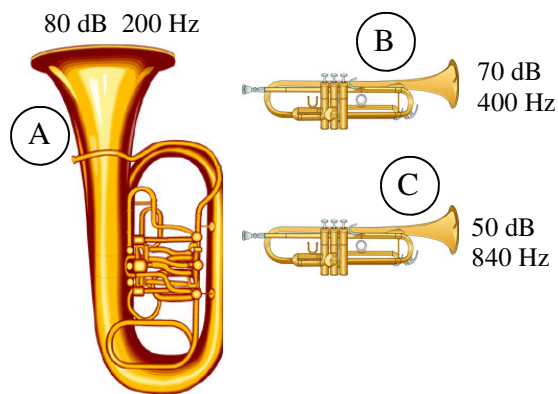
5. Use the three instrument pictures at the left to answer the following.
    A. Which one has the greatest amplitude?
    B. Which one has the highest frequency?
    C. Which two have the same timbre?
    D. Which one is playing the longest wavelength?
    E. Which one is producing the fastest speed of sound?
    F. Which one has the smallest period?
   G. * Which two will sound "in tune"?
    H. Why?

6. Slim Jim is driving his truck and honks its horn when he sees Slim Kim on the side of the road.
    A. What does Kim hear as the truck passes?
    B. What does Bim the dog hear in the back of the truck?
    C. What is this called?
    D. If Kim was blowing an air horn while Jim passes in the truck, what would Jim hear?

7. A sound source has an intensity of 2.1×10^{-7} W/m^2 from 10 m away.
    A. How powerful is the sound source?

    B. * What would be the intensity twice as far away?

Intensity Due to a Spherical Wave

$$\text{intensity} = \frac{\text{Power (in watts)}}{4\pi r^2} \longleftarrow \text{Surface area of a sphere}$$

(in W/m^2)

1   2

3
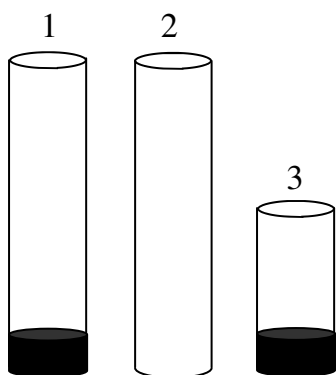
8. Pipes 1 and 2 are exactly twice as long as pipe 3. Pipe 2 is open at both ends.
    Also, remember that a harmonic must have at least 1 node and 1 antinode.
    (*If you don't remember this, come early to class and use the gear.*)

    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?

    J. * If pipe 3 is 12 cm long and the speed of sound is 330 m/s, what is are the
        frequencies of the first possible harmonics of pipe 3?

5G) A and B because the notes are harmonics of each other (octaves, actually).

7B) 1/4 as much, so 5.25×10^{-8} W/m^2

8G) 1 (in the middle)

8I) 1/4 wavelength

8J) 688 Hz, 2064 Hz, 3440 Hz