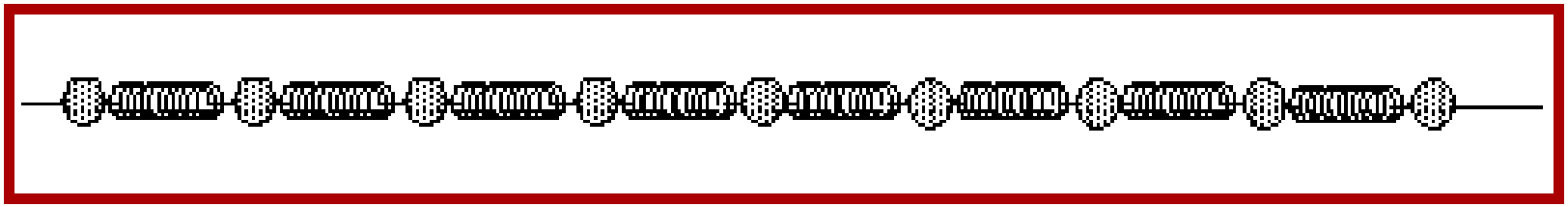
Sound: Amplitude & Pitch

Essential Question:

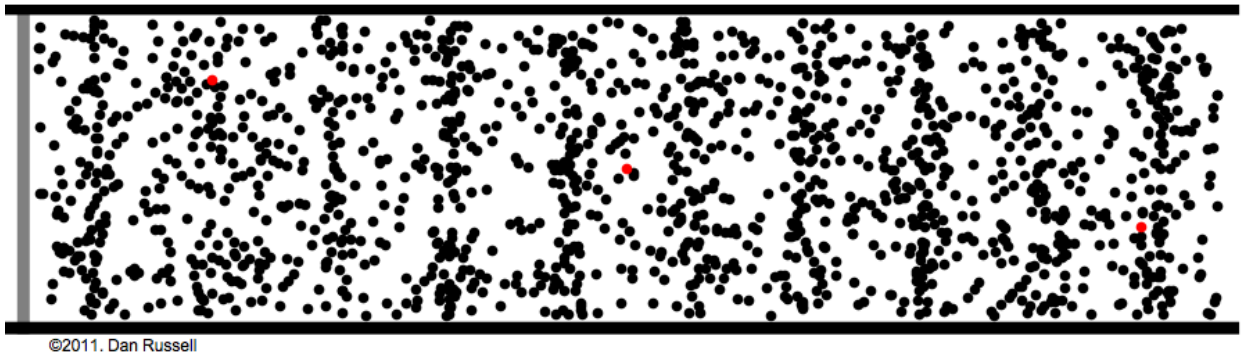
How are sound waves affected by changes in amplitude and pitch?

Sound Waves

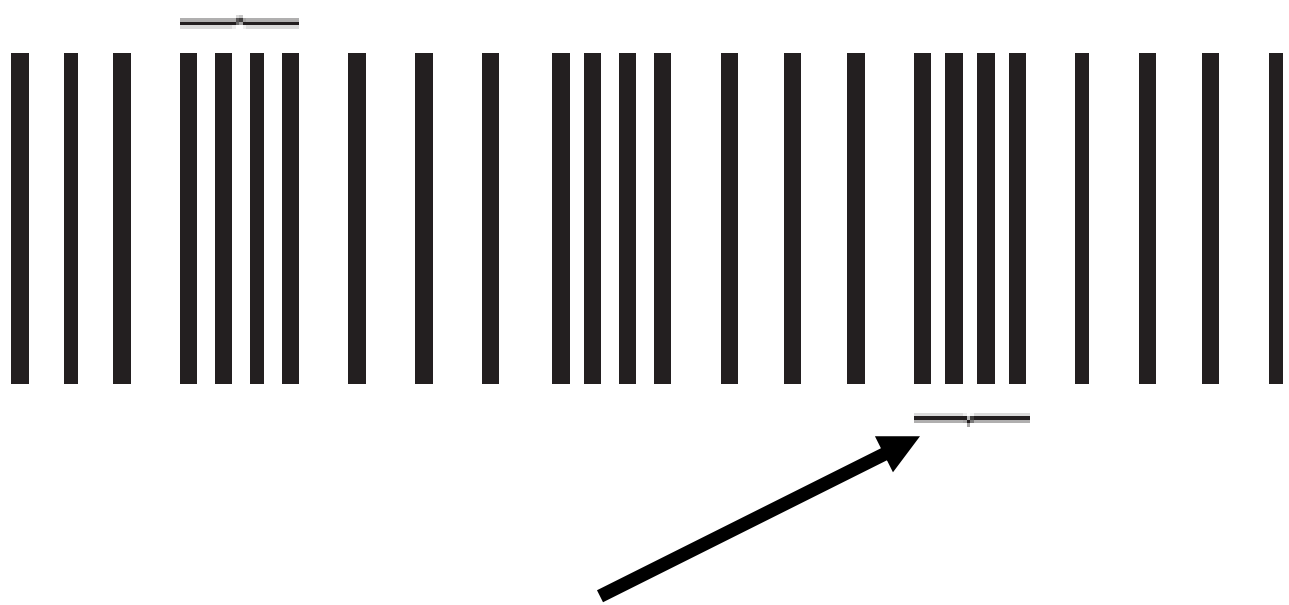
- A Sound wave is a mechanical wave because it has to travel through a medium. (Review medium)
- A Sound wave is also a Compressional wave because matter in the medium moves forward and backward along the same direction that the wave travels.



Let's Review the Parts of a Compressional Wave

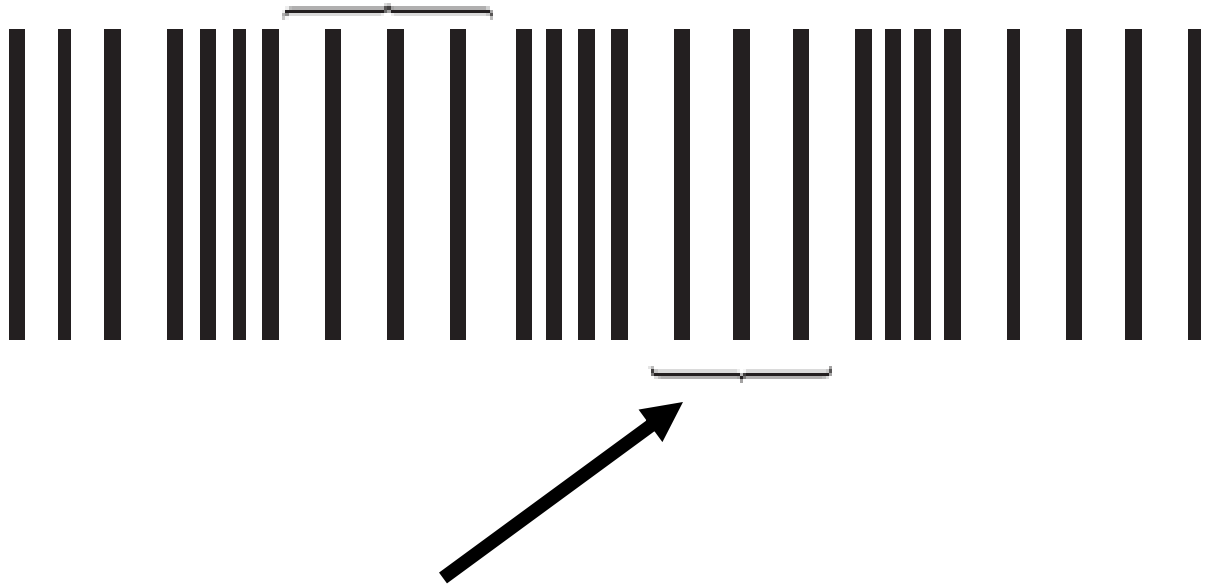


Parts of a Compressional Wave (Longitudinal)



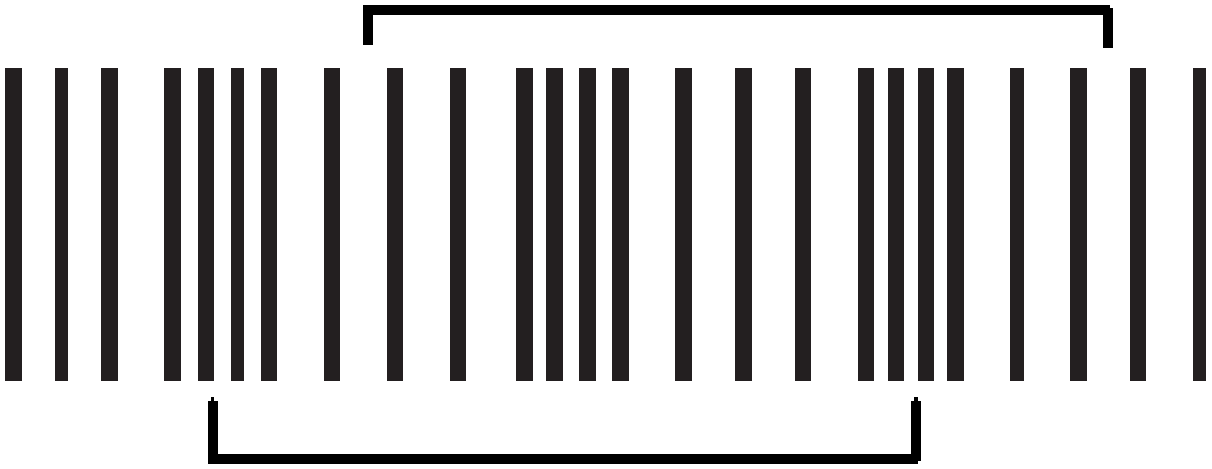
The **compression** is the part of the compressional wave where the particles are crowded together.

Parts of a Compressional Wave (Longitudinal)

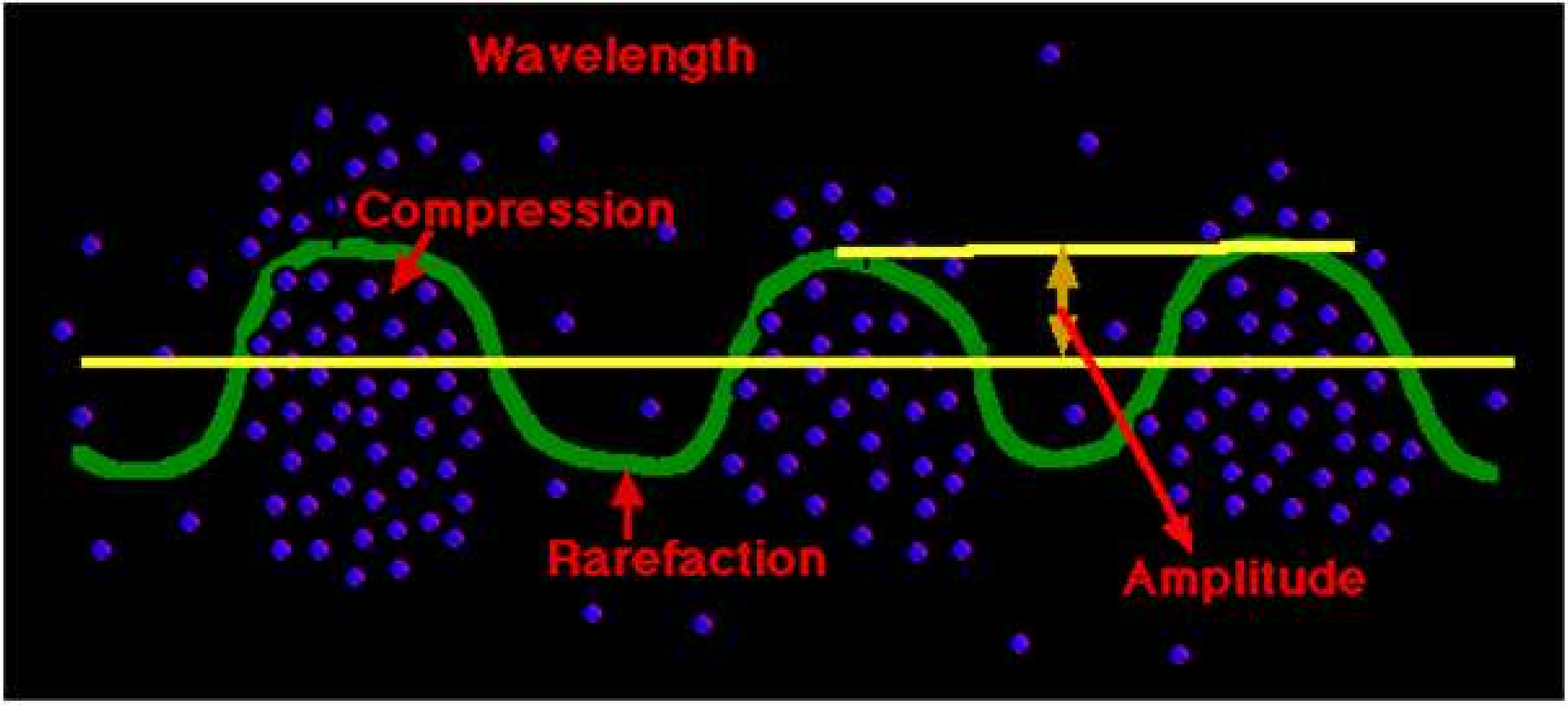


The **rarefaction** is the part of the compressional wave where the particles are spread apart.

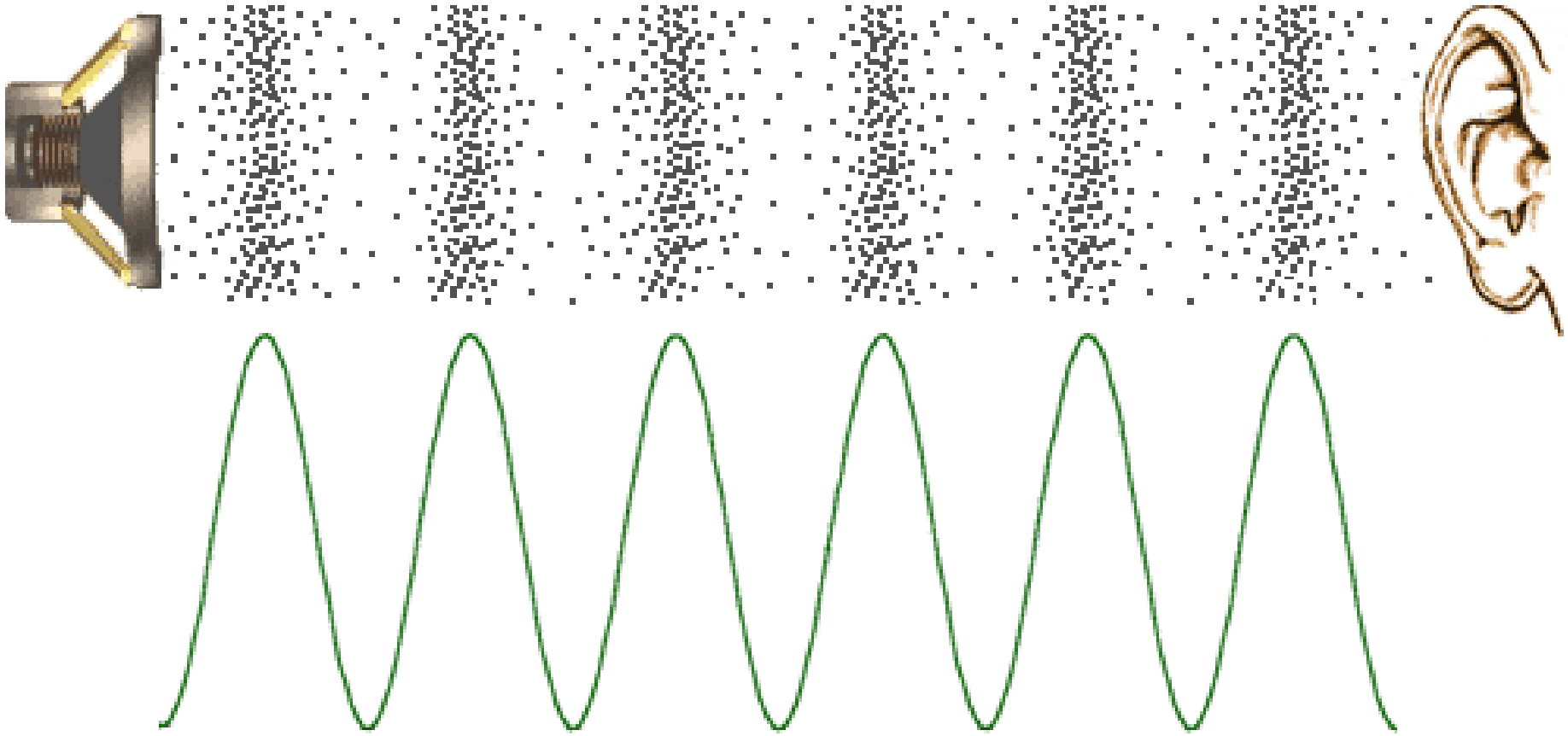
Parts of a Compressional Wave (Longitudinal)



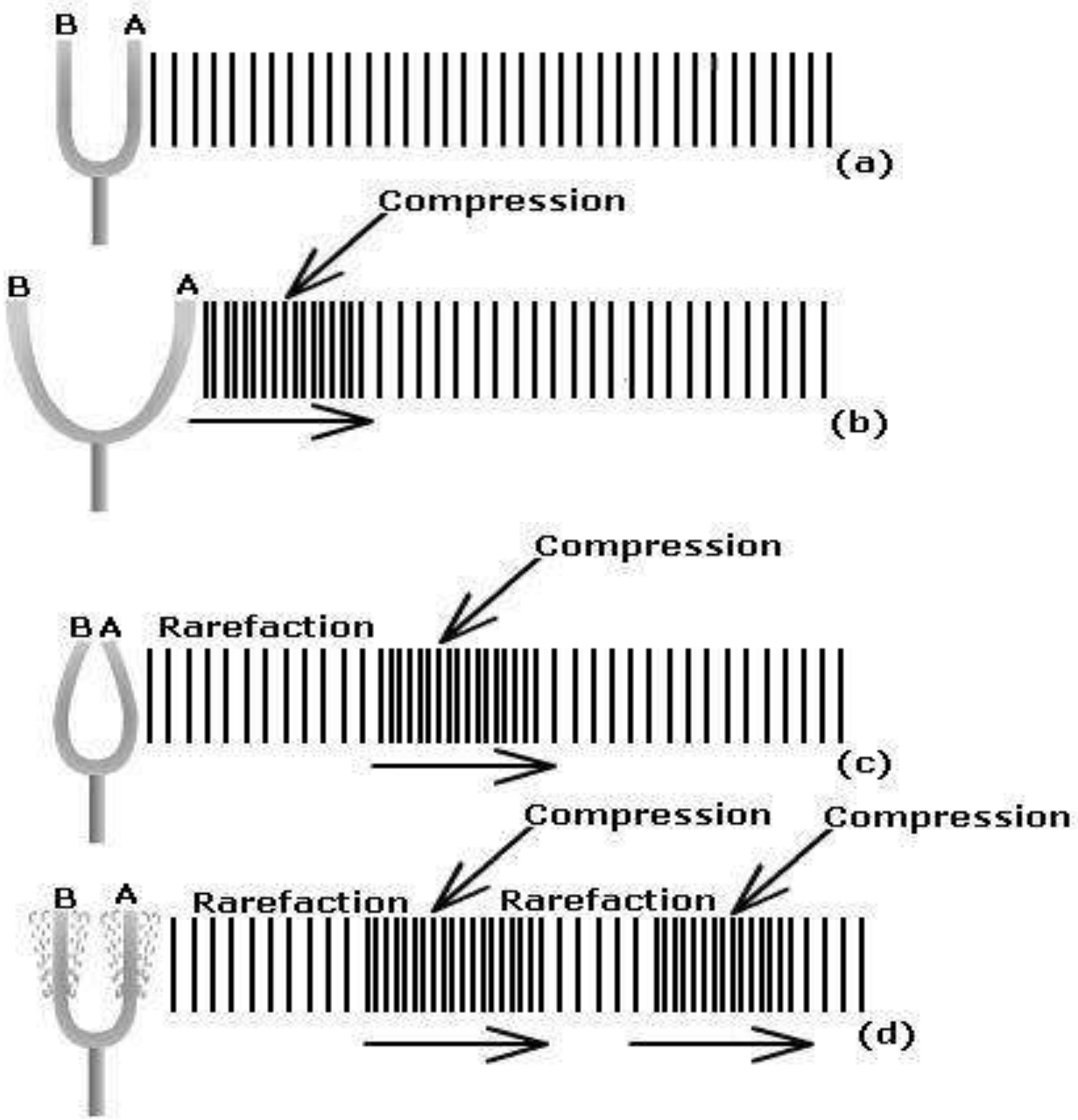
The **wavelength** is the distance from compression to compression or rarefaction to rarefaction in a compressional wave.



http://www.fi.edu/fellows/fellow2/apr99/soundvib.html

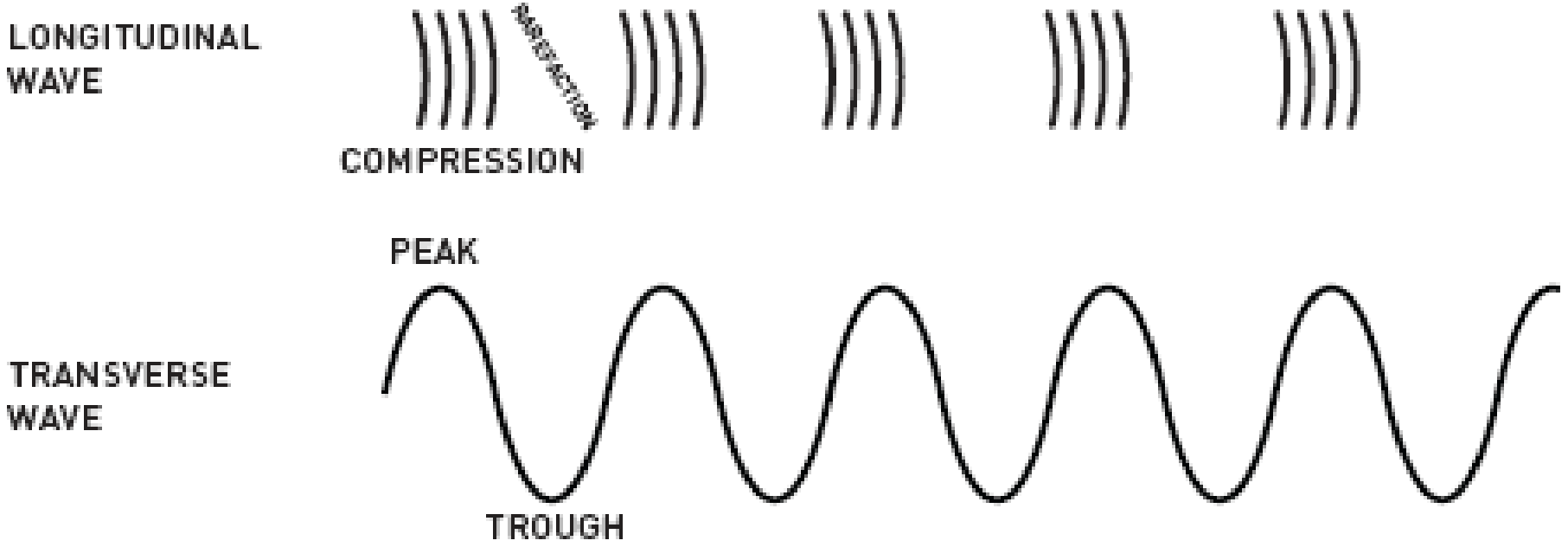


http://www.mediacollege.com/audio/01/sound-waves.html



http://physics.tutorvista.com/waves/longitudinal-waves.html

Compare Compressional Wave to Transverse Wave



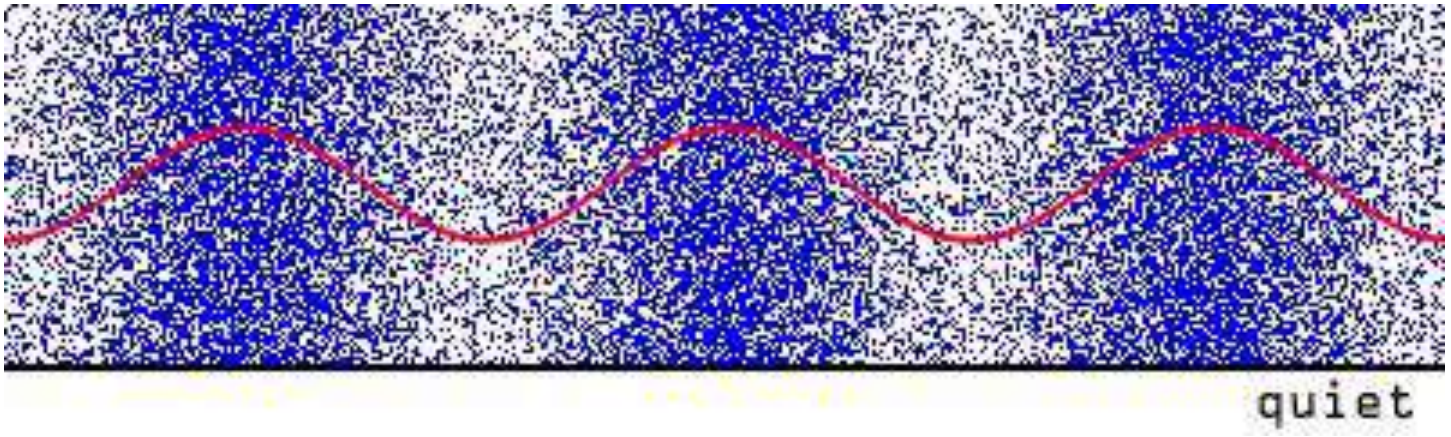
http://www.learner.org/courses/mathilluminated/units/10/textbook/03.php

Distributed Summarizing

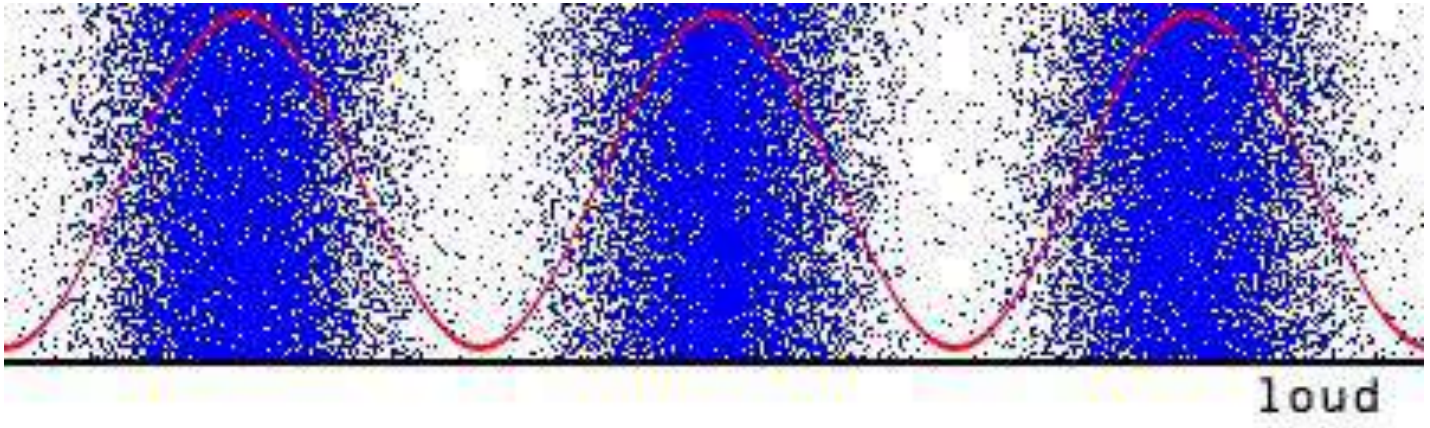
In the box on your Notes, draw an illustration to show how a compressional wave is different from a transverse wave.

Amplitude and Loudness of Sound

- Loudness is the human perception of how much energy a sound wave carries.
- The greater the amplitude of a wave, the more energy it carries.
- In a compressional wave, the amplitude is greater when the particles of the medium are squeezed closer together in each compression and spread farther apart in each rarefaction. (See Figure 4 on page 493 in Glencoe textbook)
- Larger amplitude = louder sound
- Smaller amplitude = softer sound



Low Amplitude because particles in compression and rarefaction are more spread out

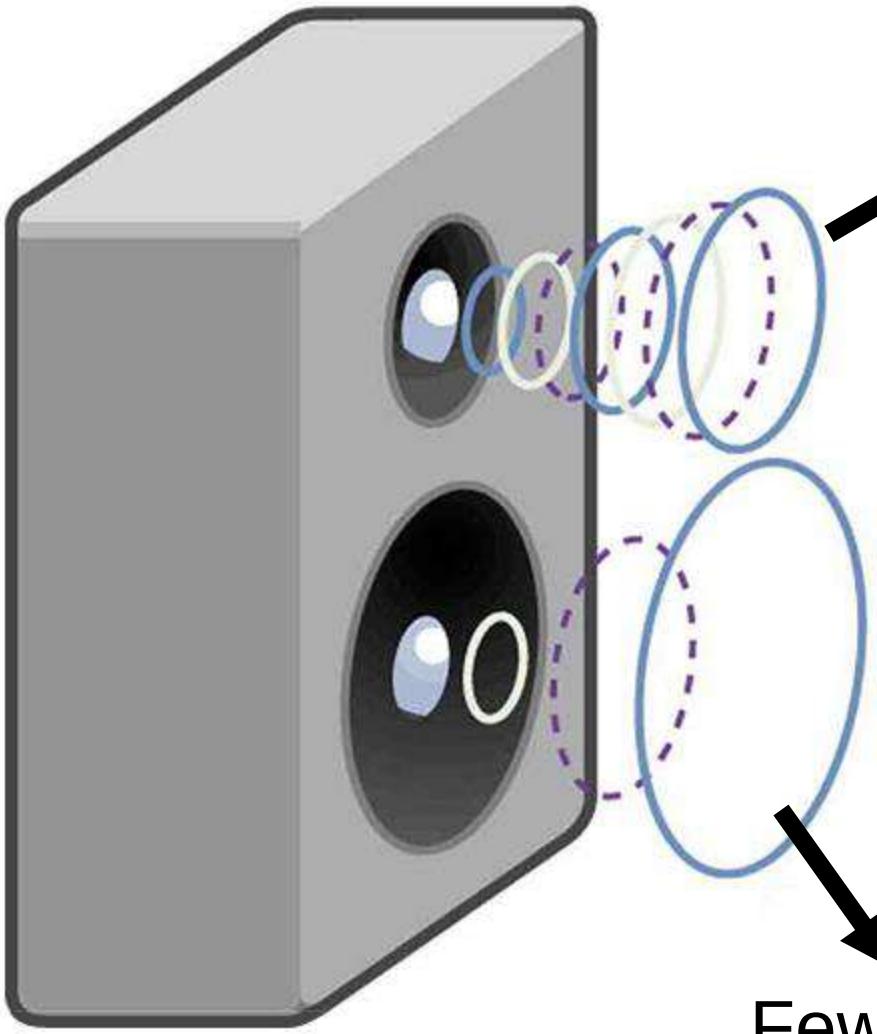


High Amplitude because particles in compression are more compressed and particles in the rarefaction are more spread out

http://www.physics.uiowa.edu/~umallik/adventure/sound.htm

Pitch and Frequency of Sound

- The pitch of a sound is how high or low it sounds.
- The frequency of a sound wave is the number of compressions that pass by a given point in one second.
- The higher the pitch, the higher the frequency.
- An object that vibrates faster forms a sound wave with a higher frequency.

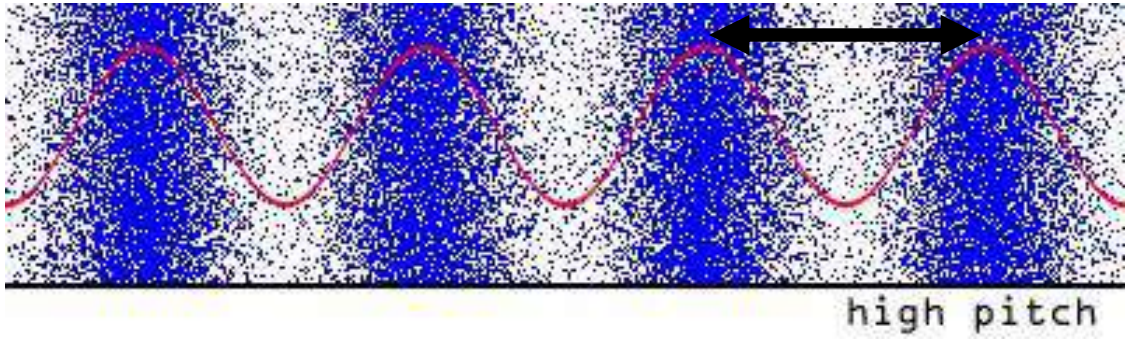


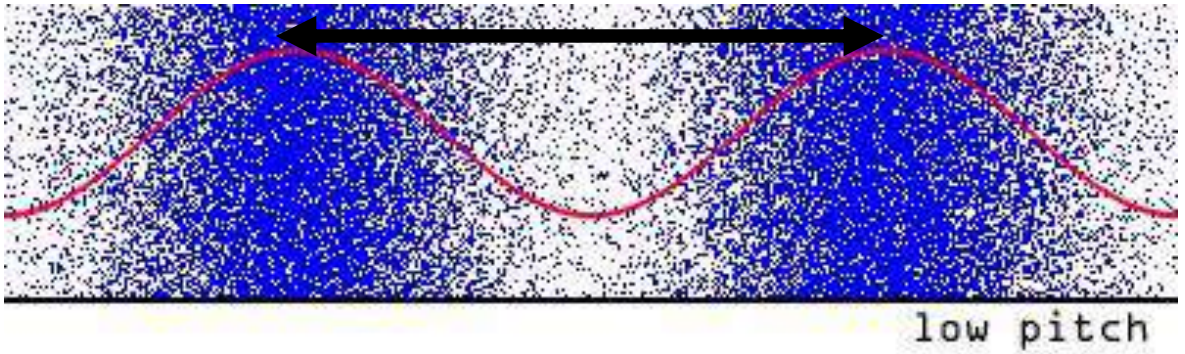
More Compressions in the same amount of time; therefore, higher Frequency, higher Pitch

Fewer Compressions in the same amount of time; therefore, lower Frequency, lower Pitch

Pitch and Frequency of Sound

- Sound waves with a higher pitch have a shorter wavelength.





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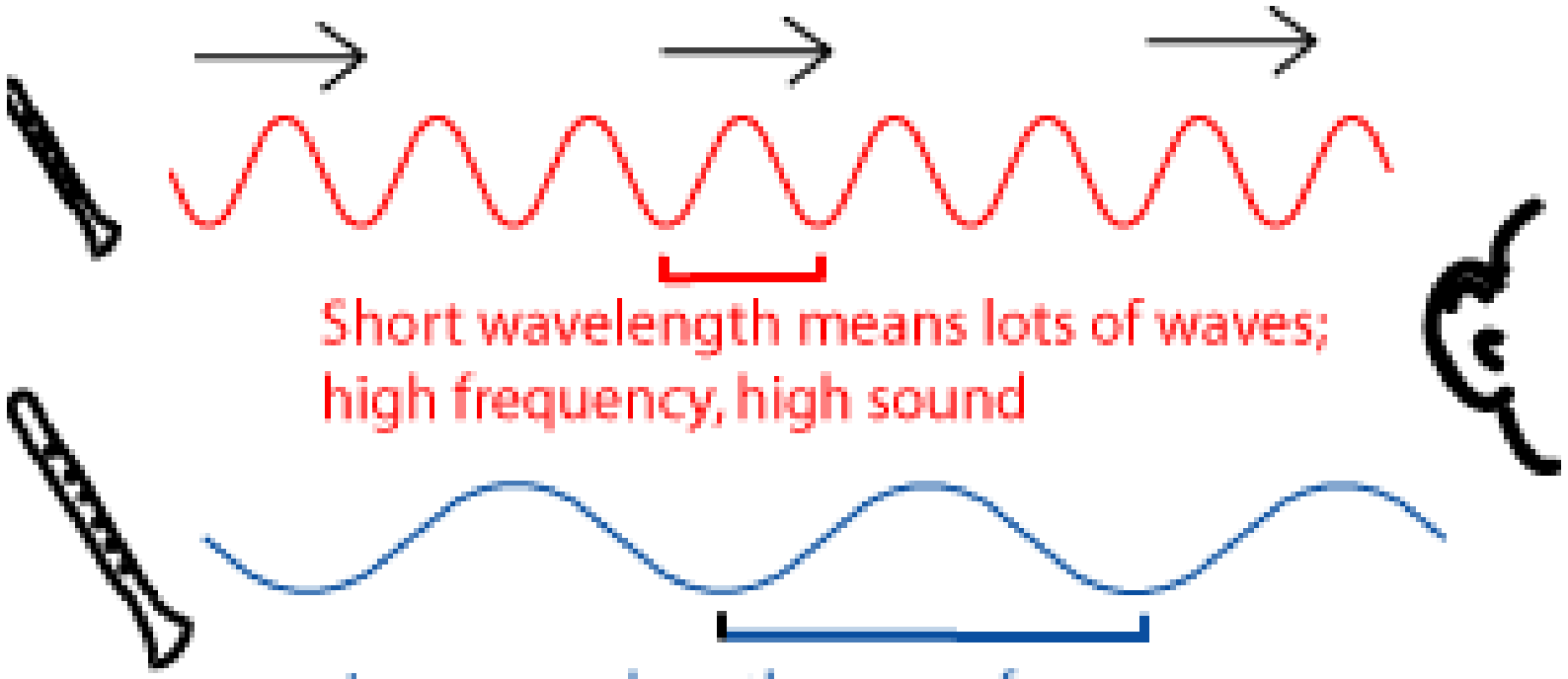
The waves are all travelling at about the same speed, so this is the number of each wave that will reach the ear in a hundredth of a second.



Short wavelength means lots of waves; high frequency, high sound

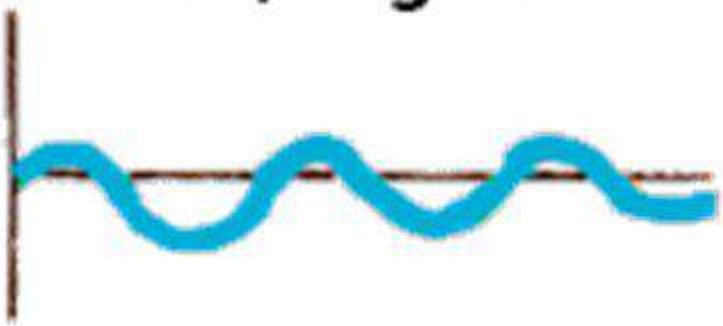
Long wavelength means fewer waves; low frequency, low sound

Amplitude and Pitch

Which of the following waves has high amplitude? High Pitch?

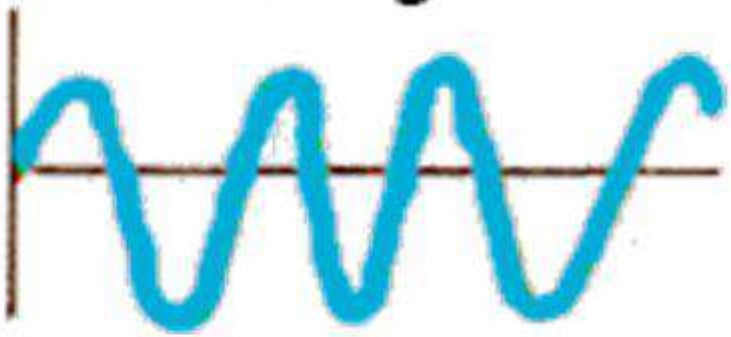
Soft, high note.

1



Loud, high note.

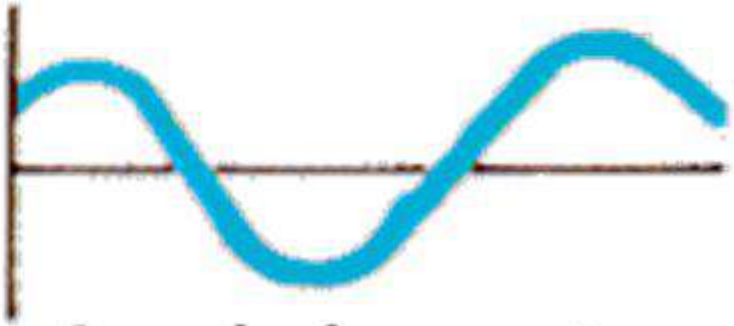
3



2

Soft, low note.

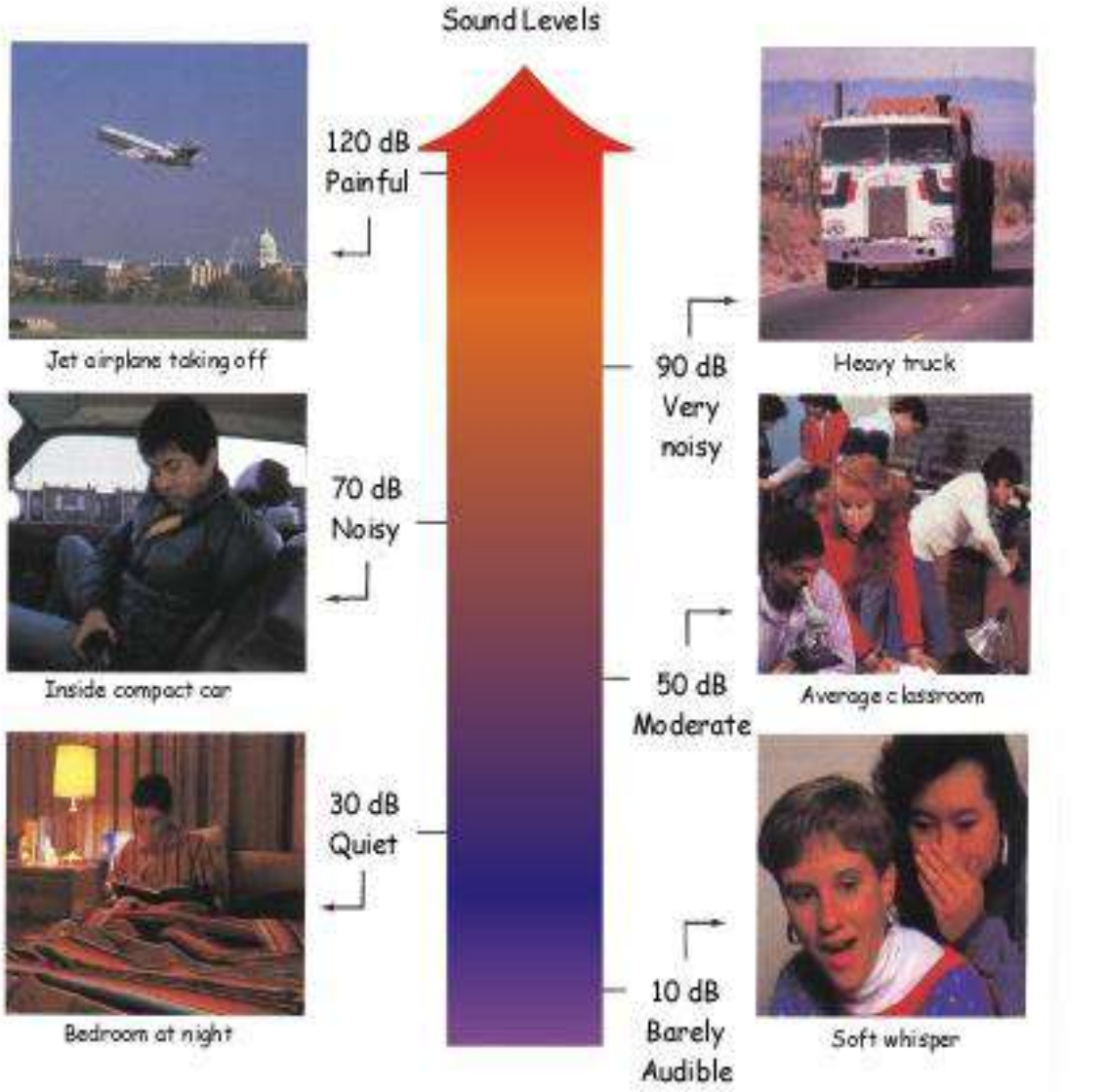
4



Loud, low note.

Measuring Sound

- The energy carried in a sound wave can be described in decibels (dB).
- Hearing damage begins at about 85dB.



Decibel scale showing the intensity level of some familiar sounds.