Quiz 9 – Atomic Structure
AP Chemistry

This quiz must be completed and brought to my room <u>before</u> the start of first period on Tuesday. Failure to do so will incur a 25% penalty unless there is a legal reason.

You must <u>show all work</u> in order to receive credit.

1. A photon has a frequency of 4.05×10^4 Hz.
     a. Convert this frequency into wavelength (nm)
     b. Is this wavelength visible? If not, what type of radiation is it?
     c. What is the mass of the photon
     d. Calculate the energy, in joules, of this photon.
     e. Calculate the energy (in kilojoules) of 1 mole of photons all with this frequency.

2. When a compound containing cesium ions is heated in a Bunsen burner flame, photons with energy of 4.30×10^{-19} J are emitted. What color is the cesium flame? Show your calculations that determined the correct wavelength.

3. Consider the following energy levels of a hypothetical atom:

     E_4 _____ -1.0×10^{-19}

     E_3 _____ -5.0×10^{-19}

     E_2 _____ $-10. \times 10^{-19}$

     E_1 _____ -15×10^{-19}

     a. What is the wavelength of the photon needed to excite an electron from E_1 to E_4?

     b. What is the energy (in joules) a photon must have in order to excite an electron from E_2 to E_3?

4. Calculate the frequency and wavelength of the emitted photon when an electron drops from the n=5 to the n=2 level in a hydrogen atom.
     c. Explain whether the H atom emits energy or whether it absorbs energy during the transition. Justify your answer
     d. Account for the observation that the amount of energy associated with the same electronic transition from n=5 to n=2 in the He^+ ion is greater than that associated with the corresponding transition in the H atom. (Bonus: show the calculation for the He^+ energy)

5. What is the deBroglie wavelength in cm of a 12.4g hummingbird flying at 1.20×10^2 mph?
             (1 mile – 1.61km)

6. Use the Aufbau principle to obtain the ground state electron configuration of selenium.