**Problem Set 7.4 - Electron Configuration**

Key Points:

* Bohr stated that electrons can only occupy certain distinct (quantified) energy levels. We refer to these energy levels as orbitals.
* **Quantum** means a district quantity of energy. Each electron has a quantum number which refers to its location.
* Refer to the following 3-D images of s,p,d,f orbitals to help you visualize as you learn - https://www.youtube.com/watch?v=K-jNgq16jEY

**Electron Configuration**

Each element has a specific electron configuration defining where the electrons are located. In order to understand the location of electrons, we must now look at the atom in three dimensions rather than the planetary early model of the atom. The orbitals are not two dimensional tracks like railroads circling an atom, but are rather areas of three dimensional space where we expect to find the electron. These shapes are still called orbitals, and we can describe their location and nature using quantum numbers.

**Quantum Numbers**

Each electron has a quantum number, or location defined by: **n l #**

The principal quantum number (n) indicates the **relative size** of the orbital (ex. 1-7). A shell is made up of all orbitals with the same ‘n’ value. ex. (2s and 2p).

  

The second quantum number (**l**) is called the angular momentum quantum number and refers to the **shape** of the orbital (ex. s=0,p=1,d=2,f=3). A subshell refers to a set of orbitals of the same type (ex. p orbitals)



The # tells us how many electrons are in that particular orbital. The maximum number of electrons in each type of orbital corresponds with the layout of the periodic table (ex. S – 2; P – 6; D- 10; F – 14)

To determine the electron configuration, we must fill in the following order and obey the principles below:



**The Pauli Exclusion Principle**

No two electrons in the same atom can be described by the same set of quantum numbers.

**The Aufbau Principle**

When filling orbitals, the lowest energy orbitals are filled first.

Practice Problems:

1. Li 2. Si

 

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3. Y 4. Cu

 

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**Core** Notation: (state the noble gas directly **before** the element in square brackets, then list the quantum numbers of the valence electrons only).

a. Cl: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ b. Al: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

  

**Ion** Notation: (remove from the highest energy electrons first)

c. Ca 2+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_d. Na + Core: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 

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