1. Form a group of 4 students. Divide the 4 elements (S, Cl, Se, Br) such that every member of your group has one of the 4 elements. Answer the following questions for your individual element:
   a) Write the ground-state electronic configuration and orbital diagram for a neutral atom of your element.

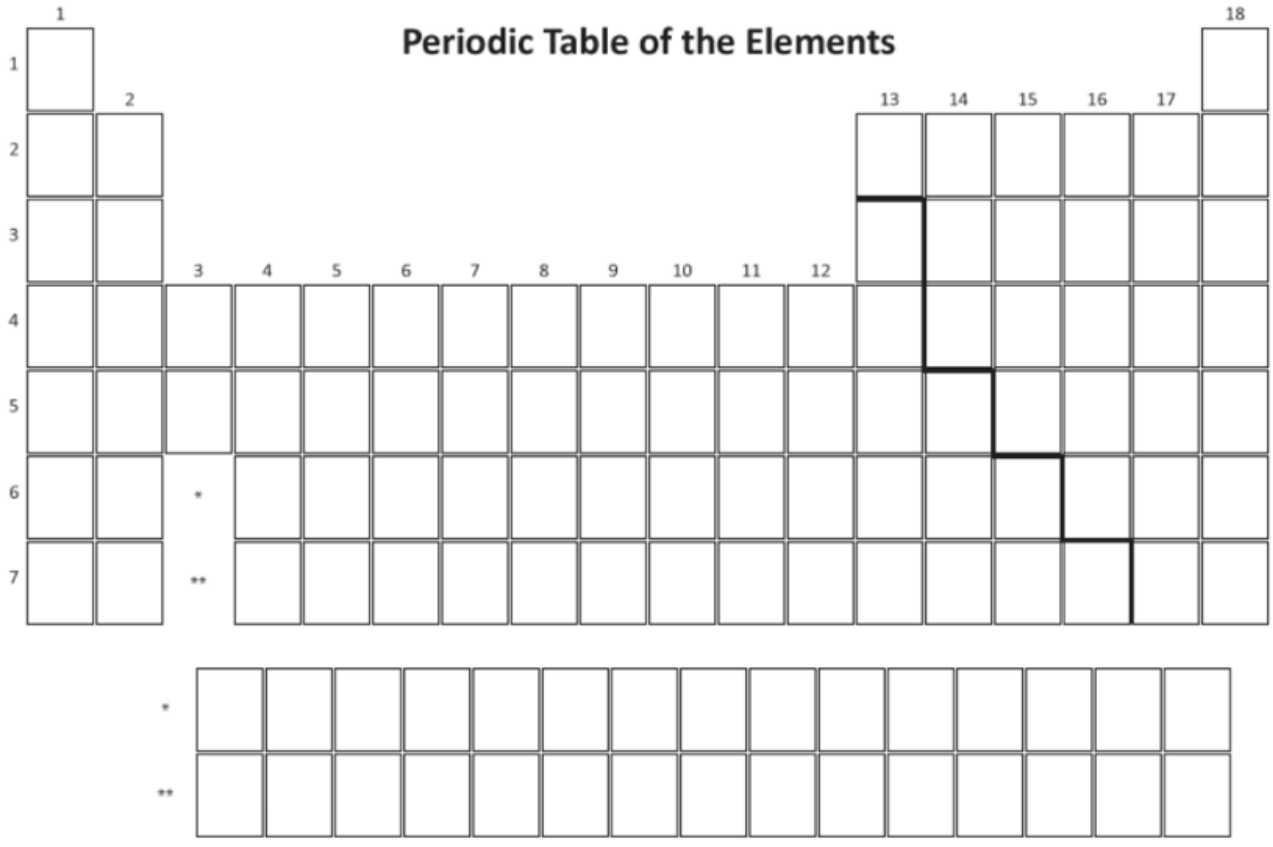
   b) For your element, write all four quantum numbers for at least three of the electrons.

   c) How many valence electrons does a neutral atom of your element have?

   d) How many unpaired electrons does a neutral atom of your element have?

   e) Now, explain your answers to the other three members of your group, and see if they agree that your answers make sense. If you need to revise your answers, do so!

2. On the empty periodic table below, draw arrows corresponding to the general trends for ionization energies going across a period and down a group. Compare your answers to those from members of your group.



3. Consider the following four electron transitions:
   From $n = 1$ to $n = 2$
   From $n = 2$ to $n = 3$
   From $n = 3$ to $n = 4$
   From $n = 4$ to $n = 5$

   a) Without calculating the wavelengths, provide reasoning that explains which of the following electron transitions in a hydrogen atom would be associated with **radiation having the shortest wavelength**. Explain your reasoning using a qualitative diagram showing the energy levels of the hydrogen atom.

   b) Calculate the wavelengths for the transitions based on the equation to check your answers.

$$\frac{1}{\lambda} = [1.097 \times 10^{-2}\ \text{nm}^{-1}]\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

   c) What kind of electromagnetic radiation (visible, IR, etc.) are these photons?

4. Which of these is not a possible orbital?
   Explain your answer using the definitions of the different quantum numbers.

   A) $3p$ B) $2p$ C) $5s$ D) $2d$

5. For each pair of atoms/ions, identify which one has a larger radius.

   a) Na or K

   b) K or Ca

   c) Kr or Kr^+

   d) Rb^+ or Kr

   e) Cl^- or Ar