November 9th 2015

DO: I WILL BE ABLE TO EXPLAIN AND DEMONSTRATE THE NATURE OF WAVES IN A MEDIUM THROUGH NOTES, EXAMPLES, AND ILLUSTRATIONS.

EQ:

What are the basic properties of light?

How does light move?

Why do objects partially submerged in water appear broken or bent?

How do we see colors?

WAVE REVIEW

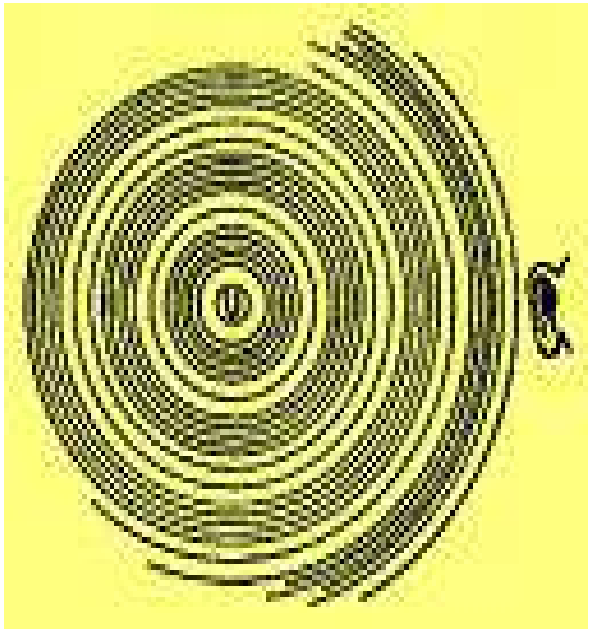
WAVES

All waves are disturbances that transmit energy.

Energy from a pebble moves the water as the wave passes; this interruption of the quiet, calm water is called a **disturbance.**

There are TWO types of waves Mechanical and Electromagnetic.

The material through which waves can travel is called a medium

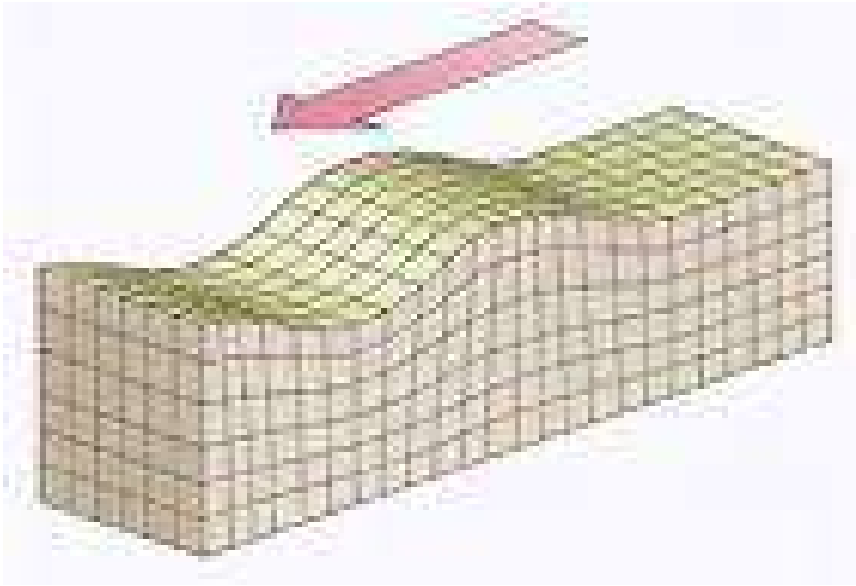


Energy is also carried from the source by **vibrations**

A vibrating particle transfers its energy to a nearby particle and so on.

*

MECHANICAL WAVES



A medium can be gas, a liquid, or a solid

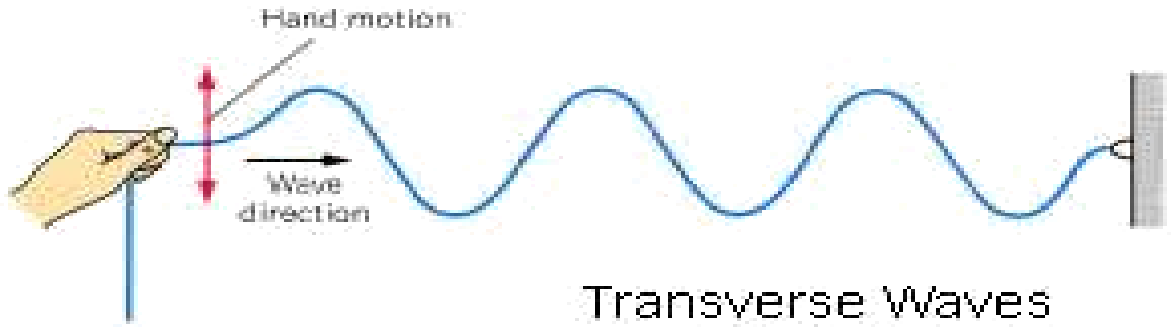
A wave that needs

a medium to travel is called a mechanical wave.

Water is the medium for ocean waves

TRANSVERSE MECHANICAL WAVES

A wave that transfers energy in a direction that is perpendicular (at a right angle) to its medium is called a transverse wave. The wave moves up and down while the energy goes out or side to side.



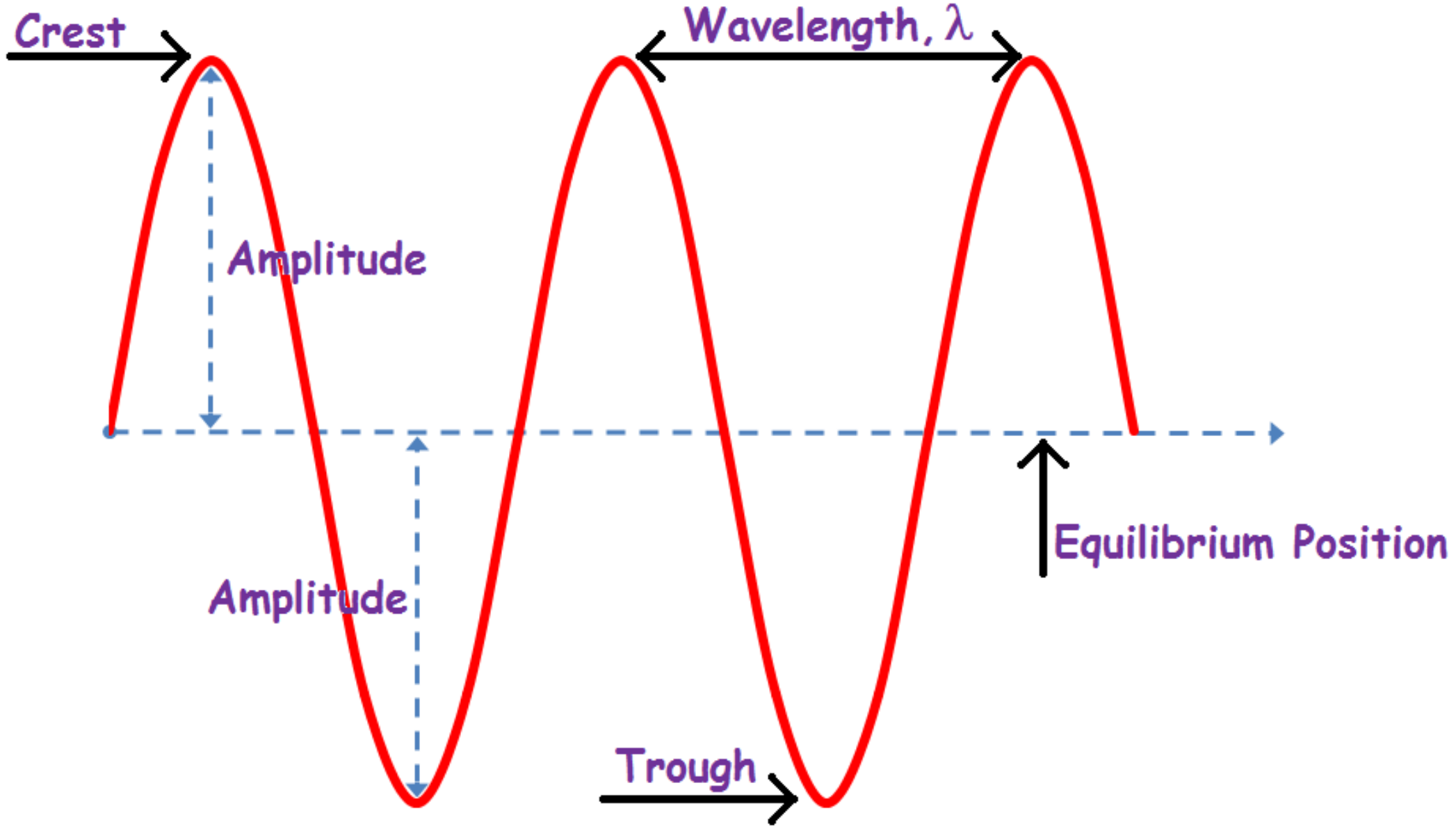
Transverse Waves

LONGITUDINAL MECHANICAL WAVES

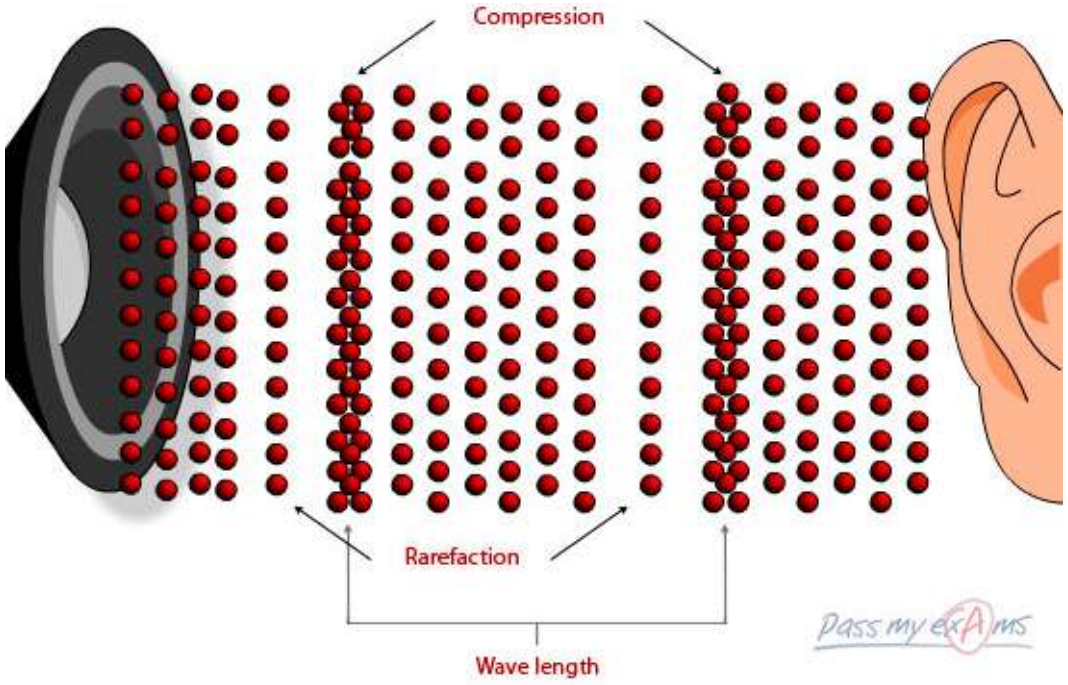
A wave that transfers energy in the same direction as the medium is called a Longitudinal wave.

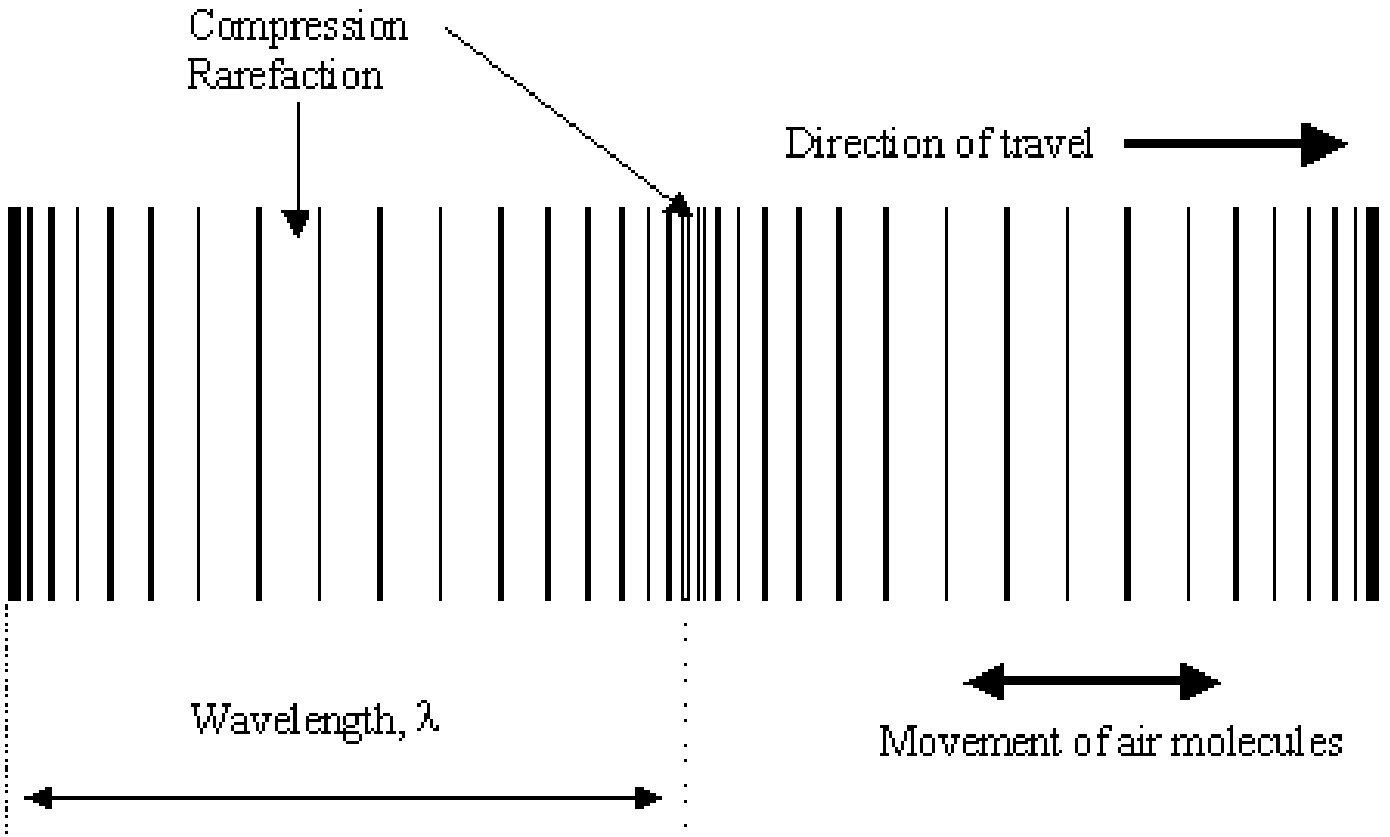
Longitudinal Waves

TRANSVERSE WAVES



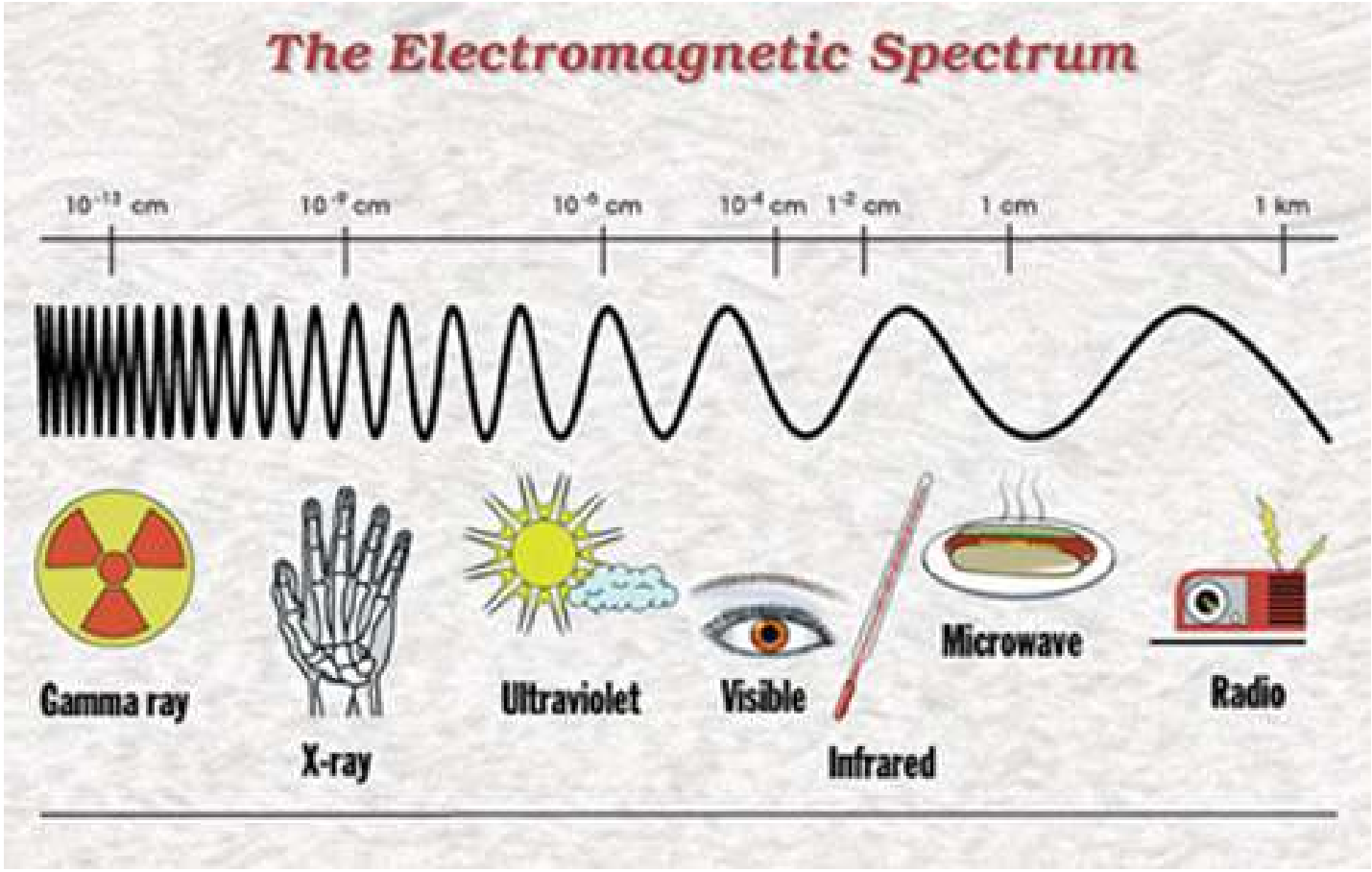
LONGITUDINAL WAVES





ELECTROMAGNETIC WAVES

Not all waves need a medium to transfer energy: Visible light, microwaves, UV or ultraviolet light, X-rays, infrared waves, and gamma rays can all travel through empty space



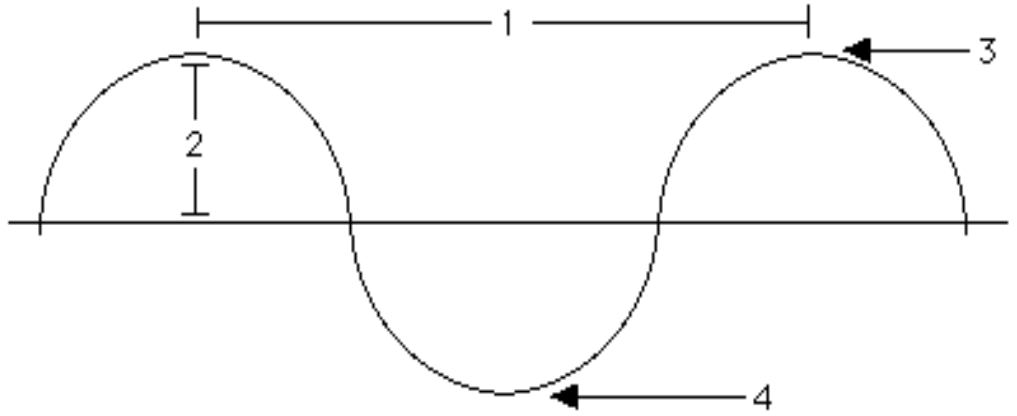
Waves RECAP

A wave is a disturbance. A wave transfers energy.

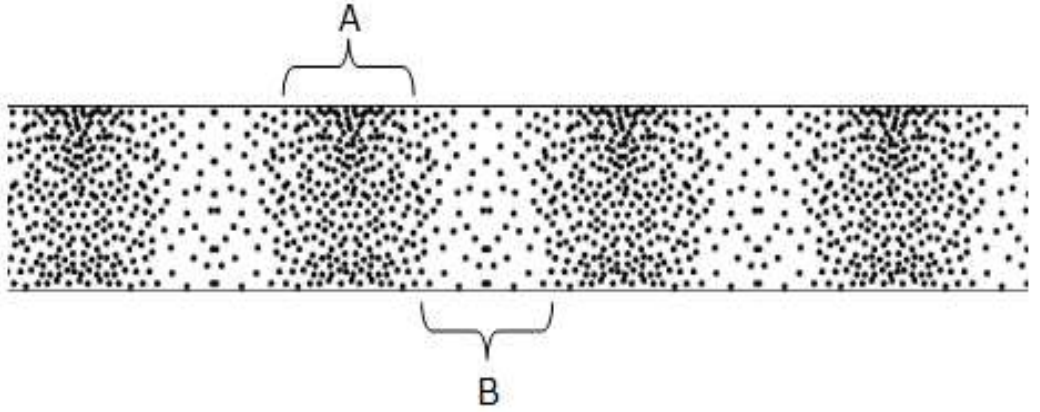
The two types of waves are:

1. Mechanical waves. These waves need mediums like solids, liquids, or gases to transfer energy.

A. Transverse Mechanical Wave



B. Longitudinal Mechanical Wave



2. Electromagnetic (EM) waves. These waves do NOT need a medium to transfer energy; these waves are like light and heat from the sun they can cross empty space or a vacuum.

WAVE INTERACTIONS

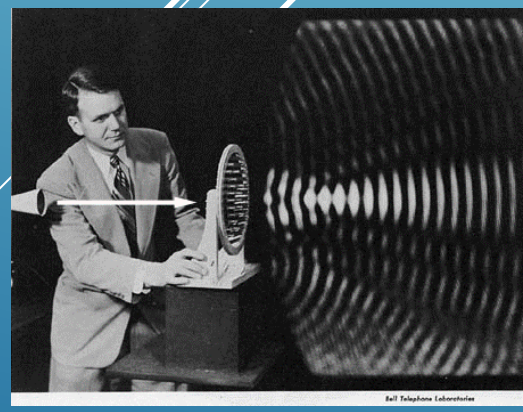
WAVE BEHAVIOR (INTERACTIONS)

- Waves do not always travel in one direction:

1. They often bounce off one surface and then travel in another direction
2. Waves can continue to bounce around and change direction long after the original source of the energy has stopped

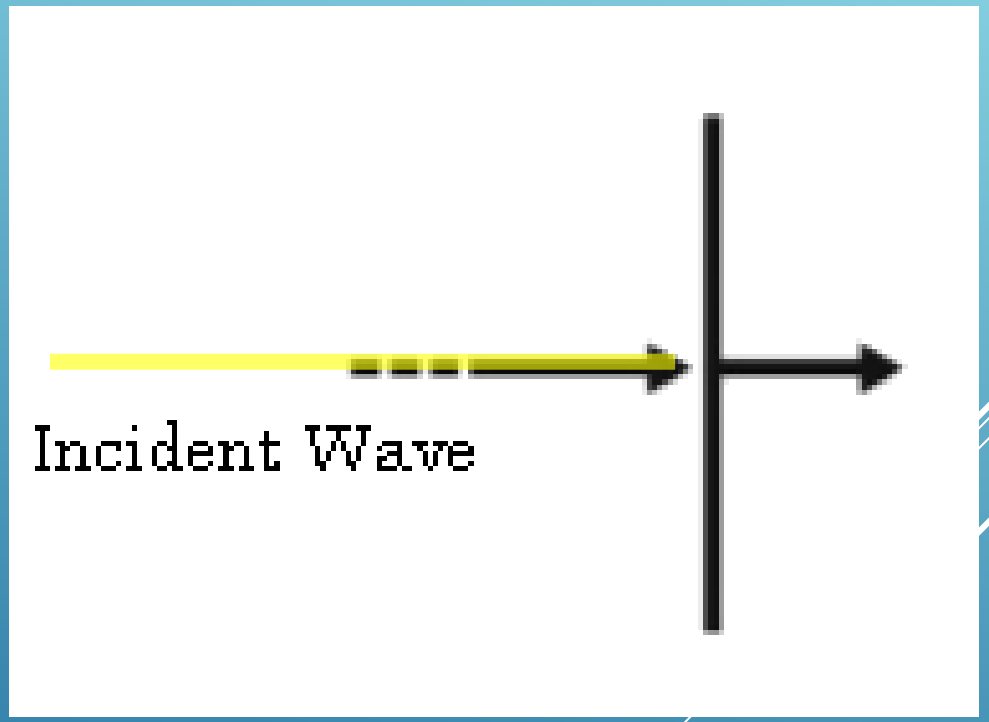
- When any type of wave hits an obstacle or passes from one medium to another, it is possible that the wave will change in speed, direction, or shape.

- When sound waves demonstrate this property, you hear echoes
- Light waves can also bounce off sources and change the direction in which they travel



THE INCIDENT WAVE

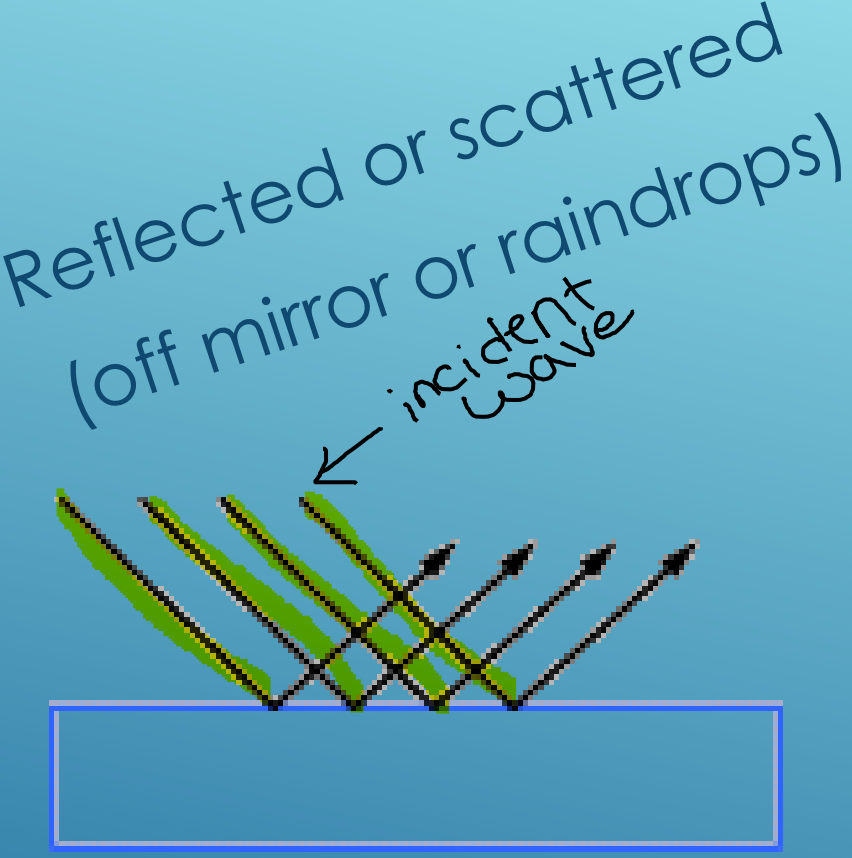
- **The initial wave, the source, a wave that has not encountered an object.**
- **Highlight the incident wave as it appears throughout your notes.**



REFLECTION

- Water waves, sound, light waves, heat, all of these different types of waves can be reflected
- Reflection is also the property of light that allows you to see your image in a mirror

- When a wave strikes a sea barrier and bounces back toward the ocean, this is an example of reflection
- The echo of a voice is actually reflected sound.

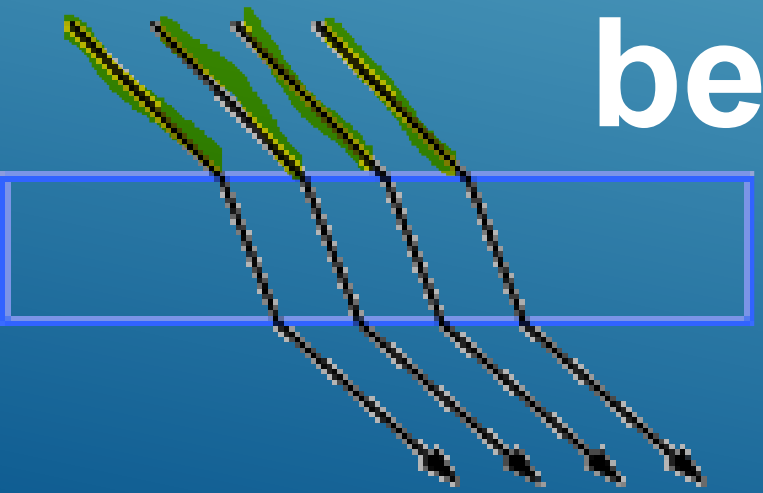


The light waves can be **reflected** off the object. Waves can be reflected as they lap against the side of a pool and back into the water. Echo's are sound reflections as the wave bounce off objects.

REFRACTION

- Light rays that reflect off an object will change direction as they pass from the air and into the glass of the lens
- The light rays change direction again when they pass from the glass back into the air before reaching your eye.

The waves can be **refracted** through the object. Look at the straw. It appears bent. It is really the light waves being bent.



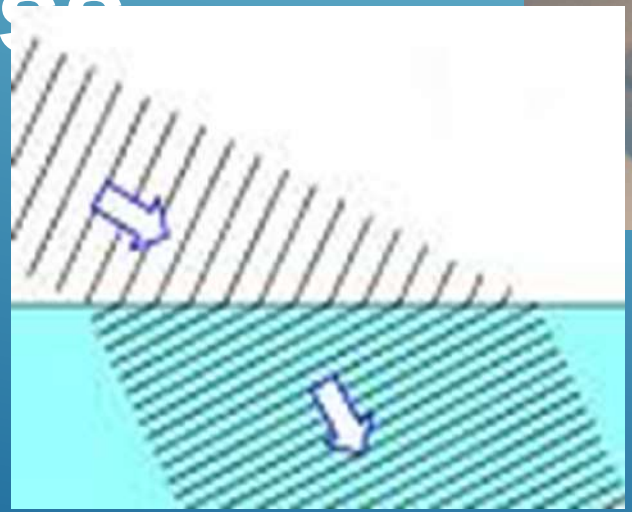
REFRACTION

- Refraction of light takes place when light passes from a medium having one density

  to a medium with a different **density**

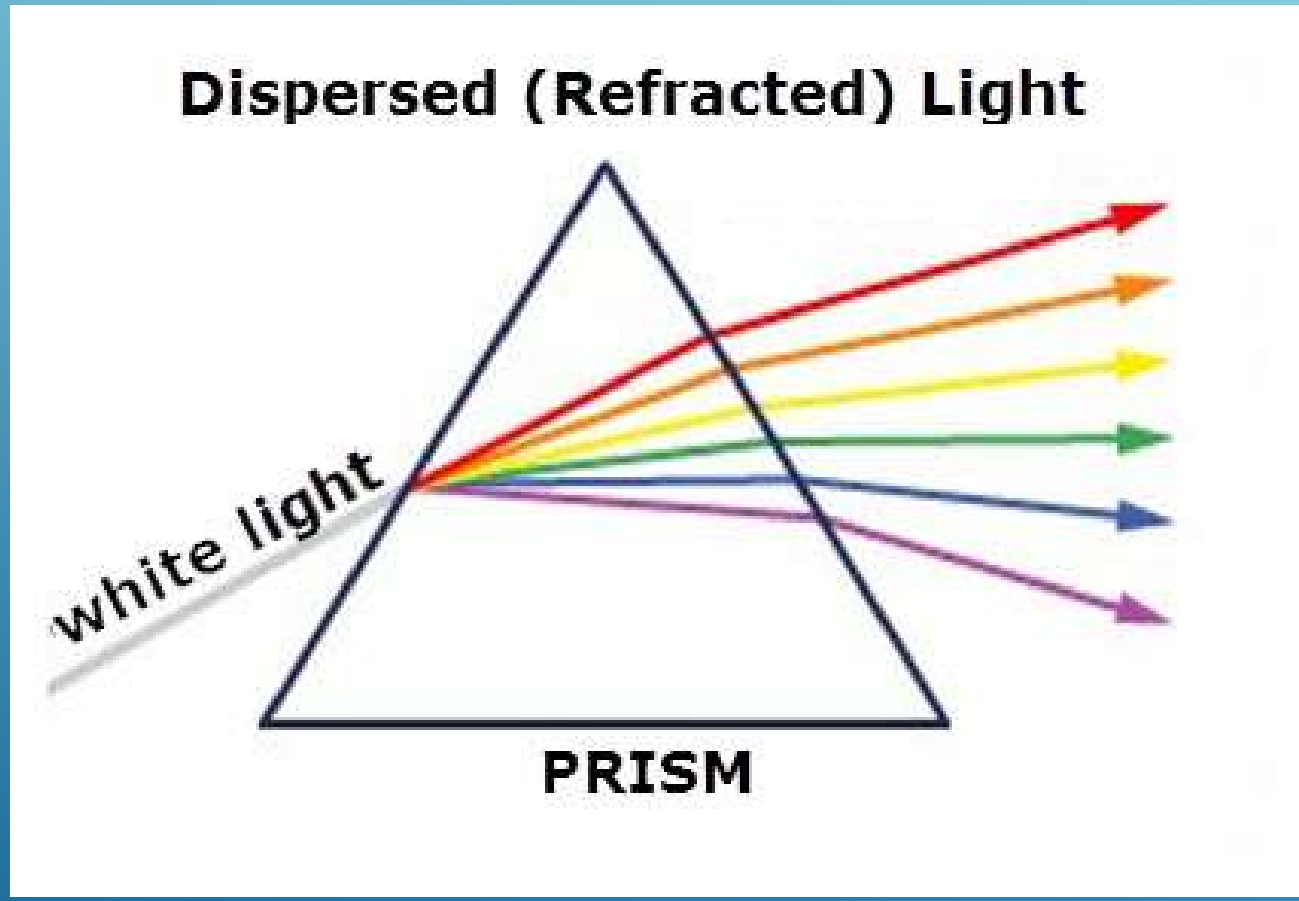
- This is what makes the object appear larger than its actual size

- Light waves bend as they pass from the air into water.



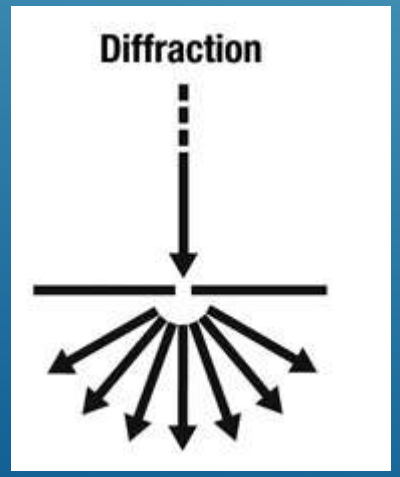
REFRACTION

- Refraction can also be observed in light through a prism.



DIFFRACTION

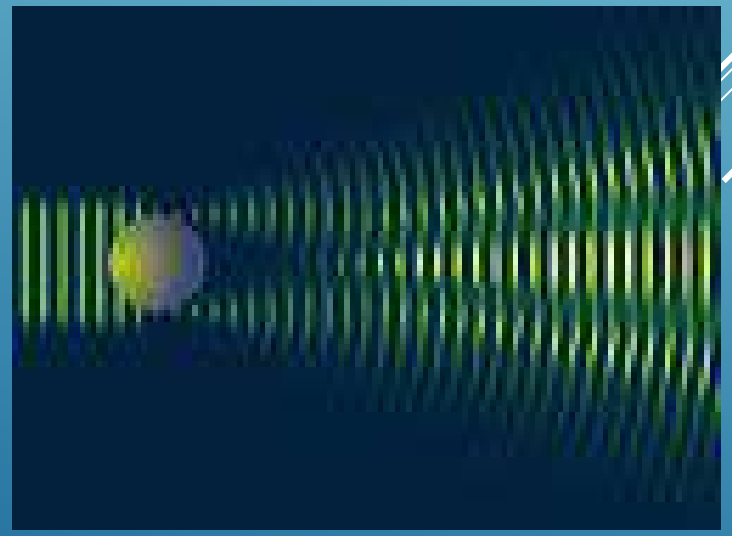
- **Diffraction refers to the bending, spreading, and interference of waves when they go through a narrow opening**
- **Diffraction occurs with any type of waves, including sound waves, water waves, and electromagnetic waves**
- **The most simple example of diffraction is light passing through a key hole, a pattern of ripples forms and spreads in all directions As if there were a wave source right at the position of the keyhole itself**



DIFFRACTION

▶When the slit is more than a wavelength wide, there is a diffraction pattern that occurs right at the edges of the wave

- **The center part of the wave travels unaffected at short distances**
- **The diffraction at the edges will cause a spreading, diffraction pattern when observed from longer distances**

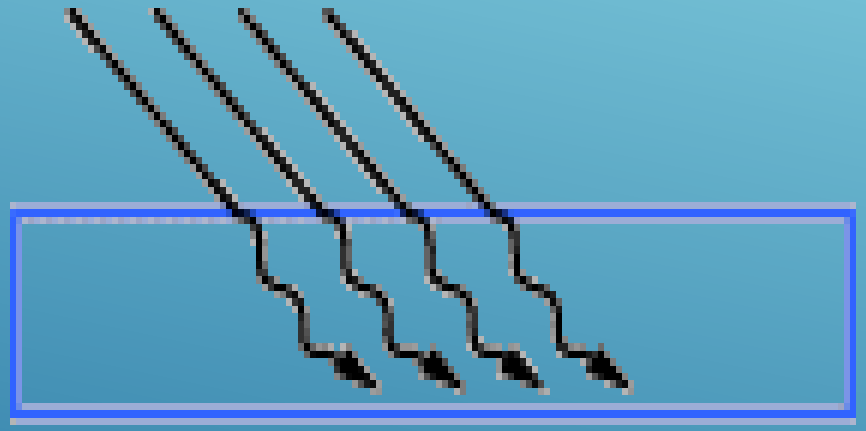


TRANSMISSION

- **Transmission is the passing of waves through a medium**
- **A radio wave is a type of electromagnetic wave produced at the radio station**
- **The wave travels from the station's transmitter out in all directions at the speed of light**
- **Even though you cannot hear radio waves when your radio is turned off, the waves are still right there in the room**

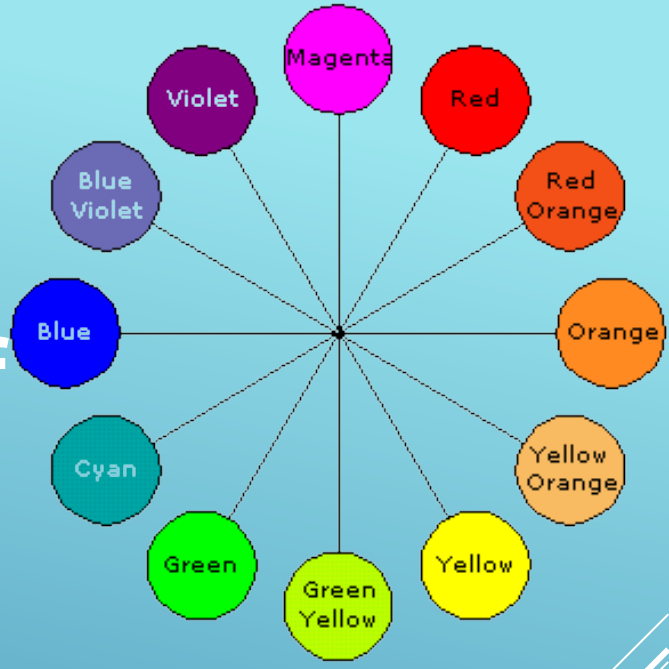
*** You hear sounds from a radio station because your radio detects the electromagnetic waves that station broadcasts, and then changes them into sound waves that your ears can detect**

THE WAVES CAN BE **ABSORBED** BY THE OBJECT



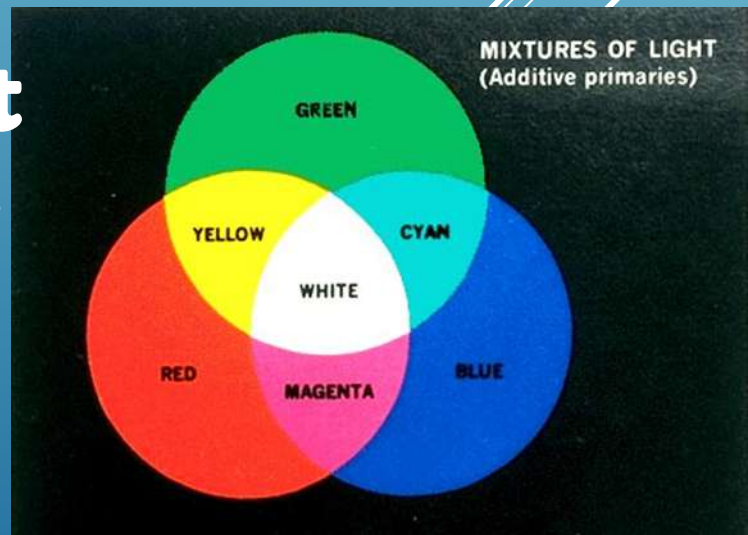
Absorbed (off a black cat or shirt)

ABSORPTION



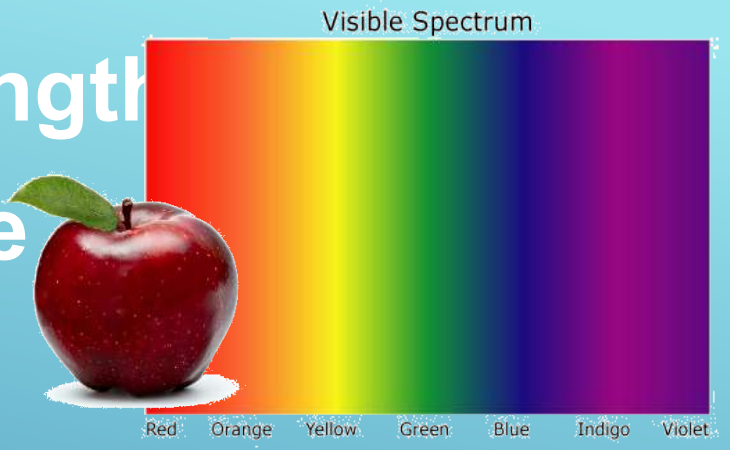
- The color that you see is the result of whatever light waves your eye is able to detect that are reflected by an object

* **Example: An apple absorbs wavelengths for most colors of light while reflecting the wavelength for red light**

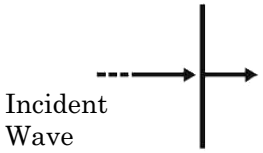
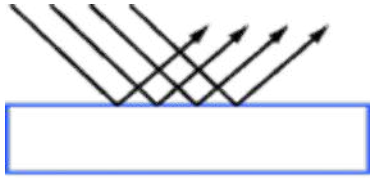
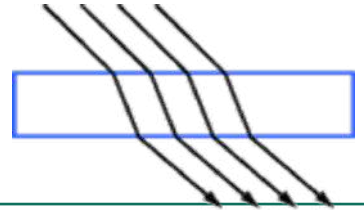
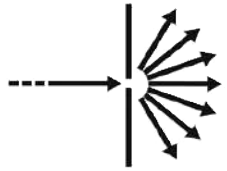
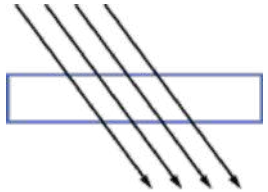


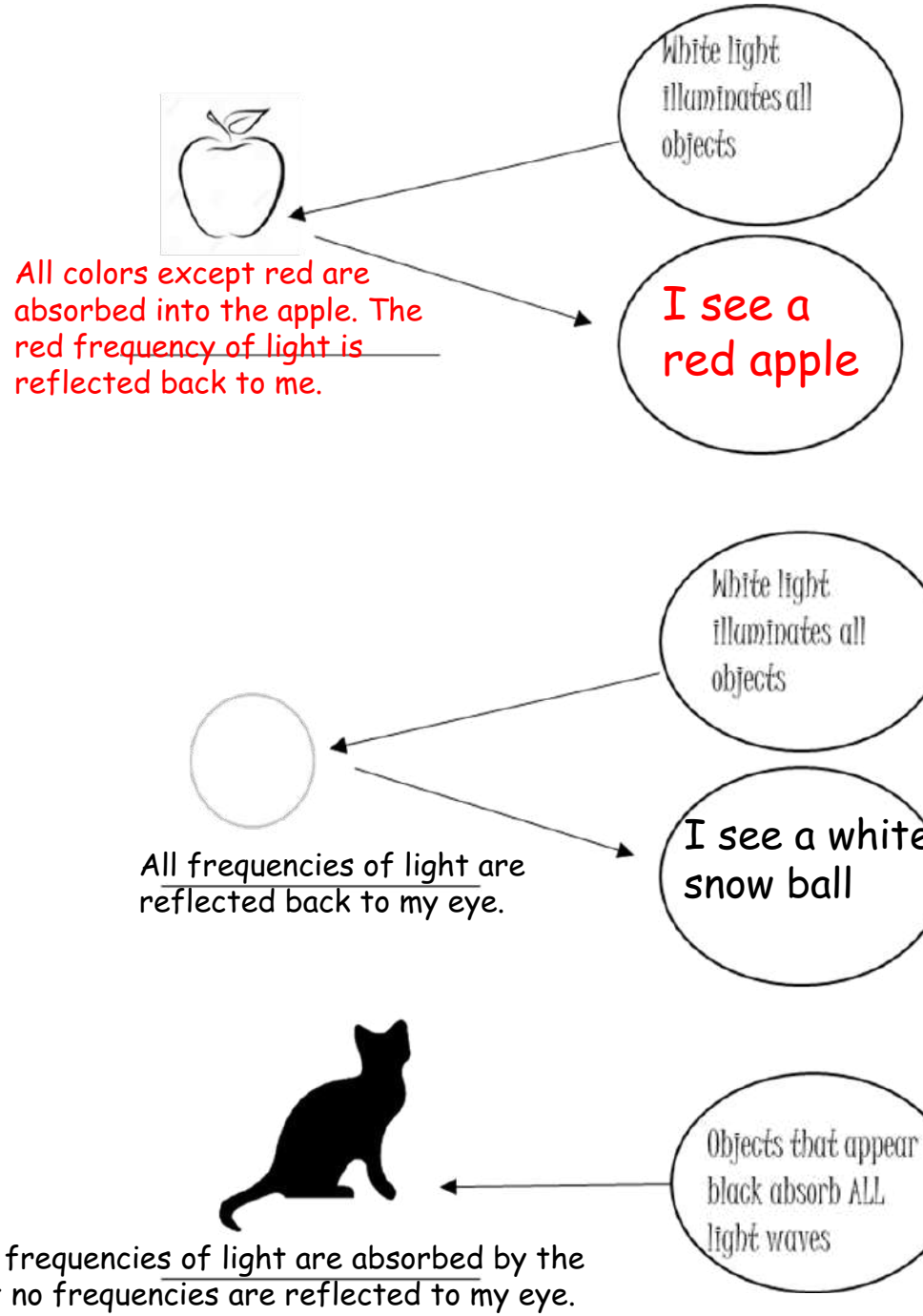
ABSORPTION

- Your eye detects these reflected wavelengths of red light, causing you to see the apple as red



- Some materials absorb all wavelengths of visible light.
- A material that absorbs all wavelengths of visible light appears black
- * A material that reflects all wavelengths of visible light appears white

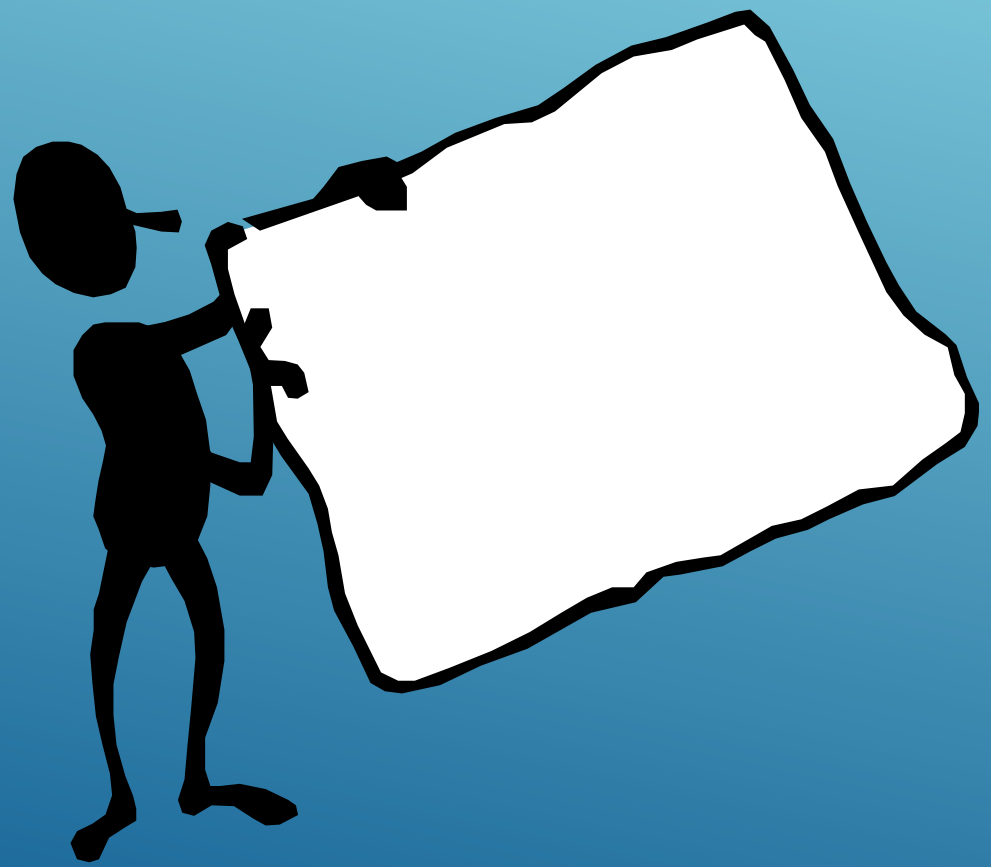
Vocabulary	Definition	Illustration
Incident Wave		
Reflection		
Refraction		
Diffraction		
Absorption		
Transmission		



REFLECTION AND COLOR

- Why does a blue wall look blue in the sunshine but different when it's in the shade?
- In the shade, no light reflects off it. Under light, it reflects only blue light; it absorbs all the other colors.

LIGHT AND MATTER



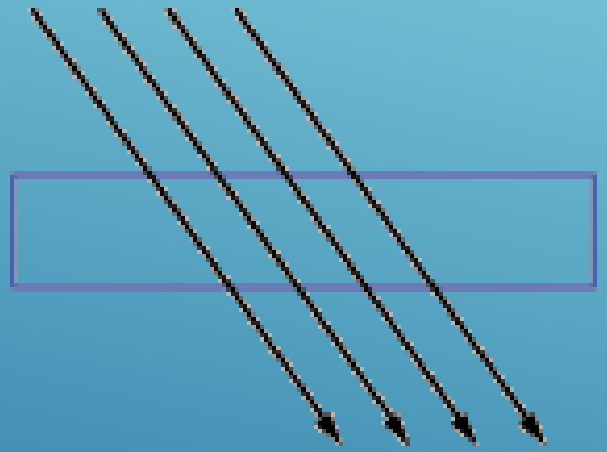
- **Often it's some combination. Take a simple piece of paper: you can see some light through, white reflects, black print absorbs.**

ABSORPTION & COLOR

A white car reflects all wavelengths of light.

A black car absorbs all wavelengths of light, absorbing the energy and turning it to heat.

TRANSMISSION

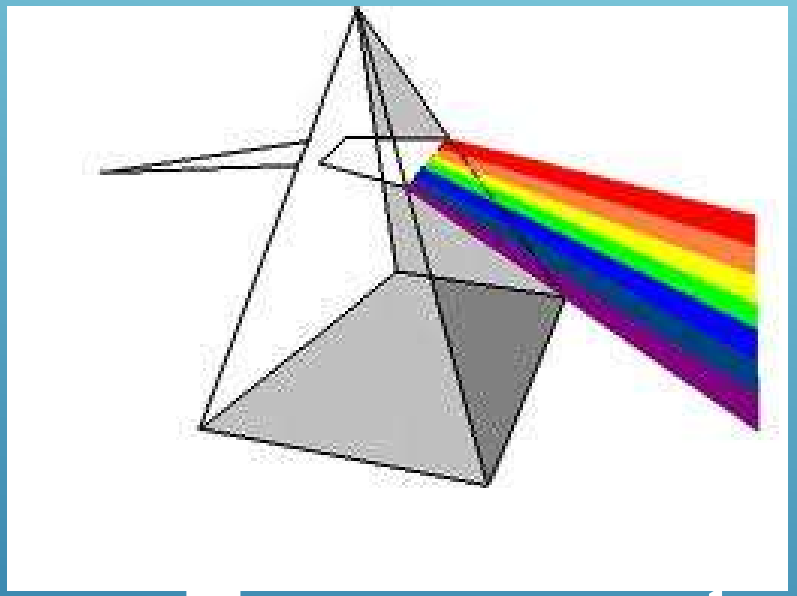


The waves can pass through the object

When light hits something it may be:

- **Transmitted (if the thing is transparent)**

LIGHT TRANSMISSION



Transparent materials transmit light, like windows.

Different frequencies have different speeds in transparent materials – that causes a prism to separate the colors.

ABC BOOK

- Directions

- 1st create a list of words from the reading on 509-514 in the text; 7min then continue adding them throughout notes. In the next days we are going to assemble a ABC Vocabulary book that can explain waves to a 5th grader. The book should include an alphabetized arrangement of definitions and illustrations for the readers.