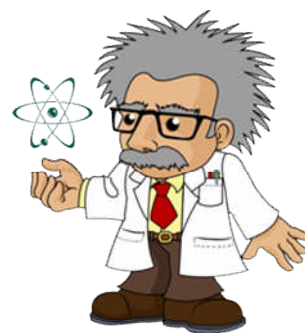


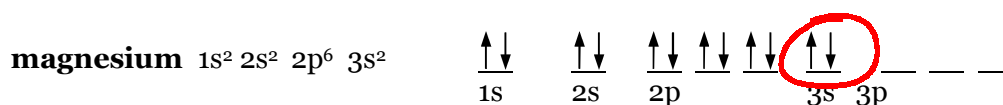
Valence Electrons



Valence electrons are the electrons in the highest energy level. Notice that boron has five electrons but only three are in the highest energy level $n=2$. So, boron has “3” valence electrons.

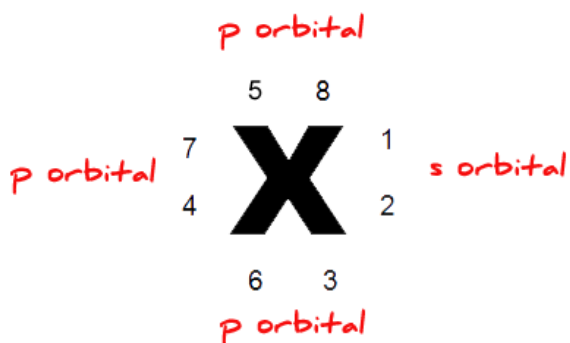


Now look at magnesium, it has twelve electrons but only two in the highest energy level $n=3$. So, magnesium has “2” valence electrons.

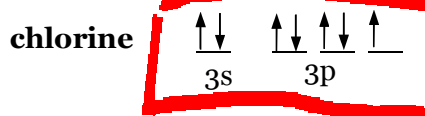


Lewis Dot Symbols

A **Lewis dot symbol** is a symbolic representation of the valence electrons in an atom. “X” is any element’s symbol and the numbers represent the order of the valence electrons for the element. Notice that the “p” orbitals are placed according to Hund’s Rule.



Examples



7 valence e^-

Write the orbital notation for the following elements. (Example: $\uparrow\downarrow$)

P _____

Ca _____

Cl _____

Cu _____

Al _____

O _____

C _____

Directions: Determine the number of valence electrons in the following elements.

____ **P** ____ **Ca** ____ **Cl** ____ **Cu** ____ **Al** ____ **O** ____ **C**

Draw the Lewis dot diagram for the following:

phosphorus	calcium	chlorine	copper
aluminum	oxygen	carbon	hydrogen

Octet Rule

The octet rule is very important to the understanding of how ions are formed. Remember that an ion is formed when an atom gains or loses electrons. If an atom gains electrons it forms an anion (O^{2-}) with a negative charge. However, if an atom loses electrons it will form a cation (Ca^{2+}) with a positive charge.

Why electrons gain or lose electrons can be best understood through the octet rule, which states: **elements tend to gain or lose electrons in order to obtain a Noble gas valence.** You must also remember that nature tends to move toward the least resistance or lowest energy and **gaining electrons and losing electrons both require energy.** *

Since the octet rule usually deals with the valence electrons Lewis dot symbols are very useful in determining charges and eventually chemical bonds.

Oxidation Numbers

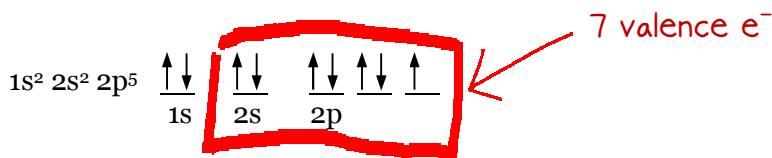
The oxidation number is the **possible charge an element could obtain by gaining or losing electrons**. In order to determine this possible charge of an element you need the element's Lewis dot symbol, the octet rule and ask yourself the following question:

* "Will this element gain electrons or lose electrons to obtain a Noble gas valence?"

If the answer is "gain" then an anion is formed, but if the answer is "lose" then a cation is formed. Let's do an example.

Example

What is the oxidation number of fluorine?



Lewis dot symbols →



Will fluorine gain 1e⁻ or lose 7e⁻ ?

Because it cost energy whether you gain or lose electrons, it is easier to gain one electron than to lose seven. Thus, fluorine will gain one electron to obtain a Noble gas valence.

Fluorine's oxidation is 1⁻

Directions: Determine the oxidation numbers of the following elements.

___ P ___ Ca ___ Cl ___ Cu ___ Al ___ O ___ C

"There are three classes of people. Those who see; those who see when they are shown; those who do not see." - Leonardo DaVinci