Worksheet: Electron Distributions **Name** *KEY*

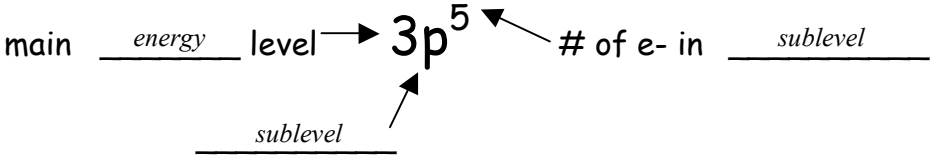
1. There are four types of orbitals:
   - **s :** shaped like a *sphere*
     An E level can contain only *1* s orbital, making up the "s sublevel".
   - **p :** shaped like *dumbbells*
     An E level can contain *3* p orbitals, making up the "p sublevel".
   - **d :** shaped like double dumbbells
     An E level can contain *5* d orbitals, making up the "d sublevel".
   - **f :** too complex to draw or describe
     An E level can contain *7* f orbitals, making up the "f sublevel".

2. Each orbital can hold a maximum of *2* electrons. Since both electrons have a *negative* charge, they *repel*. What keeps them from flying apart?

   Each electron spins on its axis. One spins clockwise and the other spins counter-clockwise. When charged particles spin, they act like tiny magnets. Since the two electrons spin in opposite directions, one acts like the north pole of a magnet and the other acts like the south pole. This makes the electrons attract .

3. Since each orbital can hold *2* electrons:
   The "s sublevel" can hold *2* electrons.
   The "p" sublevel can hold *6* electrons.
   The "d" sublevel can hold *10* electrons.
   The "f" sublevel can hold *14* electrons.

   We use this notation to describe an electron:



   How are electrons distributed within a sublevel?

   According to Hund's Rule, each orbital within a sublevel is half-filled before any is filled.

We draw **orbital diagrams** to show the distribution of electrons in a sublevel. Circles are used to represent the individual _____. _____ are used to represent electrons in the orbital. The first electron in an orbital is represented by a ↑ and the second by a ↓.

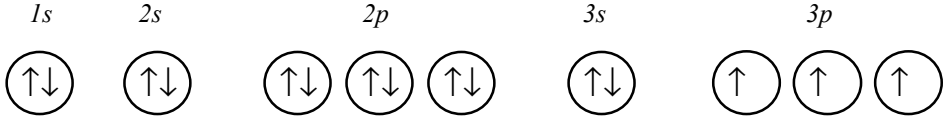
A set of four _____ numbers is assigned to each _____ to describe its energy and location within the atom. The quantum numbers use the symbols _____, _____, _____, and _____.

_____ is the principle quantum number and represents the _____ level of the electron.
_____ represents the sublevel of the electron, which depends on the type of _____.

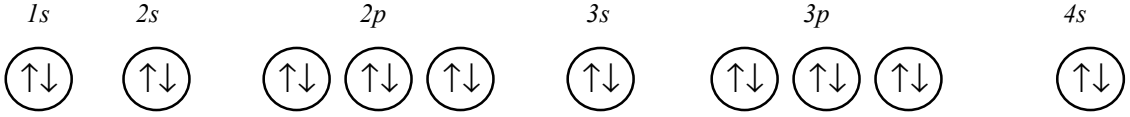
Pauli's Exclusion Principle states that within an atom, no two electrons can have the same set of _____ _____. If two electrons have the same n, l, and m numbers, they are in the same _____ level, the same _____, and the same _____. They must then have _____spins! So, the s quantum numbers must be different.

Practice: Write electron distributions and do the orbital notation for the following:

1. P : $1s^2 2s^2 2p^6 3s^2 3p^3$



2. Ca: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$



Only do the electron distributions for the following:

1. Co: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^7$

2. Eu: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^7$

3. Tc: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^5$