Electron Configurations

This worksheet is designed to be used in conjunction with an electron configuration simulation program such as Electron Configurations (http://employees.oneonta.edu/viningwj/sims/atomic_electron_configurations_s2.html.) Most of the questions (except 10-11) can also be answered by filling out an energy orbital diagram as you proceed through the worksheet.

1. Click on hydrogen (or fill out the diagram for hydrogen) and note the change in the **orbital diagram**. Then click on helium. For elements in the first period in their ground state, electrons go into the _______ orbital.

2. Starting with Li, click on each element in the second period. What is the maximum number of electrons that goes into one orbital? ________. Is this true for all elements? ________.

3. For the elements B through Ne, the last electron added goes into what type of orbital? _____

4. All of the 2p orbitals have the same energy. True or false? _____________

5. Again, click on hydrogen and note the change in the orbital diagram. Repeat this process for helium, lithium, and the rest of the elements in the first **four** periods. In the space below, list the ORDER that the orbitals are filled with electrons:

6. Based on your observations, explain the correlation between the ORDER the orbitals are filled and the ENERGY of each orbital.

7. Click on a few different elements and look carefully at the **spectroscopic notation**. If you are not using a simulation, consult your textbook.

   a. What do the ***non-superscripted numbers*** represent? _______________________

   b. What do the ***letters*** represent? ____

   c. What do the ***superscripts*** represent? _______________________________________

8. Which element has an electronic configuration with the spectroscopic notation $1s^2 2s^2 2p^6 3s^2$?

9. In orbital diagrams, electrons are represented by small arrows. When there are two electrons occupying a single orbital, what do you notice about the arrows? Is this always true?

10. Click on boron and pay careful attention to the 2p orbitals in the diagram. Then click on carbon and notice the distribution of electrons. Continue by clicking on N, O, F, and Ne. Based on your observations, devise a **rule** that determines how electrons fill orbitals of the same energy.

11. Test the rule for elements in another period. Does it still work?

12. Click on lithium and note its electron configuration. Then, click on sodium. What similarities do these two elements share?

13. Now click on potassium, rubidium, cesium, and francium, paying careful attention to the electron configurations of the elements. What do you observe?

14. Try the same exercise for the following groups of elements:

    a. Be, Mg, Ca, Sr, Ba, Ra
    b. F, Cl, Br, I

    Can you draw any conclusions based on your observations?

15. Look carefully at the electron configurations for the noble gases. What is unique about these elements?