Unit 3 HW #4: Electronic Structure of Atoms

1. Fill in the blanks with the appropriate terms:
   a. A discrete quantity (often of energy) is called a _____
   b. _____ discovered that atoms emit energy in discrete quantities.
   c. Electrons, like light, can behave as _____ or as _____
   d. Electrons in higher energy levels than expected are called _____
   e. A packet of light waves is called a _____
   f. Energy required for an electron to move up in energy level comes in the form of _____. Energy released as an electron moves back down in energy levels comes in the form of _____
   g. The distance from peak to peak of a wave is called _____
   h. The number of peaks that pass a given point in a given amount of time is called _____
   i. According to the _____ Uncertainty Principle, it is impossible to know both the _____ and _____ of an electron simultaneously.
   j. A 3-D region where an electron is likely to be found is called an _____
   k. A place in atom where an electron cannot be is called a _____
   l. S orbitals are _____ in shape, come in sets of _____, and can hold a total of _____ electrons.
   m. P orbitals are _____ shaped, come in sets of _____, and can hold a total of _____ electrons.
   n. D orbitals are _____ shaped, come in sets of _____, and can hold a total of _____ electrons.
   o. F orbitals are _____ shaped, come in sets of _____, and can hold a total of _____ electrons.
   p. There are _____ possible energy levels.
   q. Any one orbital can hold at most _____ electrons. This is known as the _____ exclusion principle. When an orbital contains 2 electrons, they must have opposite _____.
   r. According to _____ rule, when electrons are added to equal energy orbitals, each orbital receives _____ electron before any orbital receives a _____ electron.

2. Solve the following problems involving the energy of light.
   a. A certain photon of light has a wavelength of 422 nm. What is the frequency of the light? How much energy does this photon possess? What color would this light appear?
   b. When neon gas at low pressure is subjected to high voltage electricity, it emits waves of light. One of the more intense waves in the visible spectrum has a frequency of 4.69×10^{14} Hz. What is the wavelength of this light in nanometers? Is this light visible? If so, what color is it?
   c. How many waves of the light described in (b) would be needed to reach a length of 1.0 yards?
   d. What is the energy of a photon of light with a frequency of 7.39×10^{24} Hz? What is the wavelength of this photon?
   e. A certain light has a wavelength of 6.8×10^{-6} m. What is the frequency of the light? What color is this light?
   f. A photon of light has an energy of 2.84×10^{-19} J. What is the wavelength of this light?
   g. A photon of light has a frequency of 6.91×10^{14} Hz. What is the energy of this quantum of light? What color is this light?
   h. Calculate the frequency of light that has a wavelength of 3.0 feet.
   i. What is the energy of light that has a wavelength of 1.0 miles?
   j. Ocean waves travel at approximately 5.00 miles/hour, and the crests pass a fixed point at the rate of 16.5 waves per minute. What is the wavelength of ocean waves in nanometers?

3. Application.
   Watch the video at this link (https://www.youtube.com/watch?v=nPHegSuII_M) and be prepared to discuss.