Name_____ Period _____

Wave Notes

A wave is a disturbance which moves through a medium.

The **amplitude** is the height of the wave.

Science 8



The wavelength is the distance from one wave top, or crest to the next.



The phase shift describes how far to the left or right the wave slides.

Rarefaction is the name given to the region where the coils of the spring are pushed together.

Frequency is the number of complete cycles in one second.

The **period** of a wave is the time taken for one complete cycle.

Waves transmit energy without transmitting matter.

This means that waves can move energy from one place to another without moving any matter from one place to another.

The amount of energy which a wave has depends on its amplitude.

Most waves move through media (matter) but only move it backwards and forwards (longitudinal) or side to side (transverse) while the wave passes.

After the wave has gone, the matter is back where it started but energy has been carried by the wave from its origin (where it begins) to its destination (where it finishes).

An electromagnetic wave does not need any media to get it from its origin to its destination. It can travel through a vacuum (nothing) so these waves can travel from our sun other stars to Earth and other planets through space

Types of Waves:

Mechanical waves require a material medium to travel (air, water, ropes). These waves are divided into three different types.

Transverse waves cause the medium to move perpendicular to the direction of the wave. (up and down)



Longitudinal waves (sometimes called compressional waves) cause the medium to move parallel to the direction of the wave. (side to side)

Examples: sound, P-waves



Surface waves are both transverse waves and longitudinal waves mixed in one medium.

Electromagnetic waves do not require a medium to travel (light, radio).

Measuring Waves:

The **wavelength** can be measured as the distance between the center of two compressions, crests, or troughs.

The **amplitude** of the wave is measured from the crest (or trough) to the midpoint . Amplitude is a measure of how much energy the wave has.

Frequency is defined as the number of complete cycles in one second.

Hertz is the unit of frequency (symbol Hz). 1 Hertz = 1 cycle per second.

The period of a wave is defined as the time taken for one complete cycle.



Electromagnetic Waves

Electromagnetic Waves - transverse waves that have some electrical properties and some magnetic properties

An electromagnetic wave consists of changing electric and magnetic fields.

All electromagnetic waves travel at the same speed, but they have different wavelengths and different frequencies.

Microwaves

When you turn on your microwave it gives off electromagnetic waves that bounce around inside the oven. These waves bounce off and penetrate the food. Water molecules in the food absorb the energy from the microwaves. This absorption of energy causes the food to get hot.

Radar

Radar stands for RAdio Detection And Ranging

A radar device sends out short pules of radio waves. The waves are reflected by the objects that they strike. A receiver then detects the reflected waves and measures the time it takes for them to come back. This allows the receiver to calculate the distance of the object.







Sound is a disturbance that travels through a medium as a longitudinal wave. Sound is made by vibrations in materials making wave-like disturbances that spread away from the source.

Sound in Different Mediums

Sound can travel through solids and liquids. Sound can only travel if there is a medium to transmit the compressions and rarefactions.

Sound <u>Cannot</u> Travel in a Vacuum.

Sound Bends

Sound waves spread out, or diffract. Because of diffraction, you can hear sounds around corners. Waves passing a corner spread out as they pass it.

The speed of sound depends on the elasticity, density, and temperature of the medium.

Frequency - the number of complete waves that pass a given point in a certain period of time

Resonance - the increase in the amplitude of vibration that occurs when external vibrations match the object's natural frequency.

Doppler Effect - the apparent change in frequency of a sound as the source moves in relation to the listener



The Doppler Effect for a Moving Sound Source

<u>Light</u>

When light strikes an object, the light can be reflected, absorbed, or transmitted.

You can see most objects because light reflects, or bounces, off them.

Reflection - the bouncing back of a wave when it hits a surface through which it cannot pass

White light is a mixture of many wavelengths. When you separate, or refract white light you can see all of the colors of the visible spectrum.

Refraction + the bending of waves as they enter a different medium

Prisms can separate light. When white light enters a prism, each wavelength is refracted by a different amount.



Colors of the visible spectrum (makes up white light). Red, Orange, Yellow, Green, Blue, Indigo, Violet - ROYGBIV

Your eyes see what colors (wavelengths) are reflected into your eyes. If an object appears blue it is because the blue wavelength is being reflected into your eyes.

When you see an object that appears white, it is reflecting all of the colors of the visible spectrum to you.

When you see an object that appears black, it is absorbing all of the colors of the visible spectrum.