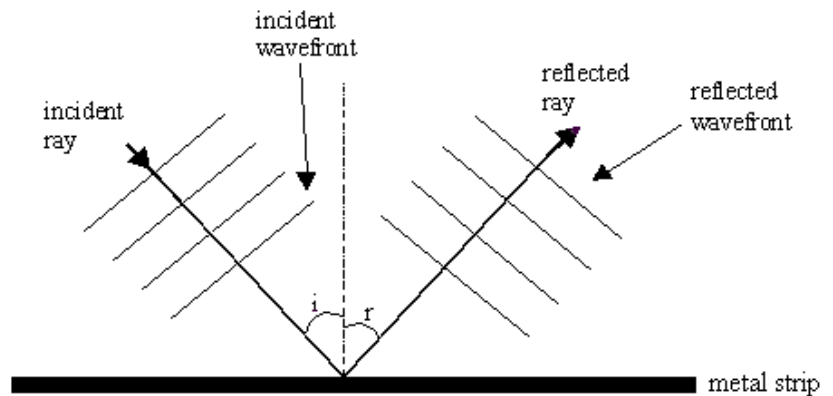


Waves and sounds review questions

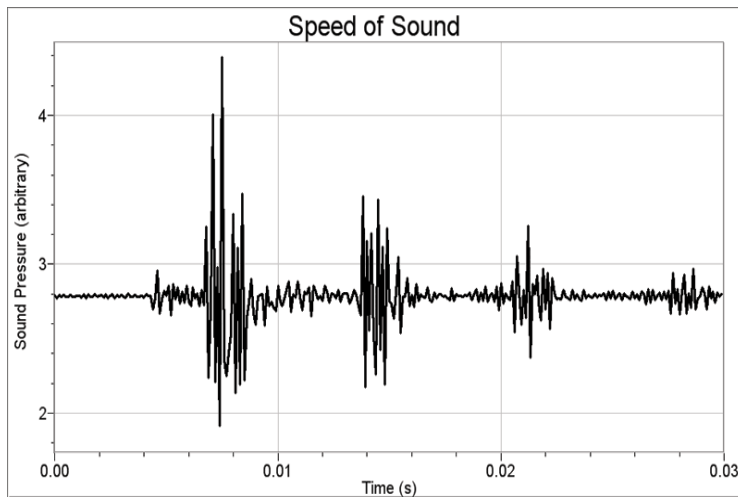
1) Water wave properties

The diagram on the right represents a water wave reflecting off a barrier.

- What is the angle between the wave fronts and the direction of travel of the wave?
- The wave fronts are drawn at the crest of each wave. If there is 12cm between the first and last of the group of four wave fronts drawn what is the wavelength of the wave?
- Why are water waves considered to be transverse waves?
- If the height difference between the crest and trough of a wave is 0.8cm what is the amplitude of the wave?
- If the waves are travelling at 30 cm/s (0.3 m/s) use your answer to (b) to work out the frequency of the waves

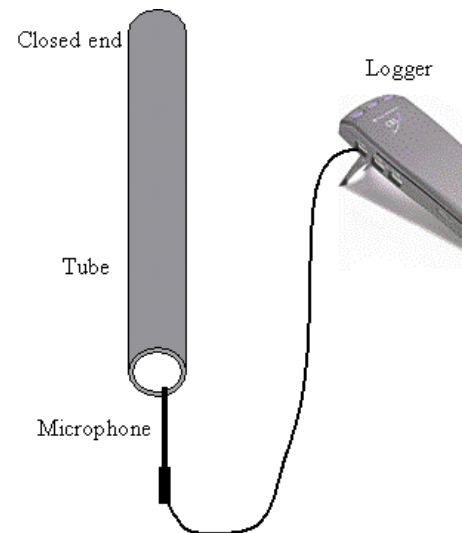


2) Speed of sound

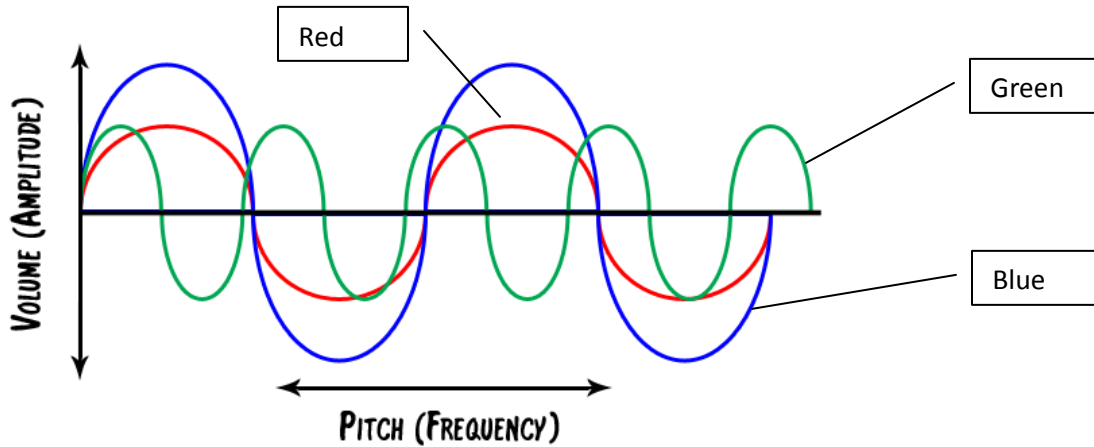


The graph above shows a microphone recording of a microphone placed at the end of a tube. A sound is made next to the microphone at the open end of the tube. The sound reflects at the ends of the tube.

- If the tube is 1m long how far has the sound travelled when the microphone receives the first echo?
- How long does the sound take to travel to the end of the tube and back?
- What is the speed of sound in the tube?
- Sound waves are longitudinal. What does this mean?
- If the sound wave has a frequency of 1000Hz what is its wavelength?



3) Sound wave properties



The diagram above shows a sound wave traces recorded on an oscilloscope using a microphone. Which trace is from the sound which is:

- The loudest?
- The highest pitch?
- Compare the green and the red recordings in terms of frequency, time period and amplitude.
- The trace from most musical instruments, for example a guitar, will be different from the traces above. Explain the differences.

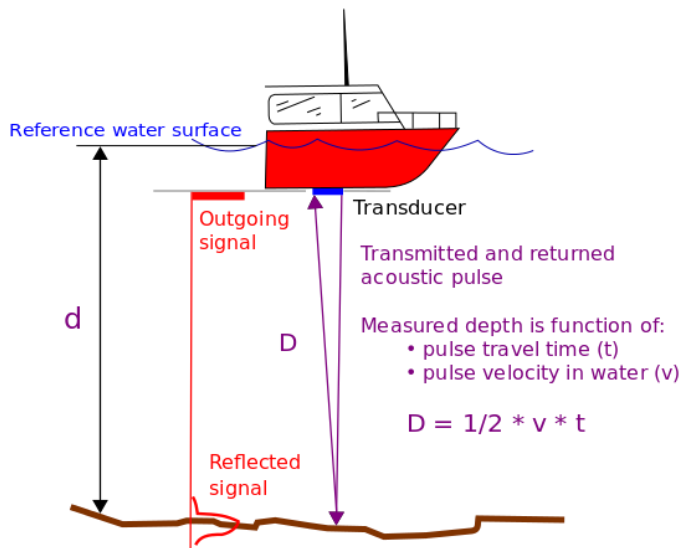


Figure 9-1. Acoustic depth measurement

4) Echo location

The speed of sound in water is about 1450m/s. The ship uses echo-sounding. The echo of an acoustic pulse takes three seconds to travel from the ship to the sea bed and back.

- How deep below the echo sounder if the sea bed?
- If the boat is a fishing boat explain how sonar might be used to detect a school of fish?

Sources:

- <http://www.themeandvariations.org/Images/other/soundwave.png>
- http://www.engineeringtoolbox.com/sound-speed-water-d_598.html
- http://en.wikipedia.org/wiki/Echo_sounding
- <http://www.animatedscience.co.uk>
- <http://www.vernier.com/innovate/speed-of-sound-in-a-snap/>