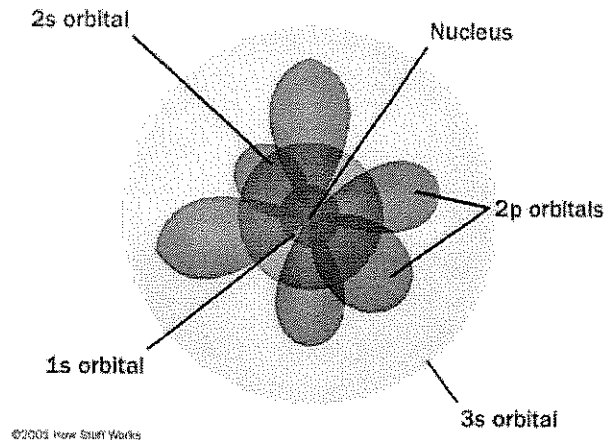


## The Quantum Model of the Atom

### A. The Nature of Electrons

1. The amount of energy an electron has determines its distance from the nucleus
2. Electrons can have only certain amounts of energy (quanta)
3. This means that electrons orbit at certain levels away from the nucleus



### B. Energy Levels

1. There are maximum of 7 energy levels
2. The maximum number of electrons that can exist in an energy level is  $2n^2$  (where n is the number of the energy level)

### C. Sublevels

1. Each energy level has a number of sublevels equal to the number of that energy level
2. There are only 4 sublevels due to the numbers of electrons they can hold
3. The sublevels are named s, p, d, and f
4. These names come from old spectroscopic terms (sharp, principal, diffuse, and fundamental)

### D. Orbitals

1. Each sublevel can contain a certain number of electron orbitals

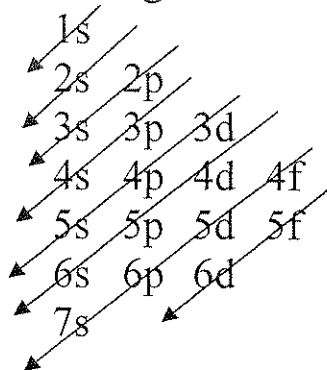
| Sublevel | # of Orbitals |
|----------|---------------|
| s        | 1             |
| p        | 3             |
| d        | 5             |
| f        | 7             |

2. Each orbital can hold two electrons
3. Each orbital within a sublevel must receive one electron before any of them receive two electrons

### E. Electron Configuration

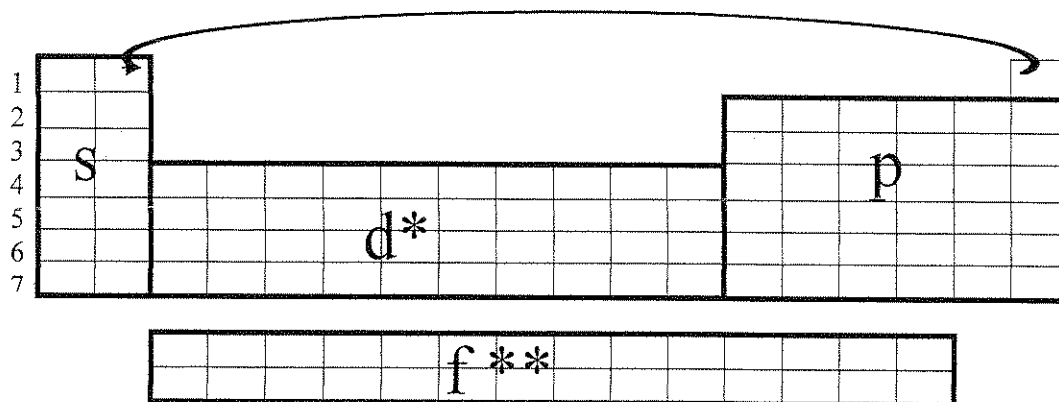
1. An electron configuration is a chemist's shorthand way of showing how many electrons an atom has in each of its sublevels

## 2. Filling order - the Aufbau Diagram



- Start at the upper left
- Fill the orbitals and sublevels as you move down the column
- When you reach the bottom of a column, move to the top of the next column to the right and continue

## 3. Periodic Table method



## F. Orbital Notation

- Boxes or circles are used to represent the orbitals grouped within a sublevel
- Arrows pointing up or down are used to represent the individual electrons within the orbitals
- Every orbital within a sublevel must contain one electron before any can have two electrons
- The second electron to be placed in an orbital must have opposite spin and be drawn oppositely as the first electron

## G. Electron Dot Diagrams

- An electron dot diagram shows the symbol of the element and uses dots to represent only the outer shell electrons (valence electrons)
- The s orbital electrons go above the symbol
- The three p orbitals are positioned on the right, bottom, and left of the symbol (in that order)