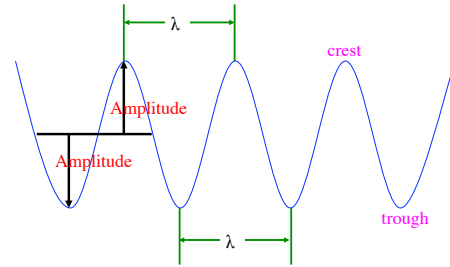


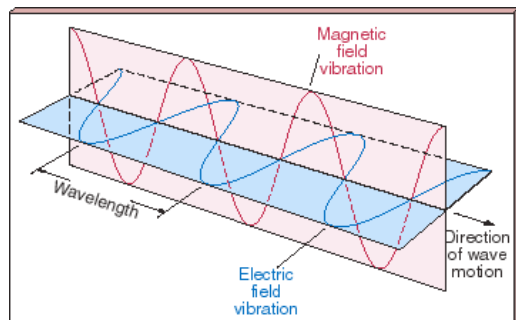
Light - electromagnetic radiation

- Electromagnetic radiation is a result of interactions of electricity and magnetism.
- Light travels as a transverse wave with crests and troughs in both magnetic and electric fields.
- [NASA Electromagnetic Spectrum](#)

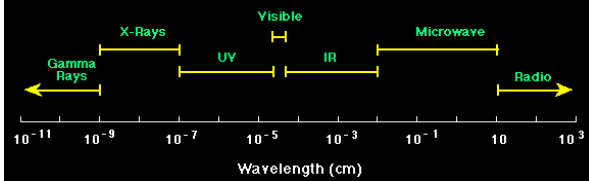
Transverse Waves



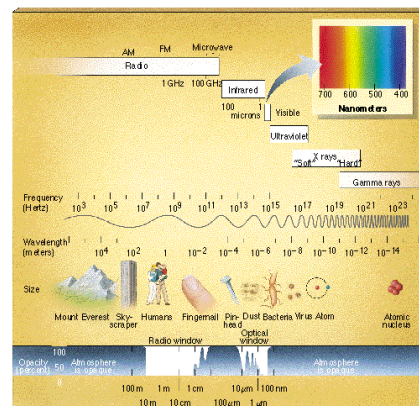
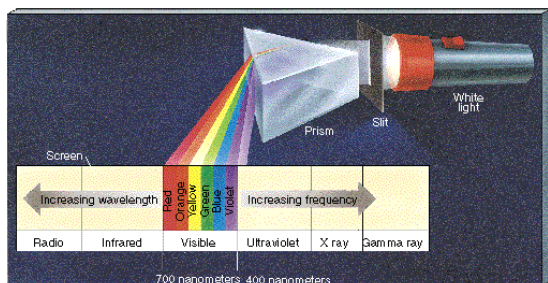
Electromagnetic Wave



Electromagnetic Spectrum



Electromagnetic Radiation



The Speed of Light

- The speed of light through space is constant, 3.00×10^8 m/s.
- The speed of a wave depends only on the kind of wave and the kind of material it travels through.
- The speed of light is the speed limit of the universe. The speed of light is the same in all reference frames.

Color, wavelength, frequency

- The frequency and wavelength of a wave are inversely proportional $c = f\lambda$.
- Changing the frequency or the wavelength do not change the speed of the wave.
- [Wavelength and Frequency](#)
- The amount of energy in the light depends on the frequency. Skin cancer discussion.

Colors

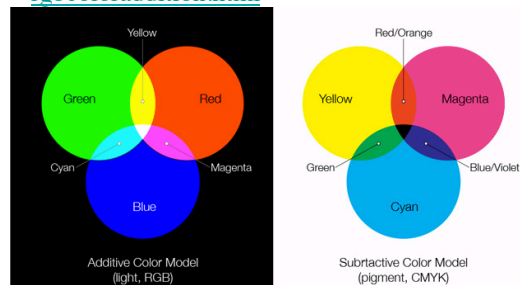
How do you see color?

<http://www.physicsclassroom.com/class/light/Lesson-2/Light-Absorption,-Reflection,-and-Transmission>

You see the light that is reflected!

Colors

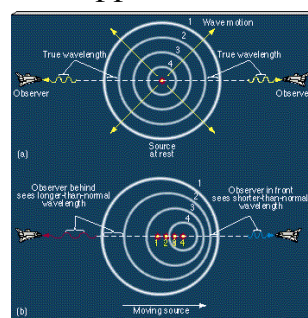
<http://www.mrmont.com/games/rgbcoloraddition.html>



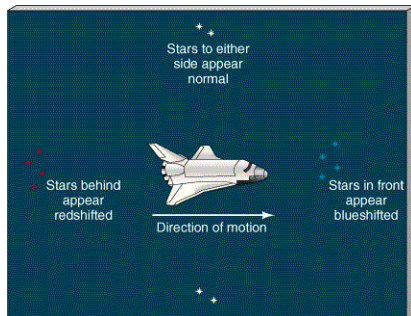
Doppler Effect

- The speed of a wave is determined **ONLY** by the kind of wave and the material it is traveling through.
- If the source of the wave is moving, the wave doesn't change speed, it changes the wavelength and frequency.
- The change in the frequency of a wave because of the motion of the source is called the Doppler Effect.

Doppler Effect



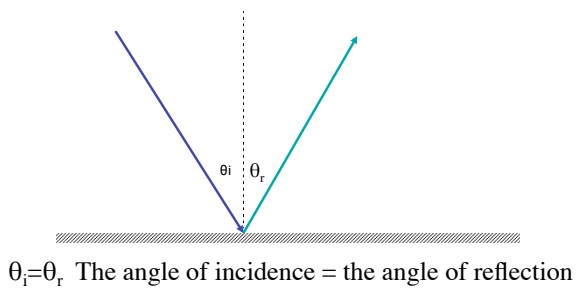
Doppler Effect



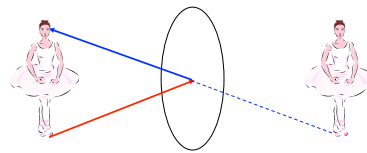
Law of Reflection

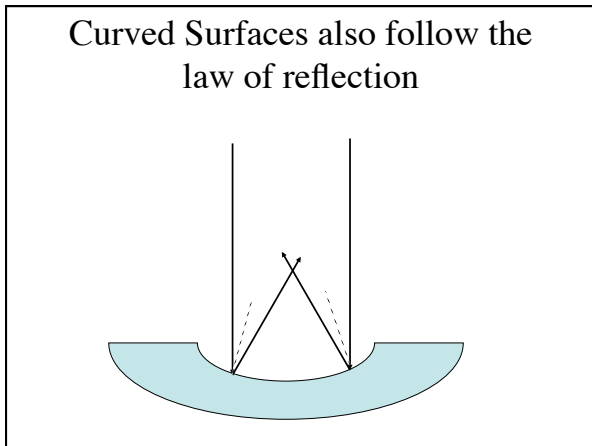
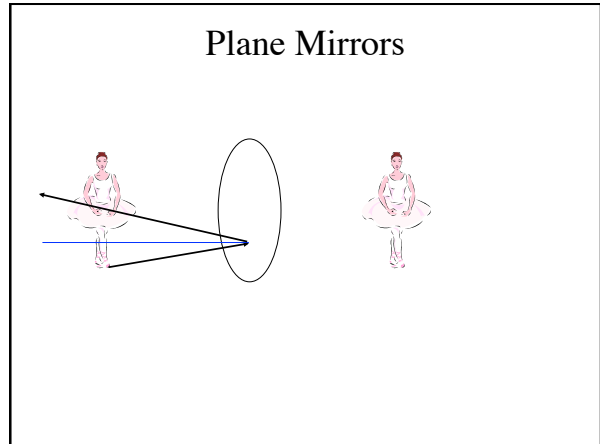
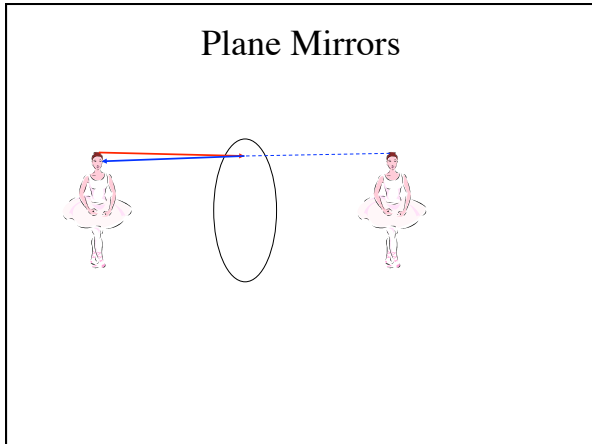
- Waves bounce off (reflect) following the law of reflection.
- The angle of incidence is equal to the angle of reflection.
- The angles are measured from the normal line.
- A normal line is defined as the line perpendicular (90 degrees) to the surface.

The law of reflection



Plane Mirrors

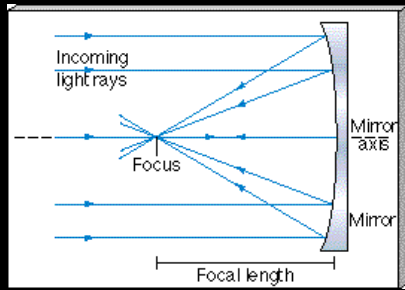




Mirrors

- Concave mirrors can gather and “focus” light.
- Convex mirrors actually spread out the light. The focus is virtual - light does not actually pass through the focus.

Reflector



Light Refraction

- Waves bend when going from one kind of material into another because the speed of the wave changes.
- This bending of light can also be used to gather and “focus” light.
- The relationship follows Snell’s Law.
- $n_1 \sin \theta_1 = n_2 \sin \theta_2$

Light Refraction

