

Electron Configuration Example Script

This video demonstrates how to write electron configurations and draw orbital diagrams for main group elements.

To write an electron configuration you could memorize the order in which orbitals are filled according to their energy level, but a more convenient method is to use the periodic table. The periodic table is arranged in blocks, each block represents an orbital, and each space in the block counts as one electron. The s block is the first two left-hand columns of the periodic table and includes helium. The p block is the last six columns on the right hand side starting at boron. The d block is the transition metals in the middle of the periodic table, and the f block is the lanthanide and actinide series.

To begin start at the top left hand corner of the periodic table and work your way down by reading across a row from left to right and filling in the proper amount of electrons for each orbital until you reach your element.

Use the number assigned to each row, 1 thru 7, as the value of the principle quantum number n , when you arrive at the d and f blocks; subtract one from the n value for the d orbitals, and two from the n value for the f orbitals.

This periodic table has the electron configuration for each row written along the left hand side using the method just outlined.

Let's use it to write the electron configuration of a neutral bromine atom, a bromine atom has 35 electrons.

Using the blocks in the periodic table we can write the electron configuration of bromine as: $1s^22s^22p^63s^23p^64s^23d^{10}4p^5$.

If we were writing the electron configuration for the bromine anion, we would begin writing the same configuration as the neutral bromine atom except the number of electrons in the p orbitals changes from five to six because the bromine ion has 36 electrons.

To write a shorthand electronic configuration use the chemical symbol of the previous noble gas in square brackets, for bromine it's argon, then write out the orbitals that are occupied by valence electrons.

This makes the shorthand electron configuration for bromine $[\text{Ar}]4s^23d^{10}4p^5$.

The last example is an orbital diagram. We are going to draw the orbital diagram for oxygen. A neutral oxygen atom has 8 electrons, so the orbitals that will contain electrons are the 1s, 2s and 2p. The levels need to be arranged in order of increasing energy, and the lowest energy level orbitals are filled first.

Each filled orbital is assigned two electrons of opposite spin according to the Pauli Exclusion Principle. So two of oxygen's electrons go in the 1s orbital, and two electrons go in the 2s orbital. That leaves four electrons to fill the 2p orbitals.

Remember Hund's rule and place one electron with the same spin orientation in each of the three p orbitals before pairing the fourth electron.

Now you know the basics of electron configurations and orbital diagrams. You should be able to write electron configurations and draw orbital diagrams for all of the main group elements including ions using this method.