NAME:_____
PERIOD:_____
DATE:_____

## ENERGY

The relationship between frequency (v) and energy (E) are linked together based off of Plank's. Planck's law is the following:

$$E = h\nu$$

Where E is the energy (measured in Joules, J), v is the frequency ($s^{-1}$), and h is Planck's constant which has the value of $6.6261 \times 10^{-34}$ J s.

**Critical Thinking Question**

1. Having Planck's Law and the mathematical expression for frequency (v), wavelength (λ), and speed of light (c) write a mathematical expression that will relate wavelength (λ) and energy (E). *(Hint: What do both equations have in common? You will have to substitute.)*

2. How much energy does a red light have if its wavelength is 650.0nm?

3. How much energy does a green light have if its wavelength is 525.0nm?

4. Which light has higher energy red or green?

**On Your Own**

1. You are listening to your favorite radio station 93.3FM and the question pops into your head; if radio waves are EM radiation why does it not hurt you? The wavelength of 93.3FM is 3.22m what is its energy and explain why it does not hurt you?

2. Define the terms “ground state” and “excited state”.

3. What is the wavelength of light that has a frequency of $4.22 \times 10^{15}$ Hz?

4. What is the energy of light that has a frequency of $1.30 \times 10^{14}$ Hz?

5. A certain atom has a green spectrum line of about 540 nm. What is the difference in energy between the two energy levels responsible for producing the line?

6. The wavelength of a certain beam of light was $3.52 \times 10^{-7}$m.
    a. Find the frequency of this light.

    b. Calculate how much energy this light has.

7. What is the frequency and wavelength of light that has energy of $5.09 \times 10^{-19}$ J?