

# Introduction to Waves

Essential Question:  
What are the characteristics  
of mechanical and  
electromagnetic waves?  
(S8P4a,d,f)

Use the PowerPoint to fill in the Waves graphic organizer as we discuss the characteristics of waves

Name \_\_\_\_\_ Date \_\_\_\_\_ Period \_\_\_\_\_

**Waves**

Definition: \_\_\_\_\_

**Mechanical Waves**

Definition: \_\_\_\_\_

Matter Used Called: \_\_\_\_\_

Types of Mediums: \_\_\_\_\_

**Transverse Wave**

Definition: \_\_\_\_\_

Examples: \_\_\_\_\_

Parts: \_\_\_\_\_

Image: \_\_\_\_\_

**Compressional (Longitudinal) Wave**

Definition: \_\_\_\_\_

Examples: \_\_\_\_\_

Parts: \_\_\_\_\_

Image: \_\_\_\_\_

**Electromagnetic Waves**

Definition: \_\_\_\_\_

Definition: \_\_\_\_\_

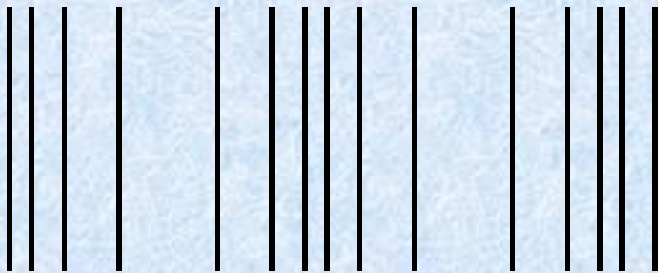
Examples: \_\_\_\_\_

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:

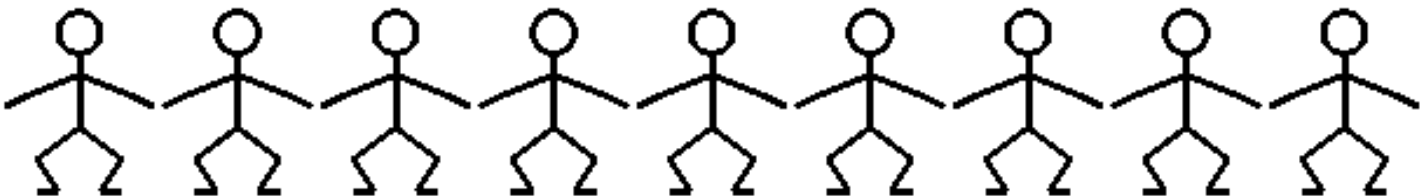
Examples: Sound waves, ocean  
waves, ripples in water,  
earthquakes, wave of people at  
a sporting event



# Some examples of Mechanical Waves



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# Distributed Summarizing

Answer the following question with an elbow partner:

Look back at the examples of mechanical waves. If waves transfer energy, which type of mechanical wave do you think transferred the most energy? Why?

# Transverse (Mechanical) Waves



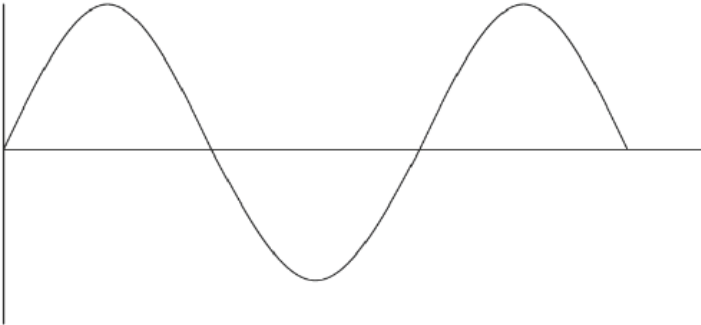
- Energy causes the matter in the medium to move up and down or back and forth at right angles to the direction the wave travels.
- Examples: waves in water
- [http://www.stmary.ws/highschool/physics/home/notes/waves/intro/video/Creating\\_a\\_Transverse\\_Wave.mov](http://www.stmary.ws/highschool/physics/home/notes/waves/intro/video/Creating_a_Transverse_Wave.mov)
- <http://www.stmary.ws/highschool/physics/home/notes/waves/intro/wavesVibration.html>



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:


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**Compressional (Longitudinal) Wave**

Rarefaction:



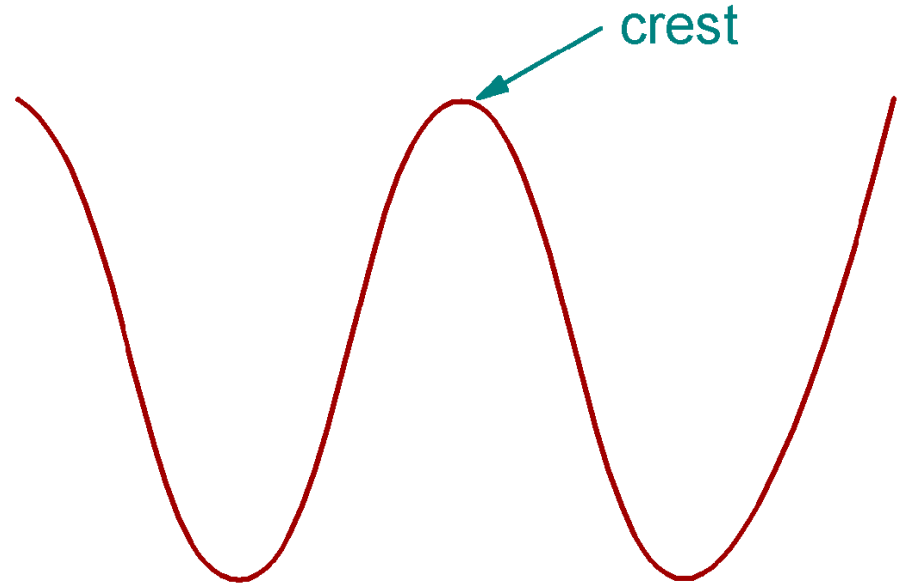
Compression:



# Parts of a Transverse Wave

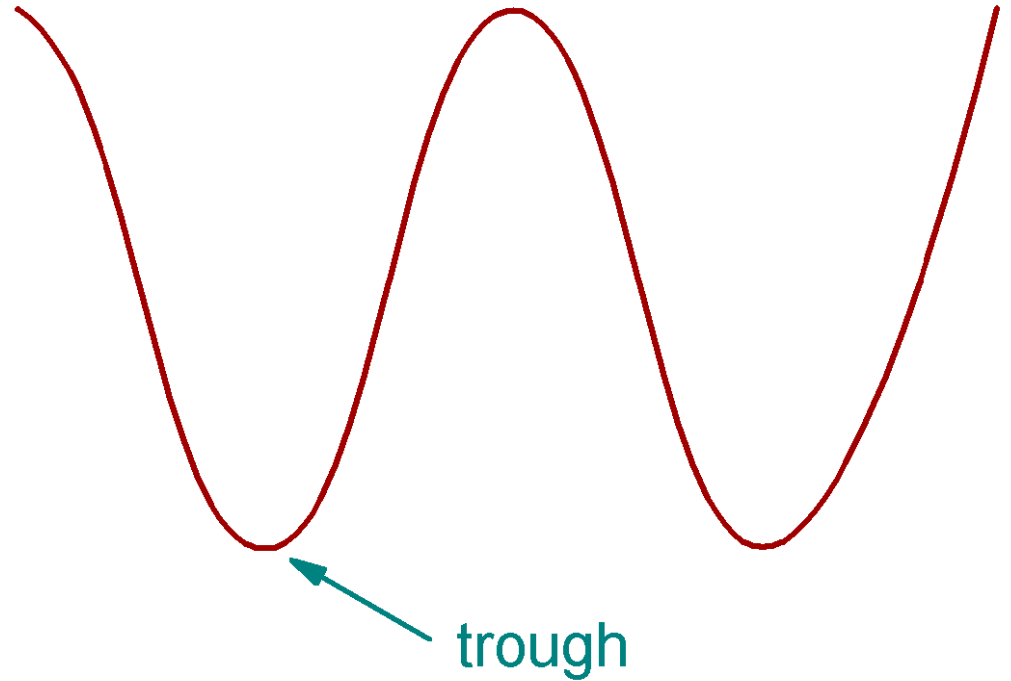


The **crest** is the highest point on a wave.



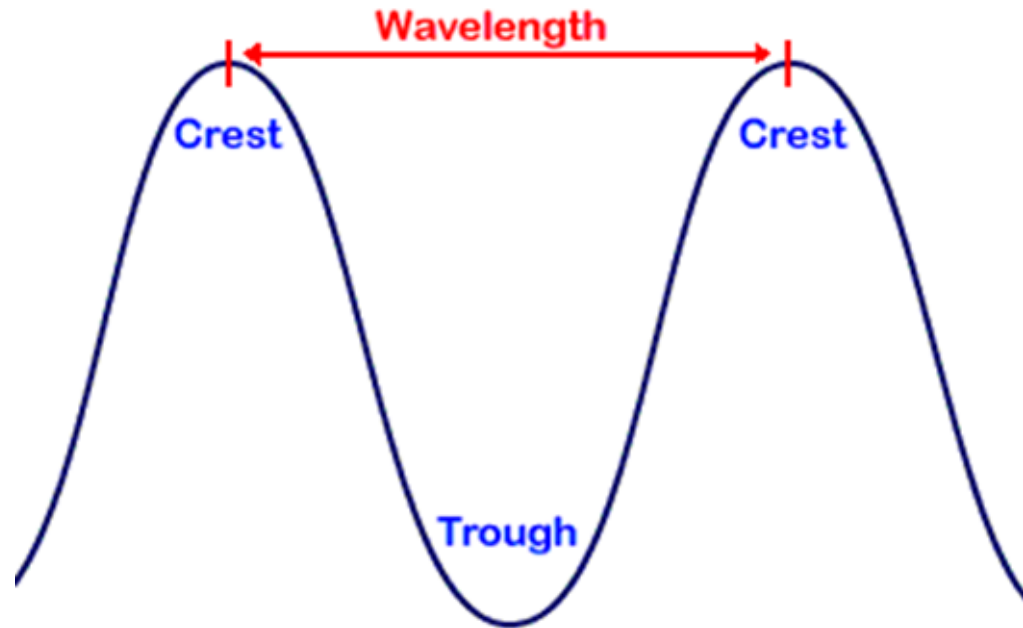
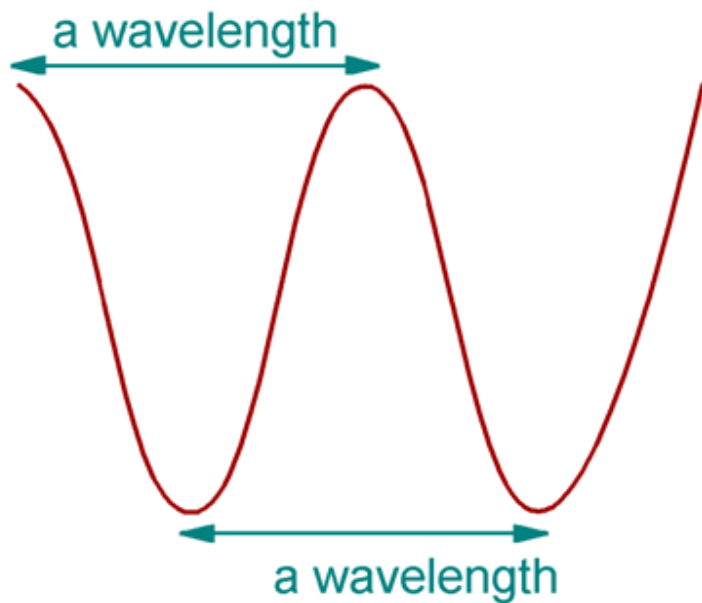
# Parts of a Transverse Wave

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



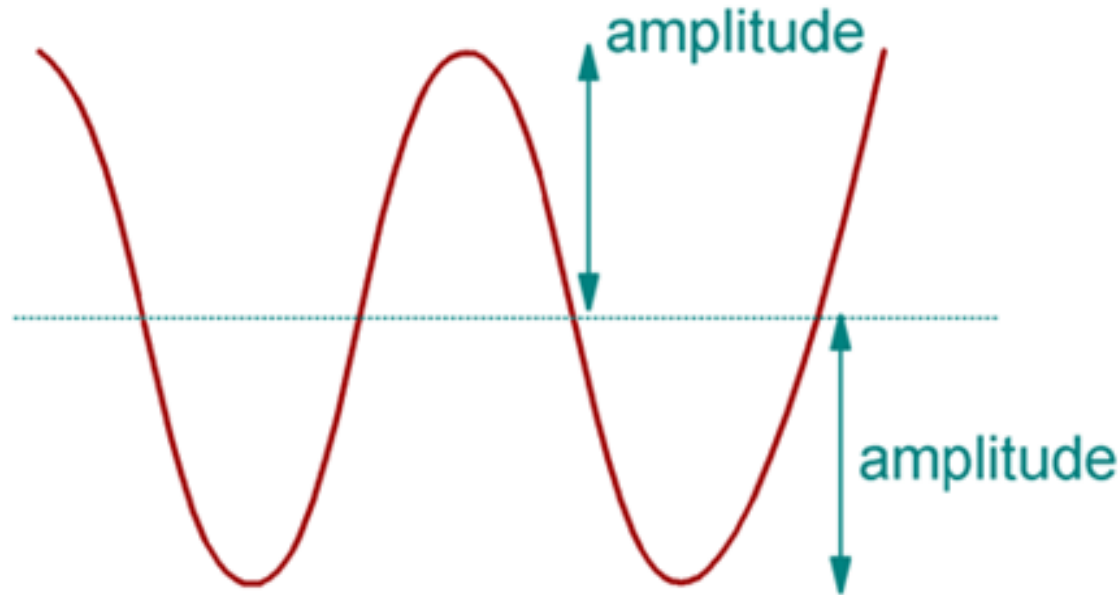
# Parts of a Transverse Wave

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



# Parts of a Transverse Wave

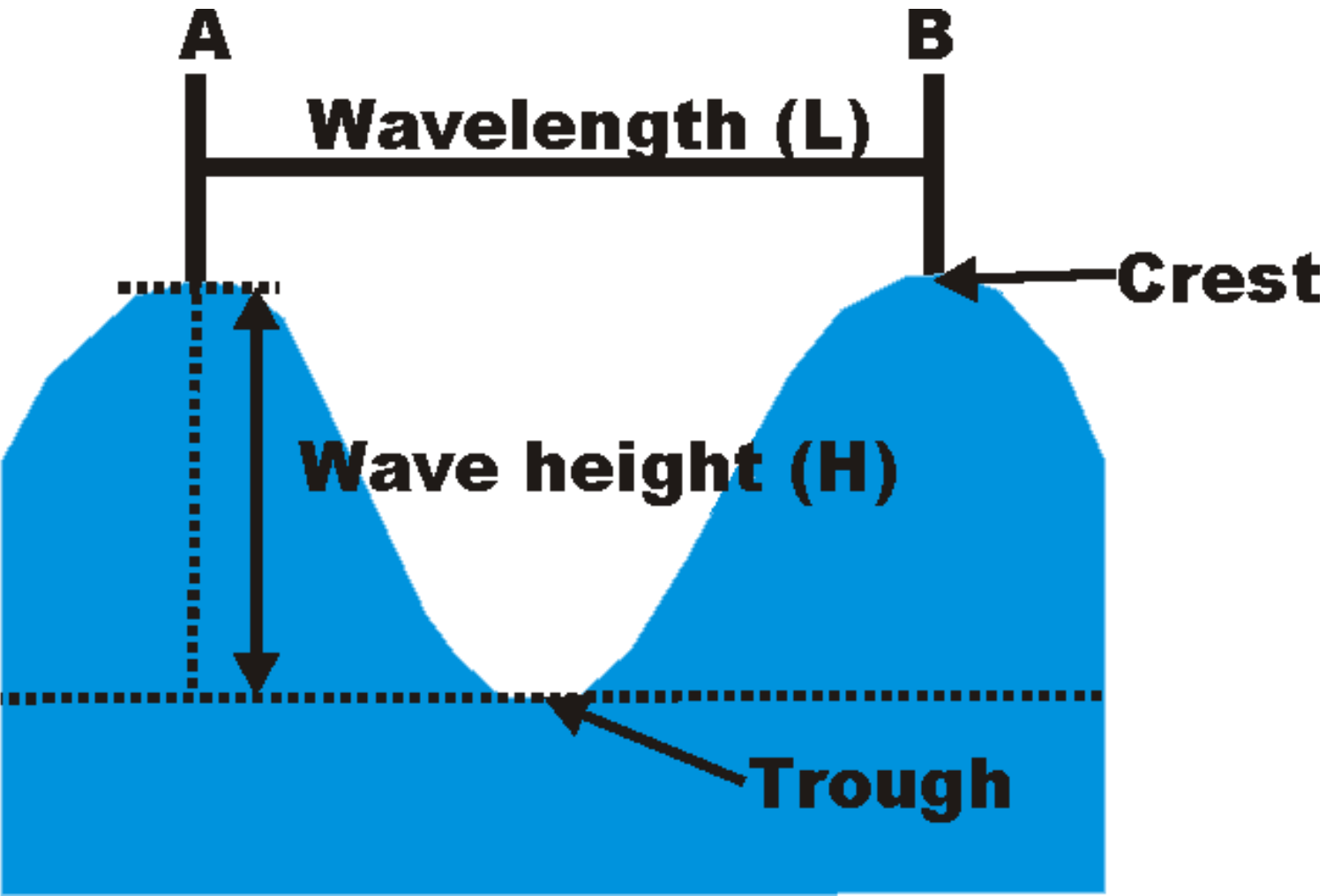
The **amplitude** is the peak (greatest) value (either positive or negative) of a wave. The distance from the undisturbed level to the trough or crest.

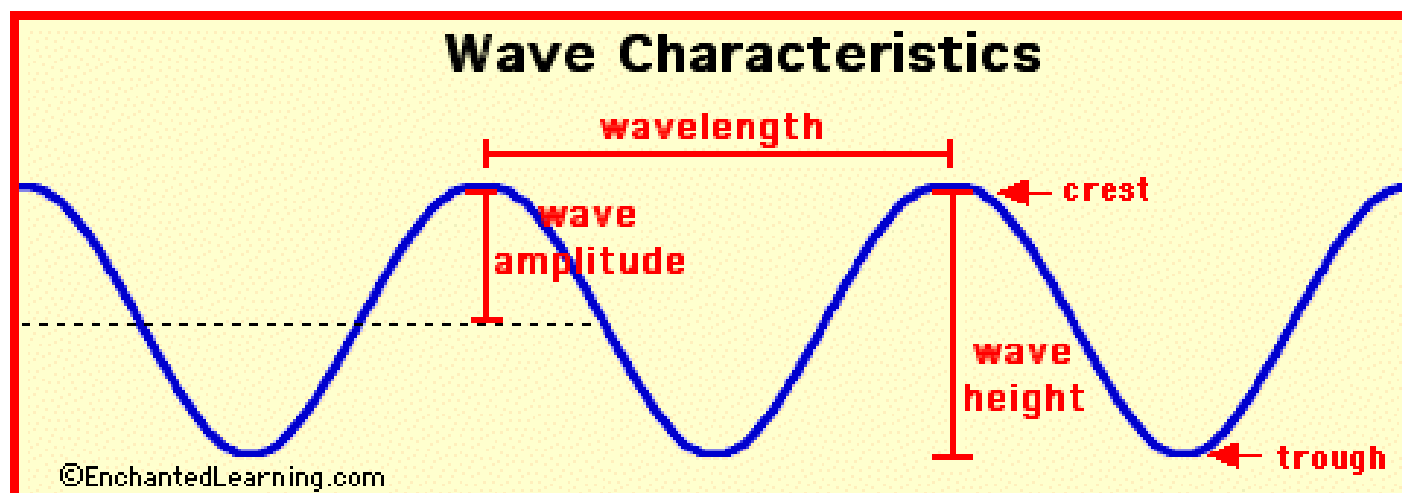
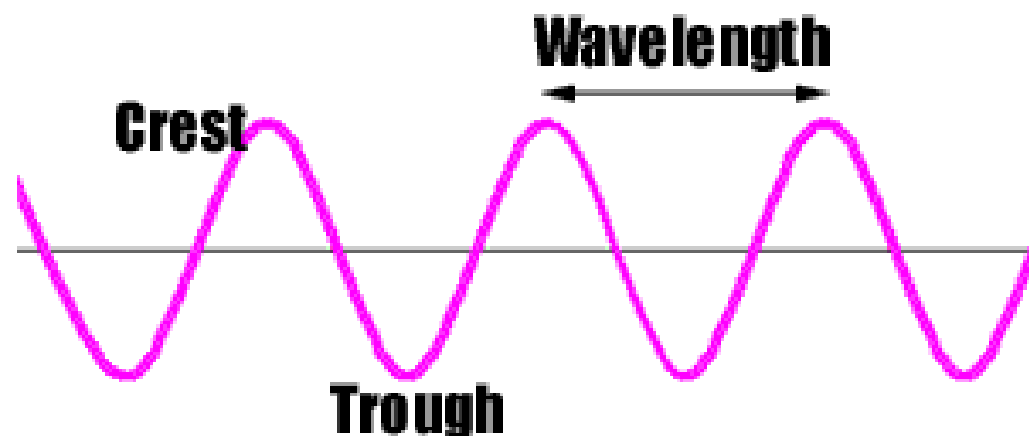
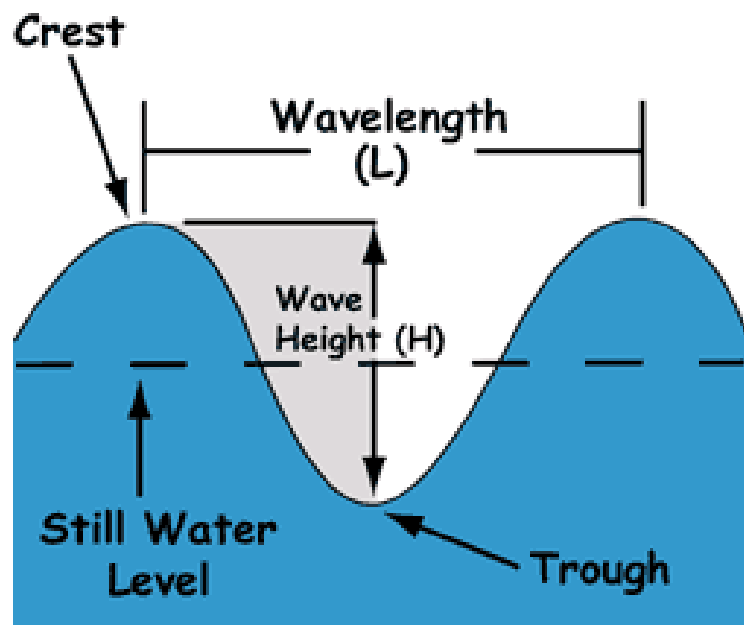




# An ocean wave is an example of a mechanical transverse wave

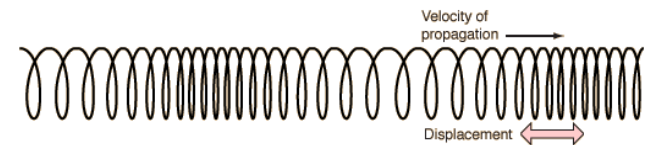
WAVE SIMULATOR



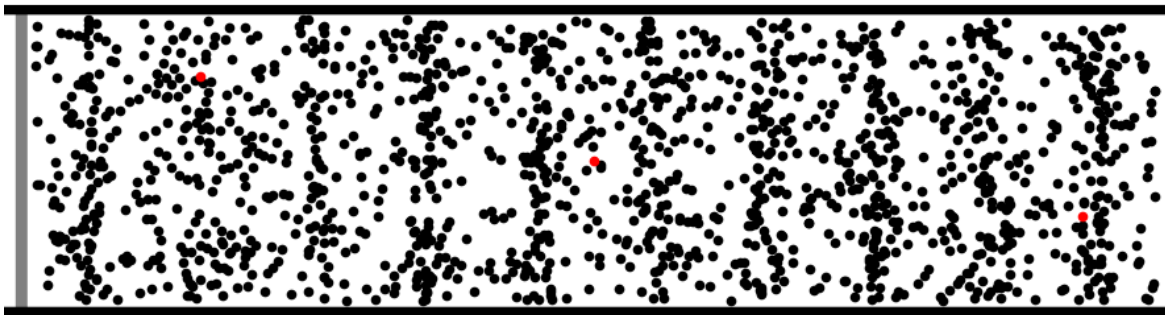


# Compressional Wave (longitudinal)

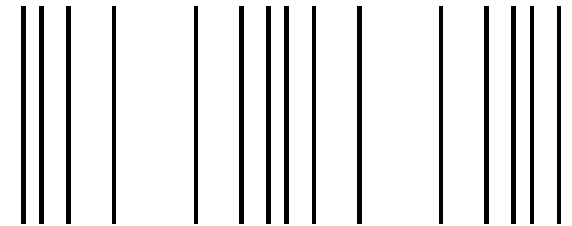
- A mechanical wave in which matter in the medium moves forward and backward along the same direction that the wave travels.
- Ex. Sound waves



A slinky is a good illustration of how a compressional wave moves



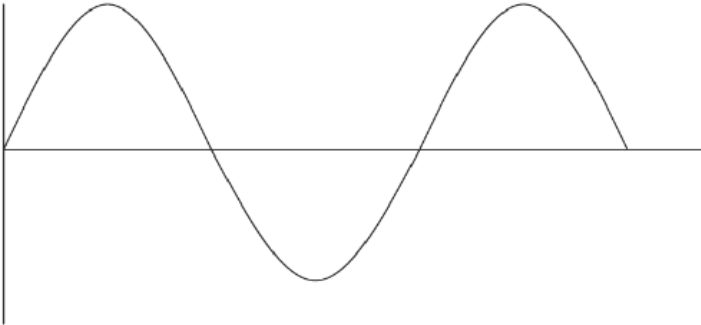
©2011, Dan Russell



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:


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**Compressional (Longitudinal) Wave**

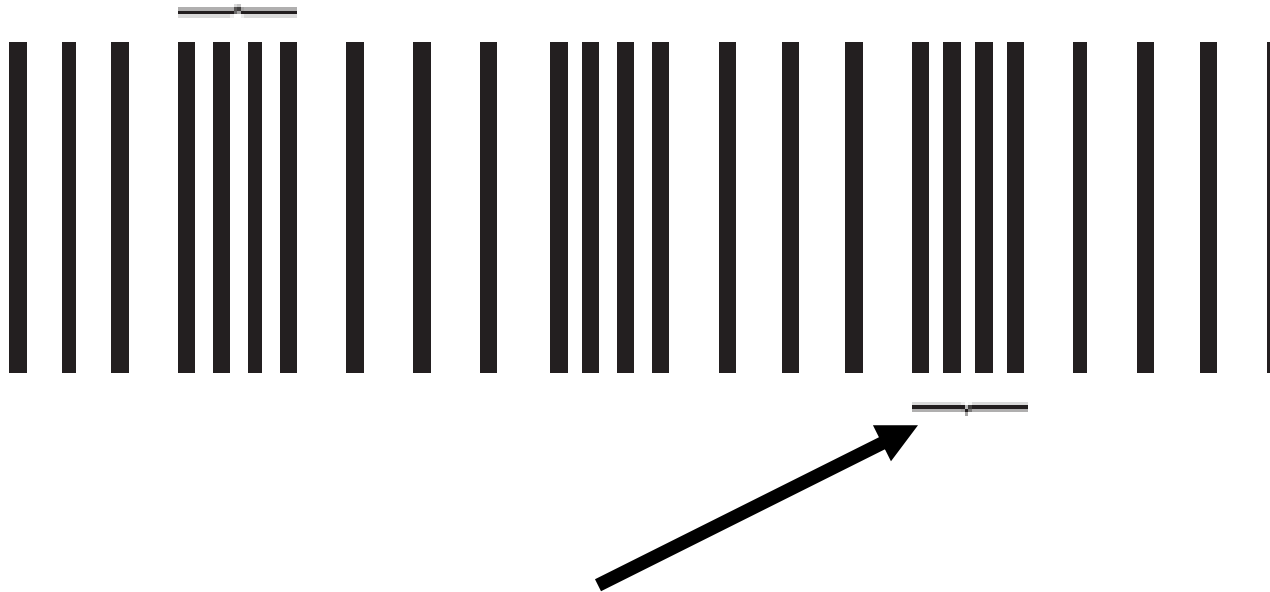
Rarefaction:



Compression:



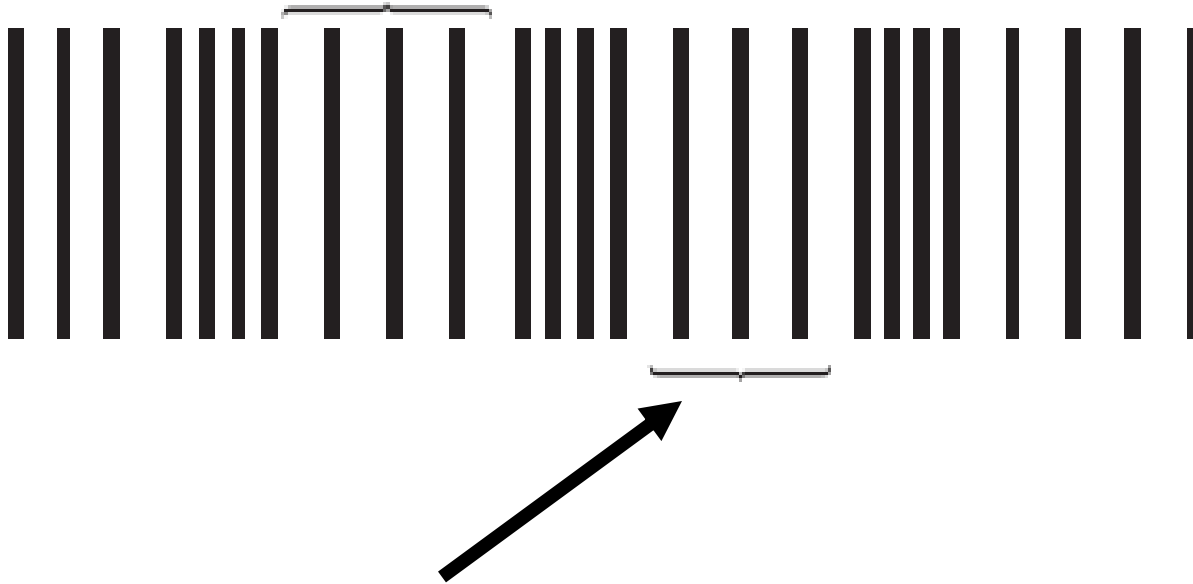
# Parts of a Compressional Wave (Longitudinal)



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

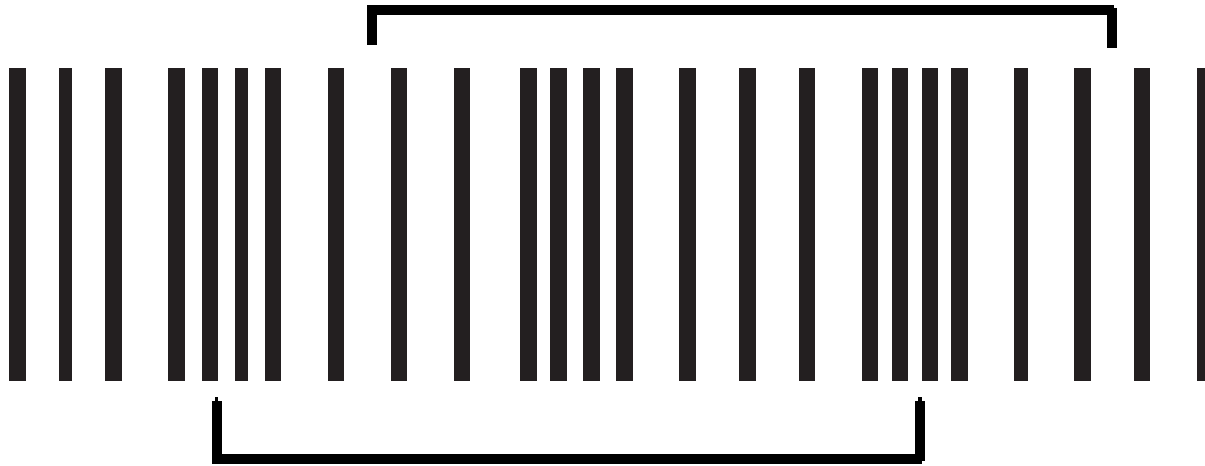


# Parts of a Compressional Wave (Longitudinal)



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.

Molecules that  
make up air

Compression

Compression

Rarefaction

# Animation of Transverse and Longitudinal (Compression) Waves:

<http://www.stmary.ws/highschool/physics/home/animations3/waves/wavemotion.html>

# 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

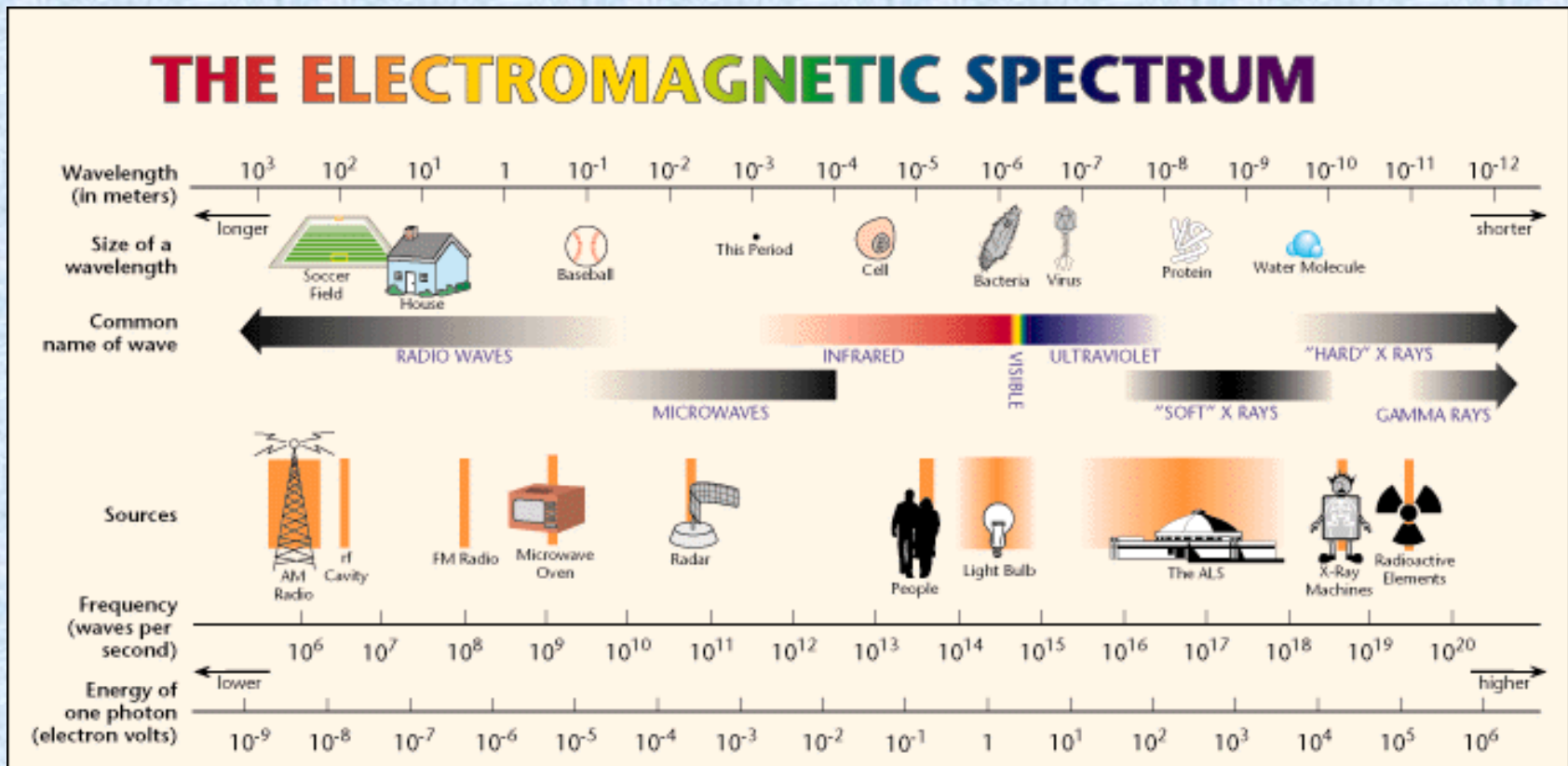
Electromagnetic waves are considered  
transverse waves because they have  
similar characteristics; therefore, they  
have the same parts.

More to come on Electromagnetic waves...

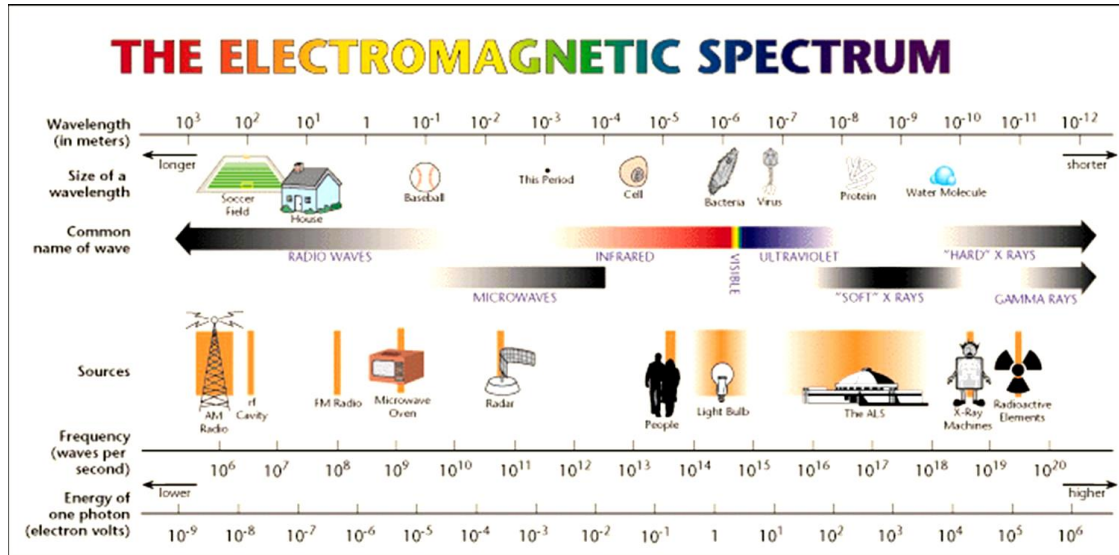


# Electromagnetic Spectrum

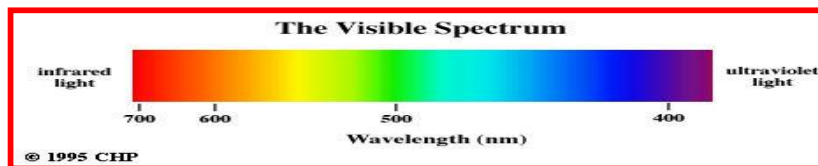
The electromagnetic spectrum illustrates the range of wavelengths and frequencies of electromagnetic waves.



# Electromagnetic Spectrum Sheet



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



- Compare the wavelength of infrared light to the wavelength of ultraviolet light.

# Summarizing Strategy

## 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? \_\_\_\_\_