

# *CH 151 Summer 2025:*

# **“Nomenclature” Lab -**

# *Instructions*

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## *Step One:*

**Get a printed copy of this lab!** You will need a printed (hard copy) version of pages Ia-3-3 through Ia-3-8 to complete this lab. If you do not turn in a printed copy of the lab, there will be a 2-point deduction.

## *Step Two:*

**Watch the video introduction** for this lab **here: <http://mhchem.org/t/3.htm>**

The video introduction will help prepare you for the lab and assist you in completing the work before turning it in to the instructor.

## *Step Three:*

**Bring the printed copy of the lab with you on Monday, June 30.** During lab in room AC 2509, you will use these sheets (with the valuable instructions!) to gather data, all of which will be recorded in the printed pages below.

## *Step Four:*

Complete the lab work and calculations on your own, then **turn it in** (pages Ia-3-5 through Ia-3-8 *only* to avoid a point penalty) **at 8 AM on Tuesday, July 1.** The graded lab will be returned to you the following week during recitation.

*If you have any questions regarding this assignment, please email ([mike.russell@mhcc.edu](mailto:mike.russell@mhcc.edu)) the instructor. Good luck on this assignment!*

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## Nomenclature: The Language of Chemistry

Systematic chemical names of inorganic compounds were developed by a group of scientists who were part of the International Union of Pure and Applied Chemistry (IUPAC) which first met in 1921. Elements are represented by symbols which are the first, first two, or first and third letters from the name of the element. There are some notable exceptions, where the symbols appear to have no connection to the name of the element. These symbols are derived from early names for these elements. The table below illustrates some of these.

<u>Present Name</u>	<u>Symbol</u>	<u>Former Name</u>
Antimony	Sb	Stibium
Copper	Cu	Cuprum
Gold	Au	Aurum
Iron	Fe	Ferrum
Lead	Pb	Plumbum
Potassium	K	Kalium
Silver	Ag	Argentum
Sodium	Na	Natrium
Tin	Sn	Stannum
Tungsten	W	Wolfram

The names of inorganic compounds are constructed so that every compound can be named from its formula and each formula has a name unique to that formula. For the purpose of clarity, we will divide the formulas into the following categories:

- 1) Binary compounds of nonmetals (covalent molecules)
- 2) Binary compounds of a metal and nonmetal (ionic compounds)
- 3) Ternary and higher compounds (polyatomic ions and acids)

### I. Binary Covalent Compounds: two nonmetals

1. Name first element, preceded by Greek prefix for number of atoms. If one, omit mono.
2. Name the second element, preceded by Greek prefix for number of atoms even if one.

The ending of the second element is -ide.

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

<u>Examples:</u>	<u>Formula</u>	<u>Name</u>
	PCl <sub>3</sub>	Phosphorous trichloride
	SO <sub>2</sub>	Sulfur dioxide
	CO	Carbon monoxide
	N <sub>2</sub> O	Dinitrogen monoxide

## II. Ionic Compounds: metal + nonmetal - A. Metal with a fixed charge

1. Name metal (cation) first - **only** for metals in Groups IA, IIA and the “stairs”
2. Name nonmetal (anion) with the ending changed to -ide. Charge = **group number - 8**

<u>Ex:</u>	<u>Formula</u>	<u>Name</u>	<u>Fixed Charge Cations</u>
	KCl	Potassium chloride	IA = +1
	Na <sub>2</sub> S	Sodium sulfide	IIA = +2
	Al <sub>2</sub> S <sub>3</sub>	Aluminum sulfide	IIIA = +3 one of the 'stairs' ( <i>video</i> )

In ionic compounds, the metal and nonmetal must combine in a ratio to give an overall neutral charge. To write formulas based on name, first write the symbol with the correct charge for the cation and anion. Then determine the lowest ratio for a neutral compound.

## B. Metals with variable charge (transition metals, lanthanides, actinides, etc.)

1. Name metal. In parentheses write the charge of the metal in Roman numerals.  
The charge is determined based on the fixed charge of the nonmetal.  
[Fixed charges of nonmetal: VIIA = -1; VIA = -2; VA = -3]
2. Name nonmetal with the ending -ide. Charge = **group number - 8**

<u>Examples:</u>	<u>Formula</u>	<u>Name</u>	<u>Old Method – do NOT use!</u>
	CuCl	Copper(I) chloride	<i>Cuprous chloride</i>
	CuCl <sub>2</sub>	Copper(II) chloride	<i>Cupric chloride</i>
	FeO	Iron(II) oxide	<i>Ferrous oxide</i>
	Fe <sub>2</sub> O <sub>3</sub>	Iron(III) oxide	<i>Ferric oxide</i>

## III. Polyatomic Anions and Acids

When writing names of ionic compounds composed of polyatomic anions or of acids, you must first learn the name, number of oxygens, and charge of the most common polyatomics (listed below). Then add the following rules for naming polyatomics and acids with differing number of oxygens. Notice that as oxygens are added/subtracted, the polyatomic charge remains the same. **Common polyatomic ions** include:

CO <sub>3</sub> <sup>2-</sup>	carbonate	ClO <sub>3</sub> <sup>1-</sup>	chlorate	OH <sup>1-</sup>	hydroxide
NO <sub>3</sub> <sup>1-</sup>	nitrate	BrO <sub>3</sub> <sup>1-</sup>	bromate	NH <sub>4</sub> <sup>1+</sup>	ammonium
PO <sub>4</sub> <sup>3-</sup>	phosphate	IO <sub>3</sub> <sup>1-</sup>	iodate	HCO <sub>3</sub> <sup>1-</sup>	hydrogen carbonate
SO <sub>4</sub> <sup>2-</sup>	sulfate	MnO <sub>4</sub> <sup>1-</sup>	permanganate	Cr <sub>2</sub> O <sub>7</sub> <sup>2-</sup>	dichromate
C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> <sup>1-</sup>	- acetate				

<u># Oxygens</u>	<u>Anion</u>	<u>Example</u>	<u>Acid</u>	<u>Example</u>
+1 Oxygen	per-ate	perchlorate, ClO <sub>4</sub> <sup>1-</sup>	per-ic	perchloric acid, HClO <sub>4</sub>
common	-ate	chlorate, ClO <sub>3</sub> <sup>1-</sup>	-ic	chloric acid, HClO <sub>3</sub>
-1 Oxygen	-ite	chlorite, ClO <sub>2</sub> <sup>1-</sup>	-ous	chlorous acid, HClO <sub>2</sub>
-2 Oxygen	hypo-ite	hypochlorite, ClO <sup>1-</sup>	hypo-ous	hypochlorous acid, HClO
No Oxygen	-ide	chloride, Cl <sup>1-</sup>	hydro-ic	hydrochloric acid, HCl

For more polyatomic / acid help, see the “**Common Polyatomic Ions and the Corresponding Acids**” handout in your *Companion* under “Learning Resources.”

## Nomenclature Lab

Name:  
*first and last name*

### 1a. Ionic Compounds (metal + nonmetal)

	FORMULA	CATION	ANION	NAME
Ex.	CaBr <sub>2</sub>	Ca <sup>2+</sup>	Br <sup>1-</sup>	Calcium bromide
1				<b>Magnesium nitride</b>
2		<b>K<sup>+</sup></b>	<b>S<sup>2-</sup></b>	
3	<b>ZnO</b>			
4		<b>Sn<sup>4+</sup></b>	<b>O<sup>2-</sup></b>	
5	<b>Cr<sub>2</sub>S<sub>3</sub></b>			
6				<b>Copper(I) phosphide</b>
7	<b>RbI</b>			
8				<b>Calcium nitride</b>
9				<b>Titanium(IV) chloride</b>
10	<b>SrS</b>			
11	<b>Au<sub>2</sub>O<sub>3</sub></b>			
12				<b>Cadmium phosphide</b>

### 1b. Covalent Compounds (nonmetal + nonmetal)

1. SF<sub>6</sub> \_\_\_\_\_
2. IBr \_\_\_\_\_
3. \_\_\_\_\_ Carbon monoxide
4. \_\_\_\_\_ Dinitrogen pentoxide

**2. Name the following:** (Hint: First identify if the compound is ionic or covalent)

a. NaF

b. PbS

c. TiO<sub>2</sub>

d. Cr<sub>2</sub>O<sub>3</sub>

e. Zn<sub>3</sub>P<sub>2</sub>

f. MnO<sub>2</sub>

g. PI<sub>3</sub>

h. S<sub>2</sub>Br<sub>2</sub>

i. IBr<sub>5</sub>

j. XeF<sub>4</sub>

**3. Write formulas for the following compounds:** (See hint above!)

a. Barium iodide

b. Palladium(II) bromide

c. Zinc arsenide

d. Gold(III) oxide

e. Lead(IV) oxide

f. Copper(I) sulfide

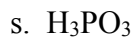
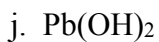
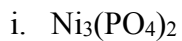
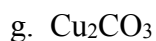
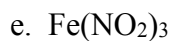
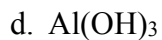
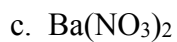
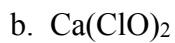
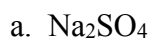
g. Sulfur hexafluoride

h. Nitrogen trichloride

i. Chlorine dioxide

## Nomenclature Lab: Polyatomic Anions and Acids

**4. Write the names for the following compounds.** If the compound is an **acid**, name as an acid and not an ionic compound to receive full credit.



**5. Write the chemical formulas for the following compounds.**

- a. sodium phosphate
- b. iron(II) sulfate
- c. calcium bromate
- d. aluminum nitrate
- e. zinc sulfite
- f. copper(I) chlorite
- g. ammonium hydroxide
- h. silver nitrite
- i. lead(II) phosphate
- j. potassium bicarbonate
- k. iodic acid
- l. hypoiodous acid
- m. periodic acid
- n. iodous acid
- o. hydroiodic acid
- p. sulfurous acid
- q. nitric acid
- r. nitrous acid
- s. phosphoric acid
- t. acetic acid
- u. carbonic acid