Sound Homework

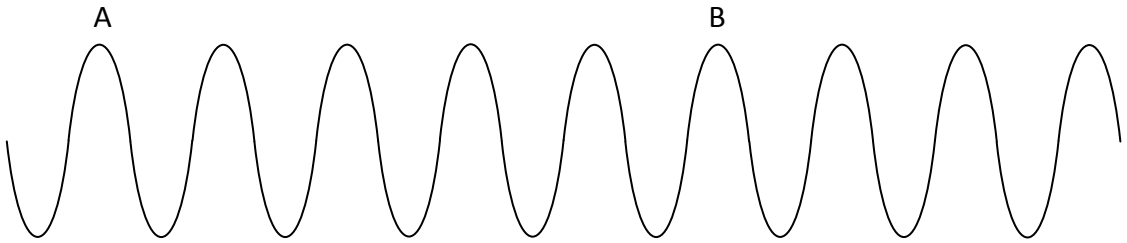
Name: _____

Hour: _____ Date: _____

1. The note from a tuning fork is sampled by the computer and the following graph output given. The time peak A was 0.0010 s and the time at peak B was 0.01236 s.
   a. What is the period of 1 wave?

   b. What is the approximate frequency of the tuning fork?

   c. How would banging the tuning fork softer affect the graph output? Draw the output on the graph below.



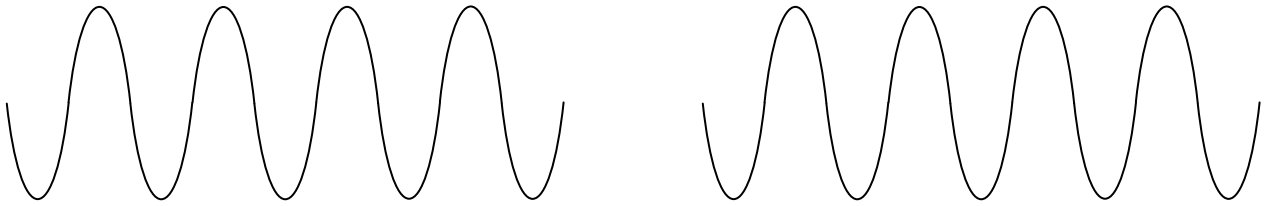
2. In a super cool (and easy) demo, a trombonist demonstrates his knowledge of physics and sound for your class. A sound is produced and then for effect, he pushes the slide outward.
   a. Describe what happens to the pitch and frequency.

   b. Explain why the pitch changes.

3. http://www.physicsclassroom.com/class/sound/u11l2a.cfm (octaves)
   A Boom Whacker with length of 38.6 cm is whacked and sampled by the computer. The first (and biggest) frequency on the FFT 440 Hz. Using a tube of the same material you would like to make two new Boom Whackers; one that is an octave higher and one with an octave lower.
   a. What is the frequency of the higher octave and the lower octave?

   b. What length should you make each of the new whackers?

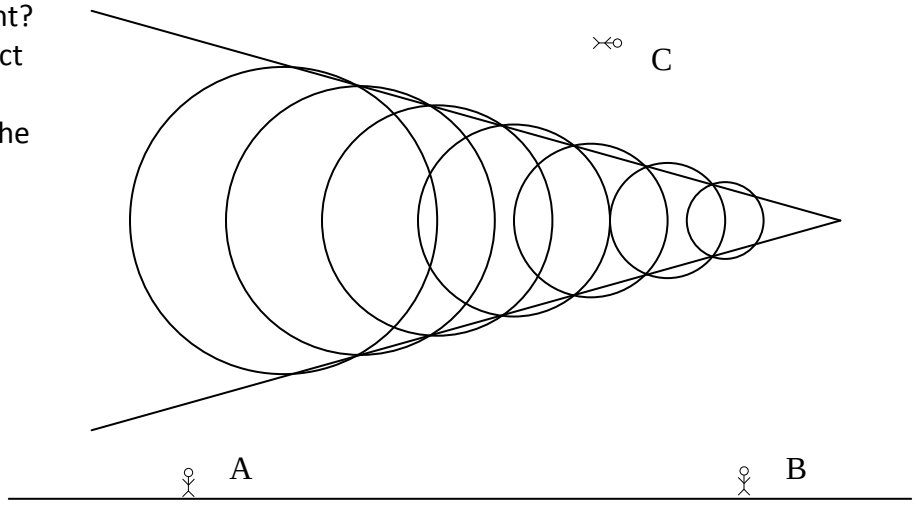
4. A tuning fork with a printed frequency of 256 Hz is struck and sampled by the computer.
   a. On top of the drawing below on the left draw a sample of what a wave might look like for the same tuning for struck **harder**.
   b. On top of the drawing below on the right draw a sample of what a wave might look like for a tuning for struck the same but with a printed frequency of **512 Hz**.



5. Is it possible to measure your distance from a wall using sound? Standing far from a wall, you yell and start your stopwatch. You hear an echo and stop the stopwatch. The stopwatch reads 0.8 second. How far are you from the wall?

6. http://paws.kettering.edu/~drussell/Demos/doppler/doppler.html
   http://www.physicsclassroom.com/Class/sound/u11l3b.cfm (shock waves and sonic booms)
   http://library.thinkquest.org/19537/java/Doppler.html (plug in your headphones and adjust speed to Mach 1 or higher!)

   The diagram at the right shows the overlapping sound waves made by a plane.
   a. How fast is the plane moving - circle one? **> 340 m/s** **= 340 m/s** **< 340 m/s**
   b. Indicate on the drawing where the plane is.
   c. What do the straight lines represent?
   d. Where do the straight lines intersect the circles?
   e. In what order do the people hear the boom?



7. http://www.youtube.com/watch?v=ce7AMJdq0Gw (if you can't reason this one out, check out the YouTube video at home!)

   An alarm clock set to 3 pm is placed in a glass jar and the jar is sealed. A pump is attached to the jar and all of the air is pumped out. The clock turns to 3 pm. Explain what happens and what you hear as an observer.

8. The "A string" on guitar is tuned to 440 Hz. The guitarist pushes the string down onto the finger board so that only half of the string now vibrates. (REMEMBER: there's an inverse relationship between length and frequency!)
   a. What is the new note (letter) and frequency of the new note?

   b. If he does it again so that the new length is now one quarter of the original – what is the new note (letter) and frequency of the new note?

   c. If he doesn't like the sound of the string he can turn the peg and tighten (increase the tension) of the string. Explain how and why this affects the sound of the tone produced by the string.

9. The speed of sound waves in air varies with the temperature but is normally around 340 m/s. A stationary train blows its whistle that has a frequency of 850 Hz.
   a. What is the wavelength of the wave?

   b. How would the wavelength change if the frequency were cut to 425 Hz?

   c. How long would it take for this wave to travel 1 mile (1600 m)?

10. http://www.colorado.edu/physics/2000/applets/doppler2.html (plug in your headphones and 'dial 911'☺) Driving down Mack, you see an Ambulance in your mirror approaching at a high speed with its lights flashing. You pull to the side of the road and stop (just like you were taught in driver's ED).
    a. Describe what happens to the pitch of the siren as it approaches you, is right next to you and passes you (compare it to what it would sound like if it were stopped).

    b. Explain (in terms of wavelength and frequency) why the siren sounds different – as described above. Pictures would be good here!

11. Back to some other waves…..Using your independent research skills (and maybe a little bit of information provided by student-led discussions), please answer the following questions about the different portions of the electromagnetic spectrum:
    a. List from highest to lowest frequency

    b. List from highest to lowest wavelength

    c. List from highest to lowest speed

Portion of EM Spectrum	***Sources (how they're made or where they're found)***	***Risks/Dangers associated with this type of wave***	***Uses of each type of wave***
Microwaves			
Ultraviolet waves			
Visible light			
Gamma rays			
Radio waves			
Infrared waves			
X-rays			