

Name: _____

Period: _____

Unit 5: Ionic Compounds- Guided Notes

Lewis Dot Structure:

- Used to represent _____ electrons
 - Remember to follow _____ rule
 - Examples:

Na

P

Mg

S

Al

Cl

Si

Ar

Chemical Bonds

- Defined as forces of attraction that hold two atoms together and allows them to function as a unit
- Formed because atoms will be more _____ and obtain an _____
- There are multiple types of bonds possible and they are determined by _____ differences (We will determine the type of bond by which elements are present)
 - _____: one or more metals
 - _____: Metal and a non-metal; possible a polyatomic ion
 - _____: 2 nonmetals
 - _____: Hydrogen and an anion or polyatomic ion

Metallic Bonds

- _____ is the force of attraction between valence electrons and the metal ions.
- It is the sharing of a _____ between many positive ions, where the electrons act as a "glue" giving the substance a definite structure
- Examples: _____

Review

- _____ - An element will gain, lose, or share electrons in order to obtain a full octet
- _____ - Lose electrons; form cations
- _____ - gain electrons; form anions
- _____ - One element with a charge
- _____ - a group of elements with an overall charge that function as a unit (common PAI are on back of PT)
- Charge of Ag _____, Charge of Zn _____, Charge of Cd _____

Ionic Bonding

- Form between _____ and _____ ions.
- Ionic bonds are formed by the _____ of electrons
- _____ Ionic Compound- Made of 2 different elements
- _____ ionic compound- made of more than 2 different elements (there is a PAI present)
- A _____ is the lowest ratio of ions in the compound (this is why we simplify subscripts).

How Ionic Compounds are formed

- The metal loses electrons to the non-metal forming a _____

Name: _____

Period: _____

- The non-metal gains electrons from the metal forming an _____
 - positive charges are very attracted to negative charges which is a type of **electrostatic forces of attraction** which we call _____
- When the cation and the anion form an ionic bond, they arrange in a three-dimensional shape called a _____
- There are charged particles present, but the compound has a net charge of _____

Properties of Ionic Compounds

- Electrically neutral (No net charge)
- _____ Melting Point
 - Requires a lot of _____ to break bonds
- Brittle and Crystalline
- Many dissolve in water (_____)
- Solid ionic compounds DO NOT conduct heat or electricity
- _____ (meaning when they are dissolved in water) of ionic compounds are good conductors of heat and energy

Writing Formulas for Ionic Compounds

- Rules to follow for Writing ionic Compounds
 - Ions are given a subscript to indicate the amount of that ion present in the compound (when adding a subscript to a PAI, you must have parentheses)
- 1. Chemical compounds must have a **net charge of** _____ (Both + ions and – ions must be present and their charges will cancel each other)
- 2. Find the charge of the cation and the anion
- 3. Crisscross the charge **without** the sign:
$$\text{Cation}_{\text{charge of anion}} \text{Anion}_{\text{charge of cation}}$$
 (if the charge is 1 do not write the charge)
 - If you have more than 1 of a polyatomic ion, you must use parentheses around the PAI
- 4. Simplify subscripts
- Examples:
 - Na and Cl:
 - Mg and Cl
 - Li and N
 - Ca and S
 - Ba and hydroxide
- Practice: Write the ionic Compound for the following element combinations.
 - Calcium and Chlorine
 - Sodium and Sulfur
 - Lead (II) and Phosphorous
 - Calcium and Sulfate
 - Magnesium and Nitrogen
 - Aluminum and Oxygen
 - Lithium and Chlorite
 - Iron (IV) and Phosphite
 - Beryllium and Acetate

Name: _____

Period: _____

Naming Ionic Compounds

- Binary Type 1 Ionic Compounds (simple)
 - Composed of a metal and a nonmetal
 - Composed of elements that always contain the same charge
 - Group _____, Group _____, Group _____, _____, _____ and _____
- Binary Type 2 Ionic Compounds (Roman Numerals)
 - Composed of a metal and a nonmetal
 - Composed of metals can form two or more different charges
 - _____ Metals and _____ group metals

Naming Binary Type 1

- The _____ is named first and the _____ is named second
- The simple cation takes its name from the element. (ex. calcium would be calcium)
- The simple anion takes the name from the element, drop the ending, and adds ide (ex. Sulfur → sulfide; oxygen → oxide)
- Examples:
 - Name ionic compound containing Ca and Br
 - CaBr_2
 - Cation: Ca is _____
 - Anion: Br is _____ → _____
 - Answer: _____
 - Name the ionic compound containing Sr and P
 - Sr_3P_2
 - Cation: Sr is _____
 - Anion: P is _____ → _____
 - Answer: _____
- Examples: Name each of these compounds.
 - CsF
 - KCl
 - BaH_2
 - AlCl_3
 - ZnS
 - Al_2S_3
 - MgI_2
 - CaBr_2

Naming Binary Type 2

- Some cations can form multiple charges.
 - Example: Pb^{2+} and Pb^{4+} , Cr^{2+} and Cr^{3+} , Fe^{2+} and Fe^{3+} , Au^+ and Au^{3+}
- Chemist decided to use _____ to specify charge.
 - Examples:
 - FeCl_2 = Iron (II) Chloride
 - FeCl_3 = Iron (III) Chloride
- The _____ difference in type two naming is the Roman numeral
- The old way of naming these compounds was to use the ending -ous for the lower charge and -ic for the higher charge.
 - Examples: FeCl_2 = Ferrous Chloride FeCl_3 = Ferric Chloride
- Practice: Write the name of each compound
 - CoCl_3
 - MnO_2
 - CuI
 - Fe_2O_3
 - SnBr_4
 - HgO
 - CuCl
 - PbS
 - HgCl_2

Name: _____

Period: _____

Naming Ternary Ionic Compounds

- **Ternary ionic compounds** are formed when there are _____ two elements (i.e. there are polyatomic ions present)
- Ternary can be type 1 or type 2 depending on the cation
- Naming Rules:
 - The _____ is named first and the _____ is named second
 - The simple cation takes its name from the element. (ex. calcium would be calcium; ammonium would stay ammonium)
 - If the cation is type 2, then you must indicate the charge of the cation ion using roman numerals (ex: $\text{Fe}^{+3} \rightarrow$ Iron (III); $\text{Pb}^{+2} \rightarrow$ Lead (II))
 - If the anion is a polyatomic ion, you use the name of the polyatomic ion (ex. Sulfate \rightarrow sulfate; hydroxide \rightarrow hydroxide)
 - If the anion is NOT a polyatomic ion, then follow the type 1 binary ionic compounds rules
 - Examples: Name the ionic compound containing sodium and sulfate (Na_2SO_4)
 - Cation: Na is _____
 - Anion: SO_4 is _____ \rightarrow _____
 - Answer: _____
 - Name the ionic compound containing aluminum acetate ($\text{Al}(\text{C}_2\text{H}_3\text{O}_2)_3$)
 - Cation: Al is _____
 - Anion: _____ \rightarrow _____
 - Answer: _____
 - Name the ionic compound containing Mn^{+4} and Chlorate ($\text{Mn}(\text{ClO}_3)_4$)
 - Cation: _____
 - Anion: _____ \rightarrow _____
 - Answer: _____
 - Practice: Write the name for the following ternary ionic compounds
 - $\text{Zn}(\text{OH})_2$
 - Be_2SO_4
 - $\text{Ga}(\text{NO}_2)_3$
 - NH_4OH