Waves Test
Remediation Notes

8.PS4.1 Develop and use models to represent the basic properties of waves including frequency, amplitude, wavelength and speed.

8.PS4.2 Compare and contrast mechanical waves and electromagnetic waves based on refraction, reflection, transmission and absorption and their behavior through a vacuum and/or various media.

Remember to write two facts from each slide

OR

Answer the questions on the slide

Once you are finished, watch the video on Ms. Bullock webpage titled

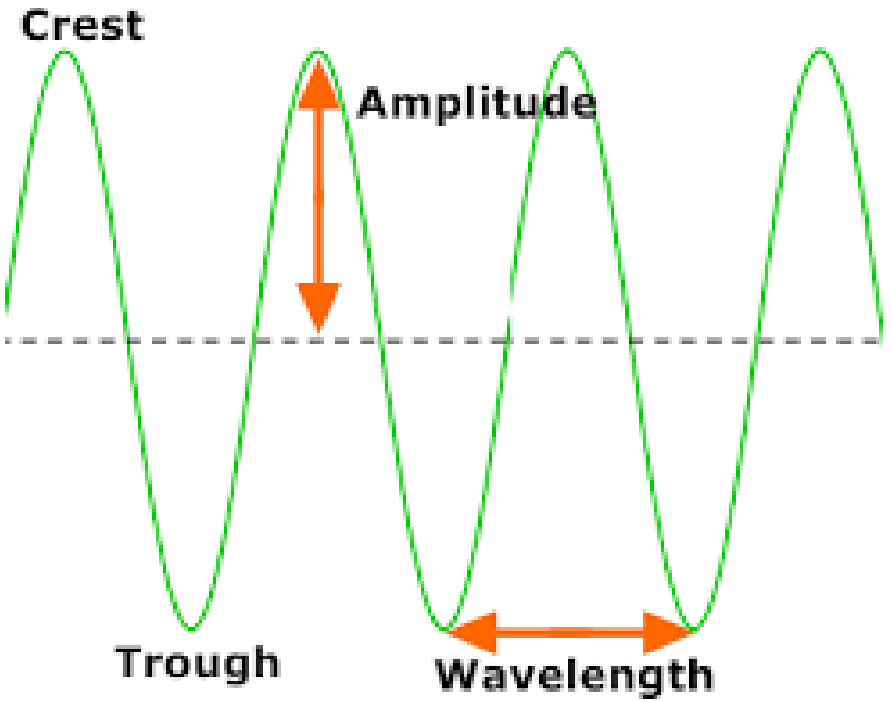
Waves Test Video

Mechanical Waves

- Mechanical waves require a medium (matter) to travel
- Waves carry or transfer energy NOT matter
- There are two types of mechanical waves:
  - Transverse waves
  - Longitudinal waves

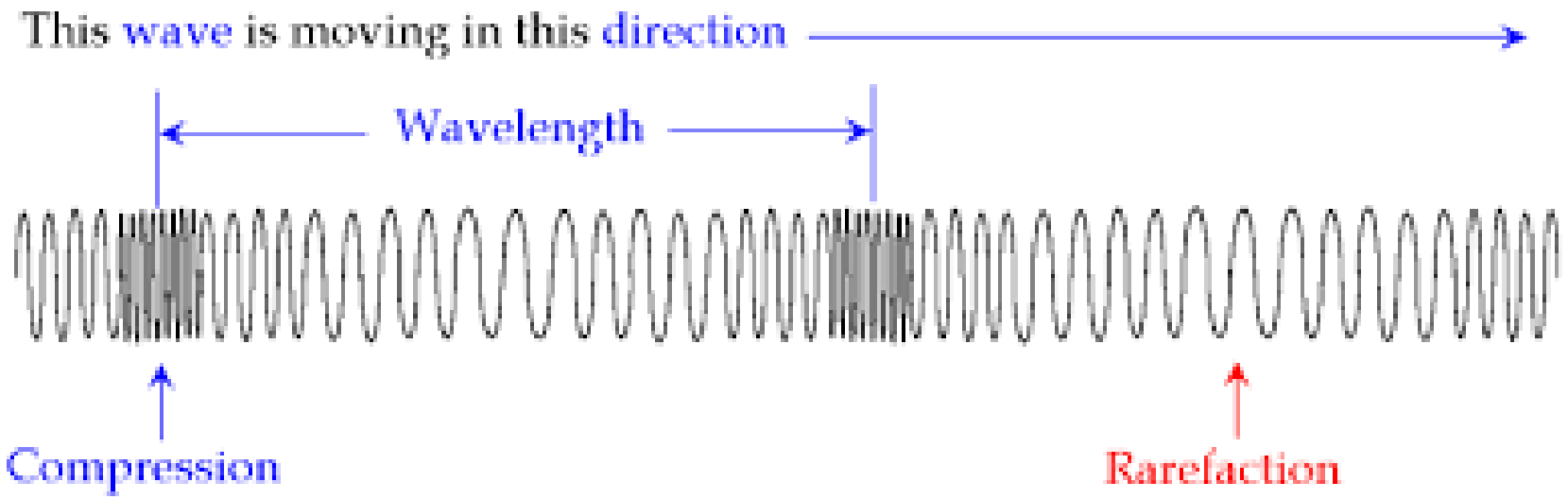
Transverse waves

- Transverse waves transfer energy by moving the particles of a medium up and down
- Transverse waves look much like ocean waves



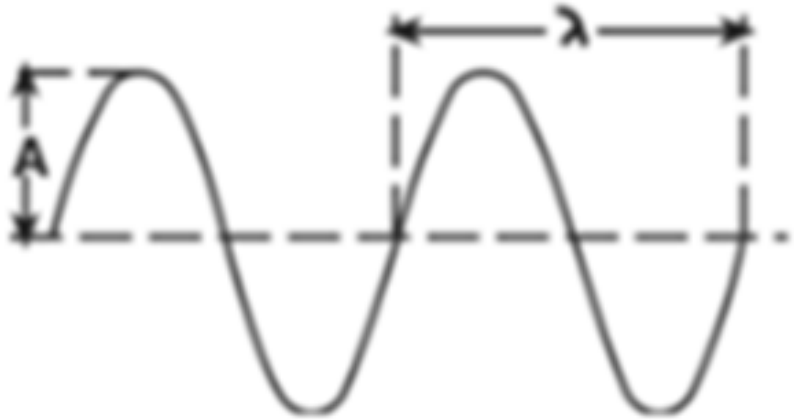
Longitudinal Waves

- Longitudinal waves carry energy by compressing and stretching particles
- Sound is a longitudinal wave



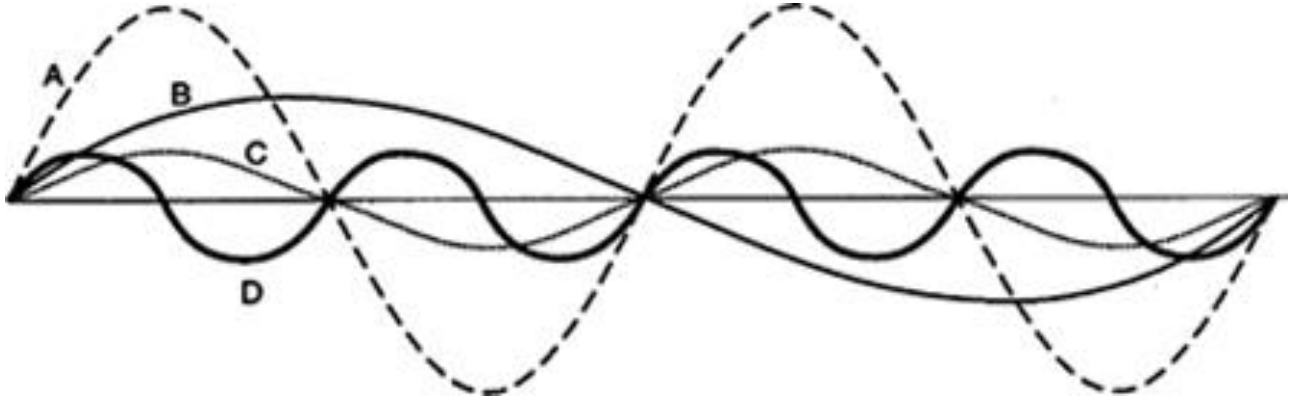
Basic properties

- Frequency is the amount of complete wavelengths in a period of time and measured in Hertz
- Wavelengths can be measured from crest to crest or compression to compression and represented with the symbol, λ
- Amplitude of a transverse wave can be measured from rest point to crest/trough



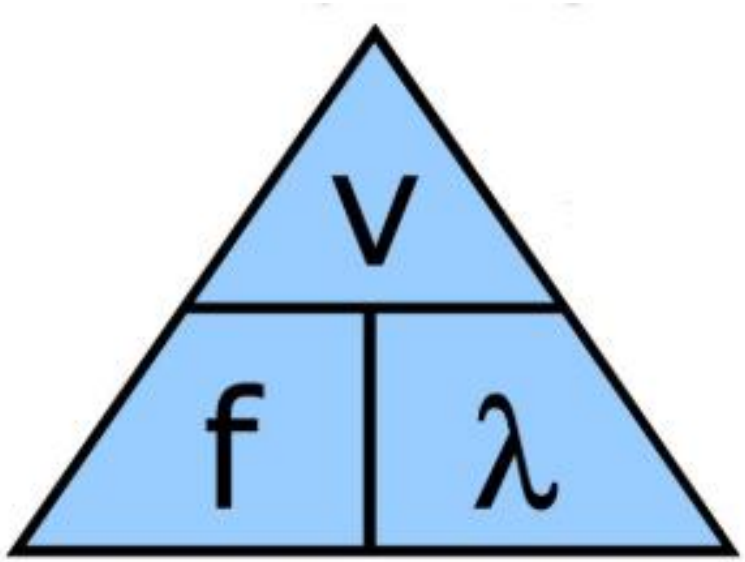
Energy

- The amount of energy the wave carries can affect the amplitude, wavelength, and frequency of a wave.
- A high energy wave is going to have a higher amplitude when compared to a low energy wave.
- A low energy wave will have a lower frequency and a high energy wave will have a higher frequency.
- For example Wave A has a higher amplitude than Wave C; Wave A must have more energy
- For example Wave D has a higher frequency than Wave B; wave D must have more energy



Wave Formula

- Frequency, wavelength, and wave speed can all be calculated using the following formula:



- V = velocity/speed
- F = frequency
- λ = wavelength

Practice

Question:

A wave has a velocity of 30 meters per second and a wavelength of 5.0 meters. What is the frequency of the wave?

Question:

A wave has a wavelength of 2 meters and a frequency of 25Hz. What is the speed of the wave?

Mechanical vs. Electromagnetic Waves

- Waves transfer energy
- Mechanical waves require a medium to transfer energy
- Electromagnetic waves do not require a medium to transfer energy
- Wave can travel through mediums at different speeds depending on density of the material
- Both types of waves can reflect, refract, and diffract

Questions

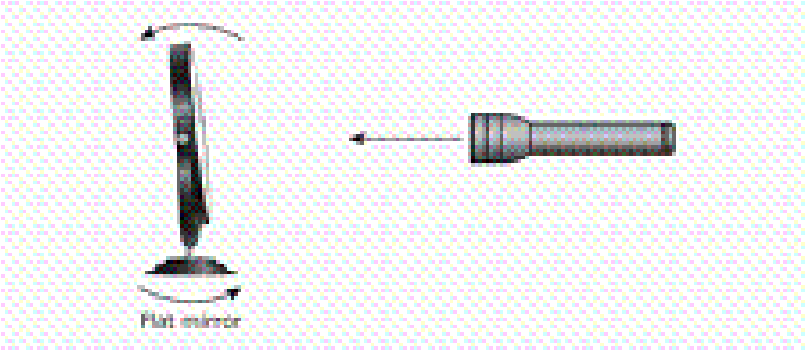
Medium	**Average Speed of Sound**
Oxygen	330 m/s
Air	346 m/s
Water	1482 m/s
Copper	5010 m/s
Granite	5950 m/s

1. Why does sound travel through granite faster than water?

_____

Reflection

- When waves encounter a change in medium they can bounce off
- The wave that is reflected off the changed medium will have less energy than the original wave
- The wave will reflect off the changed medium at the same angle
- For example:
  - Light will reflect off a mirror
  - Sound will reflect off a canyon wall producing an echo
  - Water waves will reflect off the shoreline



Questions

William goes on vacation at the Grand Canyon with his family. While hiking into the canyon he gets separated from his dad. He yells out trying to locate his dad. Within seconds he hears an echo of own voice. A few minutes later he hears his dad's voice begin to echo through the canyon.

1. What caused the echo? _____

2. What can be said about the wavelength of the echo to the wavelength of the original wave? _____

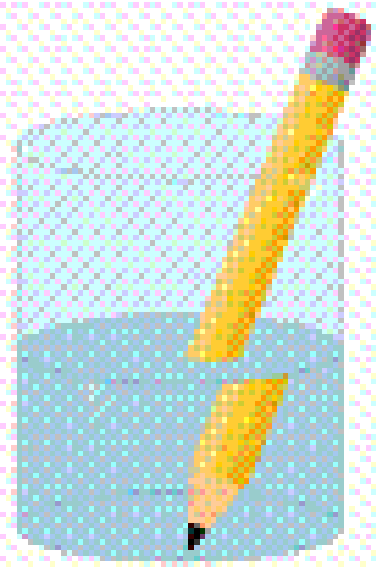
Refraction

- Waves will change speed when moving from one medium to another

- When light is moving from air to water, the change in speed can cause distortion
- The pencil appears broken because the light passes into

The water and slows speed. This causes the pencil to

Appear broken

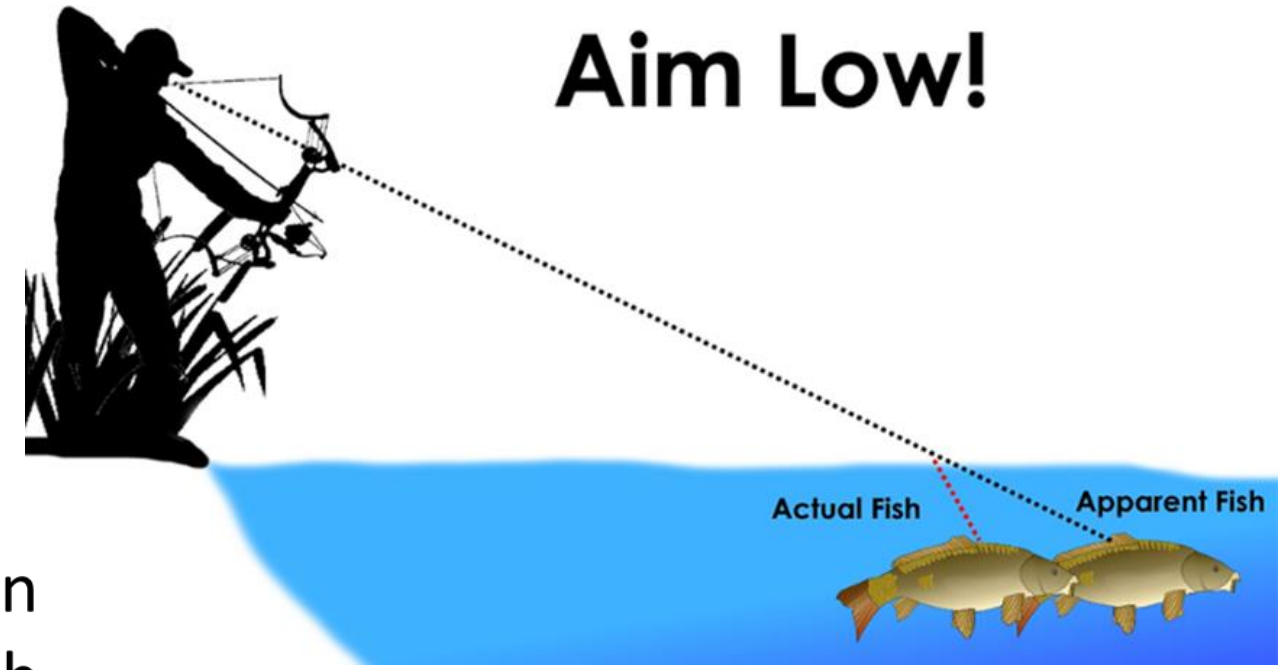


Questions

#1 What property of waves causes the fish to appear in a different location under water?

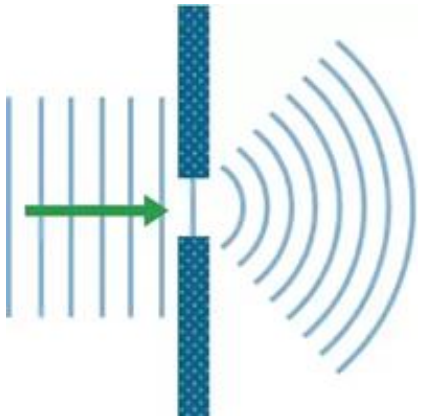
#2 What happens to the speed of the light waves has it enters the water?

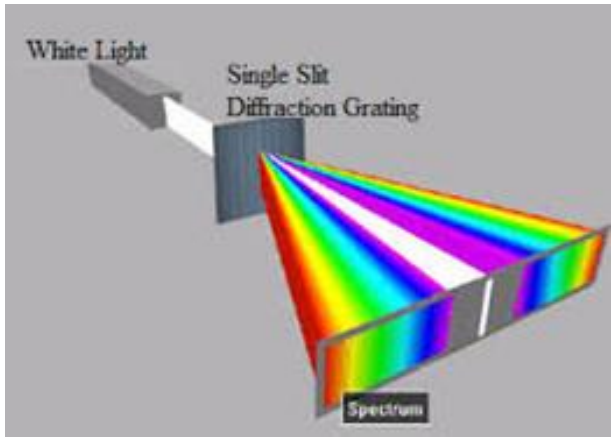
#3 Standing on the shore the fisherman needs to aim low in order to hit the fish. How would his aim change if the fisherman was also under water?



Diffraction

- Waves will bend around an obstacle or through a small opening
- Light can be diffracted through small slits and separated into multiple colors
  - For example you can see multiple colors on a CD when the light shines
- Sound can diffract, but the wave do lose energy.
  - For example you can hear a teacher talking to the class when you are standing in the hallway





Questions

1. What property is shown in the picture?

_____

2. Name two examples of wave that will diffract.

_____

3. When white light diffracts what can be observed?

_____

Communication waves

- Electromagnetic waves are primarily used for communication systems:
  - Radio waves (radio stations vary amplitude and wavelength)
  - Microwaves (cell phones system)
  - Infrared (TV remote controls)
  - Visible light (Fibre Optics)

Advantages and Disadvantages

- Radio Waves
  - Used for long distance communication
  - Waves pick up distortion the farther the distance
  - Diffract around obstacles

- Microwaves
  - Transmit large amounts of data
  - Will not diffract (require line of sight communication)

- Infrared
  - Will not diffract (require line of sight communication)
  - Devices are inexpensive