Unit 5 Notes

Naming Chemical Compounds

**I. Types of Compounds**

**There are three main types of compounds when working on Naming Compounds.**

**\_\_\_\_\_\_­­­\_\_\_\_\_\_\_\_\_\_ Compounds** – Contain a metal and a non-metal. They form an ionic bond.

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Compounds** – Contain two non-metals. They form a covalent bond.

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Compounds** – Contain polyatomic ions. The formula will have three or more elements in it.

I**I. Ionic Compounds**

* Name the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ element. (This will always be the metal.)
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the ending on the second element with an “\_\_\_\_\_\_\_\_\_\_” ending. ( This element will be the \_\_\_\_\_\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_)

NaCl \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

K2O \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**III. Naming Compounds with a Transitional Metal**

* There are some atoms that can have more than one possible \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ numeral is needed to indicate the charge.
* The following elements must have a roman numeral:

 Cr-Cu, Au, Hg, Sn, & Pb

* Ex: Cu +1 is copper (I) Fe +2 is iron (II)

 Cu +2 is copper (II) Fe +3 is iron (III)

 CuCl\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_ FeCl2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 CuCl2\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_ FeCl3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**IV. Molecular Compounds**

* Name the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ element
* Replace the ending on the second element with “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_”
* Use **prefixes** to indicate the number of atoms in the formula.
* \*Exception: A prefix is not required when the first element only has 1 atom.

Examples:

` CO2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

N2O \_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **Prefixes Molecular Compounds**

|  |
| --- |
| 1 atom = \_\_\_\_\_\_\_\_2 atoms = di3 atoms = tri4 atoms = \_\_\_\_\_\_\_\_5 atoms = penta6 atoms = hexa7 atoms = \_\_\_\_\_\_\_\_8 atoms = octa9 atoms = nona10 atoms = \_\_\_\_\_\_\_ |

**V. Polyatomic Compounds**

* Name the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ part of the compound. (+ ion)

 Element or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ion.

* Name the second part of the compound. (- ion)

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or polyatomic ion.

Examples:

 MgSO4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_­­­­­­­­­­­­­\_\_\_\_\_\_\_\_

 Cu(OH)2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 K3PO4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**VI. Naming Acids without Oxygen**

* Acids without Oxygen are named with the prefix “hydro” and end in “ic”

Examples:

 HCl \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_

 HF \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_

 HBr \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_

**VII. Naming Acids with Oxygen**

 Polyatomic ion Name of acid

 per\_\_\_\_\_\_\_ate per \_\_\_\_\_\_\_ ic acid

 \_\_\_\_\_\_\_ ate \_\_\_\_\_\_\_\_ic acid

 \_\_\_\_\_\_\_ ite \_\_\_\_\_\_\_\_ ous acid

 hypo \_\_\_\_\_\_ ite hypo \_\_\_\_\_\_\_\_ous acid

 Examples:

 H2SO4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_

 HClO \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 -----------------------------------------------------------------------------------------------------------------------------------------------------

Writing Chemical Formulas

**I. Ionic Compounds**

* Write chemical \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for each part of the compound.
* Write the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (oxidation #) for the element.
* Check if the oxidation numbers add up to zero

 1.) If they add up to \_\_\_\_\_\_\_\_\_\_\_\_\_\_, the oxidation numbers cancel.

 Rewrite with symbols only.

 Ex: calcium oxide

2.)If they do not add up to zero, \_\_\_\_\_\_\_\_\_\_ the oxidation numbers to determine the subscript for each element.

Ex: magnesium chloride

 Examples:

 calcium fluoride \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 lead (II) sulfide\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 copper (I) oxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**II. Transition Elements**

* Same rules as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ compounds.
* The charge for the transition metal will come from the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ numeral.

 Examples:

 iron (III) chloride \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 copper (I) oxide\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 lead (II) nitride\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**III. Molecular Compounds**

* Use the prefix to determine the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of each element in the formula.
* NO PREFIX on the \_\_\_\_\_\_\_\_\_\_\_\_\_ element indicates a subscript of 1

 Examples:

 carbon dixoide \_\_\_\_\_\_\_\_\_\_\_\_\_

 sulfur trioxide\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 carbon tetrachloride\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**IV. Polyatomic Compounds**

* The rules for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ions will be the same as ionic compounds.
* \*Polyatomic ions must be placed in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ if the subscript is larger than 1 when criss-crossing.

 Examples:

 magnesium sulfate\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 iron (III) phosphate\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 calcium hydroxide\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 ammonium carbonate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**V. Acids without Oxygen**

* Write the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and charge (oxidation #) of each element.
* If the charges do not add up to zero, criss-cross the\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ #.

Examples:

 hydrosulfuric acid \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 hydroiodic acid \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**VI. Acids with Oxygen**

* Write the symbol and the charge for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the polyatomic ion (oxyanion).
* If the charges do not add up to zero, criss-cross the oxidation numbers.

 Polyatomic ion Name of acid

 per\_\_\_\_\_\_\_ate per \_\_\_\_\_\_\_ ic acid

 \_\_\_\_\_\_\_ ate \_\_\_\_\_\_\_\_ic acid

 \_\_\_\_\_\_\_ ite \_\_\_\_\_\_\_\_ ous acid

 hypo \_\_\_\_\_\_ ite hypo \_\_\_\_\_\_\_\_ous acid

 Examples:

 sulfurous acid\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 nitric acid\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Types of Bonds

**There are three main types of Chemical bonding.**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_,\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |
| --- |
| **Ionic Bonding** occurs when there is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of electrons. |
| **Covalent Bonding** occurs when atoms \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ electrons. |
| **Metallic Bonding** consist of the attraction of free \_\_\_\_\_\_\_\_\_\_\_\_\_\_ valance electrons for positively charged \_\_\_\_\_\_\_\_\_\_ ions. |

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are used to determine what type of \_\_\_\_\_\_\_\_ is formed when atoms come together in a chemical reaction.

**To find the type of \_\_\_\_\_\_\_\_\_\_, find the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the electro negativities.**

|  |
| --- |
| If the difference is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ than 1.67 an \_\_\_\_\_\_\_\_ bond is formed. |
| If the difference is \_\_\_\_\_\_\_\_\_ than 1.67 a \_\_\_\_\_\_\_\_\_ bond is formed. |



**Rules for Ionc Bonding**

* All atoms want to obtain eight electrons in the valence energy level. To do so they will give, take, or share electrons.
* The element with the fewest atoms goes in the center.
* The other atoms go around the central atom.
* Show the transfer of the electrons with a positive charge for the atom that lost the electrons and a negative charge for the atoms that gain the electrons.
* Ex: NaCl CaF2

*  Bonds can also be determined by the difference in electronegativities.

 NaCl sodium chloride

 sodium: (\_\_\_\_\_) chlorine: (\_\_\_\_)

 The electronegativity difference is \_\_\_\_\_\_- \_\_\_\_\_\_ =\_\_\_\_\_\_

 An ionic bond is formed.

** Covalent Bonding:**

 **Elements share e-**

**Rules for Showing Covalent Bonds**

* The element with the fewest atoms goes in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The other atoms go around the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ atom.
* A bonding pair can only form where there is an \_\_\_\_\_\_\_\_\_\_ electron.
* Shared pairs or bonding pairs are shown with a \_\_\_\_\_\_\_\_. One dash equals \_\_\_\_\_\_\_\_\_\_ electrons.



* Example:
* AsI3 arsenic triiodide

 arsenic (2.2) iodine (2.7)

The electronegativity difference is 2.7- 2.2 = 0.5

A covalent bond is formed. The atoms share the electrons.

Molecular Geometry

* The shape that a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ bonded substance will take is referred to as its Molecular Geometry.
* The shape is determined by the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ atom, and the number of shared and unshared electron pairs around the atom.
* Electron pairs around the central atom will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ as far as possible to minimize the repulsive forces.
* This gives bond \_\_\_\_\_\_\_­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ depending on the shape.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Total # of electron pairs.** | **# of shared pairs** | **# of unshared pairs** | **Shape** | **Bond Angle** | **Draw shape** |
|  |  |  | **Linear** |  |  |
|  |  |  | **Trigonal****Planar** |  |  |
|  |  |  | **Trigonal****Pyramidal** |  |  |
|  |  |  | **Bent** |  |  |