Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_

Properties of Light and atomic structure

1. Complete the following table to describe the properties of light: wavelength, frequency, energy, and speed.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Property | Wavelength | Frequency | Energy | Speed |
| Symbol |  |  |  |  |
| Frequently used units (could be more than 1) |  |  |  |  |
| Equation used to solve for property |  |  |  |  |
| Relative value (high or low) for red photon |  |  |  |  |
| Relative value (high or low) for violet photon |  |  |  |  |

1. Write values and units for the following constants.

Speed of light: Planck’s constant:

1. Make a labeled diagram to compare the wavelengths, frequencies, and energies of 2 different photons. One wave should have a long wavelength and one wave should have a short wavelength.
2. One spectral line of hydrogen has a wavelength of 6.56x10-7 m. Calculate the frequency of this radiation and determine the color of the line.
3. Determine the energy of a photon of green light which has a frequency of 5.80x1014 s-1.
4. If a photon of light has an energy of 3.88x10-19 J, determine the frequency, the wavelength and the type of electromagnetic radiation or color (if found in the visible region).
5. Calculate the wavelength, in cm, of the radiation from a radio station with a broadcast frequency of 1150 kHz (1,150,000 Hz).
6. Calculate the energy of a photon of light with a wavelength of 6.45x10-5 cm.

* Determine the color of a spectral line representing this photon.
* If you compare this photon to the photon in problem (5), which photon has higher energy?
* Is the color you determined supported by their relative energies? Explain.

1. Explain how the bright lines in the spectra of different elements are produced. Include the terms: electron, ground state, excited state, photon.
2. Explain how energy is conserved ***and*** transformed when light is produced from energized atoms.