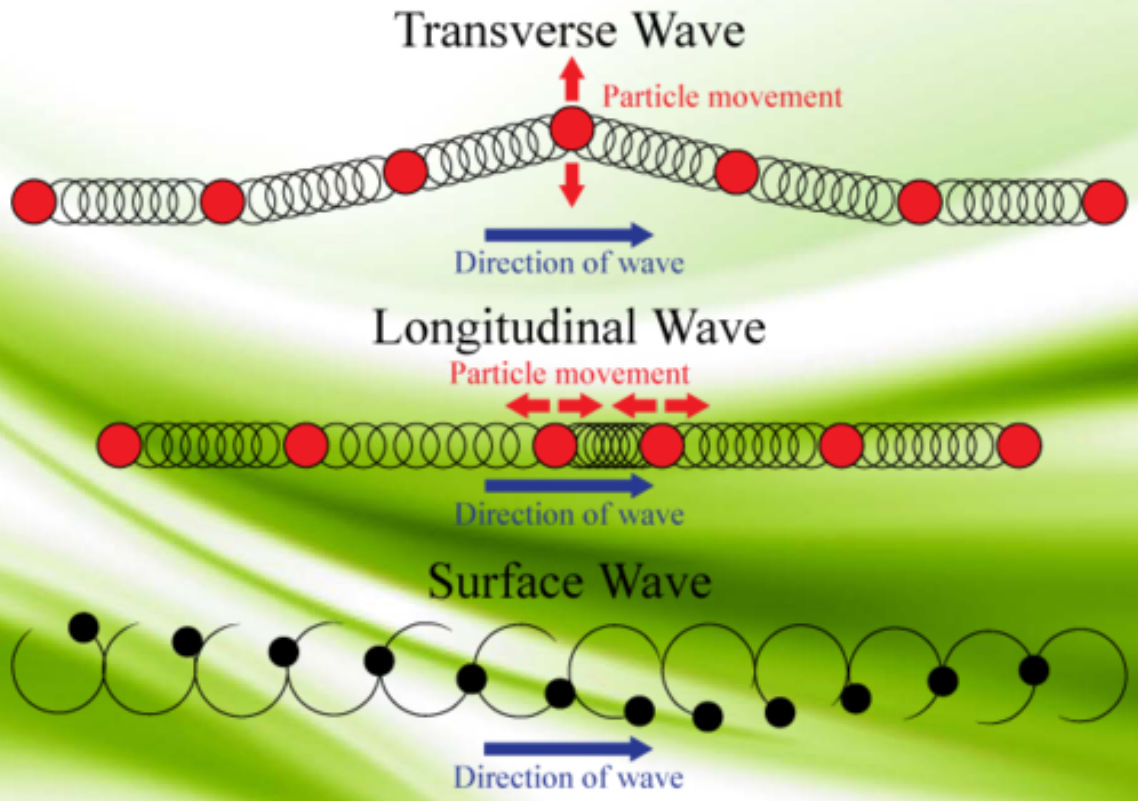


Types of Waves

Mechanical and Electromagnetic

Name_____ Date_____ Period_____

Waves

Definition:

Mechanical Waves

Definition:

Matter Used Called:

Types of Mediums:

Electromagnetic Waves

Definition:

Transverse Wave

Definition:

Examples:

Parts:

Image:

Compressional (Longitudinal) Wave

Definition:

Examples:

Parts:

Image:

Definition:

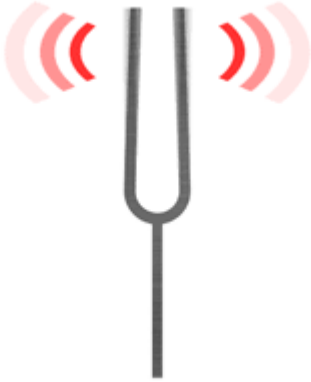
Examples:

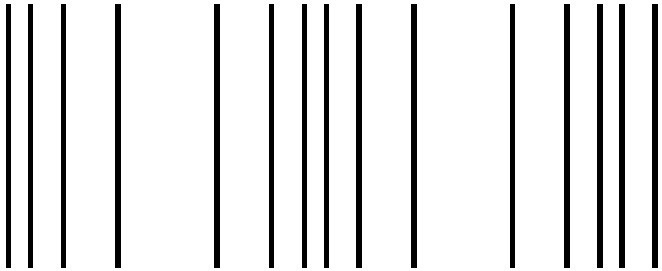
Parts:

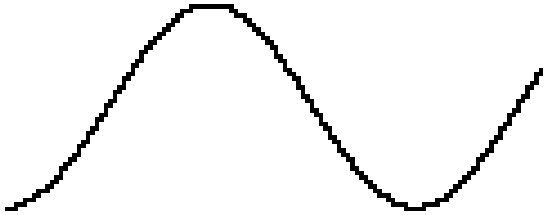
Image:

What are Waves?

Rhythmic disturbances that carry energy without carrying matter







Types of Waves

- **Mechanical Waves – need matter (or medium) to transfer energy**
  - A medium is the substance through which a wave can travel. Ex. Air; water; particles; strings; solids; liquids; gases

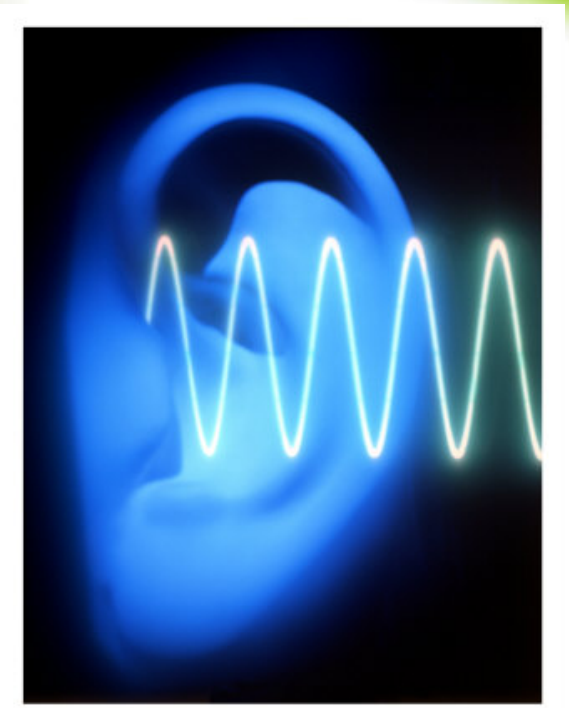
- **Electromagnetic Waves – DO NOT NEED matter (or medium) to transfer energy**
  - They do not need a medium, but they can go through matter (medium), such as air, water, and glass

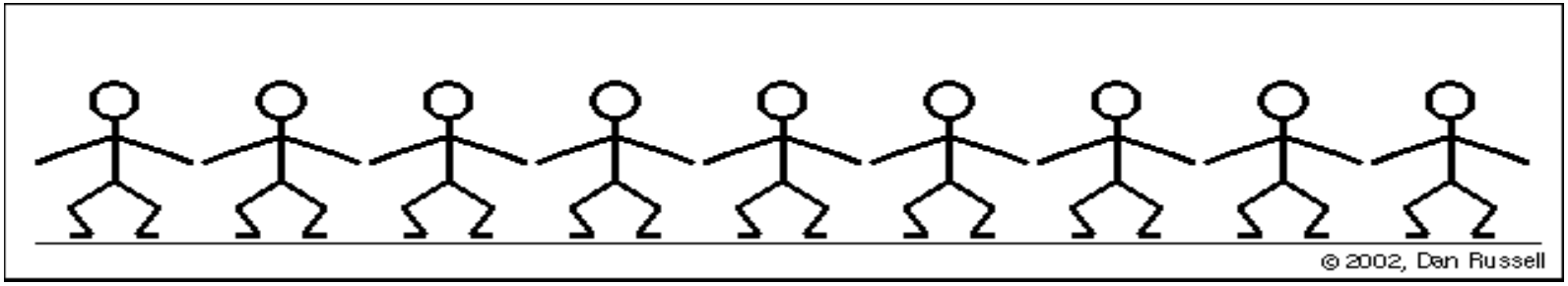
Mechanical Waves

Waves that need matter (medium) to transfer energy:

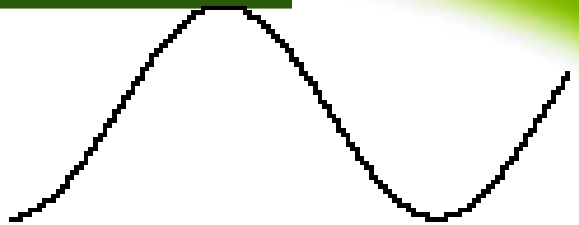
Examples: Sound waves, ocean waves, ripples in water, earthquakes, wave of people at a sporting event

Examples of Mechanical Waves

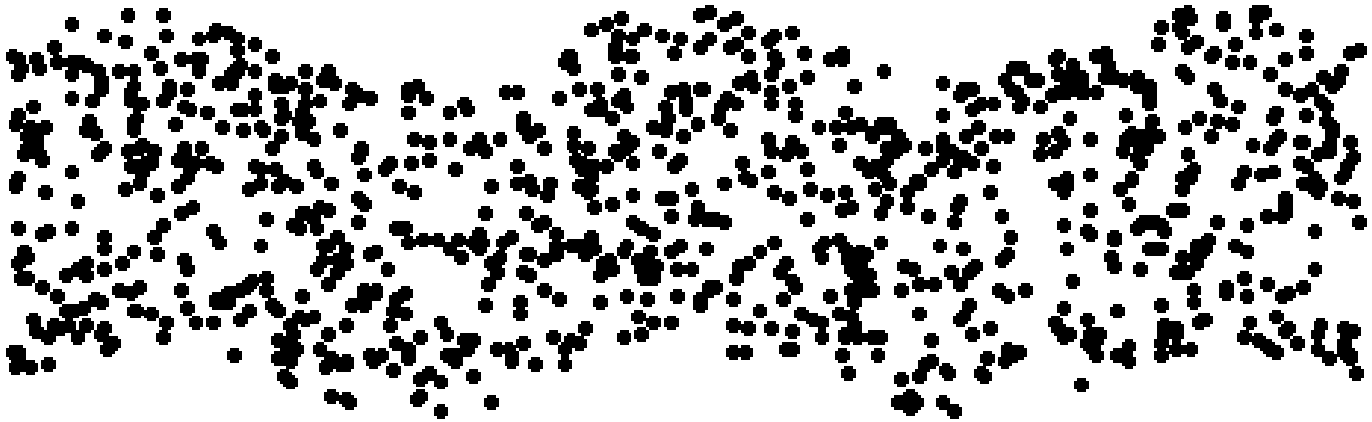




Transverse (Mechanical) Waves



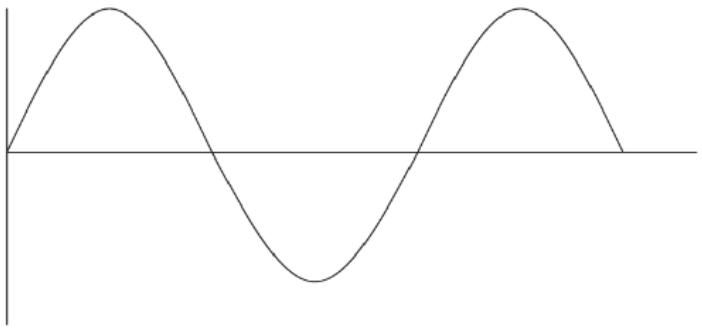
- Energy causes the matter in the medium to move up and down or back and forth at right angles to the direction the wave travels.



Use the next four slides and your Wave Diagram sheet to label and define the parts of a Transverse Wave.

Name _____ ____Date_____ Period ____

Transverse Wave



Crest:

Trough:

Wavelength:

Amplitude:

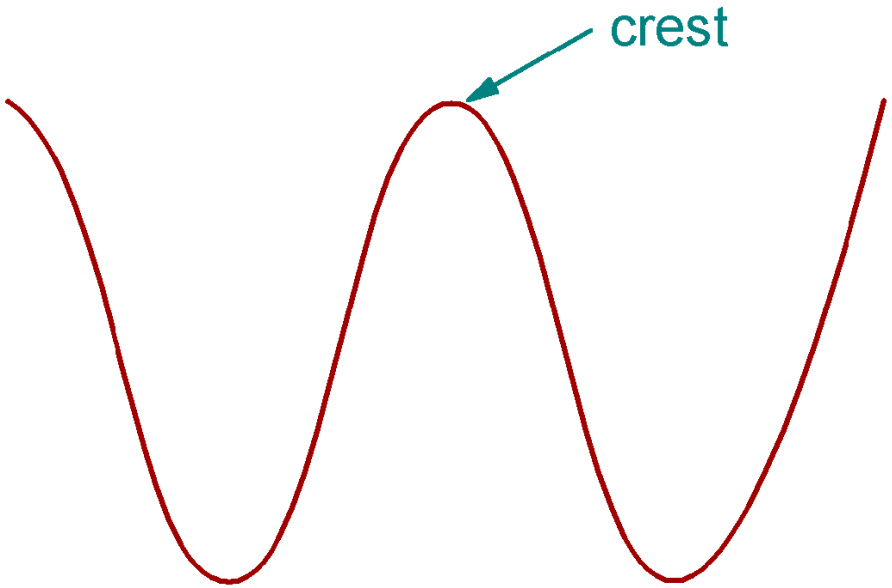
Compressional (Longitudinal) Wave

Rarefaction:

Compression:

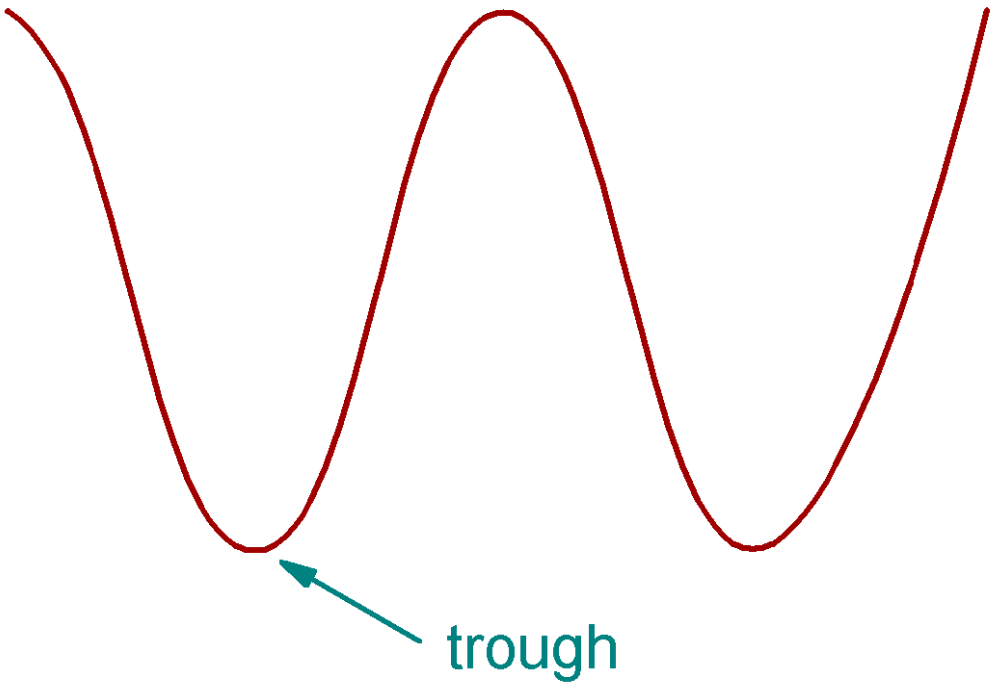
Parts of a Transverse Wave

The **crest** is the highest point on a wave.



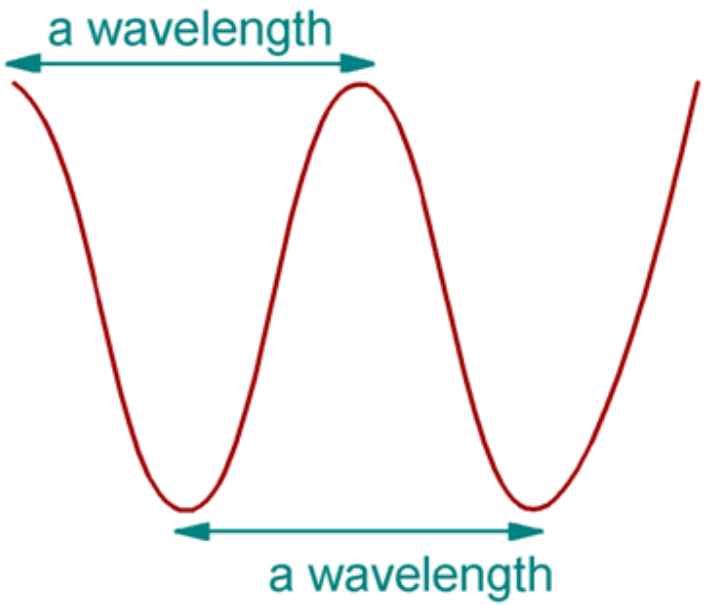
Parts of a Transverse Wave

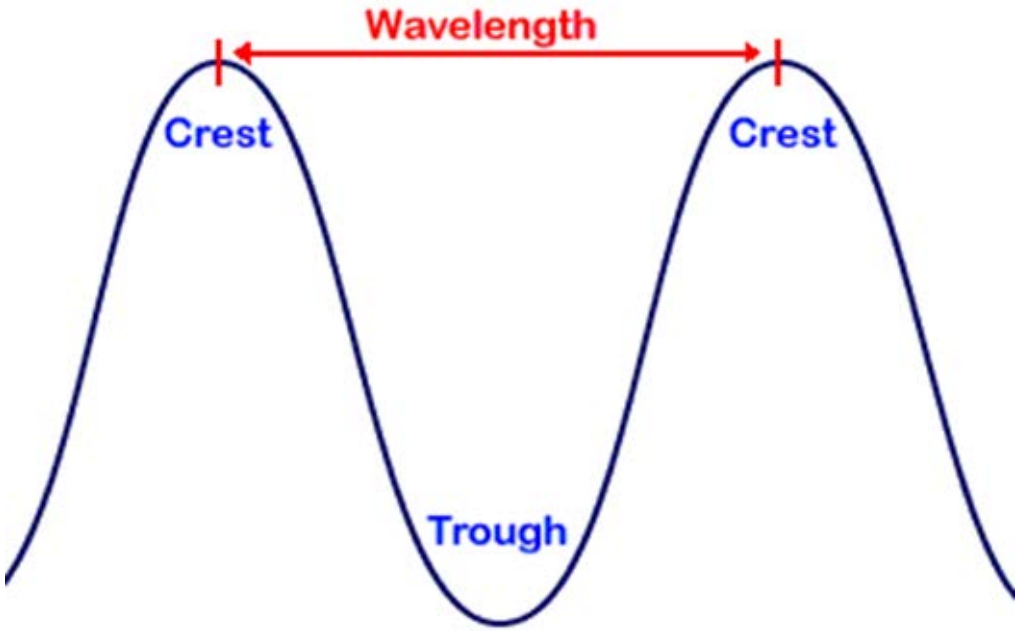
The **trough** is the valley between two waves, is the lowest point.



Parts of a Transverse Wave

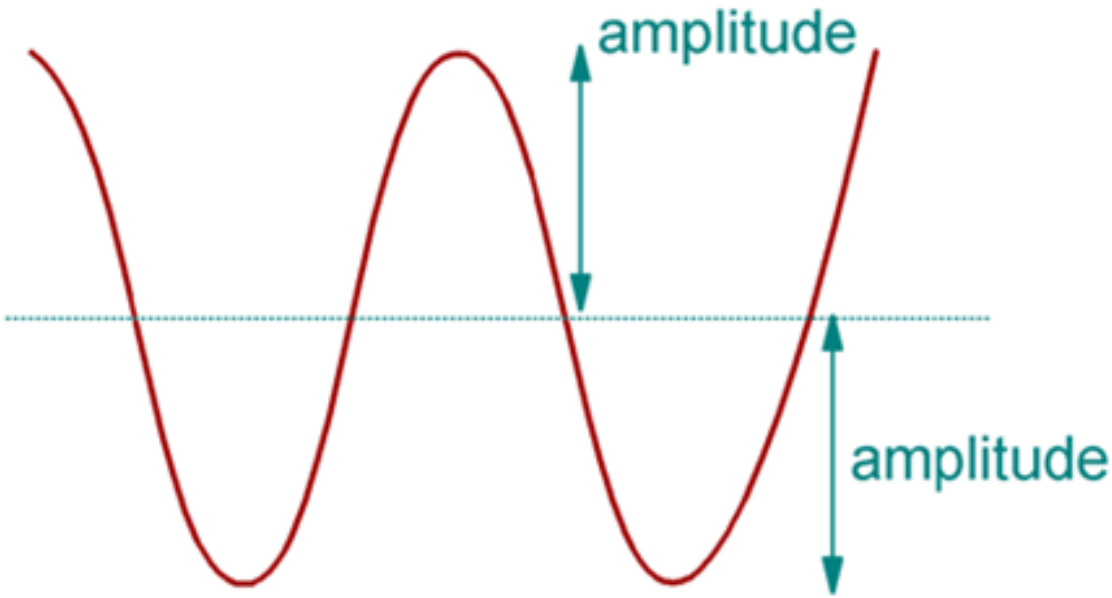
The **wavelength** is the horizontal distance, either between the crests or troughs of two consecutive waves.

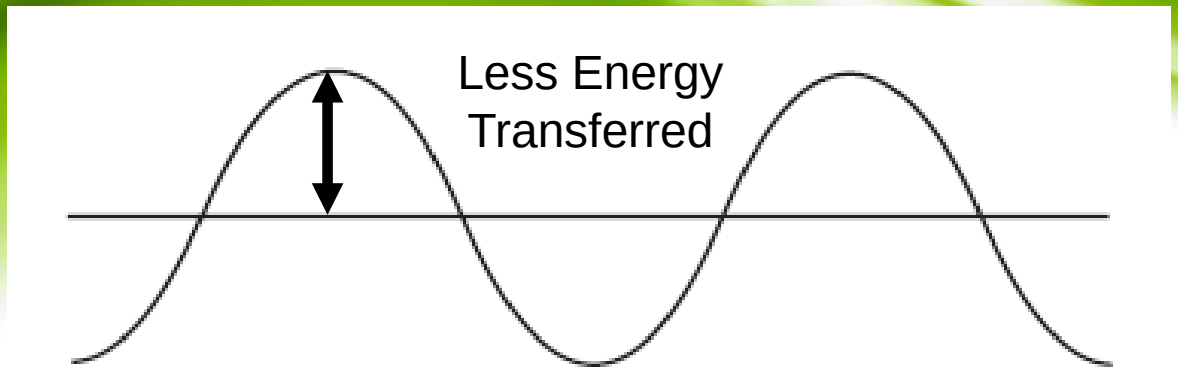


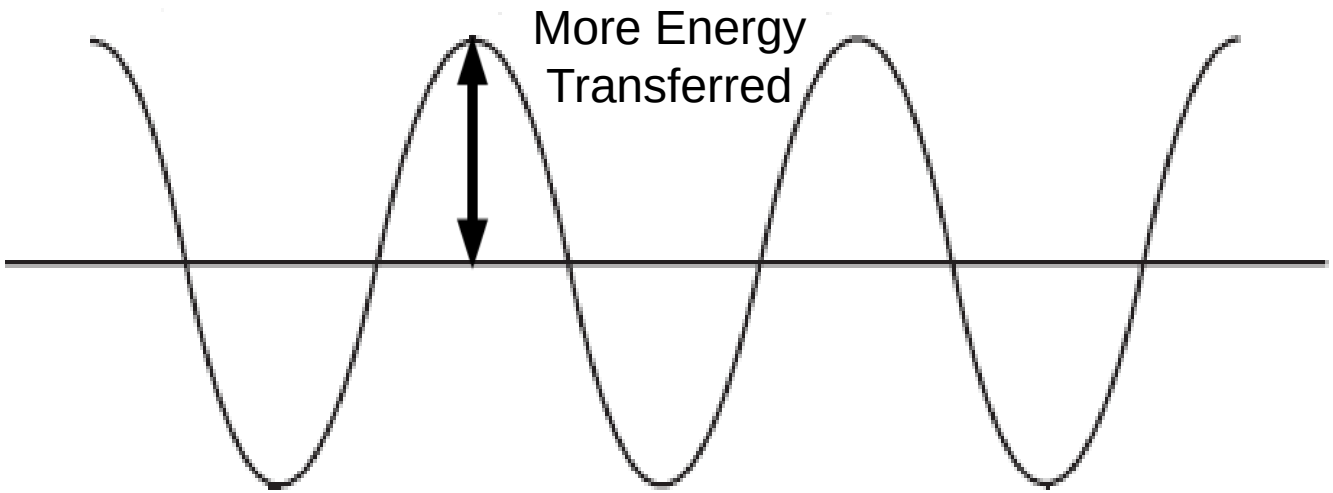


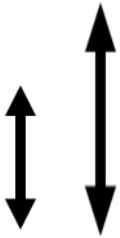
Parts of a Transverse Wave

The **amplitude** is the peak (either positive or negative) of a wave.



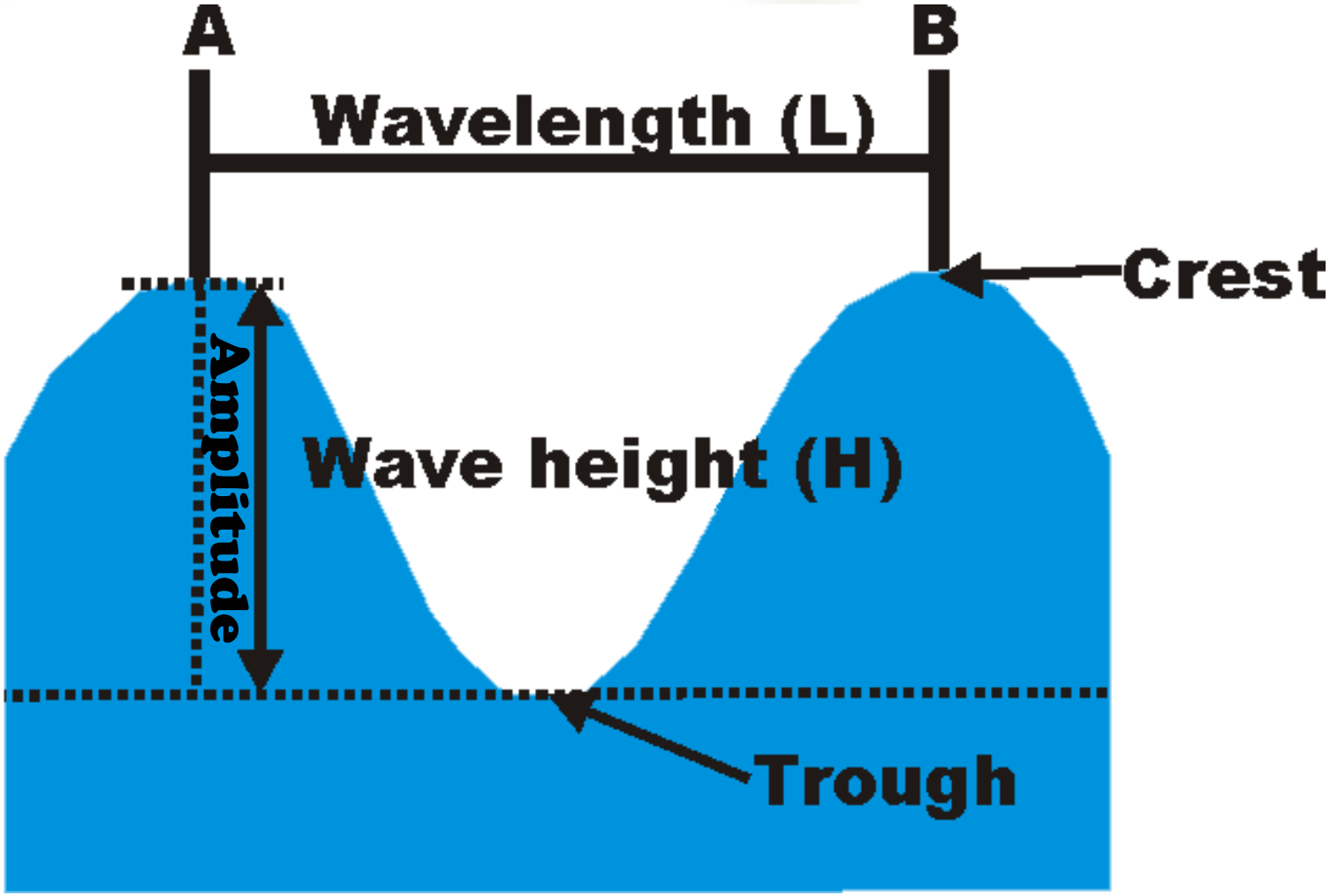


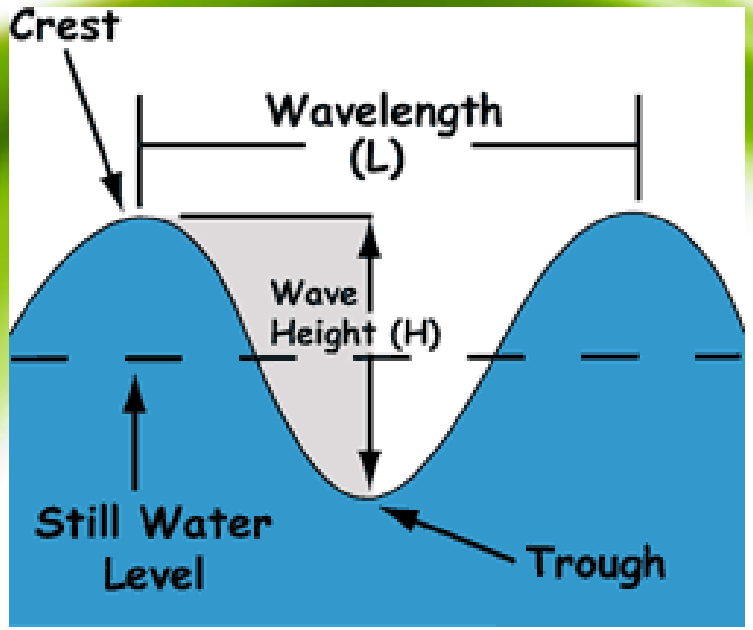


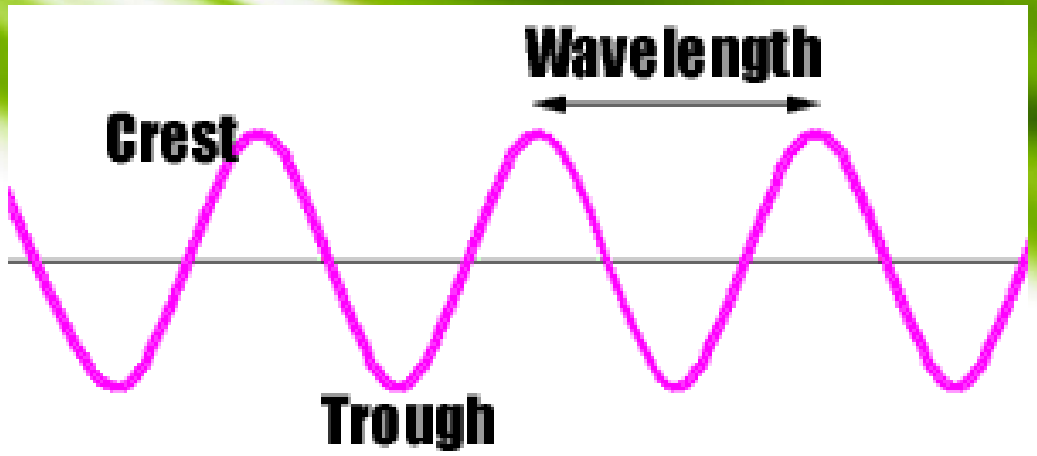


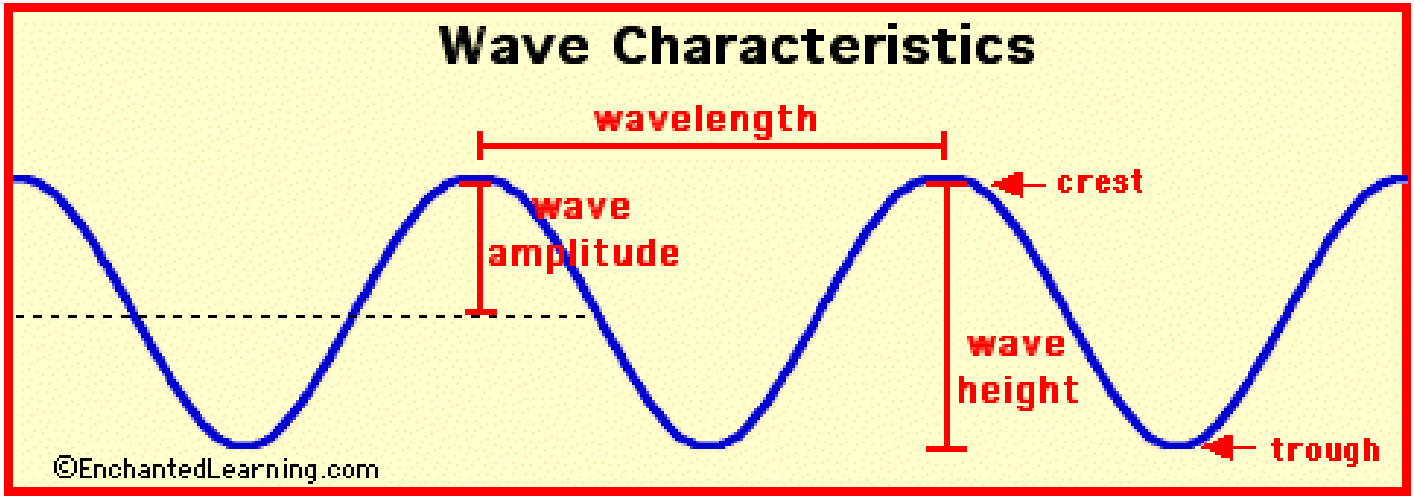
Larger amplitude = More Energy

An ocean wave is an example of a mechanical transverse wave as is an S wave that measures earthquakes




Crest
Wavelength
(L)
Wave
Height (H)
Still Water
Level
Trough


Wavelength
Crest
Trough


Wave Characteristics
wavelength
crest
wave
amplitude
wave
height
trough
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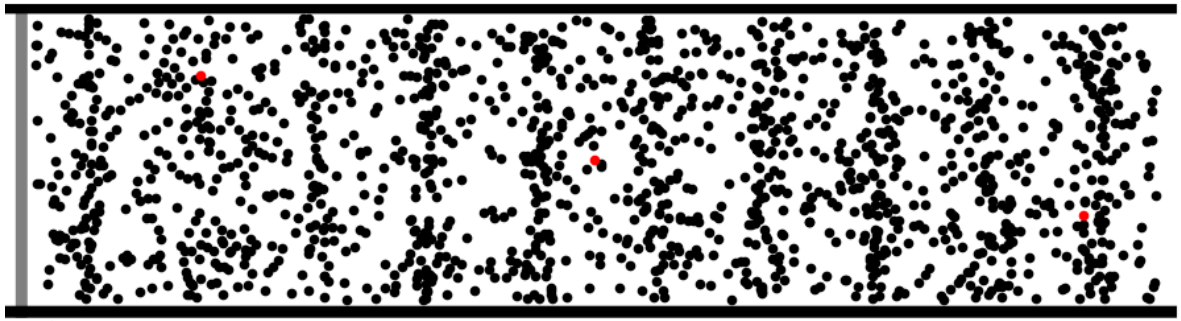
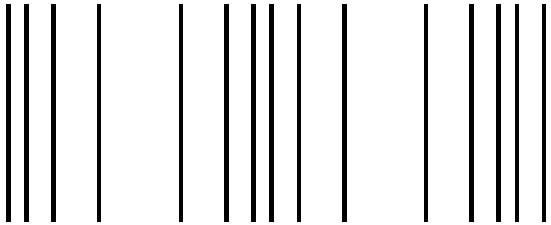
Compressional Wave (Longitudinal)

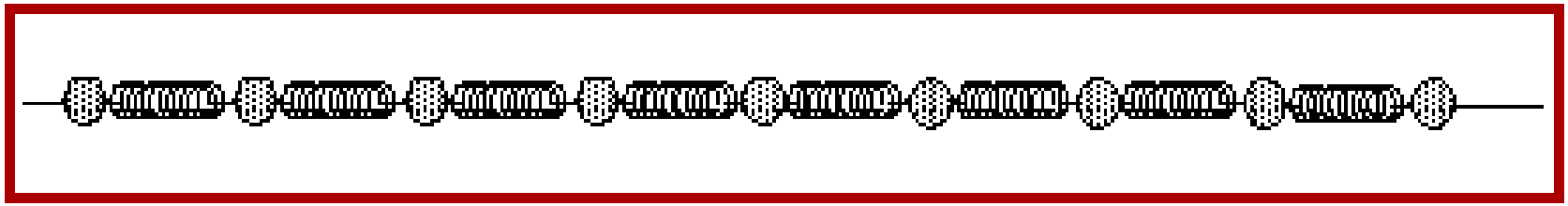
- A mechanical wave in which matter in the medium moves forward and backward along the same direction that the wave travels.

A slinky is a good illustration of how a compressional wave moves. A P wave that measures EQ is also an example.



©2011. Dan Russell

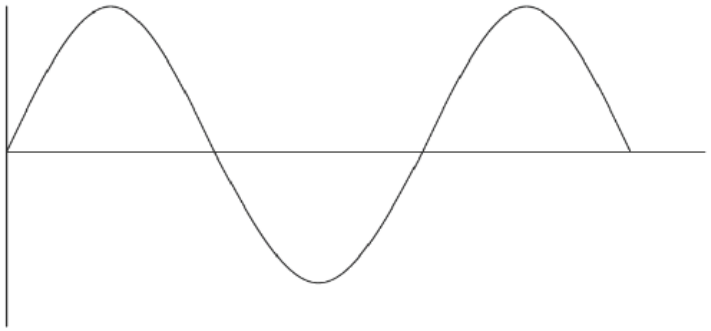




Use the next three slides and your Wave Diagram sheet to label and define the parts of a Compressional wave.

Name _____ ____Date_____ Period ___

Transverse Wave



Crest:

Trough:

Wavelength:

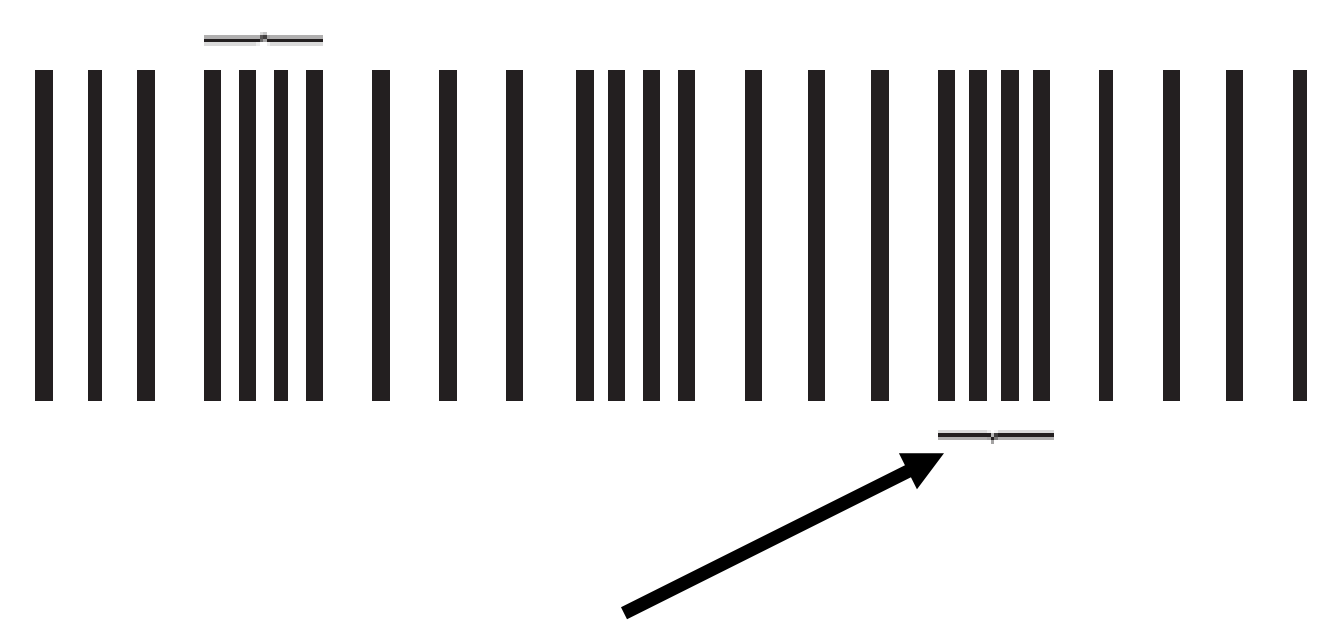
Amplitude:

Compressional (Longitudinal) Wave

Rarefaction:

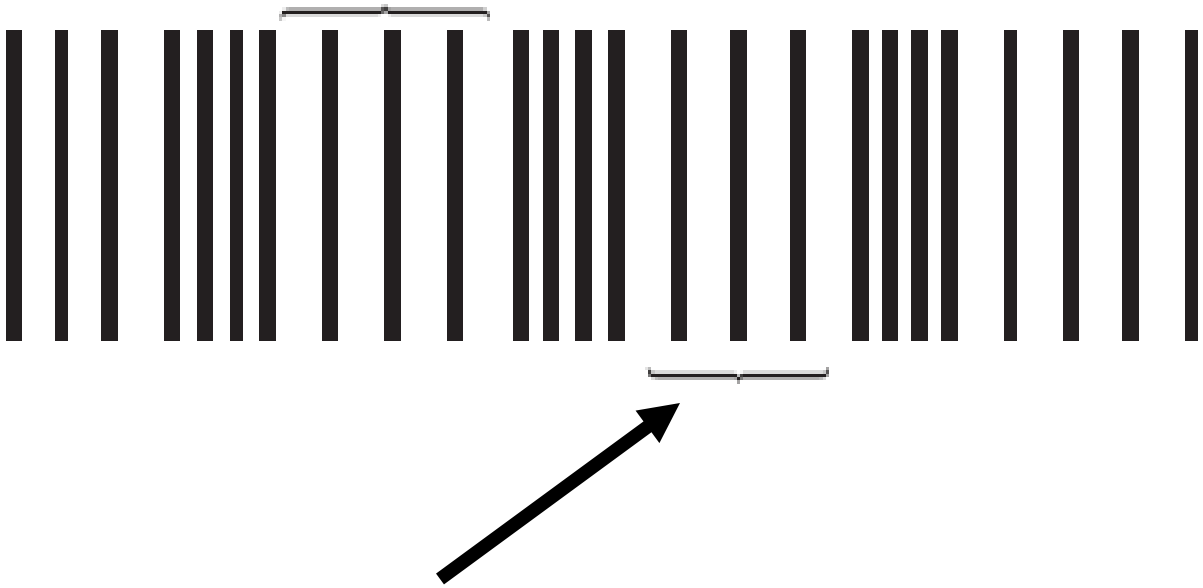
Compression:

Parts of a Compressional Wave (Longitudinal)



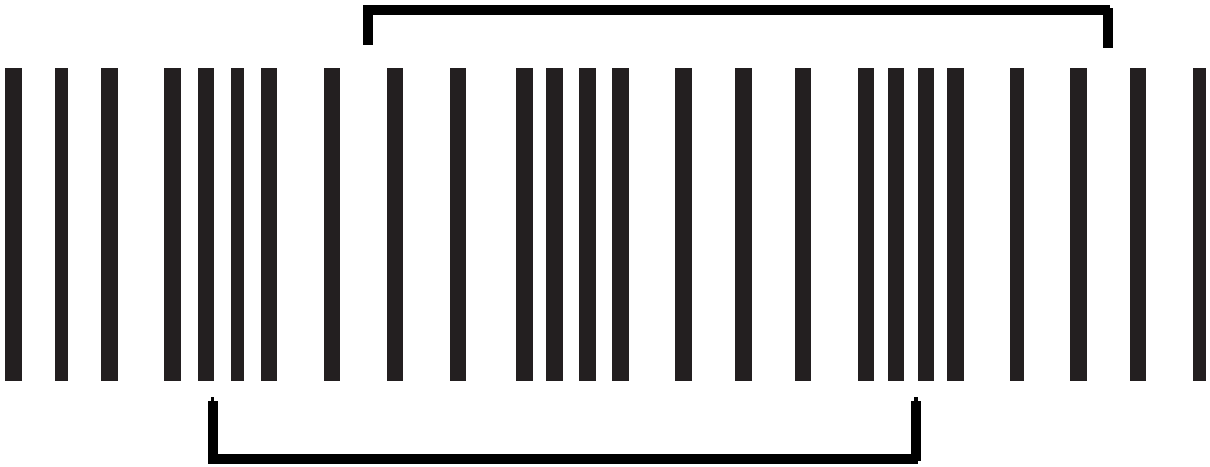
The **compression** is the part of the compressional wave where the particles are crowded together.

Parts of a Compressional Wave (Longitudinal)



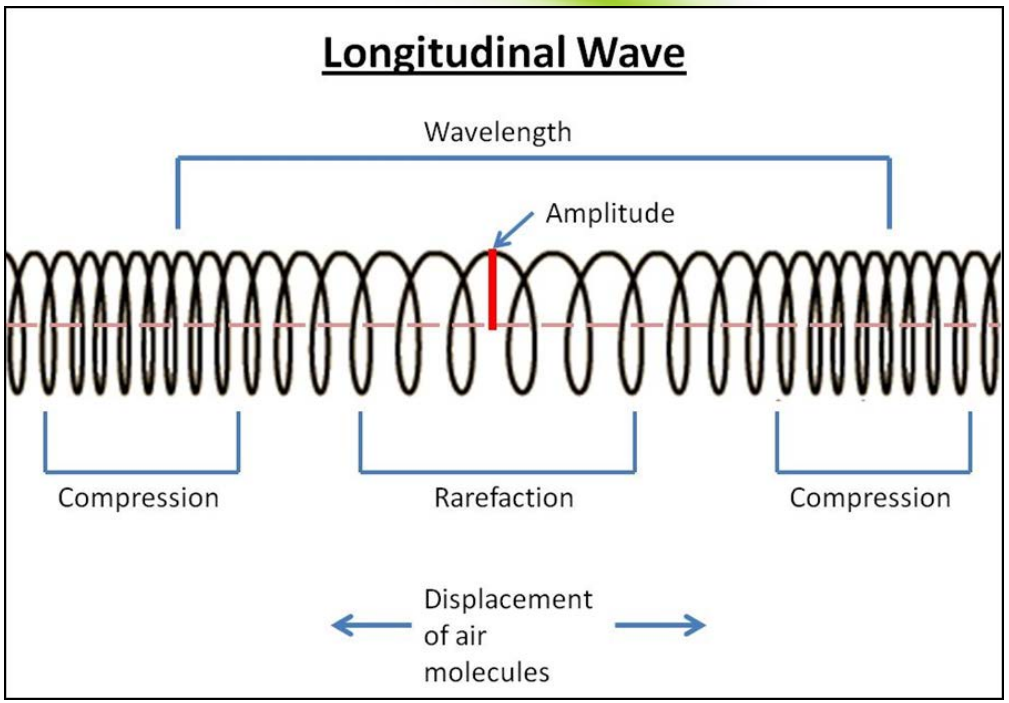
The **rarefaction** is the part of the compressional wave where the particles are spread apart.

Parts of a Compressional Wave (Longitudinal)



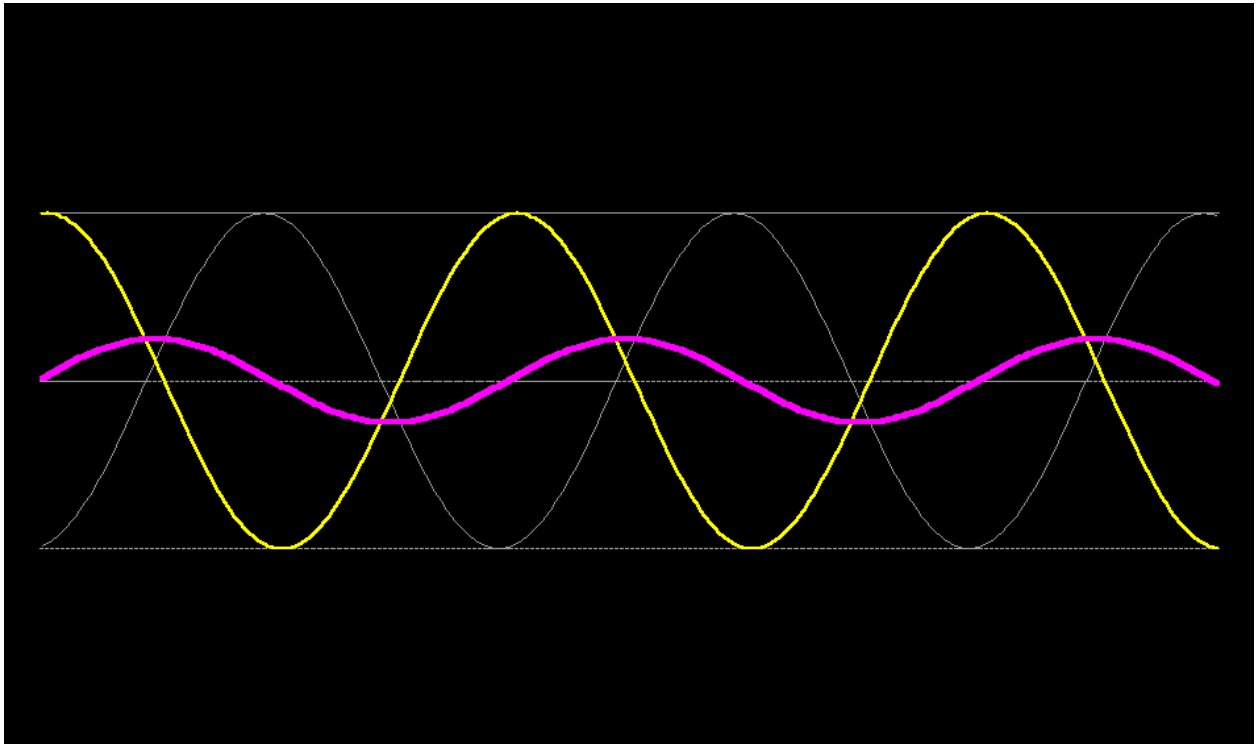
The **wavelength** is the distance from compression to compression or rarefaction to rarefaction in a compressional wave.

Parts of a Compressional Wave (Longitudinal)

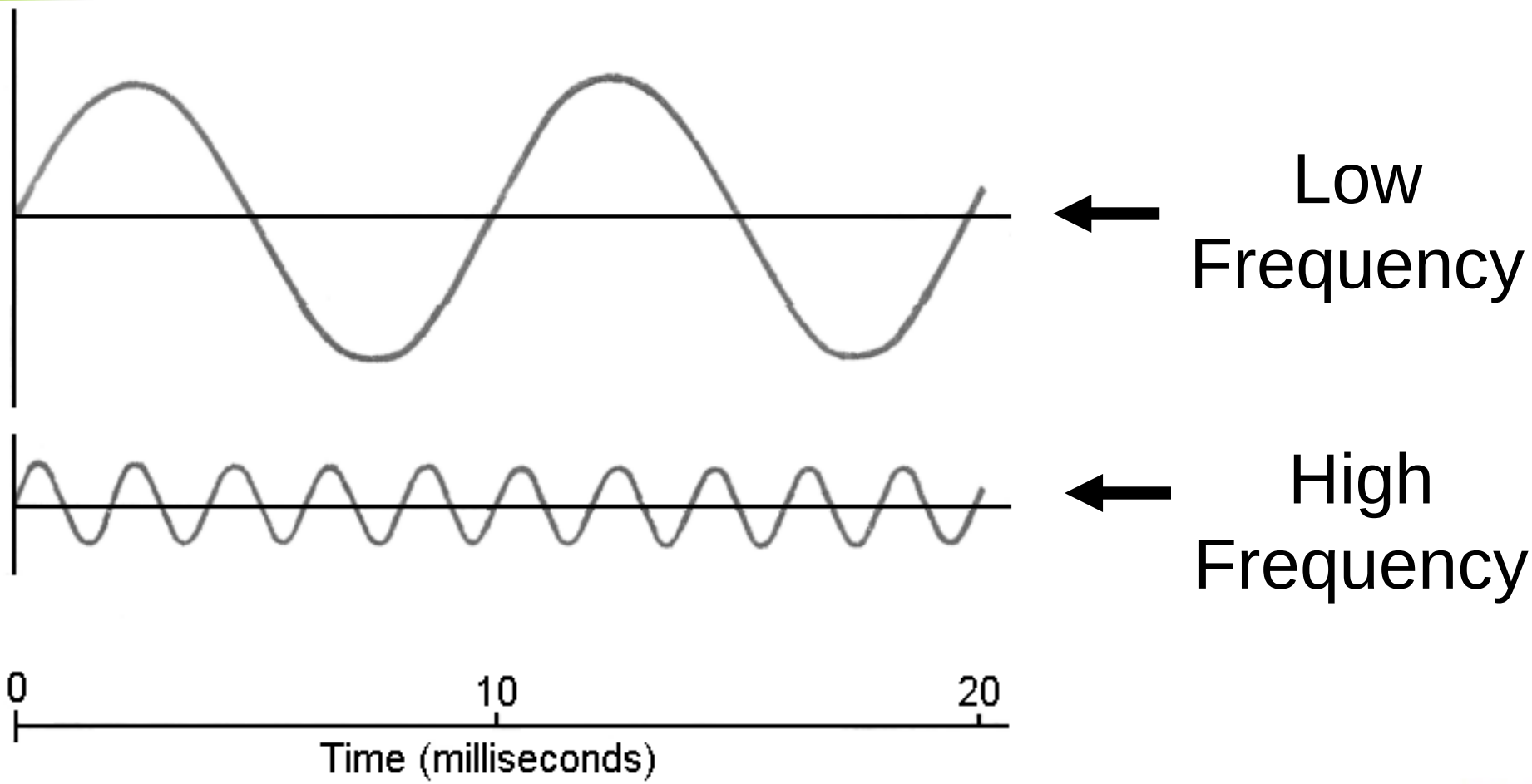


The **amplitude** is how compressed the waves are

Frequency



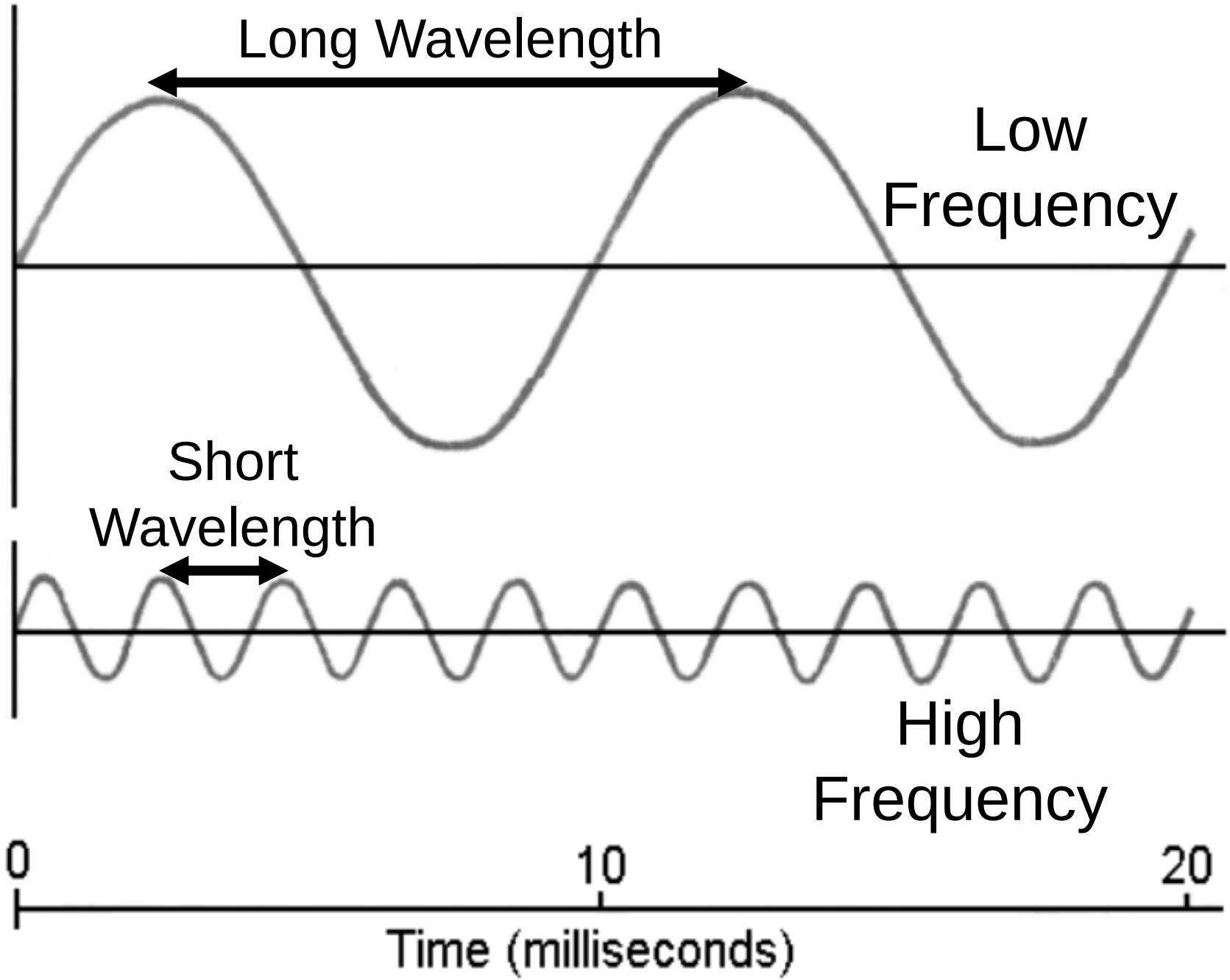
<u>Frequency</u> is the number of wavelengths that pass a point in a given amount of time.

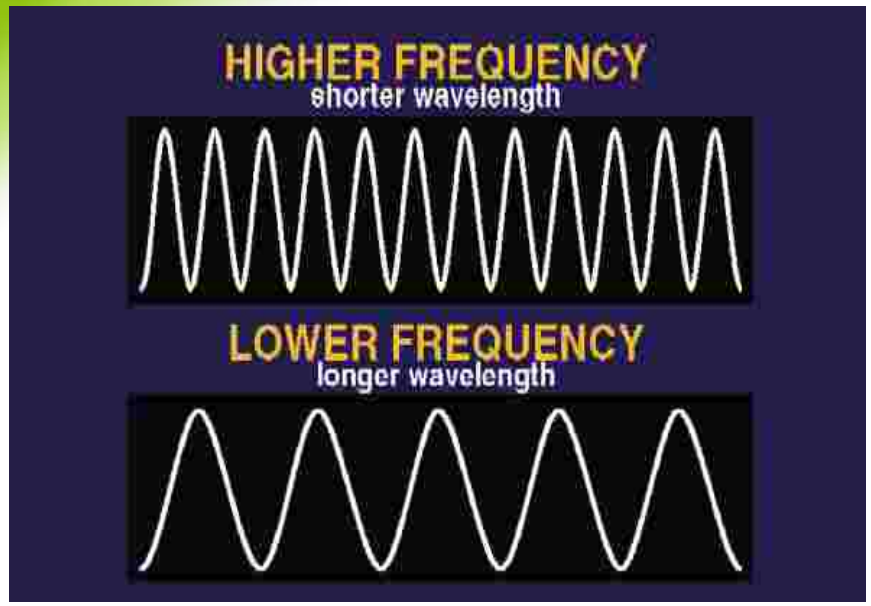


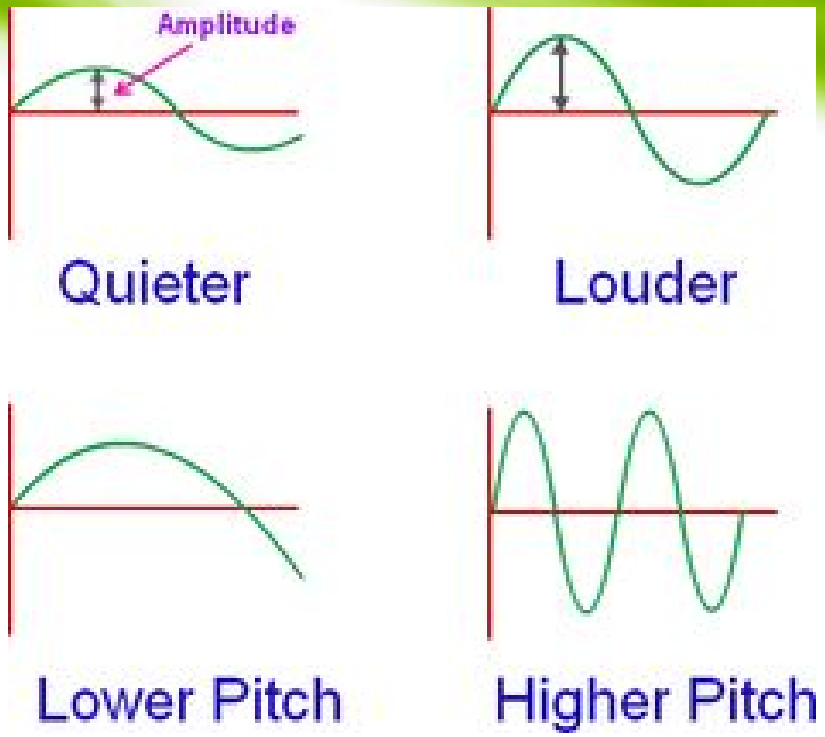
Wavelength and Frequency are inversely related.

If the wavelength of a wave decreases (less space between) than the frequency increases.

As the wavelength of a wave increases (more space between), its frequency decreases.


Long Wavelength
Low Frequency
Short Wavelength
High Frequency
0
10
20
Time (milliseconds)





Higher frequency=Higher energy

Higher amplitude=Higher energy

Electromagnetic Waves

Waves that DO NOT NEED matter (medium) to transfer energy

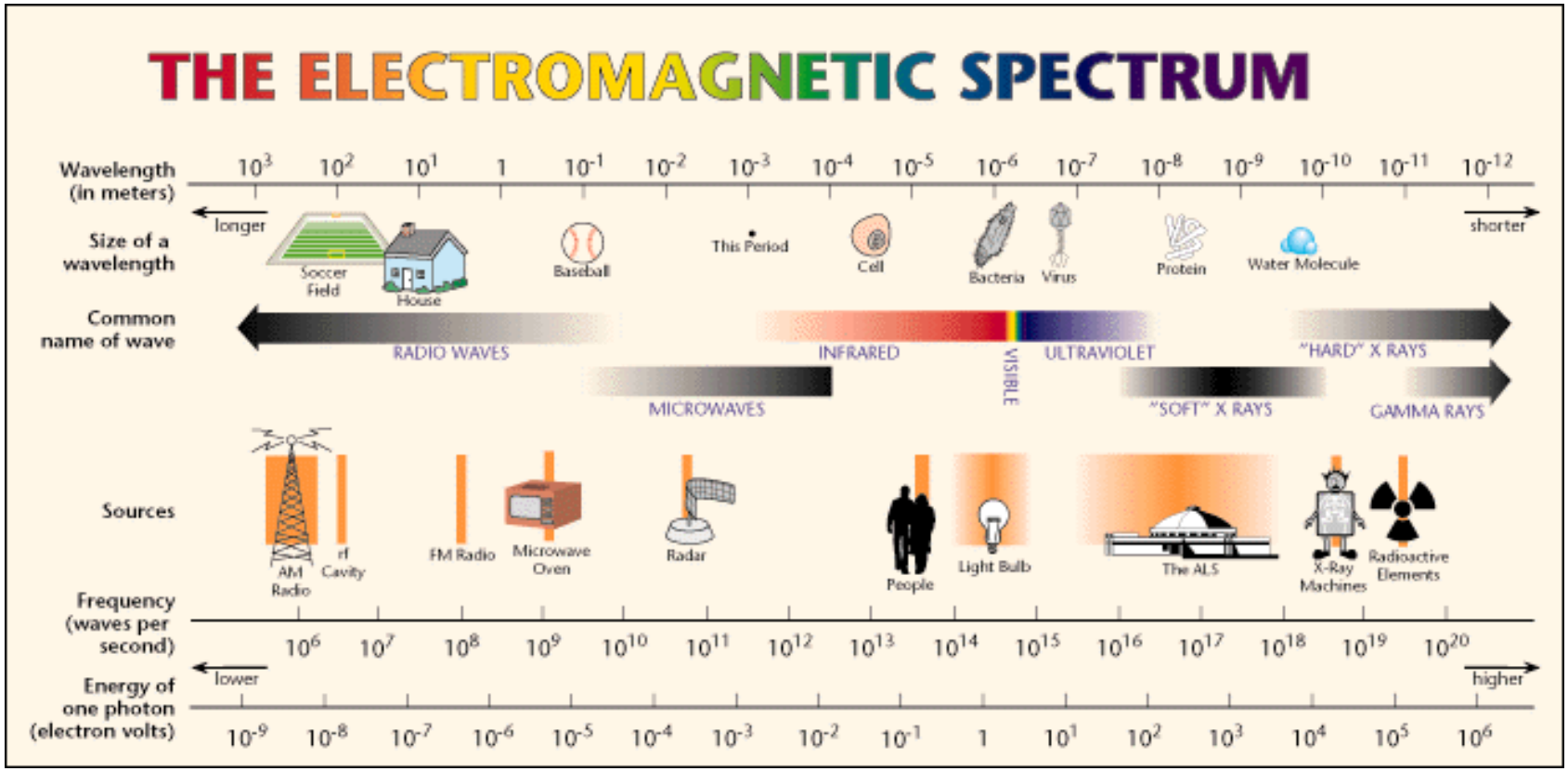
Examples: radiation, TV & radio waves, X-rays, microwaves, lasers, energy from the sun, visible light

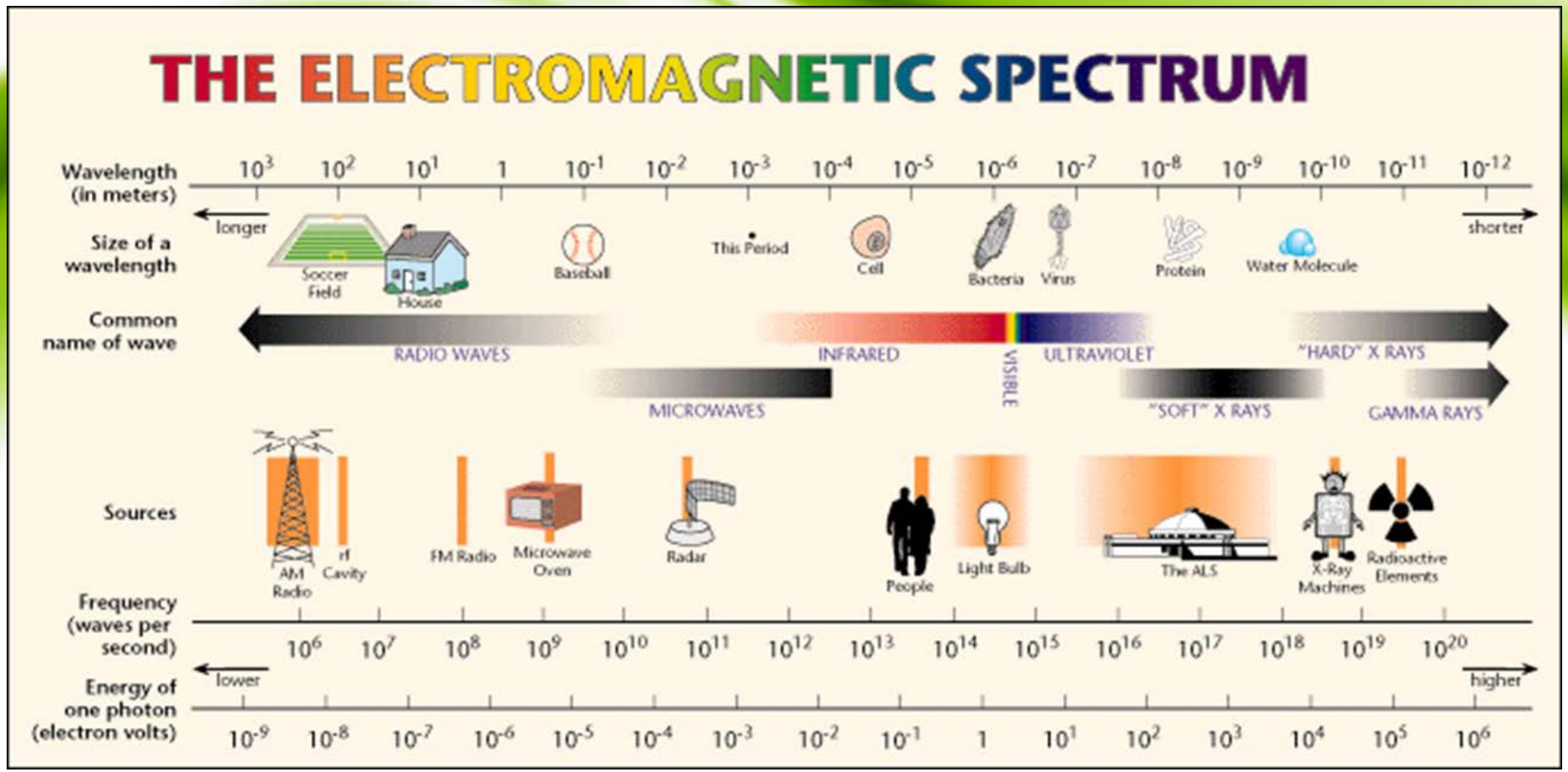
Electromagnetic waves are considered transverse waves because they have similar characteristics; therefore, they have the same parts.

More to come on Electromagnetic waves…

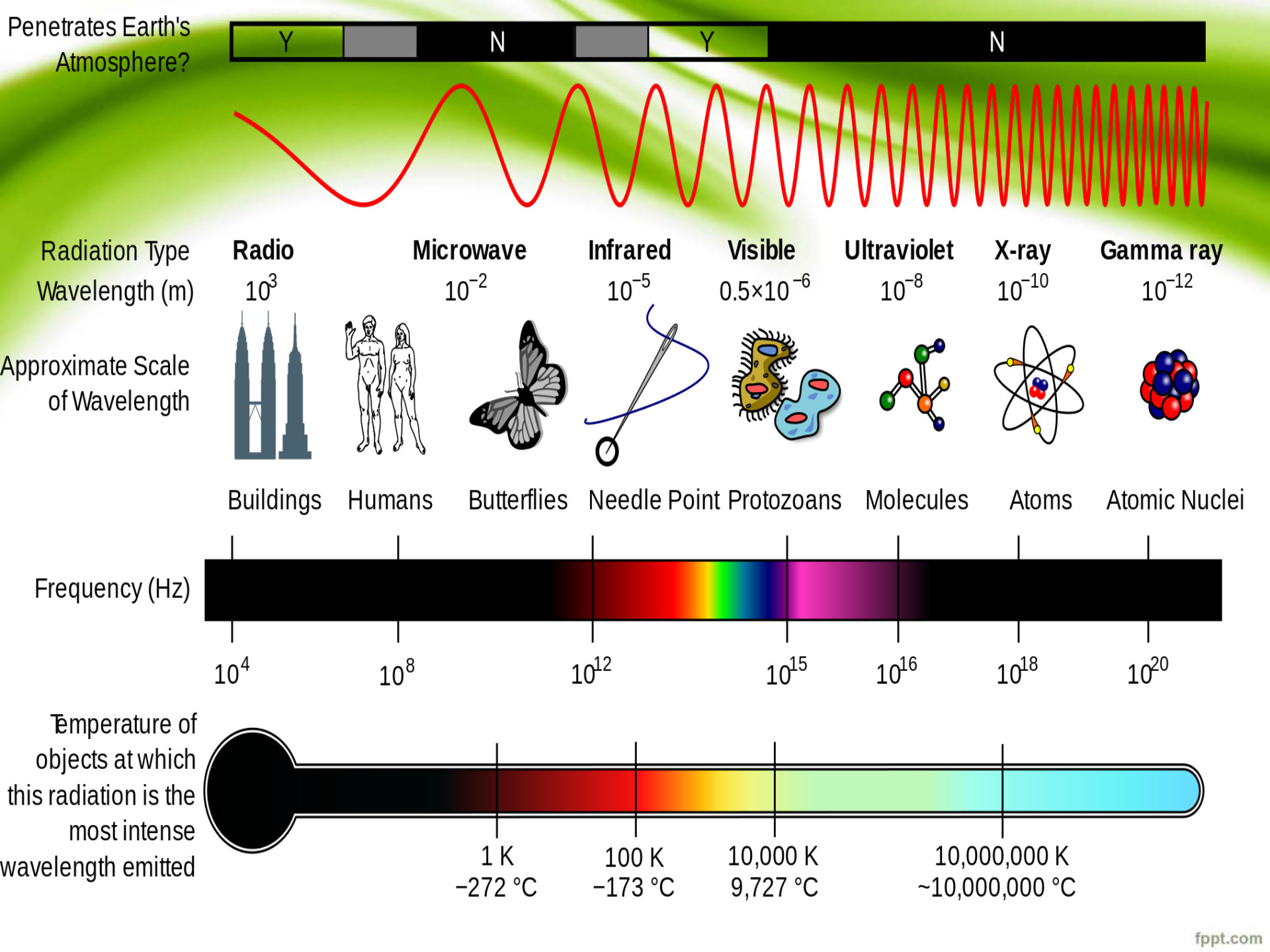
Electromagnetic Spectrum

The electromagnetic spectrum illustrates the range of wavelengths and frequencies of electromagnetic waves.





1. Which of the following has the longest wavelength? Microwave Gamma Ray Radio Wave Ultraviolet Light
2. Which of the following has the highest frequency? Microwave Gamma Ray Radio Wave Ultraviolet Light
3. Compare the wavelength and frequency of a radio wave to the wavelength and frequency of a gamma ray.


Penetrates Earth's Atmosphere?
Y
N
Y
N
Radiation Type
Radio
Microwave
Infrared
Visible
Ultraviolet
X-ray
Gamma ray
Wavelength (m)
10^{3}
10^{-2}
10^{-5}
0.5×10^{-6}
10^{-8}
10^{-10}
10^{-12}
Approximate Scale of Wavelength
Buildings
Humans
Butterflies
Needle Point
Protozoans
Molecules
Atoms
Atomic Nuclei
Frequency (Hz)
10^{4}
10^{8}
10^{12}
10^{15}
10^{16}
10^{18}
10^{20}
Temperature of objects at which this radiation is the most intense wavelength emitted
1 K
−272 °C
100 K
−173 °C
10,000 K
9,727 °C
10,000,000 K
~10,000,000 °C

Types of Waves Quad Clusters

1. Sound Wave Ocean Wave Wave on a rope Stadium Wave

Which one does not belong? Why? _____

_____

2. Microwave X-ray Laser Sound Wave

Which one does not belong? Why? _____

_____

3. Radiation Radio Signal Light Earthquake

Which one does not belong? Why? _____

_____

4. Sound Wave Ripple in water Guitar String TV Signal

Which one does not belong? Why? _____

_____

Frequency is the number of wavelengths that pass a point in a given amount of time.

If the wavelength of a wave decreases (less space between) than the frequency increases.

As the wavelength of a wave increases (more space between), its frequency decreases.

Waves

Definition: Rhythmic disturbances that carry energy without carrying matter

Mechanical Waves

Definition: waves that need matter (medium) to transfer energy

Matter Used: Medium

Types of Mediums: solid, liquid, gas; air; water; particles; strings

Electromagnetic Waves

Definition: waves that DO NOT NEED matter to transfer energy; electromagnetic waves do not need a medium, but they can go through matter, such as air, water, and glass

Transverse Wave

Definition: a mechanical wave in which energy causes the matter in the medium to move up and down or back and forth at right angles to the direction the wave travels.

Examples: waves in water

Parts: Crest, Trough, Wavelength, Amplitude

Image: 

Compressional (Longitudinal) Wave

Definition: a mechanical wave in which matter in the medium moves forward and backward along the same direction that the wave travels.

Examples: sound waves

Parts: Compression, Rarefaction

Image: 

Definition: a transverse wave in which matter (medium) is not required to transfer energy

Examples: radiation; TV & radio waves; X-rays; microwaves; lasers; energy from sun; visible light

Parts: Crest, Trough, Wavelength, Amplitude

Image: