**Light Equation Worksheet**

Max Planck theorized that energy was transferred in chunks known a quanta, equal to *hν.* The variable *h* is a constant equal to 6.63 x 10-34 J·s and the variable *ν* represents the frequency in 1/s. This equation allows us to calculate the energy of photons, given their frequency. It the wavelength is given, the energy can be determined by first using the wave equation (*c = λν*) to find the frequency, then using Planck’s equation to calculate energy.

Speed of light = wavelength x frequency *c = λν* 1nm = 1 x 10-9 m

Speed of light = c = 3.00 x 108 m/s *E = hν* h = Planck’s constant = 6.626 x 10-34 J·s

|  |  |  |  |
| --- | --- | --- | --- |
| **Color** | **Wavelength λ** | **Frequency *ν = c/λ*** | **Energy *E = hν*** |
| Red | 650 nm = 656 x 10-9 m | = 3.00 x 108 m/s 656 x 10-9 m  = 4.58 x 1014 Hz | = (6.626 x 10-34 J·s)(4.58 x 1014 Hz)  = 30.3 x 10-20 J  = 3.03 x 10-19 J |
| Orange | 590 nm |  |  |
| Blue | 570 nm |  |  |
| Green | 510 nm |  |  |
| Yellow | 475 nm |  |  |
| Orange | 445 nm |  |  |
| Red | 440 nm |  |  |

Rank these parts of the electromagnetic spectrum from lowest energy (1) to highest (7):

X-ray Ultraviolet Visible Radio Microwave Infrared Gamma

Rank these parts of the electromagnetic spectrum from lowest frequency (a) to highest (g):

X-ray Ultraviolet Visible Radio Microwave Infrared Gamma

Rank these parts of the electromagnetic spectrum from shortest wavelength (A) to longest (G):

X-ray Ultraviolet Visible Radio Microwave Infrared Gamma