

GREEN TEAM SCIENCE: Mrs. Ferdinand
ANSWERS: Waves Unit Assessment Study Guide

Test Date: **Friday, May 18, 2018**

Vocabulary

You should know the definitions and applications of the following words:

1. Decibel: **unit of measurement for sound intensity**
2. Longitudinal wave: **mechanical wave that transfers energy by compressions and rarefactions**
3. Medium: **material / matter through which a wave transfers its energy**
4. Transverse wave: **electromagnetic wave which can travel with or without a medium.**
5. Amplitude: **the maximum distance of a wave from its resting point (loudness)**
6. Frequency: **the # of waves or vibrations per second**
7. Attenuation: **the gradual loss of the intensity of a wave**
8. Analog Signal: **a stream of information that varies as it is converted to a mechanical or electrical format**
9. Digital Signal: **an analog signal translated into a series of 1s and 0s before transmission**
10. Reflection: **the bouncing of a wave off an object**
11. Refraction: **the bending of a wave as it passes through 2 mediums**
12. Transmission: **light passing through a vacuum or a material**
13. Visible light spectrum: **the colors of the rainbow (red-orange-yellow-green-blue-violet) - in that order.**
14. Visible light: **light that we can see**
15. Ultraviolet light: **invisible light that is located after visible light on the electromagnetic spectrum.**
16. Absorbed: **light that goes into an object but does not come back out as light**
17. Infrared radiation: **invisible light that is located before visible light on the electromagnetic spectrum**
18. Electromagnetic spectrum: **the complete range of electromagnetic waves**

Activity 1: It's a Noisy World

- Review Activity 1 and practice calculating the change in sound intensity
 - Example: how much will the sound intensity increase or decrease based on a given scenario

Activity 2: Making Sound Waves

- What is the frequency of a wave?
 - **The frequency of a wave is the number of waves (vibrations) per second.**
 - Frequency is related to **pitch**.
- What is relationship between frequency and wave energy?
 - **The higher the frequency, the higher the wave energy.**

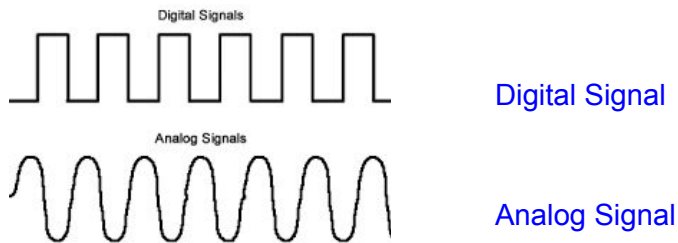
Activity 3: The Nature of Sound

- What is a longitudinal wave?
 - **A longitudinal wave is a wave that transfers energy through its medium by compressions and rarefactions.**
 - An example of a longitudinal wave is a **sound wave**.
- How do the particles in a longitudinal wave move?
 - **Particles in a longitudinal wave move in the same direction as the wave energy.**
- Define **compression** and **rarefaction**.

- Compressions are areas where the wave particles are close together (high pressure) and rarefactions are where the wave particles are farther apart (low pressure)
- What is the amplitude of a wave?
 - The amplitude of a wave is the maximum distance of the wave from its resting position.
 - Amplitude is related to loudness.
- What is the relationship between wave amplitude and wave energy?
 - The higher the amplitude of a wave, the higher the wave energy.
- Does a sound wave travel faster through more dense or less dense mediums?
 - Sound waves travel faster through more dense materials (solids). The closer the vibrating atoms or molecules, the easier and faster the sound wave will travel.

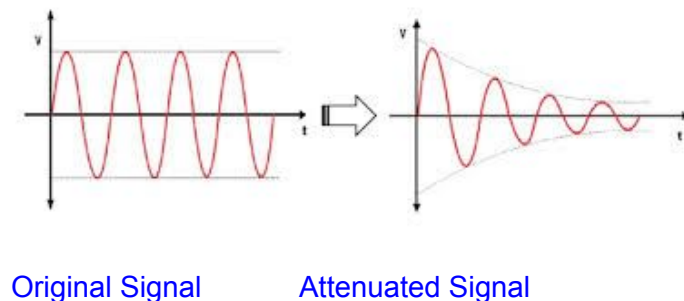
Activity 5: Telephone Model

- What is an analog signal?
 - An analog signal is a stream of information that varies as it is converted to a mechanical or electrical format. Analog signals are sent and received in their original form.
- What is a digital signal?
 - A digital signal is an analog signal that is translated into a series of 1s and 0s before it is transmitted.
- Draw an analog signal vs. a digital signal.



Activity 6: Analog and Digital Technology

- What does attenuation mean?
 - Attenuation is the gradual loss of the intensity of a wave
- Draw a diagram of an attenuated signal.

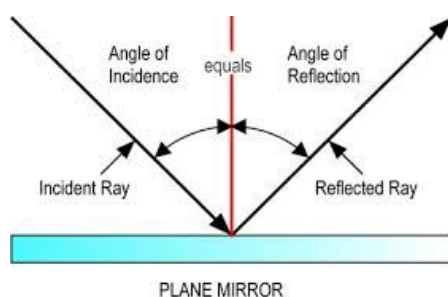


Activity 7: Another Kind of Wave

- What is a transverse wave?
 - A transverse wave is a an electromagnetic wave which can travel with or without a medium.
 - An example of a transverse wave is a light wave.
- How do the particles in a transverse wave move?
 - The particles in a transverse wave move perpendicular (up and down) to the direction of the wave energy.
- How does a transverse wave differ from a longitudinal wave? (use the Venn diagram)
 - Transverse waves are mechanical waves while longitudinal waves are electromagnetic waves
 - Transverse waves travel at a faster speed than longitudinal waves.
 - Transverse waves do not need a medium while longitudinal waves need a medium.
 - Transverse waves do not have compressions and rarefactions like longitudinal waves.
- How is a transverse wave the same as a longitudinal wave?
 - They are both types of waves
 - They both have amplitude, frequency
 - They both can transmit energy through a medium
 - They both have the property of *reflection*.
- Define wavelength.
 - Wavelength is the distance between one point on a wave and the exact same point on another wave (example: crest to crest, trough to trough)
- What is the relationship between frequency and wavelength?
 - A wave with a low frequency has a longer wavelength
 - A wave with a high frequency has a shorter wavelength
- What is the relationship between amplitude and wavelength?
 - A longer wavelength means lower amplitude.
 - Shorter wavelength means higher amplitude.
- How can we increase the energy in a wave?
 - Increase the amplitude
 - Increase the frequency
- Give 3 examples of how light waves are different than sound waves.
 - Light waves are faster than sound waves
 - Light waves can travel without a medium. Sound waves need a medium
 - Light waves are electromagnetic waves. Sound waves are mechanical waves.

Activity 8: Wave Reflection

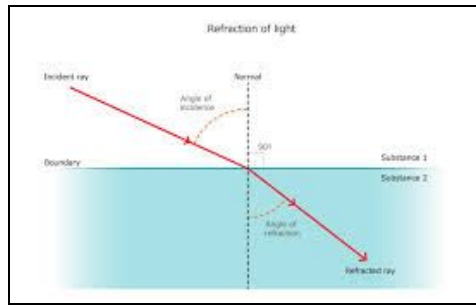
- What happens when a wave is reflected?
 - When a wave strikes an reflective surface, the wave bounces off that object. This is known as reflection. The incident ray (coming from the light source) hits the object and creates a reflected ray of equal distance (from the normal) and in the opposite direction.
- What is the relationship between the angle of reflection and the angle of incidence?
 - The angle of incidence is = to the angle of reflection



Activity 9:

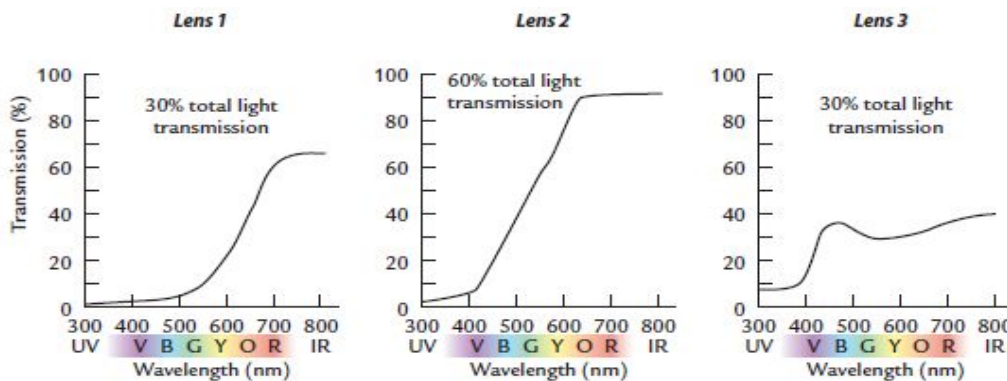
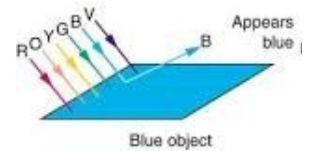
Refraction of Light

- What does it mean that a light wave has been transmitted?
 - The wave has transferred its energy through a vacuum or through a material
- What happens when a light wave is refracted?
 - Refraction is the bending of a light wave as it passes from one medium to another. As the light wave enters the second medium, the speed and direction of the wave changes and it bends. Whether it bends away from the normal or towards the normal depends on the density of the second medium compared to the first.
- How does the speed of light change during refraction?
 - The speed of light either slows down or speeds up as it enters the second medium.



Activity 10: Comparing Colors

- What is the visible light spectrum?
 - This is the spectrum where the colors of the rainbow are found.
- What colors form the visible light spectrum?
 - Red - Orange - Yellow - Green - Blue - Violet
- What happens when white light shines on a film and blue light is transmitted through the film?
 - The blue light was the only one with enough energy to be full transmitted through the film.
- Sunglasses block out white light and some other short-wavelength light that is harmful to the eyes. Looking at a transmission graph for 3 pairs of sunglasses below, how can you tell which pair of lens has the best protection for your eyes against high energy waves?



High energy waves are the waves with the highest frequency. Those are the waves with the shortest wavelength. Looking at the graph,

you can see that violet has the highest frequency of the visible light. UV light has an even higher frequency and is damaging to our eyes. Therefore the lens with the best protection for your eyes would be the ones with lowest % of UV light transmission. These are Lens 1.

Activity 11: Selective Transmission

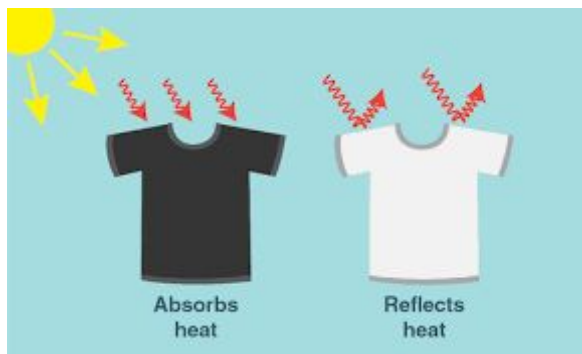
- What does it mean when light waves are absorbed?
 - This means that light waves enter an object and do not exit the object as light waves. The waves are converted into another form, mostly heat.
- What part of sunlight is transmitted through selected films?
 - UV light, visible light, infrared

Activity 12: The Electromagnetic Spectrum

- What is the electromagnetic spectrum?
 - The complete range of all the electromagnetic waves (Radio waves >>>>>Gamma rays)
- Can all wavelengths on the electromagnetic spectrum be seen?
 - No. There is only one range of visible light. All other waves are invisible.
- Most of the energy that reaches the Earth is in what form?
 - UV light, visible light and infrared
- What is infrared light?
 - light that is located before visible light on the electromagnetic spectrum. It heats up objects more than visible light because of its longer wavelength.
- What is ultraviolet light?
 - invisible light that is located after visible light on the electromagnetic spectrum. It is beneficial to our skin because it helps us produce Vitamin D but it is harmful in large doses as its high frequency wave can affect our skin cells causing skin cancer.

Activity 13: Where Does The Light Go

- What happens when direct sunlight hits a black object (example: t-shirt) as compared to a white object?
 - The black object absorbs the light and transforms it into heat which is then released. This causes the black object to heat up.
- Draw a diagram to support your answer above?



- What happens when you expose aluminium foil to direct sunlight?
 - The aluminium foil reflects the sunlight.