

Electron Configuration CHEAT SHEET

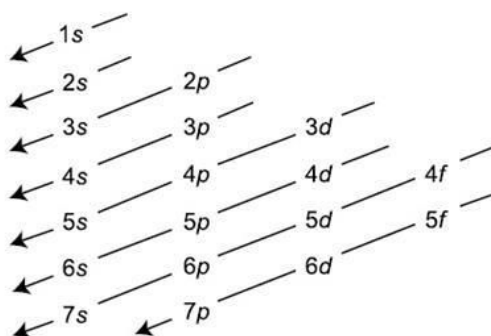
Electron Configuration - How electrons are organized in the atom.

Made up of three parts:

1. Energy level
2. Orbital type
3. Number of electrons in orbital
 - **s orbital holds 2 electrons**
 - **p orbital holds 6 electrons**
 - **d orbital holds 10 electrons**

Use **Aufbau's Principle** to fill orbitals and electrons in the correct order (starting with the LEAST amount of energy to the MOST amount of energy). Electrons always fill orbitals in this order:

1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 6s, 4f, 5d, 6p, 7s, 5f, 6d, and 7p

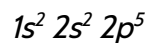


STEPS:

1. How many **total electrons** are in the atom or ion? This is how many electrons we need to map out in our electron configuration.
2. The electron configuration is written out as a **sequence** that shows which energy levels and orbitals the electrons are in. The electrons in any atom always fill in the same order, according to the **Aufbau Principle**: Starts with the **1s orbital (first 2 electrons)**, next to the **2s orbital (second 2 electrons)**, then to the **2p orbital (next 6 electrons)**, etc... **filling electrons into the orbitals until you have reached the total number of electrons in the atom or ion.**

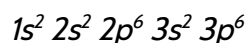
Examples:

Fluorine: 9 total electrons- we will write out the electron configuration beginning with the 1s orbital and continue filling orbitals in the correct order (according to Aufbau's Principle) until we reach 9 total electrons in our electron configuration. Pay close attention to how many electrons each orbital can hold!



(energy level one contains a full s orbital with two electrons, energy level two contains a full s orbital with two electrons and a partially filled p orbital with 5 electrons)

Ca²⁺: 18 total electrons (cation)- treat ions the same as atoms. You will write out the electron configuration starting at 1s and fill each orbital with the appropriate number of electrons until the total number of electrons reaches 18:



NOBLE GAS NOTATION: Electron configurations can get really long. (Imagine writing Uranium's!) We can abbreviate these electron configurations by using the Noble Gases (last column of the periodic table). Each Noble Gas symbol takes the place of all the electrons up to that point. For example, using the symbol for neon [Ne], which has 10 electrons, takes the place of the first 10 electrons ($1s^2 2s^2 2p^6$) of an atom. The rest of the electrons are written out as normal.

So for sodium, which has 11 electrons total, the long electron configuration would be $1s^2 2s^2 2p^6 3s^1$ but its Noble Gas Notation would be [Ne] $3s^1$, meaning the electron configuration is the same as neon plus one electron in the s orbital of the 3rd energy level.

Sodium: 11 electrons
Long notation: $1s^2 2s^2 2p^6 3s^1$
Noble Gas Notation: [Ne] $3s^1$

STEPS:

1. Find the atom or ion on periodic table. Which noble gas comes BEFORE it? How many electrons does this noble gas represent? (Hint: equal to its atomic number) Write down the symbol for this noble gas in brackets.
2. How many electrons remain for the atom after the noble gas? Start filling these electrons in after the noble gas according to the Aufbau Principle- pay close attention to which orbital comes next after where the noble gas left off.

Examples:

Potassium: 19 total electrons- the noble gas that comes before potassium is Argon. Argon (atomic number 18) represents the first 18 electrons ($1s^2 2s^2 2p^6 3s^2 3p^6$). We can use the symbol for Argon [Ar] in place of these first 18 electrons in the electron configuration for potassium. Potassium has 19 electrons total though, so AFTER the noble gas we need to add the remaining electron in the NEXT orbital. *DON'T START BACK AT 1s, continue from where Argon left off ($3p^6$)!

Long notation: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$
Noble Gas Notation: [Ar] $4s^1$

Fe³⁺: 23 total electrons (cation)- the noble gas that comes before iron is also Argon. Argon (atomic number 18) represents the first 18 electrons ($1s^2 2s^2 2p^6 3s^2 3p^6$). We can use the symbol for Argon [Ar] in place of these first 18 electrons in the electron configuration for iron. Fe³⁺ has 23 electrons total though, so AFTER the noble gas we need to add the remaining electrons in the NEXT orbitals from where Argon left off.

Long notation: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^3$
Noble Gas Notation: [Ar] $4s^2 3d^3$