WAVES, SOUND AND LIGHT STUDY GUIDE

**Chapter 20 Section 1:**

1. **What is the difference between mechanical and electromagnetic waves?**

**Mechanical** waves are periodic disturbances that **must pass through matter/medium**. Mechanical waves are longitudinal (sound) waves, seismic waves, and ocean waves. **Electromagnetic** waves are a disturbance, which **does not require a medium**, or matter in order to transmit energy; can travel even through a vacuum; and caused due to varying electric and magnetic fields. Mechanical waves are transverse waves such as radio waves, microwaves, infrared, visible light, ultraviolet, x-rays, and gamma rays.

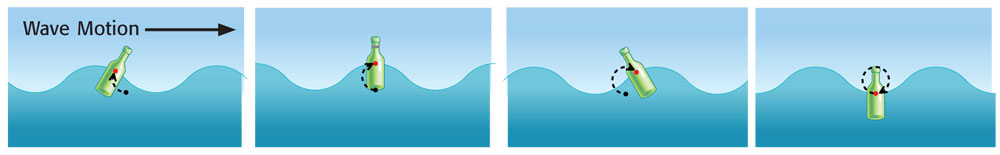
1. **Give 3 examples of electromagnetic waves.**

Visible light, gamma rays, radio waves

1. **Draw and label a transverse AND longitudinal wave.**

|  |  |
| --- | --- |
| Transverse Wave |  |
| Longitudinal Wave |  |

1. **What is a surface wave?**

Surface waves look like transverse waves, but the particles of the medium move in circles rather than up and down; a combination of transverse and longitudinal waves.

**Chapter 20 Section 2:**

1. **List and define the 3 properties that all waves have?**

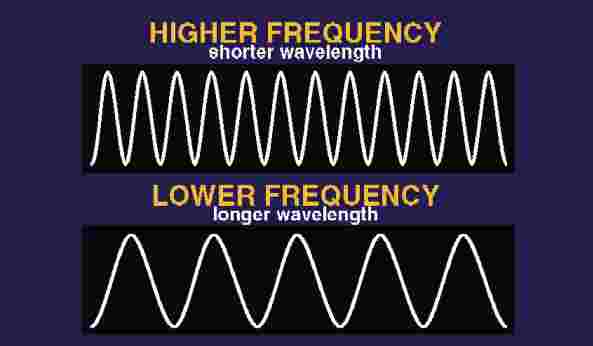
* Amplitude - the largest distance a wave moves away from the rest position.

**LARGER AMPLITUDE = MORE ENERGY**

* Frequency - The number of waves that pass a certain point in a given amount of time; Measured in HERTZ (Hz); **HIGHER FREQUENCY = MORE ENERGY**
* Wavelength - The distance between any 2 corresponding points on a wave. For example, the distance between 2 crests in a transversal wave or 2 compressions in a longitudinal wave. **SHORTER WAVELENGTH = MORE ENERGY**

1. **If wavelength increases, what happens to the frequency?**

If wavelength increases, frequency decreases.



1. **What unit is used to measure frequency?**

Frequency is measured in Hertz (Hz).

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**Chapter 20 Section 3:**

1. **What is reflection?**

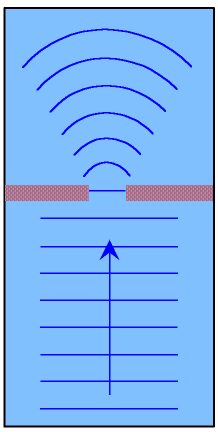
When a wave bounces off an object it cannot pass through it is called REFLECTION. All waves can be reflected.

1. **What is refraction?**

REFRACTION is the bending of waves when waves move from one medium to another.

1. **Why does refraction occur?**

When a wave hits a new medium, it changes speed and the wavelength changes

1. **What is diffraction?**

Diffraction is the bending of waves around a barrier or through a opening. The amount of diffraction of a wave depends on its wavelength and the size of the opening or barrier.

1. **a) What are the 2 kinds of interference? b) Explain the difference.**
2. Constructive and Destructive Interference
3. Constructive Interference - happens when the crests or troughs overlap to combine their energy to make higher crests or deeper troughs. Destructive Interference - happens when the crest of one wave and the trough of another cancel each other.

|  |  |
| --- | --- |
| CONSTRUCTIVE INTERFERENCE | DESTRUCTIVE INTERFERENCE |
| 35a | a4313_interference_en_g |

**Chapter 21 Section 1:**

1. **What is sound?**

A wave caused by vibrations and carried through a substance. Sound waves travel in all directions away from their source. Most of the sounds that you hear travel through air at least part of the time. But sound waves can also travel through other materials, such as water, glass, and metals.

1. **Is sound a longitudinal or transverse wave?**

**Sound** is a **longitudinal** wave.

1. **Is sound a mechanical or electromagnetic wave?**

**Sound** is a **mechanical** wave because it must travel through a medium.

**Chapter 21 Section 2**

1. **What is the speed of sound?**

**344 m/s in air**

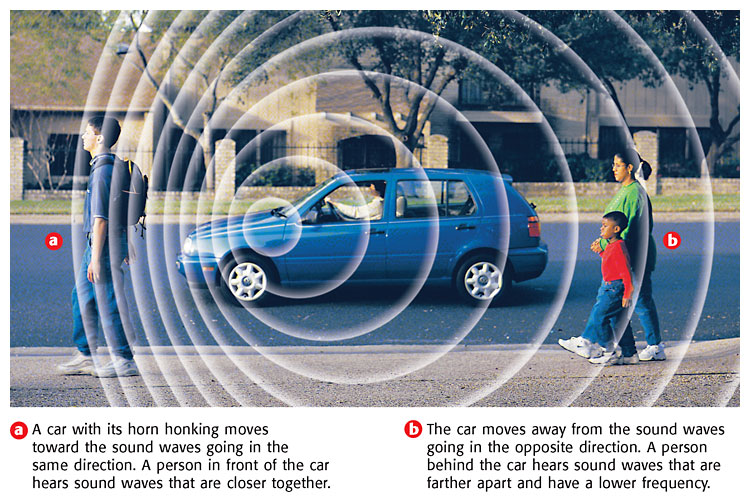
1. **a) Does sound travel fastest through a solid, liquid, or gas? b) Why is there a difference in speed through different mediums?**
2. Sound waves travel faster in solids than they do in liquids than they do in gases. (Speed of Sound = Solid > liquid> gas)
3. Because molecules in a solid medium are much closer together than those in a liquid or gas, allowing sound waves to travel more quickly through it. In fact, sound waves travel over 17 times faster through steel than through air.
4. **How are frequency and pitch related?**

Pitch is highness or lowness of a sound; depends on frequency of sound wave.

High pitch=high frequency

Low pitch=low frequency

1. **a) What is the Doppler Effect? b) Give an example**

* **a**) The **Doppler Effect** is the apparent change in the frequency of a sound caused by the motion of either the listener or the source of the sound.
* **b**) 

1. **How are loudness and amplitude related?**

**Loudness** is a measure of how well a sound can be heard. The larger the amplitude, the louder the sound, and the smaller the amplitude, the softer the sound

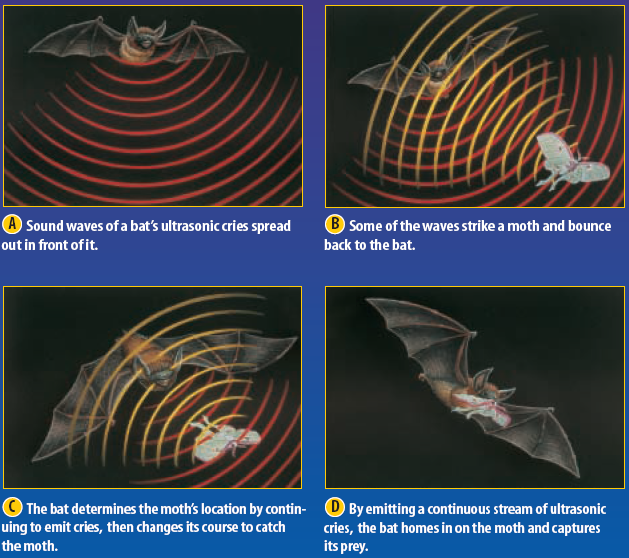
**Chapter 21 Section 3:**

1. **What is a reflected sound wave called?**

A reflected sound wave is called an echo.

1. **What kinds of surfaces does sound reflect off of the best?**

Sound waves reflect best off smooth, hard surfaces

1. **What is echolocation?**

Use of reflected sound waves to find objects

**24. What is a sonic boom?**

If the source is moving as fast or faster than the speed of sound, the sound waves pile up into a shock wave called a sonic boom.

A sonic boom sounds very much like the pressure wave from an explosion

**Chapter 22 Section 1:**

1. **What is an electromagnetic wave?**

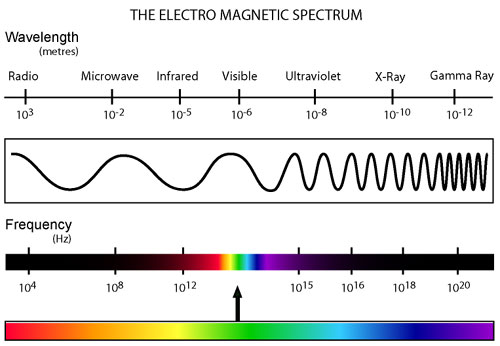
**Electromagnetic** waves are a disturbance, which **does not require a medium**, or matter in order to transmit energy; can travel even through a vacuum; and caused due to varying electric and magnetic fields.

1. **What is the speed of light?**

300,000 km/sec; 186,000 mi/sec

**Chapter 22 Section 2:**

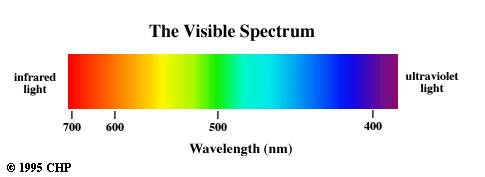
1. **Draw and label an electromagnetic spectrum.**

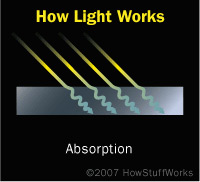


28. a) What colors are included in visible light? b) What colors have the longest and shortest wavelength?

a) Roy G. Biv – Acronym for Red, Orange, Yellow, Green, Blue, Indigo, & Violet.

b) Largest to Smallest Wavelength.

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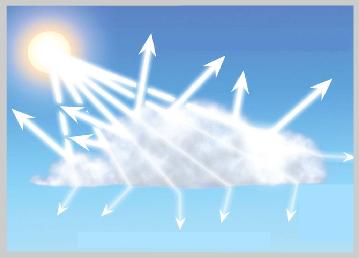
**Chapter 22 Section 3:**

**29. What is absorption?**

Waves that are not reflected can be absorbed by particles. When light is absorbed the beam of light becomes dimmer.

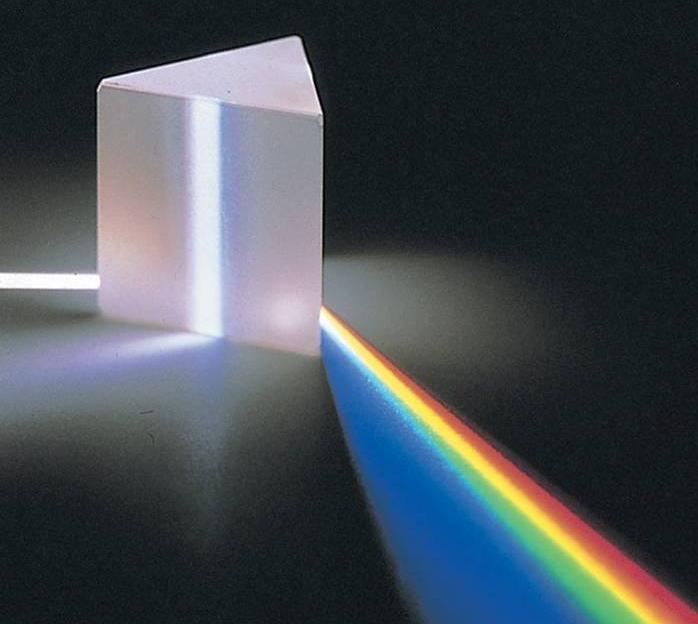
**30. What is scattering?**

Scattering occurs when light hits particles and changes direction.



**31. What medium does light travel fastest through?**

Light travels fastest in a vacuum; slower in air, water, glass

**32. a) What is light refraction? b) What happens when white light is refracted?**

1. Bending of light due to a change in speed.
2. When white light is refracted, all colors of the rainbow become visible.

**Chapter 22 Section 4:**

**33. What is transparent?**

TRANSPARENT-light is transmitted through easily

**34. What is translucent?**

TRANSLUCENT-transmits and scatters light

**35. What is opaque?**

OPAQUE- does not transmit light

**Examples:**

|  |  |  |
| --- | --- | --- |
| TRANSPARENT | TRANSLUCENT | OPAQUE |
| plastic-wrap-550x359  Saran-Wrap | peelingwaxpaper  Wax Paper | aluminum_foil  Aluminum Foil |

**36. What determines the color of an object?**

The color an opaque object appears depends on the colors of light it reflects.

