Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Class Period:\_\_\_\_\_\_\_\_\_

Chemistry

Unit three: naming & bonding

Chemical Nomenclature Inquiry

Objectives

* Distinguish between ionic and molecular/covalent compounds
* Define cation and anion and relate them to metal and nonmetal
* Distinguish among chemical formulas, molecular formulas, and formula units
* Define a polyatomic ion and give the names and formulas of the most common polyatomic ions
* Apply the rules for naming writing formulas for binary ionic compounds
* Apply the rules for naming writing formulas for binary molecular compounds
* Write the name of a compound when given its chemical formula
* Write the chemical formula of a compound when given its name

**Ionic Compounds**

|  |  |  |  |
| --- | --- | --- | --- |
| Formula | Name | Cation(s) | Anion(s) |
| Symbol | Name | Family | Symbol | Name | Family |
| NaCl | Sodium Chloride | Na+ | sodium | metal | Cl- | chlorine | non-metal |
| LiF | Lithium Fluoride | Li+ | lithium | metal | F- | fluorine | non-metal |
| CaS | Calcium Sulfide | Ca2+ | calcium | metal | S2- | sulfur | non-metal |
| BaCl2 | Barium Chloride | Ba2+ | barium | metal | 2 Cl- | chlorine | non-metal |

Using the table provided, complete the following sentences and/or answer the questions.

1. An ionic compound is generally composed of a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. A cation has a **positive / negative** charge.
3. An anion has a **positive / negative** charge.
4. What is true about the sum of the cations and anions present within an ionic compound?
5. When naming an ionic compound, the **anion / cation** is listed first, and the **anion / cation** is listed second.
6. When naming an ionic compound, what happens to the name of the cation? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. When naming an ionic compound, what happens to the name of the anion? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. Are Greek prefixes (mono-, bi-, tri-) used to indicate the number of atoms of each element present? **yes / no**

**Ionic Compounds Containing Transition Metals**

|  |  |  |  |
| --- | --- | --- | --- |
| Formula | Name | Cation(s) | Anion(s) |
| Symbol | Name | Family | Symbol | Name | Family |
| CuO | Copper (II) Oxide | Cu2+ | copper | transition metal | O2- | oxygen | non-metal |
| Cu2O | Copper (I) Oxide | 2 Cu+ | copper | transition metal | O2- | oxygen | non-metal |
| CuF2 | Copper (II) Fluoride  | Cu2+ | copper | transition metal | 2 F- | fluorine | non-metal |
| PbO | Lead (II) Oxide | Pb2+ | lead | transition metal | O2- | oxygen | non-metal |
| PbO2 | Lead (IV) Oxide  | Pb4+ | lead | transition metal | 2 O2- | oxygen | non-metal |
| Sn3P2 | Tin(II) phosphide  | 3 Sn2+ | tin | transition metal | 2 P3- | phosphorus  | non-metal |

Using the table provided, complete the following sentences and/or answer the questions.

1. What do the subscript numbers in the formula represent? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What do the superscript numbers on the symbol represent? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	1. What type of metal requires that Roman Numerals be used in naming? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. What does a Roman Numeral in the name of a compound indicate? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	3. Why are the Roman Numerals necessary?

**Ionic Compounds Containing Polyatomic Ions**

|  |  |  |  |
| --- | --- | --- | --- |
| Formula | Name | Cation(s) | Anion(s) |
| Symbol | Name | Family | Symbol | Name | Family |
| Cu2S | Copper (I) Sulfide | 2 Cu+ | copper | transition metal | S2- | sulfur | non-metal |
| Cu2SO3 | Copper (I) Sulfite | 2 Cu+ | copper | transition metal | SO32- | sulfite | polyatomic ion |
| Cu2SO4 | Copper (I) Sulfate | 2 Cu+ | copper | transition metal | SO42- | sulfate | polyatomic ion |
| Cu3N2 | Copper (II) Nitride | 3 Cu2+ | copper | transition metal | 2 N3- | nitrogen | non-metal |
| Cu(NO2)2 | Copper (II) Nitrite | Cu2+ | copper | transition metal | 2 NO2- | nitrite | polyatomic ion |
| Cu(NO3)2 | Copper (II) Nitrate | Cu2+ | copper | transition metal | 2 NO3- | nitrate | polyatomic ion |

Using the table provided, answer the questions.

1. What is a polyatomic ion? (For a table of polyatomic ions, see the last page of this packet.)
2. What happens to the name of a polyatomic ion when it is incorporated into an ionic compound?

**Covalent (aka Molecular) Compounds**

|  |  |  |  |
| --- | --- | --- | --- |
| Formula | Name | Element One | Element Two |
| Symbol | Name | Family(group number) | Symbol | Name | Family(group number) |
| CO | Carbon Monoxide | C | carbon | non-metal(14 / 4A) | O | oxygen | non-metal(16 / 6A) |
| CO2 | Carbon Dioxide | C | lithium | non-metal(14 / 4A) | 2 O | oxygen | non-metal(16 / 6A) |
| NO2 | Nitrogen Dioxide | N | nitrogen | non-metal(15 / 5A) | 2 O | oxygen | non-metal(16 / 6A) |
| N2O | Dinitrogen Monoxide | 2 N | nitrogen | non-metal(15 / 5A) | O | oxygen | non-metal(16 / 6A) |
| CCl4 | Carbon Tetrachloride | C | carbon | non-metal(14 / 4A) | 4 Cl | chlorine | non-metal(17 / 7A) |
| Cl2O7 | Dichlorine Heptaoxide | Cl | chlorine  | non-metal(17 / 7A) | 7 O | oxygen | non-metal(16 / 6A) |
| F2O | Difluorine Monoxide | 2 F | fluorine | non-metal(17 / 7A) | O | oxygen | non-metal(16 / 6A) |

Using the table provided, complete the following sentences and/or answer the questions.

1. A covalent compound is generally composed of two \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. When naming a covalent compound, what happens to the name of the first element listed in the formula?
3. When naming a covalent compound, what happens to the name of the second element listed in the formula?
	1. Are Greek prefixes (mono-, di-, tri-) used to indicate the number of atoms of each element present? **yes / no**
	2. List the Greek prefixes for the following numbers:
		1. one: \_\_\_\_\_\_\_\_\_\_
		2. two: \_\_\_\_\_\_\_\_\_\_
		3. three: \_\_\_\_\_\_\_\_\_\_
		4. four: \_\_\_\_\_\_\_\_\_\_
		5. five: \_\_\_\_\_\_\_\_\_\_
		6. six: \_\_\_\_\_\_\_\_\_\_
		7. seven: \_\_\_\_\_\_\_\_\_\_
		8. eight: \_\_\_\_\_\_\_\_\_\_
		9. nine: \_\_\_\_\_\_\_\_\_\_
		10. ten: \_\_\_\_\_\_\_\_\_\_
	3. There is one exception when using Greek prefixes in a covalent compound. What is it? (Hint: Compare the names of NO2 and N2O.)

Summary

