

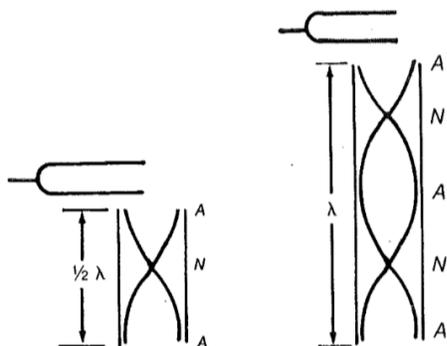
THE WAVE OVERVIEW GUIDE

DUE: Thursday, May 2

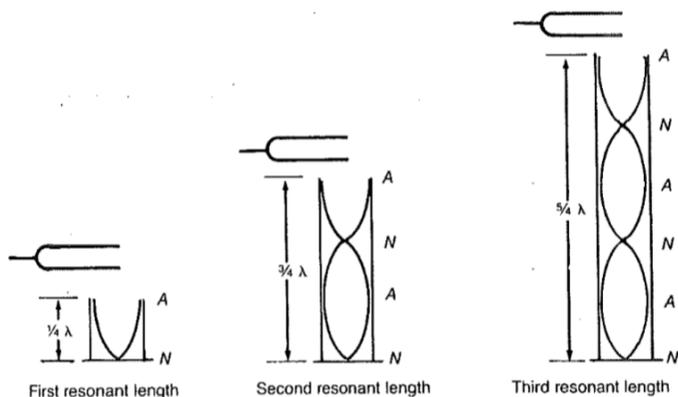
A) Visualizing concepts you (should) have learned from readings or class discussion.

BIG IDEA → in both open and closed pipes that resonance occurs every half wavelength; the difference is that the fundamental frequency in a closed pipe is 1/4 wavelength and in an open pipe it's 1/2 wavelength.

RESONANCE IN OPEN PIPES

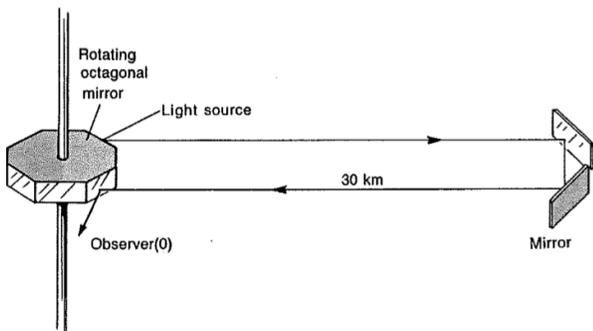


RESONANCE IN CLOSED PIPES

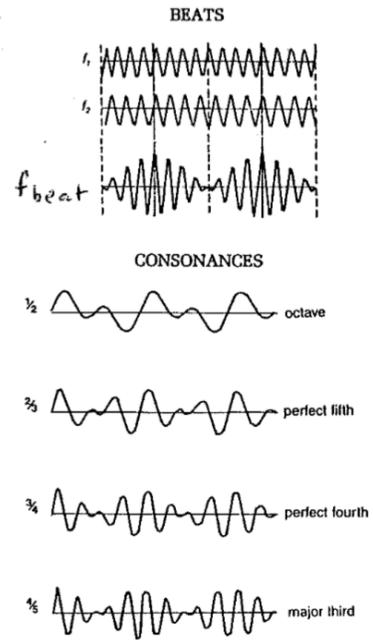


(NOT IN YOUR TEXT, BUT IMPORTANT)

Albert Michelson used this device to measure the speed of light in the 1800's! He was within 1/100 of 1% of the currently accepted value! Are your labs of this good? ☺ (Probably not, seeing as how Michelson was the first American to win a Nobel Prize in Physics)



CONSONANCES IN MUSICAL INSTRUMENTS (Compare these to what you see when we use the oscilloscope).



B) Understanding Concepts. In the space to the left, write the letter of the answer to each question.

_____ 1. Sound waves cannot travel through

- a) air b) water c) wood d) vacuum e) pudding

_____ 2. As a person rapidly approaches a sound source

- a) the frequency increases b) the wavelength increases
c) the velocity increases d) the amplitude decreases

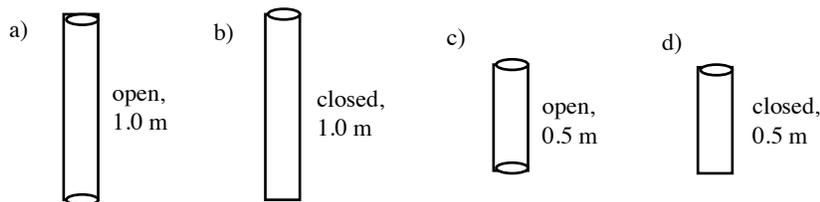
_____ 3. An open pipe will resonate at its fundamental frequency if its length is _____ part of a wavelength.

- a) 1/4 b) 1/3 c) 1/2 d) 3/4 e) both (a) and (c) are correct

_____ 4. Middle C on the piano has a frequency of 256 Hz. High C (not Hi-C the drink), one octave above, has a frequency of

- a) 256 Hz b) 257 Hz c) 264 Hz d) 512 Hz

_____ 5. Chimes are often made of open and closed pipes. Which of the chimes shown will produce the highest- pitched sound when resonating at the fundamental frequency?



_____ 6. Two sounds have frequencies of 344 Hz and 350 Hz, respectively. The beat frequency between them will be

- a) 694 Hz b) 300 Hz c) 44 Hz d) 6 Hz

_____ 7. A clarinet (an open-tube musical instrument) plays a note of a fundamental frequency of 210 Hz. The frequency of the third harmonic (2nd overtone) is:

- a) 70 Hz b) 420 Hz c) 630 Hz d) 840 Hz

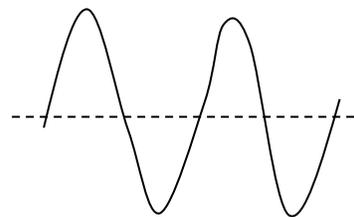
_____ 8. The reason loud resonances are seldom heard in concert halls is _____.

- a) the spaces are so large b) the shape of the hall is designed to eliminate these
c) resonance only occurs in tubes d) Music involves a mixture of sounds with many frequencies
e) (b) and (d) are correct f) all of the answers (a-d) are correct

9. Two vibrating objects produce 6 beats per second. If the frequency of one object is 364 hz, what are the possible frequencies of the second object?

10. A piano tuner hears 4 beats per second when he listens for middle C (256 Hz) against a tuning fork known to be exactly 256 Hz. As he tightens the string, the beats gradually disappear. What was the initial frequency (before tuning) of the piano's middle C? *Explain your reasoning.*

7. Starting with the wave shown, sketch the following, if possible:
(if not possible, state that clearly)



a) a wave with twice the frequency -----

b) a wave with twice the amplitude -----

c) a wave with twice the wavelength -----

e) Label the following on the **original** wave:

(i) Amplitude

(ii) 1 full wavelength

(iii) Crest

(iv) Trough