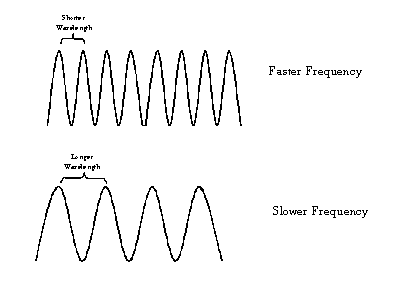
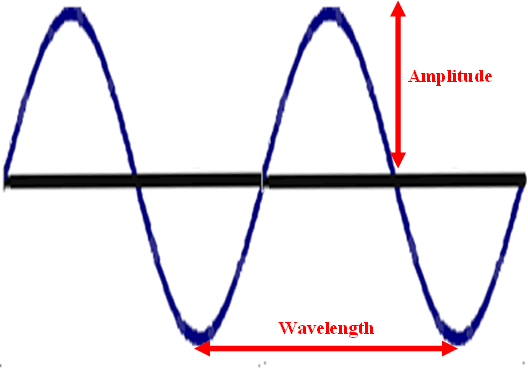
**Section 5.3**

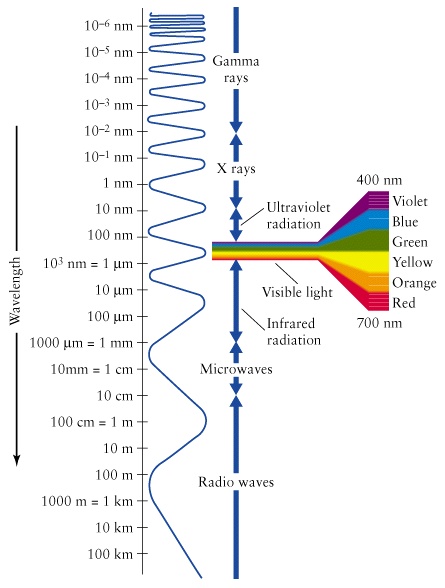
**Light**

The previous sections spoke about orbitals and how they are organized in an atom, each with particular energy levels. You also learned how to write electron configurations for atoms. In the remainder of this chapter you will get a closer look into what led to Schrodinger’s equation and the quantum mechanical model of the atom.



The quantum mechanical model came out of the study of light. Isaac Newton tried to explain the behavior of light through theorizing that light was made up of many particles. By 1900 however, there was enough experimental evidence to conclude that light was made up of waves. Each wave cycle starts at zero, increases to its highest value, passes through zero to its lowest value, and returns to zero again. The amplitude of a wave is the wave’s height from zero to the crest. The wavelength represented by the Greek letter lambda, λ, is the distance between crests. The frequency represented by the Greek letter nu, ν, is the number of wave cycles that pass a given point per unit of time. This is usually measured in cycles per second, which is measured with an SI unit called Hertz (Hz). A hertz can also be expressed as a reciprocal second (s-1). The product of frequency and wavelength always equals a constant *c* the speed of light.

*c*=λν



**The wave length and frequency of light are inversely proportional-** as the wavelength of light increases, the frequency decreases for example.

According to the wave model light consists of electromagnetic waves. Electromagnetic radiation includes radio waves, micro waves, infrared waves, visible light, ultraviolet waves, X-rays, and gamma rays. In a vacuum they all travel at the speed of 2.998 x 108 m/s.

Sunlight consists of light with a continuous range of wavelengths and frequencies. The colors of each frequency found in sunlight depend on the frequency. When light passes through a prism, the different frequencies separate into a spectrum of colors such as what happens in the atmosphere with water droplets acting as prisms creating a rainbow. Each color blends into the next in the order of red, orange, yellow, green, blue, and violet (in the visible spectrum). Red has the largest wavelength and lowest frequency in the visible spectrum.

**Practice problems for Calculating the Wavelength of Light**



Calculate the wavelength of the yellow light emitted by the sodium lamp shown if the frequency of the radiation is 5.10 x 1014 Hz (5.10 x 1014/s)

1. Lists the knowns and unknowns

**Knowns**

* Frequency *(v)* = 5.10x1014/s
* *c* = 2.998 x 108 m/s

**Unknowns**

* wavelength (λ)= ?m

1. Solve for the unknown

* Solve the equation *c*=λν for *c*
* λ= *c/*ν
* Substitute the known values to solve.
* λ= *c/*ν = 2.998 x 108 m/s = 5.8 x 10-7 m

5.10 x 1014/s