

Nomenclature – Naming of compounds

Ionic Compounds

To name ionic compounds you just name the ions present. The name of the positive ion (**cation**) is first followed by the name of the negative ion (**anion**)

Naming monatomic ions

1. Metal ions are named the same as the metal, if there is only one possible charge on the ion.
2. If there is more than one possible charge for the ion, the ion is named with the metal name with the charge written after it in Roman numerals in parenthesis.

An older system of naming metals that form more than one kind of ion involves the use of the prefixes –ous and -ic. The stem is derived from the name of the metal if the symbol is not from the Latin name. If the symbol comes from the Latin name the stem is from the Latin name of the metal.

Fe^{2+}	Iron(II) or Ferrous	Cu^+	Copper(I) or Cuprous
Fe^{3+}	Iron(III) or Ferric	Cu^{2+}	Copper(II) or Cupric
Au^+	Gold(I) or Aurous	Sn^{2+}	Tin(II) or Stannous
Au^{3+}	Gold(III) or Auric	Sn^{4+}	Tin(IV) or Stannic
Pb^{2+}	Lead(II) or Plumbous	Hg_2^{2+}	Mercury(I) or Mercurous
Pb^{4+}	Lead(IV) or Plumbic	Hg^{2+}	Mercury(II) or Mercuric

3. Non-metals: stem name + -ide.

Ionic compounds can also contain **polyatomic ions**. These are groups of atoms that are bonded together that have a charge. A list of these ions is provided in your text and in class. This list **must be memorized**. You need to know the name, formula and charge of all of the polyatomic ions in the list.

Among the polyatomic ions there are a couple of patterns. If there are two ions with similar names (e.g., sulfate and sulfite), the one whose name ends in –ate has 1 more oxygen than the one whose name ends in –ite. This can be extended to other ions. If the ion has 1 more oxygen than the –ate ion, it is given the prefix per- (e.g., **perchlorate**, ClO_4^- , **chlorate**, ClO_3^-). If the ion has one less oxygen than the –ite ion, it is given the

prefix hypo- (e.g., **hypochlorite**, ClO^- , **chlorite**, ClO_2^-). Also, if an oxygen atom is replaced with a sulfur atom the prefix thio- is added to the name (e.g., CNO^- , cyanate, CNS^- , **thiocyanate**).

The periodic law can also be applied to these patterns. For example ClO_3^- is the chlorate ion and BrO_3^- is the **bromate** ion.

To get the formula for an ionic compound between any two elements we need to know the charges on the ions.

What is the charge on the ions?

1. Main-group metals: charge = group number.
2. Main-group metal with high atomic number can have more than one charge. Usually the other charge is the group number minus 2.
3. Most transition metals have more than one charge. Most have an ion with a charge of +2. These charges have to be determined from the formula.
4. Non-metals have a charge of the group number minus 8.

The total positive charge must equal the total negative charge in the compound. This can be done by “crossing over” the charges.



Naming binary molecular compounds

Rules for naming

1. Name elements in order given above.
2. First element named is given the name of the element with the appropriate prefix see number 4.
3. Name of second element: stem name + -ide.
4. Prefixes are used for compounds containing more than one atom of the same element. Mono- not used unless it is needed to distinguish two compounds of the same two elements.

Prefixes

1	mono-	6	hexa-
2	di-	7	hepta-
3	tri-	8	octa-
4	tetra-	9	nona-
5	penta-	10	deca-

5. Compounds containing hydrogen are named as if they are ionic.

Exceptions to the above rule for binary molecular compounds

Some compounds that have been known for hundreds or thousands of years do not follow this naming system. Others, such as organic compounds, follow a different system altogether. The compounds you are required to know the common names of are:

H ₂ O	Water	NH ₃	Ammonia
PH ₃	Phosphine		

Naming acids

Binary acids

Hydro- stem name of anion -ic acid.

HCl	Hydrochloric acid
HBr	Hydrobromic acid

Oxygen containing acids are acids that contain oxygen.

Anion suffix	acid suffix
-ite	-ous
-ate	-ic

NO HYDRO- PREFIX!!!!

Hydrates

Hydrates are ionic compounds with molecules of water associated with them. The prefixes used with molecular compounds are used to denote the number of water molecules present.



This is named as the name of the ionic compound + prefix-hydrate: copper(II) sulfate pentahydrate.