

Lewis Structures for Elements

- Dots are used around the symbol of the element.
- Based on the number of valence electrons.
- Group Number represents the number of valence electrons for main group elements.

Group and # of Valence Electrons	Example
Group 1A; 1 valence electron	
Group 2A; 2 valence electrons	
Group 3A; 3 valence electrons	
Group 4A; 4 valence electrons	
Group 5A; 5 valence electrons	
Group 6A; 6 valence electrons	
Group 7A; 7 valence electrons	
Group 8A; 8 valence electrons	

Lewis Structures for Type I/II Binary Ionic Compounds

- Ionic Compounds are formed from a metal and nonmetal.
 - Metals donate/lose electrons
 - Nonmetals gain/accept electrons

Potassium Chloride, KCl

Sodium Bromide, NaBr

Barium Oxide, BaO

Calcium Iodide, CaI₂Lithium Phosphide, Li₃PMagnesium Nitride, Mg₃N₂

Lewis Structures for Covalent Compounds and Polar Covalent Compounds

- Hydrogen follows a very important rule in Lewis Structures called the **Duet Rule**.

Duet Rule—forms stable molecules where it shares two electrons

- Other elements follow an important rule for Lewis Structures called the Octet Rule

Octet Rule—elements that are surrounded by eight electrons and form stable molecules.

- When two electrons are shared among Lewis Structures, a bond forms. This is called the **Bonding Pair**.

Bonding Pair—electrons that are shared between atoms that help to form the bond of the molecule.

Single Bond—involves two atoms sharing one electron pair.

Double Bond—involves two atoms sharing two electron pairs.

Triple Bond—involves two atoms sharing three electron pairs.

- Each element will have electrons that are not involved in bonding. They are called **Lone Pairs**.

Lone Pairs—electrons that are not involved in the bonding process of the atoms to form molecules.

FOR COVALENT COMPOUNDS

- ***Covalent compounds share electrons equally***
- ***H₂, Br₂, O₂, N₂, F₂, I₂, Cl₂***

FOR POLAR COVALENT COMPOUNDS

1. Obtain the sum of the valence electrons from all the atoms.
2. Use one pair of electrons to form a bond between the atoms. A line is used to represent a bond.
3. Arrange remaining electrons to satisfy the Duet Rule for hydrogen and the Octet Rule for each second row element.

Water, H₂O

Methane, CH₄

Lewis Structures of Compounds with Multiple Bonds

Let's look at carbon dioxide.

1. Obtain the sum of the valence electrons from all the atoms.
2. Form bonds between carbon and each oxygen.
3. Distribute remaining electrons to satisfy the Octet Rule for second row elements

CAN IT BE DONE?

4. Carbon dioxide can form Resonance Structures.

Resonance—a molecule that shows more than one Lewis Structure

Resonance Structure—various Lewis Structures for a molecule that shows resonance.

Lewis Structures of Molecules with Charges

When dealing with an ion molecule, take note of the charge of the molecule. If the charge of the molecule is NEGATIVE, the number of electrons in the charge WILL BE ADDED to the sum of the valence electrons. If the charge of the molecule is POSITIVE, the number of electrons in the charge WILL BE SUBTRACTED from the sum of the valence electrons.

Let's look at the cyanide ion.

1. Sum valence electrons.
2. Form a bonds.
3. Distribute remaining electrons to satisfy the Octet Rule for second row elements.

Let's look at the ammonium ion

1. Sum valence electrons.
2. Form a bonds.
3. Distribute remaining electrons to satisfy the Octet Rule for second row elements.