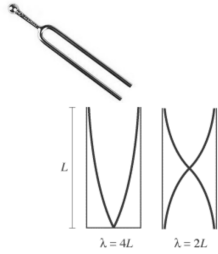


**P20 Unit D: Mechanical Waves**



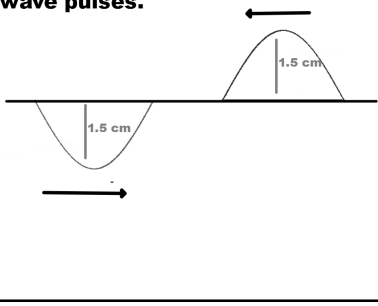
# Acoustic Resonance

## POS Checklist:

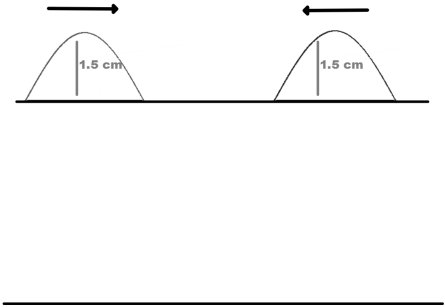
explain, qualitatively, the conditions for constructive and destructive interference of waves and for acoustic resonance

**Review: Draw a diagram to show the interference of each set of wave pulses.**

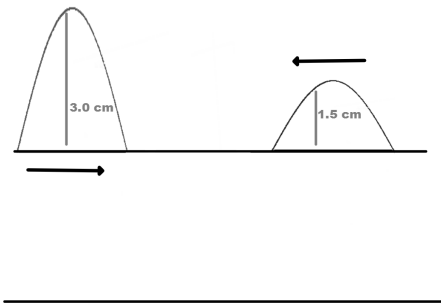
a)



b)



c)

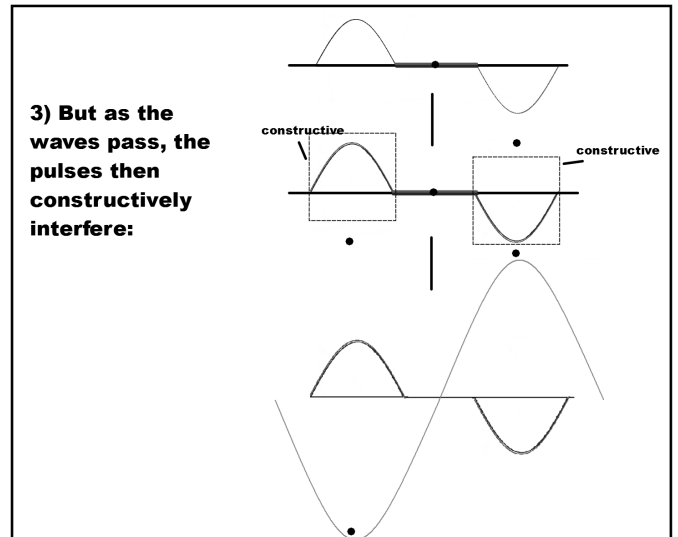
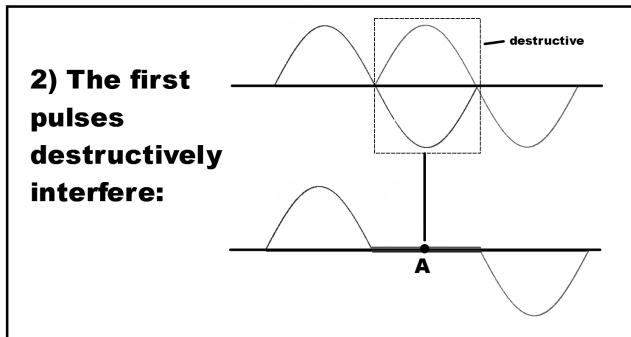


**Okay, that's cool, but...**

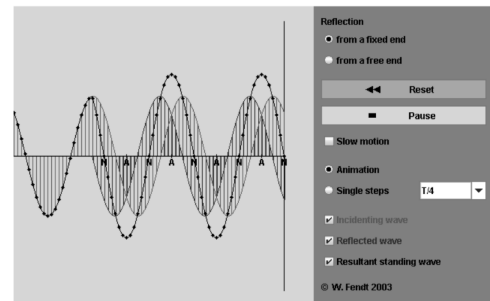
**What happens if we get a group of pulses: a wave train, interfering?**

**Let's look at this situation a little more carefully:**

**1) The pulses move towards each other and the point A on the spring/string/medium.**



<http://www.walter-fendt.de/ph14e/stwaveref1.htm>



## Resonant Frequencies Revisited:

You may have noticed from the spring lab that springs and other mediums 'like' to oscillate at certain frequencies, producing nodes and antinodes.

The tendency for a spring or other medium to do this is called resonance.



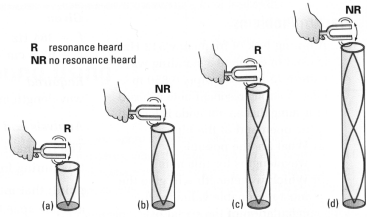
## The Sound of Resonance

Wind instruments take advantage of resonance to produce music. A simple example of this is blowing over an empty bottle:



The air vibrates as a standing wave, producing an antinode in the mouth of the bottle and a node at the bottom of the bottle.

▲ Figure 8.32 The tone produced when you blow across the top of an open bottle depends on the length of the air column.



As resonance is easily detected, and occurs when antinodes are at the open end of a cylinder, we can use an open ended air column to determine the speed of sound in air.

Remember: antinodes occur at  $1/4\lambda$  and every  $1/2\lambda$  after that ( $1/4\lambda, 3/4\lambda, 5/4\lambda$ , etc).

**Resonance only occurs in air in an open cylinder if the open end of the cylinder has an antinode and the closed end a node.**

**Resonance in air results in a greatly amplified sound wave that you can hear called a harmonic.**

**ex) A tuning fork tuned to middle C (440 Hz) is held at the end of a 1.00 m closed at one end cylinder. The second harmonic heard in the cylinder. What is the speed of the sound waves around this cylinder?**

**Homework:**

**Page 420 #1-4**

**Read Lab 8-7: we will be in the lab on Thursday**