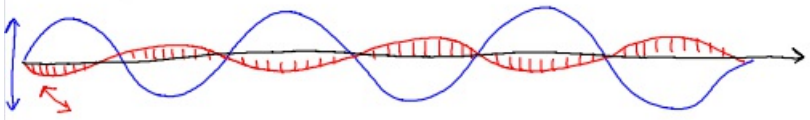
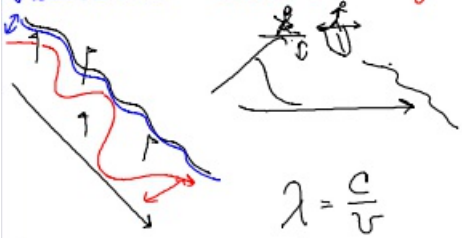
11/30/15

Electromagnetic Spectrum (EMR)



↕ electric field ↘ side to side magnetic field → foward progression



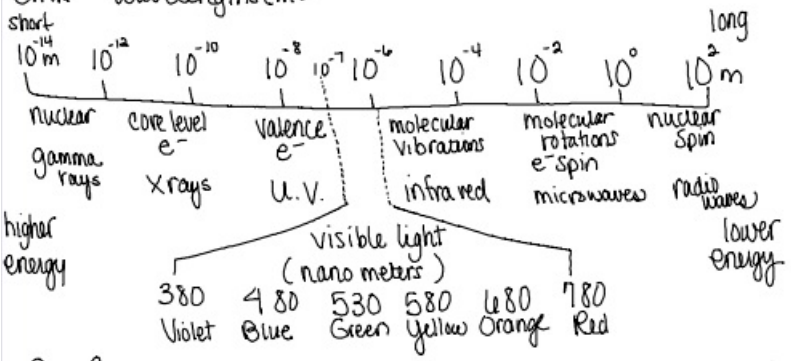
λ = (lambda) wavelength = meters or nanometers

ν = frequency = cycles per second $\frac{1}{s}$ s^{-1} hertz

C = Speed of light $\frac{m}{s}$

$$\lambda = \frac{C}{\nu}$$

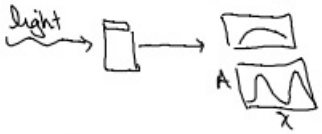
EMR wavelengths (m)



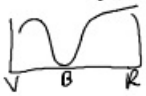
$\lambda = \frac{C}{\nu}$ wavelength & frequency have an inverse relationship

wavelength & energy have an inverse relationship

frequency & energy have a direct relationship



blue



$\lambda = \frac{C}{\nu}$ $C = 3.0 \times 10^{8} \frac{m}{s}$

Practice:

Determine the wavelength if the frequency is $\underbrace{102}_{3sf}\ s^{-1}$.

$$\lambda = \frac{C}{\nu} = \frac{3.0 \times 10^{8}\ \frac{m}{s}}{102\ \frac{1}{s}} = \boxed{2.94 \times 10^{6}\ m}$$

Determine the frequency if the wavelength is $\underbrace{4.5 \times 10^{-9}}_{2sf}$ m.

$$\nu = \frac{3.0 \times 10^{8}\ \frac{m}{s}}{4.5 \times 10^{-9}\ m} \qquad \nu = \frac{C}{\lambda} \qquad \boxed{6.7 \times 10^{16}\ \frac{1}{s}}$$

Determine the frequency if the wavelength is $\underbrace{4.35 \times 10^{-7}}_{3sf}$ nm.

$$4.35 \times 10^{-7}\ nm \times \frac{1\ m}{1 \times 10^{9}\ nm} = 4.35 \times 10^{-2}\ m$$

$$\lambda = \frac{C}{\nu} = \frac{3.0 \times 10^{8}\ \frac{m}{s}}{4.35 \times 10^{-2}\ m} = \boxed{6.89 \times 10^{9}\ \frac{1}{s}}$$

Quantum Mechanics: the study of the behavior of extremely small particles (electrons!!)

Scientists	Theory/Experiment	How to remember
Max Planck	Energy travels in small packets "Quanta"	Max energy Hit the quanta
	$E = h\nu$ (Planck's constant)	$e^- E^- \mathcal{E}^-$
	energy ↑ frequency ↑ — direct relationship	
Einstein	light is packets of energy in particles he called photons. if the correct frequency energy is transferred to another material photoelectric effect	 photo of the electric effect