Chapter 12. Sound

Contents:

New word list:

3.4 Sound

Core	Supplement
1 Describe the production of sound by vibrating sources	
2 Describe the longitudinal nature of sound waves	10 Describe compression and rarefaction
3 State the approximate range of frequencies audible to humans as 20 Hz to 20 000 Hz	
4 Know that a medium is needed to transmit sound waves	
5 Know that the speed of sound in air is approximately 330–350 m/s	11 Know that, in general, sound travels faster in solids than in liquids and faster in liquids than in gases

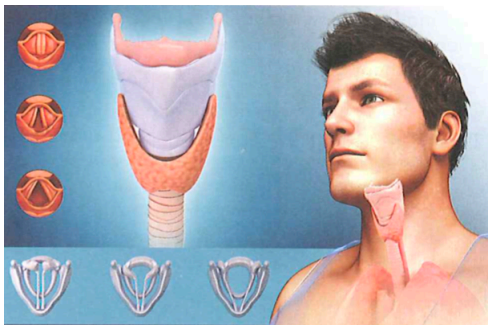
continued

3.4 Sound continued

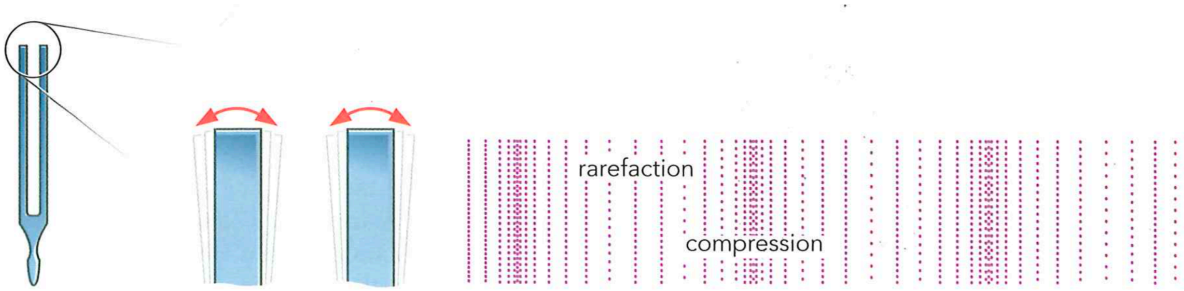
Core	Supplement
6 Describe a method involving a measurement of distance and time for determining the speed of sound in air	
7 Describe how changes in amplitude and frequency affect the loudness and pitch of sound waves	
8 Describe an echo as the reflection of sound waves	
9 Define ultrasound as sound with a frequency higher than 20 kHz	12 Describe the uses of ultrasound in non-destructive testing of materials, medical scanning of soft tissue and sonar including calculation of depth or distance from time and wave speed

11.1 Making sounds

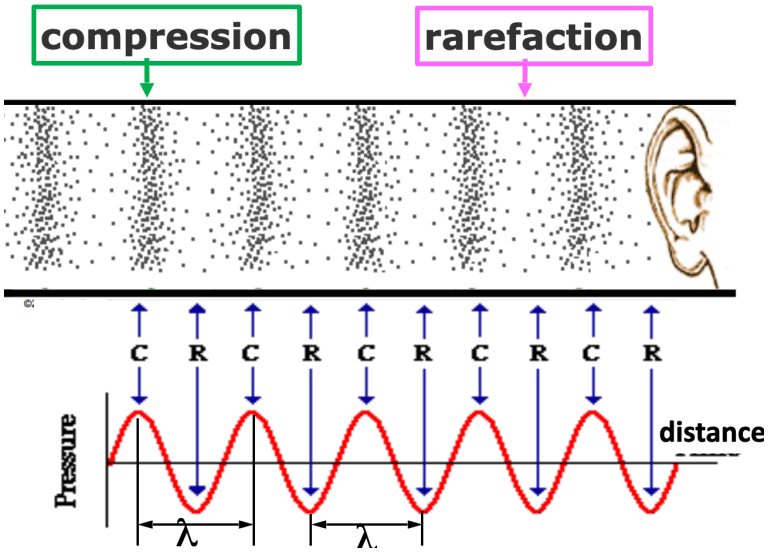
How does musical instruments make sounds?



11.2 How does sound travel

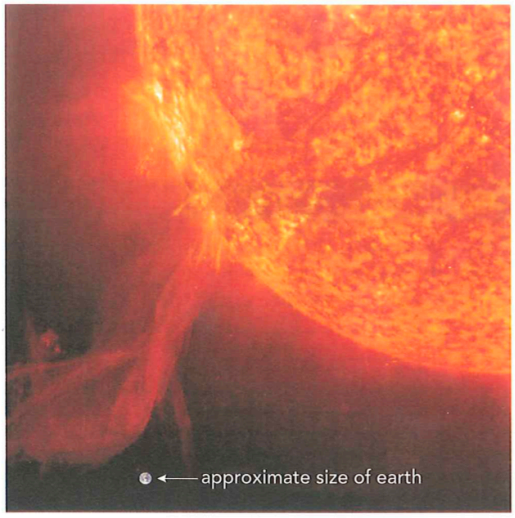


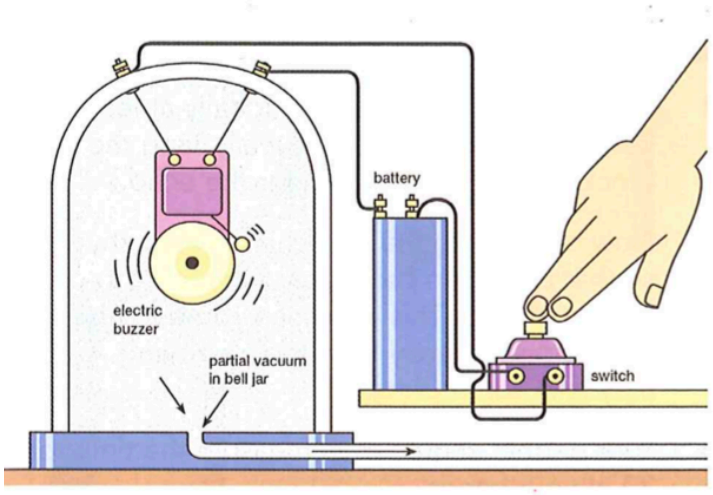
Compression:
Rarefaction:



The medium particles oscillate backwards and forwards as the compressions and rarefactions pass through.
When a compression passes, the pressure rises. When a rarefaction passes, the pressure falls

11.3 The speed of sound





Sound vs light
Why do we always see the lightening first then hear the thunder?

Sound speed in different materials

Medium	Speed of sound(m/s)
Rubber	60
Air at 0 °C	332
Air at 20 °C	343
Air at 40 °C	355
Lead	1210
Gold	3240
Glass	4540
Copper	4600
Aluminum	6320

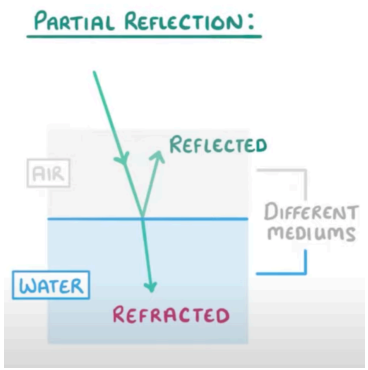
Exercise 12.1

A boy sees lightning and hears the thunderclap 9 seconds later. Calculate how far away the storm is.

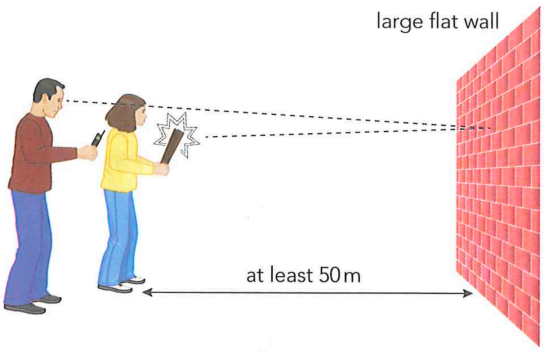
Exercise 12.2

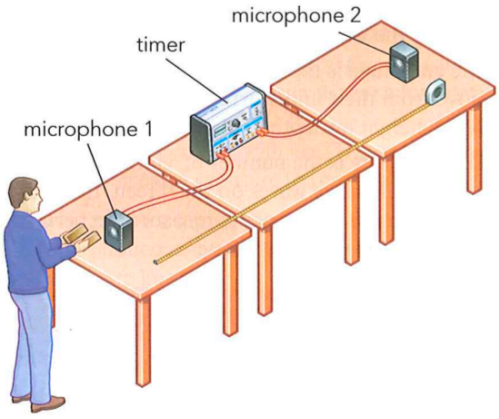
Sound travels at 1500m/s in fresh water and at 1530m/s in salt water. Explain the difference in speeds.

Sound is wave, wave can be ( ), sound waved being reflected causes ( )

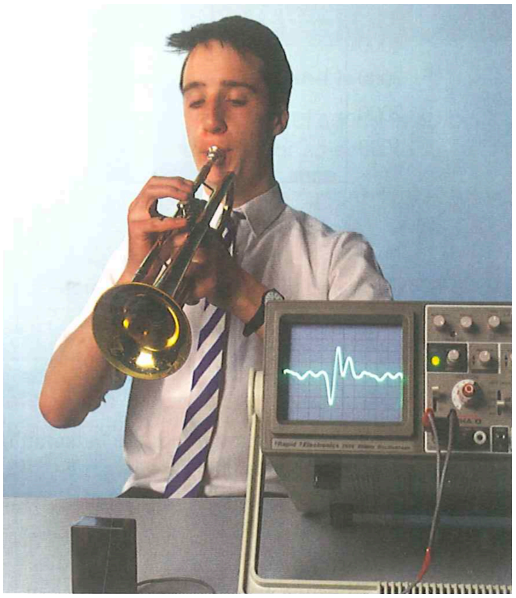


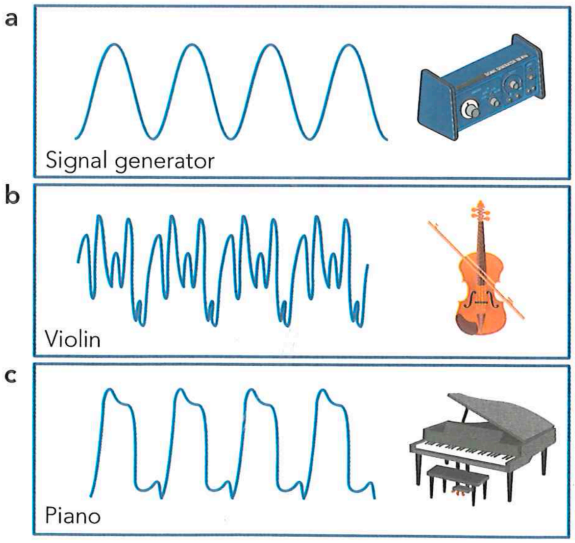
Experiment: measuring the speed of sound in air





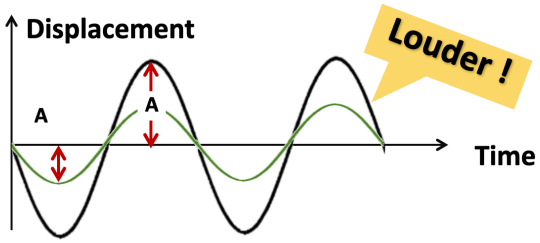
11.4 Seeing and hearing sounds



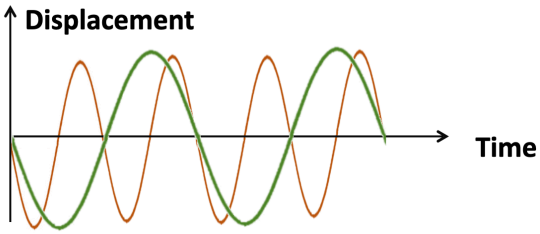


Amplitude:
Frequency:
Hertz:

loudness =>

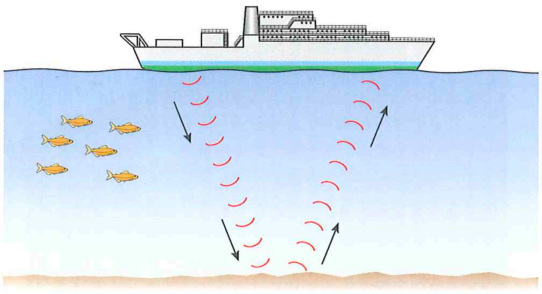


pitch=>

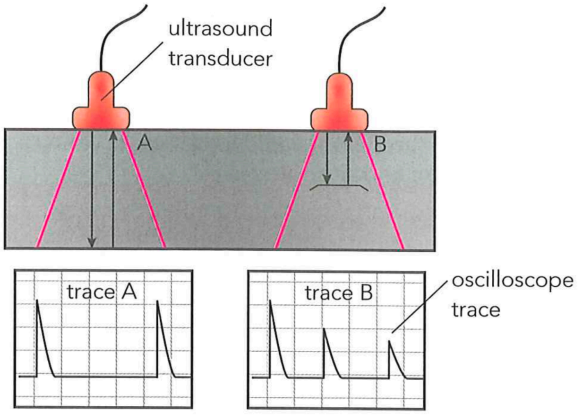


Frequencies that are audible to human:

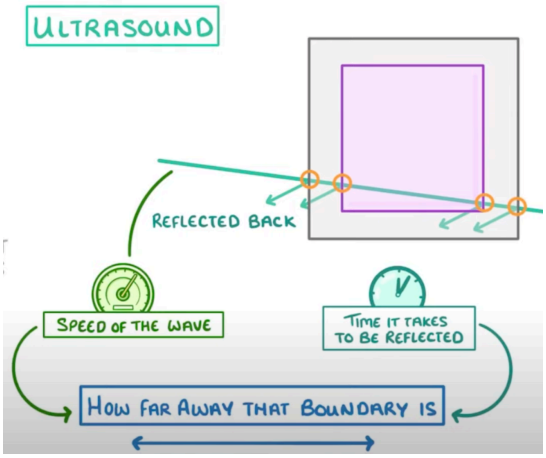
Application of ultrasound

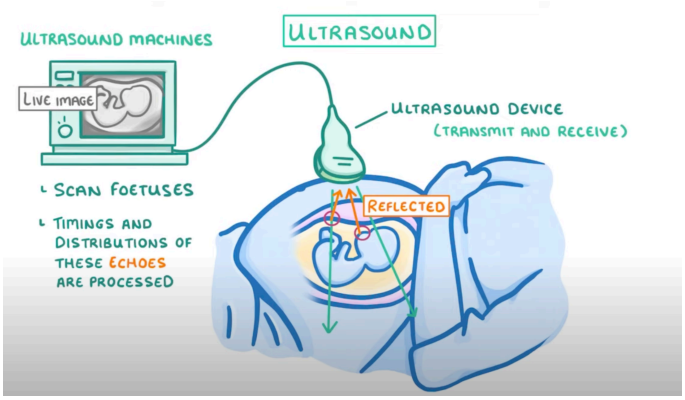


Sonar



Material testing





Medical ultrasound