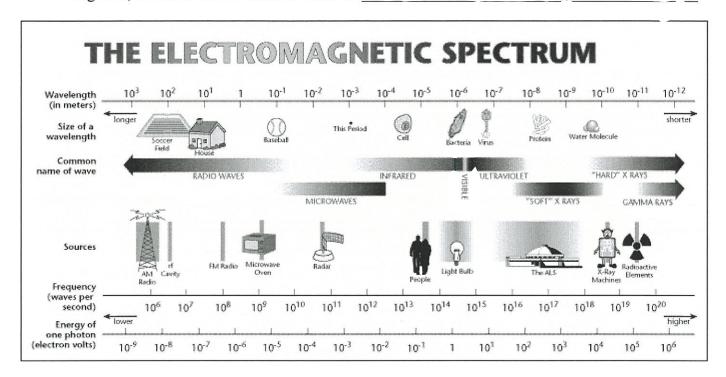
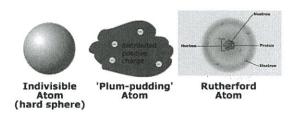
## **Properties of Light**

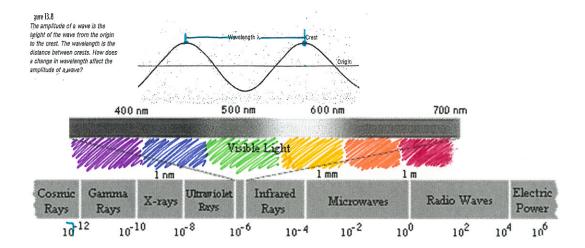
- Visible light is a form of \_\_\_\_\_\_ energy that exhibits behavior as it travels through space.
  - o different wavelengths of visible light are interpreted by your eye as different colors
  - o other forms of EM radiation include
- Together, all forms of EM radiation form the





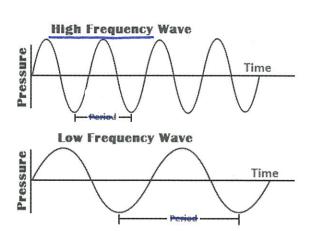
- Rutherford's model of the atom was pretty good, but it didn't explain exactly \_\_\_\_\_ the electrons were or
- The arrangement of electrons became clearer when experiments revealed the close relationship between .

Dual Nature of Light: light has properties of both \_\_\_\_\_ and \_\_\_\_.



## **Wave Properties of Light**

- all types of light energy travel at the same speed
- $\lambda = \lambda = \text{distance}$ between two consecutive peaks in a wave
- $\underline{\hspace{1cm}} = \nu = \text{the number of}$ peaks that pass a point in space in one second



Relationship between wave velocity, wavelength, and frequency:

$$c = \lambda \times \nu$$

c is a constant (speed of light) =  $3.0 \times 10^8 \text{ m/s}$ 

*Example*: The yellow light given off by a sodium vapor lamp used for public lighting has a wavelength of 589 nm. What is the frequency of this radiation?

## **Particle Properties of Light**

1900: Max Planck looked at the emission of light from hot objects, & explained that: o a hot object does not emit radiation \_\_\_\_\_ [like a wave] o it instead emitted energy in He called this \_\_\_\_\_\_  $\underline{\mathbf{quantum}}$  (plural = quanta) – amount of energy gained or lost by an atom Relationship between energy of light and its frequency:  $E = h \times v$ h is a constant (called Planck's constant) =  $6.626 \times 10^{-34} \text{ J x s}$ Example: Microwave ovens emit microwave energy with a wavelength of 0.129 m. What is the energy of microwave radiation? Wave theory could not explain the \_\_\_\_\_\_:

o the emission of \_\_\_\_\_ [electricity] when \_\_\_\_ of a specific frequency shines on a metal o light with specific amount of \_\_\_\_\_ was capable of knocking the loose from metals Electrons knocked out 1905: Albert Einstein explained this & described light as a stream of particles called o Photon - of EM radiation with no mass carrying 1 quantum of energy. **Photoelectric Effect Explained:**  Since now we know that different wavelengths of light carry different , the frequency tells us how much is needed to knock an \_\_\_\_\_loose from the metal. o Therefore, we know how tightly bonded the \_\_\_\_\_\_ is to the \_\_\_\_\_.