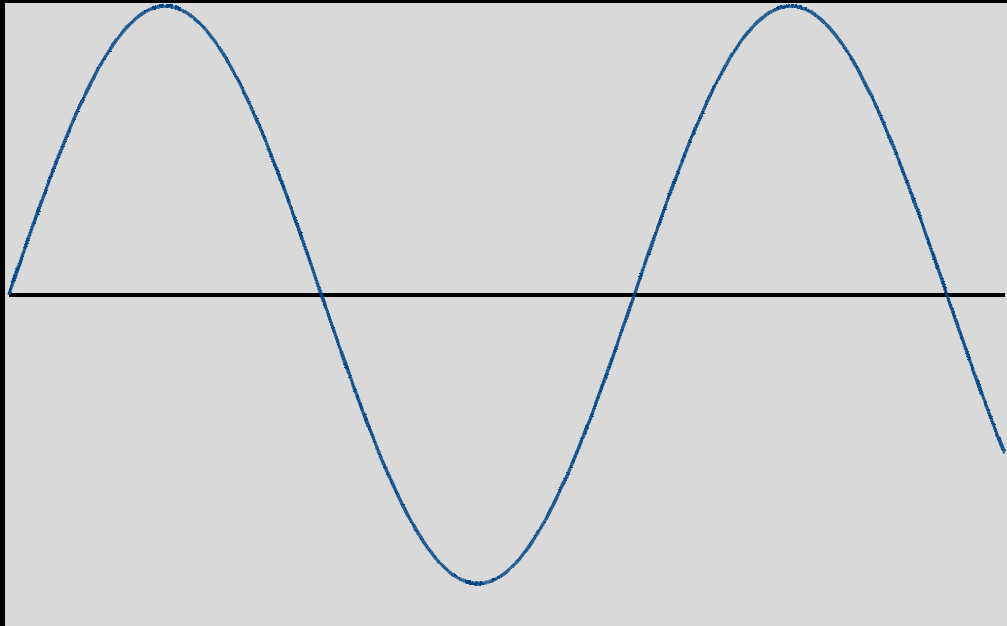


Properties of Light – Part I

- Light as a Wave

Anatomy of a Wave



- Amplitude
- Wavelength
- Crest
- Trough
- Frequency

Wave Speed

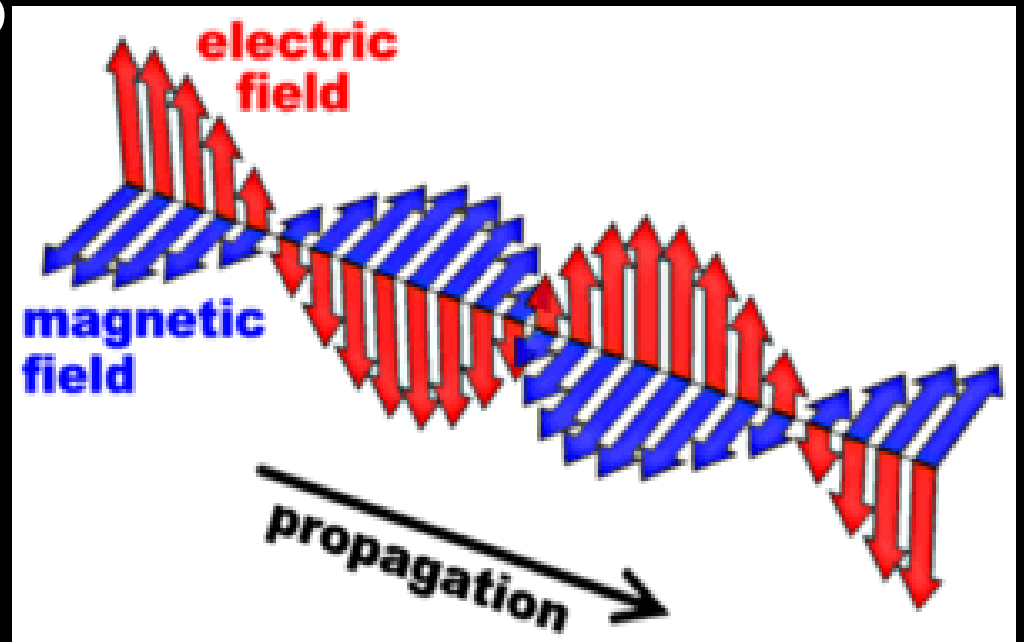
- The speed of any wave is usually the same for any frequency or wavelength.
- Typically, the speed of a wave depends only upon how rigid a material is.
- For light, the speed depends upon the electric and magnetic properties of the material through which it passes.
- The speed of light in empty space is the same for any observer, regardless of how fast they're traveling.
- The speed of light is also the maximum speed that any object may travel.

Frequency and Wavelength

- The frequency of a wave is the number of waves that pass by per second.
- The wavelength is the distance from one crest to the next.
- The product of a wave's frequency and wavelength is equal to the wave's speed:
$$v = f\lambda.$$
- As the frequency of a wave increases, its wavelength decreases.

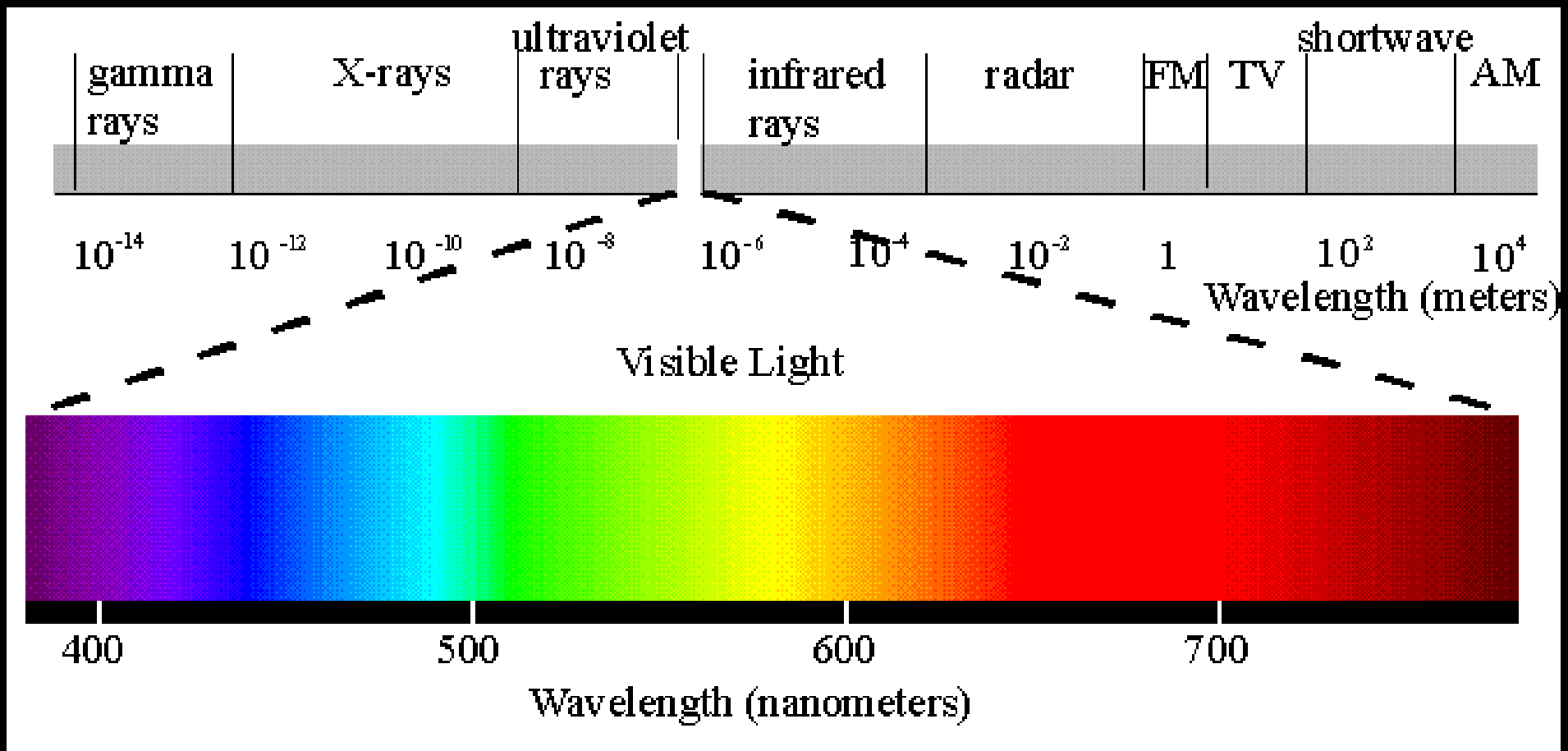
Electromagnetic Waves

- Light is a combination of two different types of waves: electric and magnetic.
- EM waves are produced by the acceleration of a charged particle.



Electromagnetic Spectrum

- The light we see with our eyes is just a small part of the entire spectrum of light.



Polarization

- The plane of polarization for light is defined by the plane of the electric field.
- Most light is unpolarized, but polarized light can be made by:
 - Using a polarizing filter
 - By reflection
 - By producing light with a dipole
- Natural polarization of light happens primarily by reflection, and the plane of polarization is same as the plane of the reflecting surface.

The Doppler Effect

- Light waves are affected by the relative velocity between the source and the observer just like sound waves are.
- When a light source is approaching, the waves become compressed and the frequency is increased. (blue-shifted)
- When a light source is receding, the waves are stretched and the frequency is decreased. (red-shifted)

The Doppler Effect Visualized

