Directions: Work out all problems on separate sheet(s) of paper and attach this page. To receive full credit you must show all work and box your answers. For problems containing tables, you can fill in the tables on this sheet. Please use the periodic table provided on our course website for any problems requiring the use of a periodic table.

1. Which of the following electronic transitions (in a hydrogen atom) will produce a photon within the visible range? Circle your answer.
   a. \( n_1 \rightarrow n_2 \)
   b. \( n_2 \rightarrow n_1 \)
   c. \( n_5 \rightarrow n_2 \)
   d. \( n_8 \rightarrow n_2 \)
   e. \( n_2 \rightarrow n_6 \)

2. Using the Bohr equation, calculate the change in energy of a hydrogen atom for the following electronic transitions. You must show your work.
   a. \( n_1 \rightarrow n_2 \)
   b. \( n_8 \rightarrow n_5 \)

3. Using the Bohr equation, calculate the energy required to remove an electron from a hydrogen atom if the electron is initially in \( n = 1 \).

4. An electron originally in the ground state within the hydrogen atom is excited to \( n_6 \). The electron returns to the ground state in one step (\( n_6 \rightarrow n_1 \)). Calculate the energy of the photon released in this process.

5. Using the Rydberg equation, calculate the wavelength of a photon emitted for the electronic transition \( n_2 \rightarrow n_1 \) in the hydrogen atom.

6. Calculate the frequency and energy of the photon described in the previous problem.

7. Using the Rydberg equation, calculate the wavelength of a photon emitted for the electronic transition \( n_3 \rightarrow n_2 \) in the hydrogen atom.

8. Calculate the frequency and energy of the photon described in the previous problem.

9. An electron within the hydrogen atom “falls” from \( n_5 \) to a lower energy level and emits a photon with a wavelength of 1282 nm. Calculate the final energy level of the electron.

10. An electron within the hydrogen atom “falls” from an initial energy level to \( n_1 \) and emits a photon with a wavelength of 97.23 nm. Calculate the initial energy level of the electron.