**Guided Notes: Properties of Waves**

**Big Idea**:

A wave is a \_\_\_\_\_\_\_\_\_\_ pattern with several key properties that can be measured and described.

**Key Concepts**:

• \_\_\_\_\_\_\_\_\_\_ is the distance between one crest of a wave to the next crest.

• \_\_\_\_\_\_\_\_\_\_ refers to the number of times the wave pattern repeats in a given amount of time.

• As frequency increases, wavelength \_\_\_\_\_\_\_\_\_\_.

• \_\_\_\_\_\_\_\_\_\_ is the maximum distance of the wave from the rest position.

• The \_\_\_\_\_\_\_\_\_\_ is the top of the wave.

• \_\_\_\_\_\_\_\_\_\_ refers to the rest position or starting point of a wave.

**Real World Examples**:

1. Using a jump rope to create waves: Moving the rope up and down faster will increase the \_\_\_\_\_\_\_\_\_\_ of the waves, while the \_\_\_\_\_\_\_\_\_\_ between crests will decrease.

2. Sound waves from music: The \_\_\_\_\_\_\_\_\_\_ of sound waves determines the pitch of the music you hear. Higher frequency waves produce higher pitched sounds, while lower frequency waves produce lower pitched sounds.

**Guided Notes: Different Types of Waves**

**Big Idea**:

Different types of waves have common characteristics but also \_\_\_\_\_\_\_\_\_\_ properties that distinguish them from each other.

**Key Concepts**:

• Waves carry \_\_\_\_\_\_\_\_\_\_ and cause particles in matter to vibrate or move.

• \_\_\_\_\_\_\_\_\_\_ waves originate from movement within the Earth and include p-waves and s-waves.

• \_\_\_\_\_\_\_\_\_\_ waves compress and expand the medium they travel through.

• Seismic waves and sound waves are examples of \_\_\_\_\_\_\_\_\_\_ waves that require a medium to transfer energy.

• \_\_\_\_\_\_\_\_\_\_ waves travel along the surface of water with a circular motion.

• \_\_\_\_\_\_\_\_\_\_ waves can travel through a vacuum or matter and include radio waves, microwaves, visible light, X-rays, etc.

• The electromagnetic spectrum organizes electromagnetic waves based on their \_\_\_\_\_\_\_\_\_\_.

**Real World Examples**:

1. Listening to music through headphones: The \_\_\_\_\_\_\_\_\_\_ waves from your device travel through the air in your ear canal to vibrate your eardrum.

2. Getting sunburned at the beach: The sun emits \_\_\_\_\_\_\_\_\_\_ waves, including ultraviolet rays that can damage your skin if you don't wear sunscreen.

**Guided Notes: Modeling Waves**

**Big Idea**:

Waves can be modeled mathematically using properties such as \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_.

**Key Concepts**:

• A wave is a \_\_\_\_\_\_\_\_\_\_ that transfers energy.

• The highest point of a wave is called the \_\_\_\_\_\_\_\_\_\_, while the lowest point is the \_\_\_\_\_\_\_\_\_\_.

• \_\_\_\_\_\_\_\_\_\_ is the distance from crest to crest or trough to trough.

• \_\_\_\_\_\_\_\_\_\_ is the distance from the point of equilibrium to the crest.

• \_\_\_\_\_\_\_\_\_\_ measures how many wavelengths pass a point in one second.

• The unit of measurement for frequency is \_\_\_\_\_\_\_\_\_\_.

• The formula v = f × λ shows the relationship between wave \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_.

• \_\_\_\_\_\_\_\_\_\_ waves, like sound, have particles that move back and forth in the same direction as the wave.

• \_\_\_\_\_\_\_\_\_\_ waves, like light, have particles that move perpendicular to the wave direction.

**Real World Examples**:

1. Playing a guitar: When you pluck a guitar string, it vibrates to produce a sound wave. The \_\_\_\_\_\_\_\_\_\_ of the wave determines the pitch of the note, while the \_\_\_\_\_\_\_\_\_\_ affects how loud the note sounds.

2. Listening to the radio: Radio stations broadcast at different \_\_\_\_\_\_\_\_\_\_. AM radio uses \_\_\_\_\_\_\_\_\_\_ (kHz), while FM radio uses \_\_\_\_\_\_\_\_\_\_ (MHz).

**Guided Notes: Light and Sound Waves**

**Big Idea**:

Light waves and sound waves have different properties and behave \_\_\_\_\_\_\_\_\_\_ as they travel through various mediums.

**Key Concepts**:

• \_\_\_\_\_\_\_\_\_\_ waves require a medium to travel through, while \_\_\_\_\_\_\_\_\_\_ waves can travel through a vacuum.

• Sound waves are an example of \_\_\_\_\_\_\_\_\_\_ waves.

• Light waves are an example of \_\_\_\_\_\_\_\_\_\_ waves.

• The \_\_\_\_\_\_\_\_\_\_ spectrum organizes waves based on their energies.

• Sound waves are \_\_\_\_\_\_\_\_\_\_ waves that vibrate parallel to their direction of travel.

• The \_\_\_\_\_\_\_\_\_\_ of a sound wave determines its pitch.

• The \_\_\_\_\_\_\_\_\_\_ of a sound wave determines its volume.

• Sound travels fastest through \_\_\_\_\_\_\_\_\_\_ because the molecules are packed closely together.

• \_\_\_\_\_\_\_\_\_\_ in the retina detect light levels, while \_\_\_\_\_\_\_\_\_\_ detect colors.

• We see color because objects \_\_\_\_\_\_\_\_\_\_ some wavelengths of light and \_\_\_\_\_\_\_\_\_\_ others.

• Visible light is only a small portion of the \_\_\_\_\_\_\_\_\_\_ spectrum.

**Real World Examples**:

1. When using a microwave oven, the electromagnetic waves heat your food, but you can't \_\_\_\_\_\_\_ or \_\_\_\_\_\_\_ them directly.

2. Taking a selfie: The light reflected from your face travels through the \_\_\_\_\_\_\_\_\_\_ in your phone's camera, which focuses the light to create an image on the camera's sensor.

**Guided Notes: Reflection of Waves**

**Big Idea**:

Waves can be \_\_\_\_\_\_\_\_\_\_ by various materials, allowing us to experience phenomena like echoes and reflections.

**Key Concepts**:

• A wave is a \_\_\_\_\_\_\_\_\_\_ that transfers energy from place to place.

• \_\_\_\_\_\_\_\_\_\_ occurs when a wave bounces off a surface.

• \_\_\_\_\_\_\_\_\_\_, flat surfaces reflect sound waves well, producing echoes.

• \_\_\_\_\_\_\_\_\_\_ surfaces reflect light waves well, producing visual reflections.

• Water can reflect both \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ waves when its surface is still.

• The \_\_\_\_\_\_\_\_\_\_ of a surface determines how well it reflects different types of waves.

• \_\_\_\_\_\_\_\_\_\_ is the act of giving and receiving information.

• There are three types of communication: \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_.

• Good communicators accurately \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ messages.

**Real World Examples**:

1. Listening to music at a concert: The sound waves from the speakers \_\_\_\_\_\_\_\_\_\_ off walls and other surfaces in the venue, creating echoes and reverberations that enhance your listening experience.

2. Video chatting with friends: Clear communication involves not just \_\_\_\_\_\_\_\_\_\_ communication through speech, but also \_\_\_\_\_\_\_\_\_\_ communication through facial expressions and gestures.

**Guided Notes: Technologies for Information Transfer**

**Big Idea**:

Waves can be \_\_\_\_\_\_\_\_\_\_ by various materials, which affects how energy is transferred and impacts many natural phenomena and technological applications.

**Key Concepts:**

• \_\_\_\_\_\_\_\_\_\_ is the transfer of wave energy to a material when the wave strikes it.

• When light hits the ocean, certain colors are \_\_\_\_\_\_\_\_\_\_ while others are \_\_\_\_\_\_\_\_\_\_.

• Sound \_\_\_\_\_\_\_\_\_\_ are materials that reduce wave reflection by absorbing sound energy.

• Wave absorption occurs at the \_\_\_\_\_\_\_\_\_\_ between different materials.

• The amount of energy \_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_ depends on the properties of the materials involved.

• \_\_\_\_\_\_\_\_\_\_ waves can be absorbed to produce images in medical applications.

• The perception of color is related to which wavelengths of light are \_\_\_\_\_\_\_\_\_\_ and which are \_\_\_\_\_\_\_\_\_\_.

• Being \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ to new perspectives is important when working collaboratively.

• Giving and receiving \_\_\_\_\_\_\_\_\_\_ is crucial for improvement and effective teamwork.

**Real World Examples:**

1. Choosing clothes for hot weather: Light-colored clothes help keep you cool because they \_\_\_\_\_\_\_\_\_\_ less heat energy from the sun compared to dark-colored clothes, which \_\_\_\_\_\_\_\_\_\_ more heat.

2. Applying sunscreen: Sunscreen works by \_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_ harmful UV waves from the sun, protecting your skin from damage.

**Guided Notes: How are Waves Transmitted?**

**Big Idea**:

Waves can be \_\_\_\_\_\_\_\_\_\_ through various materials and mediums, allowing energy to travel and be detected in different ways.

**Key Concepts**:

• \_\_\_\_\_\_\_\_\_\_ is the movement of a wave through a material or through a vacuum.

• Most waves require a \_\_\_\_\_\_\_\_\_\_ to be transmitted, but some (like light) can travel through a \_\_\_\_\_\_\_\_\_\_.

• Sound waves can be transmitted through solids, liquids, and \_\_\_\_\_\_\_\_\_\_.

• \_\_\_\_\_\_\_\_\_\_ waves are transmitted directly through the ground during earthquakes.

• Light waves can be \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, or \_\_\_\_\_\_\_\_\_\_ when they interact with different materials.

• When waves are transmitted at an angle into a different medium, they may \_\_\_\_\_\_\_\_\_\_.

• \_\_\_\_\_\_\_\_\_\_ occurs when light passes through small openings and spreads out in patterns.

• Using technology to create \_\_\_\_\_\_\_\_\_\_ presentations can help communicate complex ideas about wave transmission.

**Real World Examples**:

1. Using a cell phone: Radio waves carrying your voice and data are \_\_\_\_\_\_\_\_\_\_ through the air from your phone to a nearby cell tower, allowing you to communicate over long distances.

2. Taking underwater photos: Light waves are \_\_\_\_\_\_\_\_\_\_ as they move from air into water, which is why objects appear closer or distorted when viewed underwater.

**Guided Notes: Energy in Waves**

**Big Idea**:

The energy carried by waves is related to their \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_, with higher frequency waves generally carrying more energy.

**Key Concepts**:

• The \_\_\_\_\_\_\_\_\_\_ of a wave is the maximum distance it vibrates from its rest position.

• Waves with greater energy have a larger \_\_\_\_\_\_\_\_\_\_.

• \_\_\_\_\_\_\_\_\_\_ is the distance from one crest of a wave to the next.

• \_\_\_\_\_\_\_\_\_\_ is the number of wavelengths that pass a given point each second.

• \_\_\_\_\_\_\_\_\_\_ (Hz) is the unit of measurement for frequency, representing cycles per second.

• Electromagnetic waves with \_\_\_\_\_\_\_\_\_\_ wavelengths and \_\_\_\_\_\_\_\_\_\_ frequencies have higher energy.

• The electromagnetic spectrum organizes waves based on their \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_.

• High-energy waves like gamma rays and x-rays can \_\_\_\_\_\_\_\_\_\_ matter and potentially cause damage.

• Low-energy waves like radio waves have difficulty \_\_\_\_\_\_\_\_\_\_ dense materials.

**Real World Examples**:

1. Going through airport security: The X-ray machines use high-energy \_\_\_\_\_\_\_\_\_\_ waves to penetrate your luggage and create images of its contents.

2. Using Bluetooth headphones: Bluetooth technology uses \_\_\_\_\_\_\_\_\_\_ frequency radio waves than Wi-Fi, allowing for short-range, low-power connections between devices.

**Guided Notes: Interaction of Waves**

**Big Idea**:

Waves can interact with materials in various ways, including \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_.

**Key Concepts**:

• \_\_\_\_\_\_\_\_\_\_ is the movement of a wave through a material or through empty space.

• \_\_\_\_\_\_\_\_\_\_ occurs when a wave changes direction as it crosses the border between different materials at an angle.

• \_\_\_\_\_\_\_\_\_\_ happens when a wave bounces off the surface of a material.

• \_\_\_\_\_\_\_\_\_\_ is the intake of some or all of a wave's energy by the material it strikes or travels through.

• The direction perpendicular to a material's surface is called the \_\_\_\_\_\_\_\_\_\_.

• Different colors of light are \_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_ by objects, determining how we perceive their color.

• \_\_\_\_\_\_\_\_\_\_ causes light to bend when passing between materials with different optical densities.

• Effective \_\_\_\_\_\_\_\_\_\_ involves working peacefully with others towards a common goal.

**Real World Examples**:

1. When you look at a pencil in a glass of water, it appears \_\_\_\_\_\_\_\_\_\_\_\_ due to refraction of light between water and air.

2**.** The rainbow colors seen in an oil slick on wet pavement are caused by light \_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_ through thin layers of oil and water.

**Guided Notes: Digitalized Signals**

**Big Idea**:

Digital signals are generally a more \_\_\_\_\_\_\_\_\_\_ way to encode and transmit information compared to analog signals.

**Key Concepts:**

• An \_\_\_\_\_\_\_\_\_\_ signal is information transmitted as a variable signal.

• A \_\_\_\_\_\_\_\_\_\_ signal is an electrical signal transmitted as discrete values.

• \_\_\_\_\_\_\_\_\_\_ means to convert information, such as a song, into a different form.

• \_\_\_\_\_\_\_\_\_\_ means to send information from one location to another.

• Digital files are less likely to \_\_\_\_\_\_\_\_\_\_ or break down over time compared to analog files.

• Digital signals can be recorded more \_\_\_\_\_\_\_\_\_\_ without background noise.

• Digital signals can be transmitted over \_\_\_\_\_\_\_\_\_\_ distances and arrive more clearly.

• Analog signals tend to \_\_\_\_\_\_\_\_\_\_ over long distances.

• The process of converting analog to digital signals is called \_\_\_\_\_\_\_\_\_\_.

• Digital files are stored on \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, and computers.

**Real World Examples**:

1. Modern HD televisions receive \_\_\_\_\_\_\_\_\_\_\_\_ signals that provide clearer picture and sound quality compared to the analog signals used by older TV sets.

2. Using a digital textbook: E-textbooks store information as \_\_\_\_\_\_\_\_\_\_ files, allowing you to highlight, search for keywords, and access interactive content that wouldn't be possible with a traditional printed book.