Electron Configurations and Orbital Diagrams – Study Guide

*Sections 6.4 in OpenStax*

**Electron Configurations** **and Orbital Diagrams**

An electron configuration for an atom shows \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Electron Configurations consist of a

* + number denoting the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ level.
  + letter denoting the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of orbital.
  + superscript denoting the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of electrons in those orbitals.

The electron configuration of an S atom is: 1*s*22*s*22*p*63*s*23*p*4

An orbital diagram can also be used to represent the location of electrons in an atom. In an orbital diagram:

Each box represents one\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Half-arrows represent the\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

The direction of the arrow represents the \_\_\_\_\_\_\_\_\_\_\_\_\_\_of the electron.

The orbital diagram of helium is ↑↓

1s

The spin of an electron is specified by a fourth quantum number called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

The two possible values of, **ms**, are \_\_\_\_\_\_\_ (spin up) and \_\_\_\_\_\_\_\_\_ (spin down)

The **three principles** that are needed to specify orbital occupancy for the electrons are:

* **Pauli Exclusion Principle:** No orbital may have more than \_\_\_\_\_\_ electrons, and they must have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_spins
* **Hund’s rule:** Orbitals of the same energy fill \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with electrons of the \_\_\_\_\_\_\_\_\_\_\_\_\_ spins before pairing.
* **Aufbau Principle:** energy levels fill from \_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy to \_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy

energy sublevels fill from \_\_\_\_\_\_\_\_\_\_\_\_\_energy to \_\_\_\_\_\_\_\_\_\_\_\_\_energy

***Watch the video tutorial on*** [***Writing Electron Configurations***](https://www.youtube.com/watch?v=oV4IN1ZP0XQ&feature=youtu.be)

**Electron Configurations** **and the Periodic Table**

**Valence electrons** are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

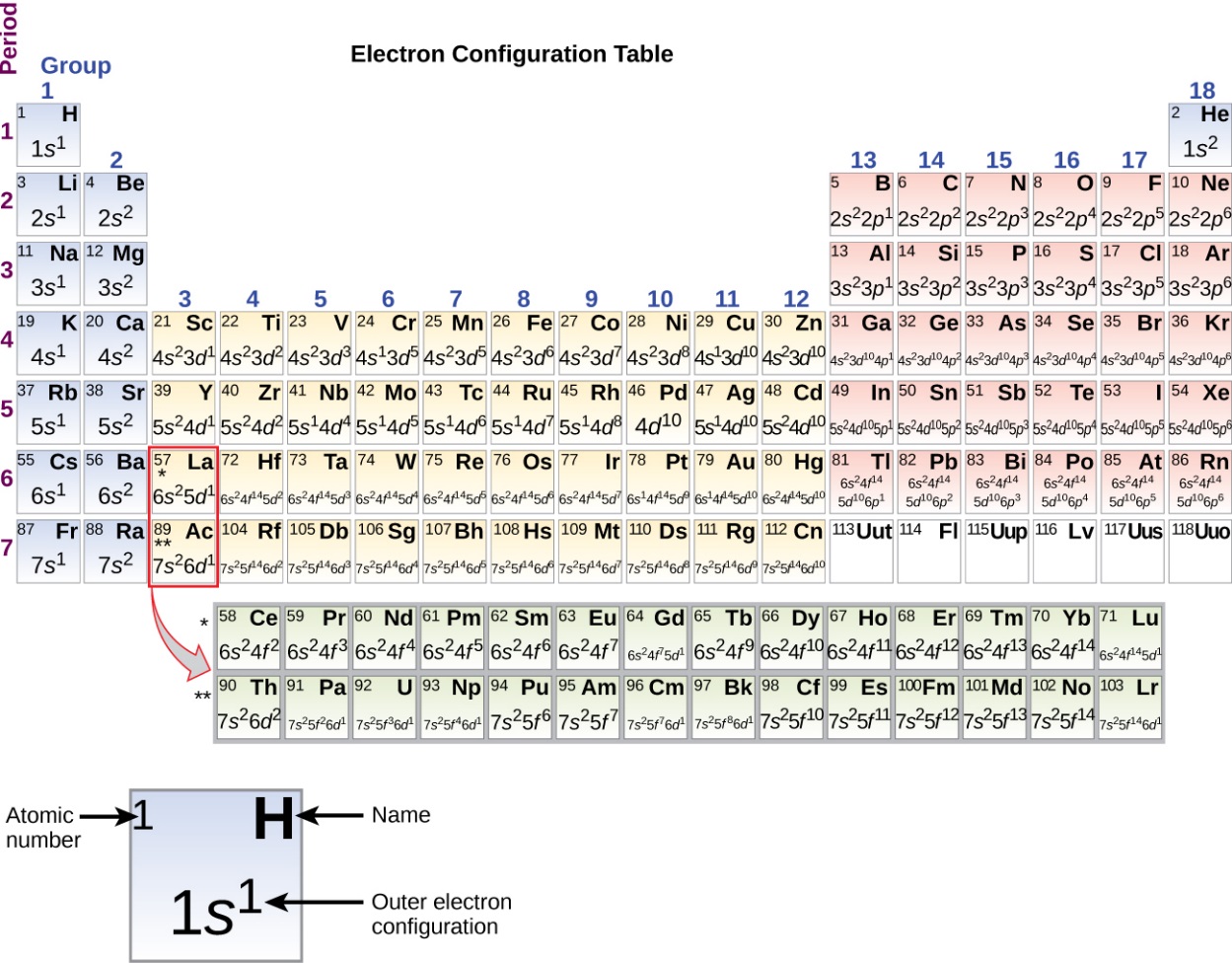
For main group elements, the valence electrons are located in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Anions** are formed when atoms \_\_\_\_\_\_\_\_\_\_\_ enough electrons to have 8 valence electrons

**Cations** are formed when an atom \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ its valence electrons

The periodic table can be divided into blocks representing the filling of particular sublevels (s, p, d or f).

Label the colored sections of the following periodic table as “s-block elements”, “p-block elements”, “d-block elements” or “f-block elements”



The number of columns in a block corresponds to the maximum \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

The row number in the periodic table is equal to the number (or n value) of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**End of Chapter 6 Practice Problems**

#49, 51, 53, 55, 57

For detailed solutions to these problems, go to the [OpenStax website](https://openstaxcollege.org/textbooks/chemistry/resources) and download the “Student Answer and Solution Guide.”