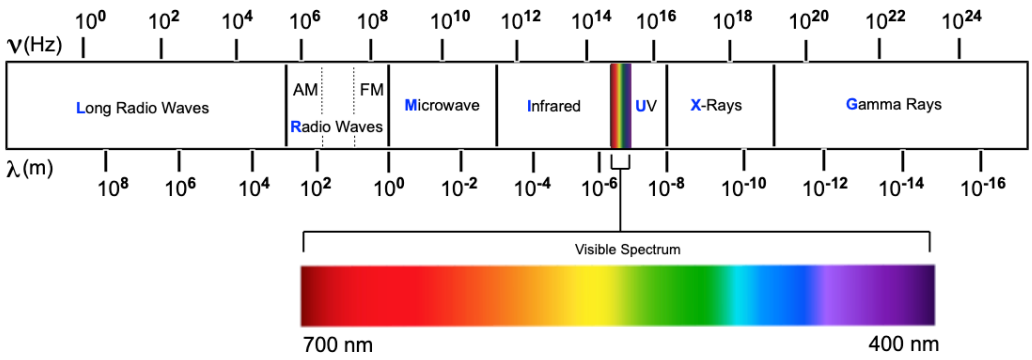
CONCEPT: THE NATURE OF LIGHT

Visible light represents a small portion of the continuum of radiant energy known as _____.



Atomic & Molecular Transitions

Radio: _____
Microwave: _____
Infrared: _____
Visible: _____
Ultraviolet: _____
X-Rays: _____
γ-Rays: _____

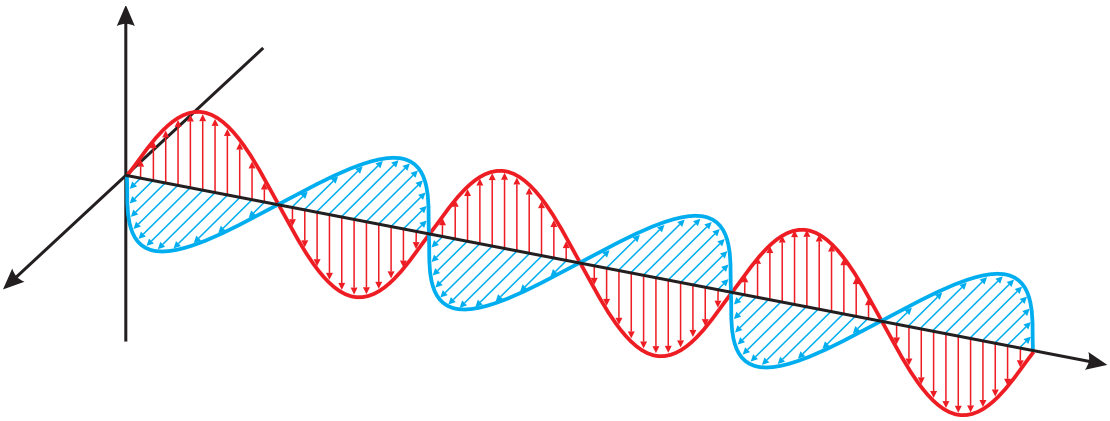
The visible light spectrum ranges from _____ to _____ .

Its wave properties of electromagnetic radiation are described by two independent variables:

_____ (ν, Greek *mu*) is the number of waves you have per second and is expressed in units of _____ or _____.

_____ (λ, Greek *lambda*) is the distance from one crest of a wave to the other and is expressed in units of _____.

Plane-polarized electromagnetic radiation:



CONCEPT: PROPERTIES OF LIGHT

The speed of a wave, is the product of ν and λ. In a vacuum, all forms of electromagnetic radiation travel at $2.998 \times 10^8 \frac{m}{s}$

$$c = \nu \cdot \lambda$$

The physicists Max Planck and Albert Einstein theorized that light was made of small "packets" of electromagnetic energy, called _____ and the energy of a single photon could be calculated by:

$$\Delta E = h \cdot \nu = h \cdot \tilde{\nu}$$

- *Planck's constant* is represented by the variable of *h* and is equal to 6.626 x 10^{-34} J · s.

EXAMPLE 1: Calculate the wavelength (in nm) of the red light emitted by a neon sign with a frequency of 4.16 ×10^8 MHz.

EXAMPLE 2: What is the energy, in joules, of a mole of photons associated with visible light of wavelength 493 nm?

PRACTICE: PROPERTIES OF LIGHT CALCULATIONS 1

EXAMPLE 1: A laser pulse produces 1.242 kJ of energy. It was experimentally determined that the pulse contains 3.50 x 10^{22} photons. Determine the wavelength of light (in meters) emitted by one photon.

EXAMPLE 2: How much total energy (in μJ/mol) would it take to remove the electrons from a mole of hydrogen atoms? The ionization energy for a hydrogen atom is 2.178 x 10^{-18} J.

PRACTICE: A low-pressure mercury-vapor lamp has a characteristic emission line at 253 nm. Knowing that this lamp is putting out 11.8 watts of light energy, how many mercury atoms are emitted per second during operation?