

CHAPTER 7 BONDING

Valence electrons:

Group	e- configuration	Valence electrons
1	ns^1	
2	ns^2	
13	ns^2np^1	
14	ns^2np^2	
15	ns^2np^3	
16	ns^2np^4	
17	ns^2np^5	
18	ns^2np^6	

Octet Rule:

- _____
—

This is called the : _____

- Bond formation follows the *octet rule*: Chemical compounds tend to form so that each atom:

—

LEWIS DOT STRUCTURES

- tracks the number of valence electrons
- **Lewis Dot Diagrams:**
 - an electron-configuration notation with only

- indicated by _____ placed around the _____.
- the _____ are **not** shown.

Practice:

H	N
Li	O
Be	F
B	Ne

Lewis Structures for compounds

- The pair of dots between the two symbols represents _____
- Each fluorine atom is also surrounded by three pairs of electrons that are _____
- An _____, also called a _____, is a pair of electrons that is **not** involved in bonding and that belongs exclusively to **one** atom.
- The pair of dots representing a _____ of electrons in a covalent bond is often replaced by a _____.

BONDING

covalent bond:

Why should atoms share electrons?

double bond:

- shown by two side-by-side pairs of dots or by two parallel dashes

triple bond:

Steps for Drawing Lewis Structures:

1. Draw skeletal structure of compound showing what atoms are bonded to each other. Put least electronegative element in the center.
2. Count total number of valence e⁻. Add 1 for each negative charge. Subtract 1 for each positive charge.
3. Complete an octet for all atoms *except* hydrogen
4. If structure contains too many electrons, form double and triple bonds on central atom as needed.

Example:

Draw the Lewis Structure for CO_3^{2-}

resonance structures:

Exceptions to the octet rule:

These elements may be stable without a valence shell of eight electrons:

ionic bond:

Example:

Bond Properties

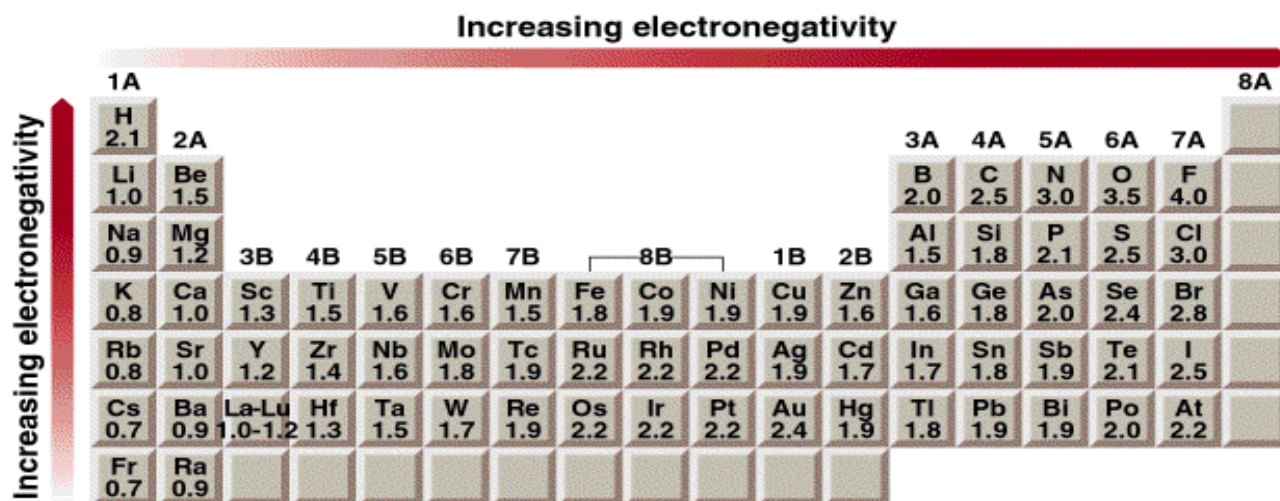
Covalent:

- Non-polar covalent:
- Polar Covalent:

Ionic:

Electronegativity:

- determines the type of bond formed between two atoms



Electronegativity Difference	Bond Type
0 to 0.3	
0.4 to 1.7	
> 1.7	

INCEASING DIFFERENCE IN ELECTRONEGATIVITY

Examples

CsCl

H₂S



Covalent Compounds

-
-
-
-
-

Ionic Compounds

-
-
-
-
-
-

Breaking Ionic Compounds

- Ionic Bonds are very tightly bound
 - positive and negative ions attracting
- **A LOT** of energy needs to be put in to break an ionic bond
 - How does this affect the melting point?

NAMING COMPOUNDS

RULE 1

Metal – Nonmetal

1. Write the metal (positive ion) first
2. Change the ending of the second word to -ide

RULE 2

Nonmetal – Nonmetal

USE PREFIXES!

1. Change the ending of the second word to -ide
2. No mono on the first word
3. Drop any double vowels

RULE 3

Polyatomic Ions

1. DO NOT CHANGE ANYTHING!
2. When you have NH_4 , change the second word to -ide

RULE 4

Transition Metals

1. Can have more than one type of charge
2. Write the charge number in roman numerals

WRITING FORMULAS

The Criss-Cross Method

Cross the number and drop the charge.

If numbers are the same, you can reduce!

Check your work:

For nonmetal-nonmetal compounds:

The prefix tells you how many you have.

ACIDS

acid: is a type of molecular compound

- _____ are acids that consist of two elements, usually hydrogen and a halogen
- _____ are acids that contain hydrogen, oxygen, and a third element (usually a nonmetal).
- In the laboratory, the term *acid* usually refers to a solution in water of an acid compound rather than the acid itself.
 - example: *hydrochloric acid* refers to a water solution of the molecular compound hydrogen chloride, HCl
- Many polyatomic ions are produced by the loss of hydrogen ions from oxyacids.

Sulfuric Acid		Sulfate	
Nitric Acid		Nitrate	
Phosphoric Acid		Phosphate	

