

Chemical Nomenclature

Naming Ions

Monatomic Ions:

- a single atom with a positive or negative charge

Polyatomic Ions:

- two or more atoms with a positive or negative charge

Cation (rules): listed first

Anion (rules): -ide ending

Polyatomic Ions

- Polyatomic ions are tightly bound groups of atoms that behave as a unit and carry a charge.
- *-ite* or *-ate* means oxygen is involved.

Binary Ionic Compounds

- Binary compounds are composed of two elements.
- The positive charge of the cation must exactly balance the negative charge of the anion

Naming Binary Ionic Compounds

- Two elements only
- -ide ending
- Stock System
- Roman numerals used on an “as needed” basis

Writing Names from Formulas

Li_3N	ScF_3
Mg_3P_2	Al_2S_3

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Writing Formulas from Names

Scandium iodide	Silver phosphide
Barium arsenide	Potassium oxide

Polyatomic vs. Monoatomic

- Must be named differently!!!!
- Monoatomic anions always end with -ide.
- Polyatomic anions end with -ide, -ite, or -ate.
- Always look for a polyatomic ion when naming compounds.

Compounds with Polyatomic Ions

- Ionic compounds containing three or more different elements
- Parentheses used as needed

Writing Names from Formulas

CaSO_4	$\text{Al}(\text{NO}_3)_3$
$\text{Rb}_2\text{C}_2\text{O}_4$	KH_2PO_4

Writing Formulas from Names

Sodium dichromate	Gallium acetate
Zinc permanganate	Strontium phosphite

Naming Multi-Valent Metals

- When these have a variable charge, the Stock system or classic name system is used.
- Variable charges exist for certain transition metals that lose a varying number of electrons.

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Stock System

- Transition metals with variable charge.
- Roman numerals identify the charge.
- Cu^+ = Copper (I), Cu^{2+} = Copper (II)
- Pb^{2+} = Lead (II), Pb^{4+} = Lead (IV)
- Fe^{2+} = Iron (II), Fe^{3+} = Iron (III)
- Au^+ = Gold (I), Au^{3+} = Gold (III)

Classic Name System

- Transition metals with variable charge.
- Latin name is used for each version.
(-ous or -ic endings)
- Cu^+ = Cuprous, Cu^{2+} = Cupric
- Pb^{2+} = Plumbous, Pb^{4+} = Plumbic
- Fe^{2+} = Ferrous, Fe^{3+} = Ferric
- Au^+ = Aurous, Au^{3+} = Auric

Writing Formulas from Names

Chromic sulfite	Cobalt (II) perchlorate
Stannic carbonate	Gold (I) phosphate

Writing Names from Formulas

MnSO_3	HgClO_2
$\text{Ni}_2(\text{Cr}_2\text{O}_7)_3$	V_2O_5

Naming Ionic Compounds

- Identify the polyatomic ion or monoatomic ion
> (-ide, -ite, -ate)
- Is there a metal with variable charge? What is charge?
> (Stock & Classic)

Calcium nitrate	Manganese (II) phosphate
$\text{Al}_2(\text{CO}_3)_3$	$\text{Pb}(\text{SO}_4)_2$

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Cuprous sulfite	Cobaltic chromate
SnC_2O_4	$\text{Au}(\text{ClO}_3)_3$

Molecular Compounds Naming and Writing Formulas

- Composed of two nonmetallic elements
- Ionic charges not used
- Use table of prefixes (*must memorize*)
- -ide ending always

Nonmetals

Carbon
Silicon
Oxygen
Chlorine
Fluorine
Nitrogen

Bromine
Iodine
Selenium
Sulfur
Phosphorus
Hydrogen

Writing Molecular Formula

- A molecular formula shows the number and kinds of atoms present in a molecule of a compound.
- Since there is no cation, which is listed first?
 - > Carbon always first
 - > The more electronegative element is last

Table of Prefixes

1 = Mono-	6 = Hexa-
2 = Di-	7 = Hepta-
3 = Tri-	8 = Octa-
4 = Tetra-	9 = Nona-
5 = Penta-	10 = Deca-

- C_2H_4
- S_3O_6
- H_2O
- CO
- CO_2

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Acids & Bases

Acids: compound containing hydrogen atoms producing H^+ when dissolved in water.

Bases: compound producing OH^- when dissolved in water.

Naming and Writing Formulas for Acids

Acids are a group of compounds that are given special treatment in naming

- MEMORIZE the 3 rules.
- **Stem:** the root of the element
 - > **Phosphorus:** phosph or phosphor
 - > **Sulfur:** sulf or sulfur
 - > **Nitrogen:** nitr
 - > **Chlorine:** chlor

Naming Acids: Rule #1

-ide ending (HCl, HF, HBr)

Monoatomic anion

Hydro- (stem)- ic

HCl:

HF:

HBr:

H_3P :

Naming Acids: Rule #2

- Polyatomic anion with -ite ending
- (*Sulfite, Nitrite, Phosphite*)
- (stem)- ous

H_2SO_3 :

HNO_2 :

H_3PO_3 :

$HClO_2$:

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Naming Acids: Rule #3

- Polyatomic anion with -ate ending
- (*Sulfate, Nitrate, Phosphate*)
- (stem)- ic



4 step Naming Process

1. Is there a Polyatomic Ion? (Ionic or Acid)
2. Is there a Metal? (Yes = Ionic)
 - Fixed or Variable charge
3. Is Hydrogen at beginning? (If so, its an acid.)
4. If not an Acid or Ionic...
 - Use prefixes, its molecular

When naming Formulas...

1. **Ionic** (*Metal present*)
2. **Molecular** (*Nonmetals only*)
3. **Acids** (*Begins with hydrogen*)

exceptions: H_2O H_2O_2
(Molecular)

5 Big Mistakes in Naming

1. Charge mistakes, which lead to formula mistakes
2. Does it end in...-ide, -ite, or -ate
3. Metals with variable and fixed charges
4. Recognizing polyatomic ions
5. Using prefixes incorrectly

Must Memorize for Test

- 22 Polyatomic Ions
- 10 Prefixes used in molecular compounds
- -ous and -ic endings
- Acid naming rules