# Physics Honors: Electromagnetic Waves & Light

#### What is the electromagnetic spectrum?

- The electromagnetic spectrum is the range of frequencies of electromagnetic radiation
- The best know section of the EM spectrum is visible light, but the entire spectrum can be referred to light
- Light waves do not require a medium to travel, so they are able to travel through space

## The Electromagnetic Spectrum



## THE ELECTROMAGNETIC SPECTRUM



Long wavelength Low energy Low frequency

#### Speed of Light

$$c = \lambda f$$

C = Speed of light in a vacuum (m/s)

 $\lambda$ = wavelength of light (m)

f = frequency of light (1/s)

In a vacuum, c = 299792458 m/s (3x10<sup>8</sup> m/s)

#### Speed of light practice

Red visible light has a wavelength of 500 nm. What is it's frequency?

Radio stations numbers are their frequency in Mhz. What is the wavelength for 101.9?

#### Visible light spectrum energy



#### Ray Model of Light

• Light is often described as a ray. A ray is a type of line that has an arrow at one end, and is closed at the other.

 When using the ray model, we describe light as moving in a straight line and bouncing off when it encounters a barrier



#### Absorb, Reflect, or Transmit Light

When light encounters matter, it can absorb, reflect, or transmit light



## **Behaviors of light**



## 02 Translucent



Absorb and reflect light; no light passes through Transmit but also scatter light; objects appear blurry. Transmits light without scattering it; you can see objects clearly



#### Luminous Flux

• Using the ray model of light, a source that is brighter has more rays being emitted

• We measure the amount of light given off using the unit Lumens (Im)

• Luminous Flux is rate at which the light source produces energy

#### **Brightness/Luminosity**

- Brightness is determined by two factors.
  - Overall Luminous Flux
  - Distance from the eye

• The inverse square law states that something two times as far away will be <sup>1</sup>/<sub>4</sub> of the brightness.

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