

Characteristics of Waves

What Are Waves?
Properties of Waves
Interactions of Waves
Seismic Waves





What Are Waves?

- What causes mechanical waves?
 - Mechanical waves are produced when a source of energy causes a medium to vibrate.
 - Wave: a disturbance that transfers energy from place to place
 - Energy: the ability to do work
 - Medium: the material through which a wave travels
 - Mechanical wave: a wave that requires a medium through which to travel
 - Vibration: a repeated back-and-forth or up-and-down motion



What Are Waves?

- How are the two types of waves classified?
 - Mechanical waves are classified by how they move.



What Are Waves?

- What are two types of waves?
 - There are two types of mechanical waves: transverse waves and longitudinal waves.
 - Transverse wave: a wave that moves the medium in a direction perpendicular to the direction in which the wave travels
 - Crest: the highest part of a transverse wave
 - Trough: the lowest part of a transverse wave
 - Longitudinal wave: a wave that moves the medium in a direction parallel to the direction in which the wave travels
 - Compression: the part of a longitudinal wave where the particles of the medium are close together
 - Rarefaction: the part of a longitudinal wave where the particles of the medium are far apart



Properties of Waves

- What are the basic properties of waves?
 - The basic properties of waves are amplitude, wavelength, frequency, and speed.
 - Amplitude: the maximum distance the particles of a medium move away from their rest position
 - Wavelength: the distance between two corresponding parts of a wave
 - Frequency: the number of complete waves that pass a given point in a certain amount of time



Properties of Waves

- How is a wave's speed related to its wavelength and frequency?
 - The speed, wavelength, and frequency of a wave are related to one another by a mathematical formula: **Speed = Wavelength x Frequency**
 - Hertz (Hz): unit of measurement for frequency



Interactions of Waves

- How do reflection, refraction, and diffraction change a wave's direction?
 - When an object or a wave hits a surface through which it cannot pass, it bounces back.
 - Reflection: the bouncing back of an object or a wave when it hits a surface through which it cannot pass
 - Law of reflection: the rule that the angle of reflection equals the angle of incidence



Interactions of Waves

- How do reflection, refraction, and diffraction change a wave's direction?
 - When a wave enters a new medium at an angle, one side of the wave changes speed before the other side, causing the wave to bend.
 - Refraction: the bending of waves as they enter a new medium at an angle



Interactions of Waves

- How do reflection, refraction, and diffraction change a wave's direction?
 - When a wave moves around a barrier or through an opening in a barrier, it bends and spreads out.
 - Diffraction: the bending of waves as they move around a barrier or pass through an opening



Interactions of Waves

- What are the different types of interference?
 - There are two types of interference: constructive and destructive.
 - Interference: the interaction between waves that meet
 - Constructive interference: the interference that occurs when waves combine to make a wave with a larger amplitude
 - Destructive interference: the interference that occurs when waves combine to make a wave with a smaller amplitude



Interactions of Waves

- How do standing waves form?
 - If the incoming wave and a reflected wave have just the right frequency, they produce a combined wave that appears to be standing still.
 - Standing wave: a wave that appears to stand in one place, even though it is really two waves interfering as they pass through each other
 - Node: a point of zero amplitude in a standing wave
 - Antinode: a point of maximum amplitude on a standing wave
 - Resonance: the increase in the amplitude of a vibration that occurs when external vibrations match an object's natural frequency



Seismic Waves

- What are the types of seismic waves?
 - Seismic waves include P waves, S waves, and surface waves.
 - Seismic wave: a wave produced by an earthquake
 - P wave: a longitudinal seismic wave
 - S wave: a transverse seismic wave
 - Surface wave: a combination of a longitudinal wave and a transverse wave that travels along the surface of a medium
 - Tsunami: a huge surface wave on the ocean caused by an underwater earthquake



Seismic Waves

- How does a seismograph work?
 - A seismograph records the ground movements caused by seismic waves as they move through Earth.
 - Seismograph: an instrument used to detect and measure earthquake waves