Chem 1 Hour\_\_\_\_\_ Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Dr. Wexler  
Formulas of Ionic Compounds Worksheet 1  
Term 3 Week 2 Practice (18pts)

**Part A. Monoatomic Ions**

Definition:  
A monoatomic ion is an ion formed from a single atom.

Question: How do we determine the chemical formula for an ionic compound?   
Answer: Use the criss-cross method - take the magnitude of the ionic charge for the positively charged ion and make it the subscript for the negatively charged ion, and vice versa.

Example: Al3+ and Cl1- The 3 becomes the subscript for the chloride ion and the 1 becomes the subscript for the aluminum ion, to form aluminum chloride - AlCl3 (note – if no subscript is written, it is assumed to be a “1”)

Fill in the following table:

|  |  |  |
| --- | --- | --- |
| Metal Ion (cation) | Nonmetal Ion (anion) | Ionic Compound |
| H+ | F- |  |
| H+ | S2- |  |
| Li+ | Cl- |  |
| Li+ | N3- |  |
| Ca2+ | Br- |  |
| Ca2+ | Te2- |  |
| Sr2+ | O2- |  |
| Sr2+ | N3- |  |
| Al3+ | I- |  |
| Al3+ | S2- |  |

**Part B. Polyatomic Ions**

Definition:   
Polyatomic ions are charged molecules containing two or more covalently bonded atoms. Since the atoms within a polyatomic ion are tightly bound together through covalent bonds, the ion maintains its identity during ionic chemical reactions.

**Common Polyatomic Ions**

|  |  |  |  |
| --- | --- | --- | --- |
| **Ion** | **Name** | **Ion** | **Name** |
| NH4+ | Ammonium | IO4- | Periodate |
| NO2- | Nitrite | C2HO2- | Acetate |
| NO3- | Nitrate | H2PO4- | Dihydrogen phosphate |
| HSO4- | Hydrogen sulfate | CO32- | Carbonate |
| OH- | Hydroxide | SO32- | Sulfite |
| CN- | Cyanide | SO42- | Sulfate |
| MnO4- | Permanganate | S2O32- | Thiosulfate |
| HCO3- | Hydrogen carbonate | O22- | Peroxide |
| ClO- | Hypochlorite | CrO42- | Chromate |
| ClO2- | Chlorite | Cr2O72- | Dichromate |
| ClO3- | Chlorate | HPO42- | Hydrogen phosphate |
| ClO4- | Perchlorate | PO43- | Phosphate |
| BrO3- | Bromated | AsO43- | Arsenate |
| IO3- | Iodate |  |  |

**Naming Ions**

Most polyatomic ions are oxyanions.

Oxyanions are composed of an element, usually a nonmetal, covalently bonded to one or more oxygen atoms.

Some oxyanions differ only in the number of oxygen atoms and are named as seen below:  
1. Use the suffix “-ate” attached to the nonmetal root if it has “more” oxygen atoms.  
2. Use the suffix “-ite” if it has “fewer” oxygen atoms.  
3. Use the prefix “per” if it has more than “more” oxygen atoms.  
4. Use the prefix “hypo” if it has less than “fewer” oxygen atoms.

For example:  
ClO4- perchlorate  
ClO3- chlorate  
ClO2- chlorite  
ClO- hypochlorite

**Questions:**

Determine the correct formula for the ionic compound composed of the following pairs of ions: (show your work). Be sure to enclose the polyatomic ion in parentheses if more than one such ion is in the compound.

For example, calcium nitrate is Ca2+ + NO3- 🡪 Ca(NO3)2

1. sodium and nitrate

2. calcium and chlorate

3. aluminum and carbonate

4. potassium and chromate

5. magnesium and carbonate

6. potassium and sulfite

7. ammonium and iodide

8. Fe3+ and nitrate