Chemical Bonding

Bonding - chemical linking of two or more elements

- Bond to have 8 valence electrons (makes them stable)
  - Valence e^- - responsible for bonding - outermost electrons
- Octet rule - 8 valence electrons = stable (happy) octet
- Two types of bonds: Ionic and Covalent

Ionic Bond

Ionic Bonding - transfer of electrons

- Between metals and nonmetals
-
- Electronegativity (EN) - how much an atom wants electrons
  - Metals - low EN - give away electrons
  - Nonmetals - high EN - take electrons

Ionic Bonding

- Metals - lose e^- to become positively charged
- Nonmetals - gain e^- to become negatively charged

- Positive and negative charges attract

Ionic Bonding

- Polyatomics also bond ionically
  - Group of atoms that have covalently bonded but not satisfied the octet rule - want to bond again
  - Stay together as a group (Do Not Change Them!)

Ionic Bonding - Polyatomic Chart (on the back of your Periodic Table)

Common Polyatomic Ions

+1	
ammonium	NH_4^{+1}

-1	
acetate	$C_2H_3O_2^{-1}$
amide	NH_2^{-1}
bicarbonate or hydrogen carbonate	HCO_3^{-1}
bisulfate or hydrogen sulfate	HSO_4^{-1}
bisulfide or hydrogen sulfide	HS^{-1}
bisulfite or hydrogen sulfite	HSO_3^{-1}
bromate	BrO_3^{-1}
chlorate	ClO_3^{-1}
chlorite	ClO_2^{-1}
cyanide	CN^{-1}
dihydrogen phosphate	$H_2PO_4^{-1}$
hydroxide	OH^{-1}
hypobromite	BrO^{-1}
hypochlorite	ClO^{-1}
hypoiodite	IO^{-1}
iodate	IO_3^{-1}
nitrate	NO_3^{-1}
nitrite	NO_2^{-1}
perchlorate	ClO_4^{-1}
permanganate	MnO_4^{-1}
thiocyanate	SCN^{-1}

-2	
carbonate	CO_3^{-2}
chromate	CrO_4^{-2}
dichromate	$Cr_2O_7^{-2}$
monohydrogen phosphate	HPO_4^{-2}
oxalate	$C_2O_4^{-2}$
sulfate	SO_4^{-2}
sulfite	SO_3^{-2}
thiosulfate	$S_2O_3^{-2}$

-3	
arsenate	AsO_4^{-3}
arsenite	AsO_3^{-3}
borate	BO_3^{-3}
phosphate	PO_4^{-3}
ferricyanide	$Fe(CN)_6^{-3}$

-4	
ferrocyanide	$Fe(CN)_6^{-4}$
pyrophosphate	$P_2O_7^{-4}$
orthosilicate	SiO_4^{-4}

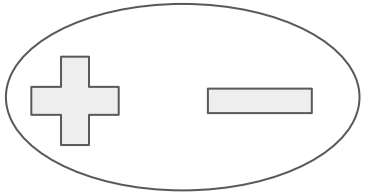
-5	
periodate	IO_6^{-5}

Ionic Bond

Metal → Non-metal

e^-

Cation Anion

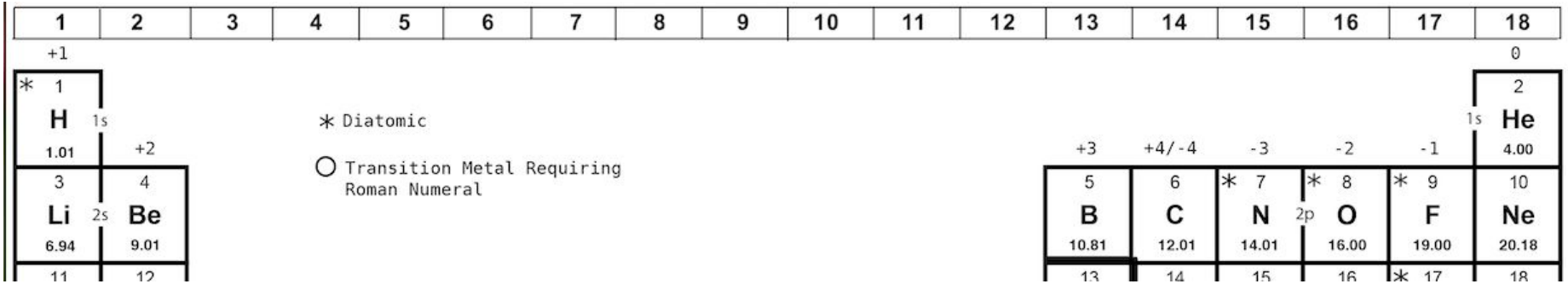


Ionic Bond

Oxidation Number - represents the number of electrons lost or gained by an element

Positive Oxidation Number: lost e^-

Negative Oxidation Number: gained e^-



Ionic Bond

Group # will tell you the Oxidation # **except** for Transition Metals

- Can potentially have more than one Oxidation #.
  - Your periodic table identifies the Transition metals with a circle around the Atomic Numbers
    - Examples coming soon - be patient!

Ionic Bonding - Lewis Dot Structure

Shows the Valence Electrons

Li		F
Ca	C	S
Al		N

Ionic Bonding Process: Electron from Cation to Anion

Na Cl

Ca Cl

Ionic Bonding with Transition Metals

You will be told the charge of the Transition Metal

Iron (II) Oxide

Iron (III) Oxide

Covalent Bonding

Covalent Bond - share electrons to have 8

- Between 2 non-metals

Covalent Bonding

H O H

O C O