

Chemical Bonding

Bonding

- A **bond** is a force that holds atoms together making them function as a unit.
- Breaking a bond **requires** energy, so we say energy is **absorbed**.
- When bonds are reformed, energy is always **released** to the surrounding area.

Bond Energy

- Endothermic** reactions absorb more energy breaking the bonds of the reactants than is released by reforming the bonds of the products.
- Exothermic** reactions release more energy forming their products bonds than is absorbed by breaking the bonds of the reactant.

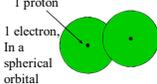
Ionic Bonds

- Ionic Bonds are transfers of electrons.
- The atoms are held together by an electromagnetic force.

What is covalent bonding

- Covalent bonding - sharing of electrons by elements in order to get a full valence shell.
- So the simplest atom- hydrogen

When it is covalently bonded to another H atom the orbitals overlap. This is H₂ (gas)
The electrons could be anywhere in that figure "8" around both nuclei



Representing that diagram

- instead of the nucleus write the element symbol
- For each valence electron draw a dot
- When electrons are shared, draw them as a pair in between the two elements

H:H

This is called a Lewis Dot Structure.



The covalent bond- (shared pair of electrons)

- The shared pair of electrons is called a single bond
- most atoms also have unshared electrons
- These are also drawn as pairs (to the left right above and below the atom)

Lewis Dot structures for atoms with unshared electrons

- So for Chlorine gas Cl₂
- Each Cl has 7 valence electrons

:Cl:Cl:

-this is the single bond, both electrons can be found around both atoms.
-each atom now has 8 valence e⁻ (a full shell), that is represented by the dots touching the symbol.

-all other electrons are unshared, they only orbit the original atom

Lewis Dot structures for larger molecules

- simple rules for drawing Lewis dot structures
- each atom wants to have 8 electrons touching (unless its H- it only wants 2)
- So for H₂O



These 6 are oxygen's originals
These are the 2 hydrogen bring in

We still have the same number of electrons brought in by each atom, but they also now have a full shell!

Rules

- **Octet Rule-** Most atoms are in the most stable configuration with 8 valence electrons. That is both s and p orbitals full in their valence shell
- **Duet Rule-** Some atoms have a full shell with 2 valence electrons.
- That is just their 1st energy s shell.
- H, He, Li, and Be follow the duet rule. Only H will form covalent bonds

Bonds

- **Single bond-** one shared pair of electrons between two atoms
- Like in H₂
- H:H

Double bonds

- **Double bond-** two shared pairs of electrons between two atoms
- Like in O₂
- 
- Each atom ends with 8 electrons touching

Triple Bond

- **Triple Bond-** three shared pairs of electrons between atoms
- Like in N₂

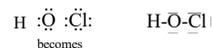


Draw the Lewis Dot Structures for...

- CH₄
- NCl₃
- CH₂O
- SiO₂
- H₂S

Abbreviating Lewis Dot Structures

- It can sometime be tedious writing out all the dots, and they can also be difficult to see.
- So it is very common to use a dash to represent a pair of electrons.
- So...



If it's a double bond

- **Single bond** is a single dash, double bond is a double dash.
- So CO₂

- Make sure bonds connect the elements, and unpaired electrons don't connect to another element