Electron Configuration Web Quest Name ____________________________

**Please complete these exercises to help with learning how to determine and write electron configurations using information in the periodic table, as well as the position of a symbol in the periodic table. Record all information on a separate sheet of paper.**

Topic: More often than not, when people visualize an atom they think of a small, positively charged nucleus being orbited by negatively charged electrons traveling in predictable paths. Unfortunately, electron movement is much more complicated than this.

As far as we know, electrons swarm around the nucleus of an atom in a mostly unpredictable fashion. At best, scientists can make guesses about where electrons are likely to be at any given time. Erratic electron behavior is best described by the electron cloud model. By definition, the **electron cloud** is the area around the nucleus of an atom where electrons are most likely to be found.

The website below uses the Bohr model instead of the cloud model to help us grasp how electrons can exist in energy levels. Use the link below to help you in your understanding of electrons and their behavior.

I. Link: Click Here

1. How many electrons can the 1st energy level hold at maximum? _____
2. How many electrons can the 2nd energy level hold at maximum? _____
3. By observing how the 1st eleven elements change in electron distribution into the energy levels, describe how electrons are ordered in energy levels. What are the max numbers of electrons for each level?

II. Each energy level (shell) of the electron cloud contains orbitals (subshells) that differ in energy, shape, number, and maximum electron content. In the diagram, energy is increasing as you move from top to bottom of the diagram, and energy is increasing as you move from left to right in the diagram. Click Here

1. Describe in general how the shapes of the orbitals change as they increase in energy.

2. For each energy level, list the **types** (s, p, d, or f) of orbitals that are found in each.

1________________________
2________________________
3 ________________________
4________________________
5_______________________
6______________________

Use this link to see the periodic blocks of the Periodic Table. Click Here

3. If an energy level has each of these types of orbitals, then how many copies of it does it contain? Also, if each copy of an orbital can hold up to 2 electrons, then how many total electrons in that type of orbital are present in the energy level?

   Click Here to see the types of orbitals in the electron cloud.

| Type of orbital | # copies in an energy level | total electrons for this type orbit |
|---|---|---|
| s | | |
| p | | |
| d | | |
| f | | |

III. Watch the short movie about the rules governing the order in which electrons are added to the electron cloud. Click Here

1. What does the Aufbau Principle describe?
2. What are the 3 components of an electron configuration? Use hydrogen as your example.
3. How is the electron configuration and order of electron addition the same for every element?
4. When filling the P orbital, where do you place electrons after the first one has been added?

IV. Use this link to show you the orbital diagrams of all the different elements. At the bottom of the orbital diagram you will see what is called the Spectroscopic notation- this is just the fancy science term for electron configuration.

1 What is true about the spin direction for electrons in the same orbital (one box)?

2. How many arrows (the electrons) are in each orbital, maximum?

3. Choose Rhenium in the drop down box. Looking at its orbital diagram answer the following questions. When more than one copy of the same kind of orbital (e.g, the 5 d orbitals) are found in the same energy level, then what is true about the way in which the arrows (electrons) are added?

V. **Relationship between position in the periodic table and orbital diagrams for electron configuration**. Click Here

1. Use Google and come up with a definition for what are Valence electrons?
2. Using the link above, what is common about the electron configuration (where the valence electrons are) in elements of the same period?

3. Find group one on the periodic table- it starts with Hydrogen. In what electron orbital do ALL the valence electrons end in? What about group 7- it starts with Fluorine.

4. How does the energy of valence electrons change as the atomic number of an element increases?

4. Which electrons have more energy: 4d or 5s? ______ 6p or 5f? _______

VI. **Writing electron configurations**. Use the periodic block method to help you write electron configurations of elements.

Watch how the electron configuration is written for Sodium: Watch Here
Use this periodic table to help you write configurations: e- config table

1. Write the electron configuration for Lithium:
2. Write the electron configuration for Neon:
3. Write the electron configuration for Silicon:

Challenge: Write the electron configuration for Vanadium

Below is a simple review of what you just did.

Once you can write the standard electron configuration pattern, you can then write the electron configuration for any atom or ion. (An ion is an atom with an *unequal* number of protons and electrons.) To write the electron configuration, you just count the number of electrons you have and use as many orbital sublevels as you need to hold all your electrons. Be sure to always fill the lowest energy levels first.


For example, let's say you have an atom of lithium. Lithium's atomic number is 3. So a neutral atom of lithium has 3 protons and 3 electrons. We would need space for 3 electrons. Write:

$$1s^2 2s^1$$

There are 2 electrons in the 1s sublevel and 1 electron in the 2s sublevel. 2 + 1 = 3. That's it!

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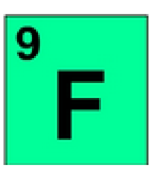


Now let's try fluorine, which has an atomic number of 9. A neutral atom of fluorine has 9 protons and 9 electrons. We need enough space for 9 electrons. The 1s orbital can hold 2 electrons and the 2s orbital can hold 2 more electrons. The five remaining electrons must go into the next orbital, the 2p orbital. The 2p orbital can hold up to 6, but we only have 5. So the following would be the correct electron configuration for a neutral atom of fluorine. 2 + 2 + 5 = 9.

$$1s^2 2s^2 2p^5$$