ENERGY OF WAVES

Wave Basics

When a disturbance transfers energy from one place to another, this is referred to as a **wave**. Most waves, except for electromagnetic waves, require a substance or **medium** through which they can travel. This medium could be a solid, liquid or vapor like air. Waves requiring a medium are called **mechanical waves.** In these waves, energy is transferred from particle to particle, as the particles bump into each other and pass along the waves of energy. Basically, the source of energy is causing the particles in the medium to vibrate. Waves of energy travel through the particles of the medium, but they don't carry the medium with them.

LESSON CHECKPOINT: What is the relationship between a medium and a wave?

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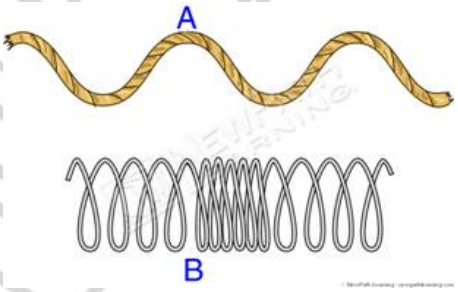
A wave tha rection in which the ure below illustrates

Waves that move the medium parallel to the direction of the wave are called **longitudinal**. The picture of the spring illustrates a typical longitudinal wave.

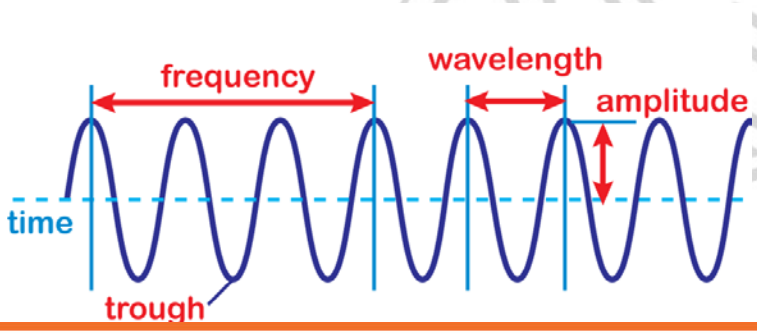


In the diagram above, energy creates areas of **compression** where particles of the medium are brought close together. Areas of the wave where the mediums particles are spread out are called **rarefactions**.

LESSON CHECKPOINT:
What are the two different types of mechanical waves?

The term **amplitude** is used to describe the maximum distance that the medium particles move away from their resting position when a wave is passing through. In a transverse wave, amplitude would describe how much up and down movement the particles exhibit and, in a longitudinal wave, it describes the amount of compression and rarefaction that occurs.

A **wavelength** is the distance between two corresponding locations on a wave.



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LESSON CHECKPOINT:
What is the difference between the amplitude, wavelength, and frequency of a wave?

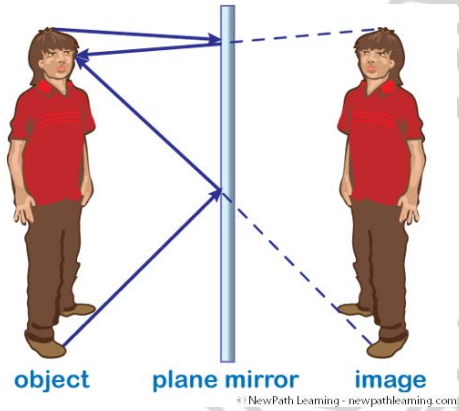
Waves travel at different speeds. To calculate the **speed** of a wave, use the formula below:

Speed = wavelength x frequency

Interactions of Waves

Waves interact in several different ways.

- One type of interaction is **reflection**. In this case, when a wave makes contact with an object that it can not pass through, it bounces off. Light reflecting off a mirror is a good example of this.



- Another type of interaction is called **refraction**, which is the bending [illegible] has spread [illegible] kes contact [illegible]

- Another type of interaction is called **diffraction**. This accounts for how waves spread out through openings or how waves go around corners.

- The final type of interaction is called **interference**. Sometimes waves combine in a constructive manner to make a wave of greater amplitude. Other times, waves can combine in a destructive manner to decrease the overall amplitude of the new wave. See the diagram below for an illustration of this.

LESSON CHECKPOINT: What are the ways that waves interact with each other?

Seismic Waves

Waves that are caused by earthquakes are called **seismic** waves. The movement and breaking of rock in the Earth's crust causes earthquakes. When an earthquake occurs, energy gets released through rock as both transverse and longitudinal waves. The transverse waves are called **S** waves and the longitudinal waves are referred to as **P** waves. Earthquakes under the ocean cause the ocean crust to shift and break, and large amounts of water can be displaced, creating large waves of water called tsunamis. These waves of water typically have very long wavelengths, often several hundred kilometers long. Tsunamis are powerful and can be very destructive when they reach shorelines.

LESSON CHECKPOINT:

What waves cause earthquakes?