Name: _____

Period: _____

More Chemical Bonding

Bonding Review

Most elements react to form compounds. Elements do this to gain a full set of valence electrons (Octet Rule— "If I 8 I full").

Ionic Compounds occur between metals and non-metals because metals become *cations* (positive ions) and non-metals become *anions* (negative ions). And opposites attract.

Opposites attract

$Be^{2+} \longleftrightarrow Cl^{1-}$

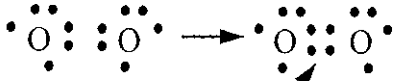
Cross the number not the sign to get:

$BeCl_2$

Beryllium Chloride

Covalent Compounds occur between non-metals. Because neither element will give up their electrons (too many protons), they share electrons to complete the full set of 8.

Oxygens sharing to gain 8 electrons each



4 shared electrons (2 from each)

$O=O$ Short cut notation for a *double* bond.

Polyatomic Compounds are compounds with 3 or more elements. These are just large ionic compounds. They happen because sometimes when two elements react they don't fulfill the octet rule and end up with a net electrical charge.

Big opposites attract, too

$Mg^{2+} \longleftrightarrow NO_3^-$

$Mg(NO_3)_2$

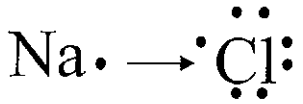
Magnesium nitrate

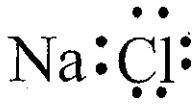
Ionic, Covalent, or Polyatomic?

K_2O _____ (Potassium oxide)	AlF_3 _____ (Aluminum fluoride)	Li_2CrO_4 _____ (Lithium chromate)	Ca_3N_2 _____ (Calcium nitride)
CO_2 _____ (Carbon dioxide)	$MgCO_3$ _____ (Magnesium carbonate)	$SiCl_4$ _____ (Silicon tetrachloride)	NaCl _____ (Sodium chloride—table salt)

Making Ionic Compounds

Use dot diagrams like puzzle pieces. For ionic compounds remember that the metal is actually *losing* the electron to the non-metal.





Or use the "*cross the number not the sign*" method:

$Ca^{2+}_{1} \; Cl^{1-}_{2}$

This compound will be stable because the net charge is zero.
$1(2) + 2(-1) = 2 - 2 = 0$

Ionic compounds are balanced if the net charge is zero. Use this formula:

Number of atoms of element 1 and 2

$O_1(N_1) + O_2(N_2) = C_N$ ← Net charge - if zero, then it is an ionic compound

Oxidation numbers of ion 1 and 2

Make Balanced Ionic Compounds			
Li and N	Ca and O	Al and Cl	Na and Ne

Using the formula above show that Na2O is balanced.

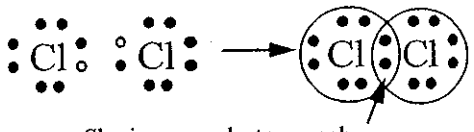
Name: _____ Ch. 19:3

Period: _____

Covalent Bonds—Diatomic Molecules

Diatomic molecules have 2 atoms of the same element. N, O, F, Cl

Seeing how covalent bonds connect together is easy for single bonds, like chlorine. Yet it can be hard to see for triple bonds like Nitrogen. For compounds it can get even more difficult.



Sharing one electron each

Cl—Cl

Short cut notation for a *single* bond.

Each oxygen needs 2 more electrons.

Sharing 2 electrons each

Each line stands for a shared pair of electrons: 1 from each

O═O

Short cut notation for a *double* bond.

Draw the covalent bond between two Bromine atoms:

Draw the covalent bond between two Fluorine atoms:

Two Tricks—

1) If you cover one of the atoms up with a piece of paper (or a finger) you can see if the other atom has the necessary 8 electrons.

2) The number of extra electrons you need to make 8 goes on the sharing side of the chemical symbol. Ex. Nitrogen has 5 valence electrons and needs 3 more to be full, so put 3 electrons on the side toward the other N.

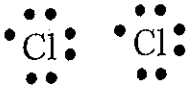
Covalent Compounds

When trying to figure out covalent compounds, it may take some time and creativity. Remember to look at the atoms as puzzle pieces.

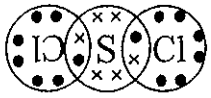
Ex. Make Sulfur Dichloride (SCl_2)

6 valence electrons

7 valence electrons



Move them around until each atom has 8 electrons by sharing.



Tip: it can help to draw the electrons differently (like x's and o's) for the different elements. This can help you keep track from where the electrons came.

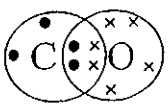
Short hand notation

Cl—S—Cl

Each bar is a <u>*shared*</u> electron pair

Make Carbon monoxide (CO)

Carbon has only 6



Oxygen needs 2 more electrons, but carbon needs 4. Either oxygen will have too many, or carbon will have too few.

This is why CO is an unstable, poisonous compound! It will react with oxygen in your body to form CO_2 and could kill you!

Draw the covalent compound of CO_2:

Draw the covalent compound of NF_3:

Draw the covalent compound of CH_4 (methane):

TYPES OF CHEMICAL BONDS

Name _____

Classify the following compounds as ionic (metal + nonmetal), covalent (nonmetal + nonmetal) or both (compound containing a polyatomic ion).

1. $CaCl_2$ _____
2. CO_2 _____
3. H_2O _____
4. $BaSO_4$ _____
5. K_2O _____
6. NaF _____
7. Na_2CO_3 _____
8. CH_4 _____
9. SO_3 _____
10. LiBr _____
11. MgO _____
12. NH_4Cl _____
13. HCl _____
14. KI _____
15. NaOH _____
16. NO_2 _____
17. $AlPO_4$ _____
18. $FeCl_3$ _____
19. P_2O_5 _____
20. N_2O_3 _____

(3) Sodium + Oxygen

Na_2O

(3) Chlorine + Chlorine

Cl_2

(4) Sodium + Chlorine

$NaCl$

(4) Oxygen + Oxygen

O_2

(5) Calcium + Chlorine

$CaCl_2$

(5) Carbon + Oxygen

CO_2

(6) Aluminum + Chlorine

$AlCl_3$

(6) Carbon + Hydrogen

CH_4