

I. INTRODUCTION

In this experiment you will name and write formulas for compounds.

A. NOMENCLATURE OF BINARY COVALENT COMPOUNDS

1. Writing names for Binary Covalent Compounds

a. Write the names of the two elements in the compound

(1) The name of the first element remains the same.

(2) Change the ending of the name of the second element to "ide".

b. Indicate the number of atoms of each element in the compound by using the following

Greek prefixes:

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

Note: If mono is the prefix for the first nonmetal, it is omitted from the name.

c. Example: C_3S_2 is tricarbon disulfide

2. Writing Formulas for Binary Covalent Compounds

To write the formula of a molecular compound from its name, write the symbols for the two nonmetals and write the subscript for each one as given by its Greek prefix.

Example: disilicon hexachloride is Si_2Cl_6

B. NOMENCLATURE OF IONIC COMPOUNDS AND ACIDS

1. Symbols/Formulas and Names of Ions

a. Monatomic Ions

Nonmetal Ions					
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SYMBOL	NAME	SYMBOL	NAME	SYMBOL	NAME
H ⁺	hydrogen	F ⁻	fluoride	O ²⁻	oxide
H ⁻	hydride	Cl ⁻	chloride	S ²⁻	sulfide
		Br ⁻	bromide	N ³⁻	nitride
		I ⁻	iodide	P ³⁻	phosphide

Metal Ions				
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SYMBOL	IUPAC name	SYMBOL	IUPAC NAME	COMMON NAME
Li ⁺	lithium	Cr ²⁺	chromium (II)	chromous
Na ⁺	sodium	Cr ³⁺	chromium (III)	chromic
K ⁺	potassium	Mn ²⁺	manganese (II)	manganous
Rb ⁺	rubidium	Mn ³⁺	manganese (III)	manganic
Cs ⁺	cesium	Fe ²⁺	iron (II)	ferrous
		Fe ³⁺	iron (III)	ferric
Mg ²⁺	magnesium	Co ²⁺	cobalt (II)	cobaltous
Ca ²⁺	calcium	Co ³⁺	cobalt (III)	cobaltic
Sr ²⁺	strontium	Ni ²⁺	nickel (II)	nickelous
Ba ²⁺	barium	Ni ³⁺	nickel (III)	nickelic
		Cu ⁺	copper (I)	cuprous
Ag ⁺	silver	Cu ²⁺	copper (II)	cupric
Zn ²⁺	zinc			
Cd ²⁺	cadmium	Sn ²⁺	tin (II)	stannous
Al ³⁺	aluminum	Sn ⁴⁺	tin (IV)	stannic
		Pb ²⁺	lead (II)	plumbous
As ³⁺	arsenic (III)	Pb ⁴⁺	lead (IV)	plumbic
As ⁵⁺	arsenic (V)			
Sb ³⁺	antimony (III)	Au ⁺	gold (I)	aurous
Sb ⁵⁺	antimony (V)	Au ³⁺	gold (III)	auric
Bi ³⁺	bismuth (III)	Hg ₂ ²⁺	mercury (I)	mercurous
Bi ⁵⁺	bismuth (V)	Hg ²⁺	mercury (II)	mercuric

(+1)	(+2)											nonmetals	(-3)	(-2)	(-1)	
IA	↓												↓	↓	↓	
H ⁺																
	IIA											IIIA	IVA	VA	VIA	VIIA
Li ⁺														N ³⁻	O ²⁻	F ⁻
Na ⁺	Mg ²⁺											Al ³⁺		P ³⁻	S ²⁻	Cl ⁻
		IIIB	IVB	VB	VIB	VIIB	VIII B			IB	IIB			As ³⁺		Br ⁻
K ⁺	Ca ²⁺				Cr ²⁺ Cr ³⁺	Mn ²⁺ Mn ³⁺	Fe ²⁺ Fe ³⁺	Co ²⁺ Co ³⁺	Ni ²⁺ Ni ³⁺	Cu ⁺ Cu ²⁺	Zn ²⁺			As ⁵⁺		
Rb ⁺	Sr ²⁺									Ag ⁺	Cd ²⁺		Sn ²⁺ Sn ⁴⁺	Sb ³⁺ Sb ⁵⁺		I ⁻
Cs ⁺	Ba ²⁺									Au ⁺ Au ³⁺	Hg ₂ ²⁺ Hg ²⁺		Pb ²⁺ Pb ⁴⁺	Bi ³⁺ Bi ⁵⁺		

b. Polyatomic Ions

Cations

NH_4^+ ammonium

Hg_2^{2+} mercury (I) or mercurous

Anions

-1	-2	-3
HSO_3^- bisulfite	SO_3^{2-} sulfite	
HSO_4^- bisulfate	SO_4^{2-} sulfate	
	$\text{S}_2\text{O}_3^{2-}$ thiosulfate	
HCO_3^- bicarbonate	CO_3^{2-} carbonate	
HS^- bisulfide		PO_3^{3-} phosphite
H_2PO_4^- dihydrogen phosphate	HPO_4^{2-} monohydrogen phosphate	PO_4^{3-} phosphate
CN^- cyanide		AsO_4^{3-} arsenate
SCN^- thiocyanate	CrO_4^{2-} chromate	BO_3^{3-} borate
OCN^- cyanate	$\text{Cr}_2\text{O}_7^{2-}$ dichromate	
NO_2^- nitrite		
NO_3^- nitrate	$\text{C}_2\text{O}_4^{2-}$ oxalate	
ClO^- hypochlorite		
ClO_2^- chlorite	O_2^{2-} peroxide	
ClO_3^- chlorate		
ClO_4^- perchlorate		
BrO^- hypobromite		
BrO_2^- bromite		
BrO_3^- bromate		
BrO_4^- perbromate		
IO^- hypoiodite		
IO_2^- iodite		
IO_3^- iodate		
IO_4^- periodate		
MnO_4^- permanganate		
OH^- hydroxide		
$\text{C}_2\text{H}_3\text{O}_2^-$ acetate		

PREFIXES AND SUFFIXES (what they mean)

-ate "most common variety"	-ide only one kind of atom in the anion
-ite one less oxygen atom than "ate" variety (same charge)	thio- one oxygen atom replaced by S
per- one more oxygen atom than in "ate" variety (same charge)	bi- one H^+ added to divalent anion
hypo- one less oxygen atom than in "ite" variety (same charge)	di- two

2. Writing Formulas for Ionic Compounds and Acids

- Write the symbol (or formula) for each ion, writing the cation first and the anion second.
- Place parentheses around formulas for polyatomic ions.
- Choose subscripts for the ions such that the net charge is zero. (Remember - a polyatomic ion is a single ion, even though it is made of several atoms)
- Be sure the subscripts are in lowest whole number ratio.
- Rewrite the formula without showing the charges.
- If the subscript for a monoatomic ion is 1, the 1 is not shown.
- If the subscript for a polyatomic ion is 1, the 1 is not shown and the parentheses are removed.

3. Writing Systematic Names of Ionic Compounds and Acids

- Write the name of the cation. Be sure to give the correct names for metal cations of variable charge.
- Write the name of the anion.
- DO NOT USE GREEK PREFIXES!

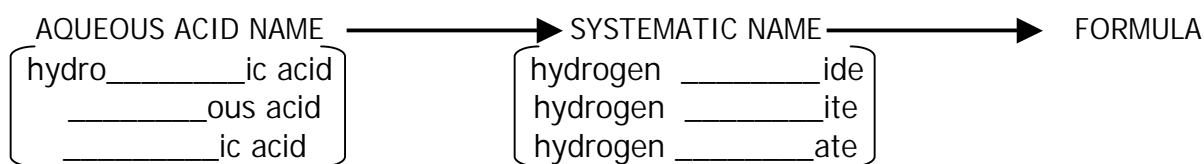
4. Writing Aqueous Acid Names

Acids are molecular compounds that contain hydrogen. However, we write their systematic names as if they were ionic. When acids dissolve in water they have different properties and are given different names, aqueous acid names.

Examples of Acid Names

		SYSTEMATIC NAME	AQUEOUS ACID NAME
BINARY ACIDS		hydrogen _____ide	hydro_____ic acid
	HCl	hydrogen <u>chloride</u>	hydro <u>chloric</u> acid
	H ₂ S	hydrogen <u>sulfide</u>	hydro <u>sulfuric</u> acid
	HI	hydrogen <u>iodide</u>	hydro <u>iodic</u> acid
TERNARY OXY ACIDS		hydrogen _____ite	_____ous acid
	HNO ₂	hydrogen <u>nitrite</u>	<u>nitrous</u> acid
	H ₂ SO ₃	hydrogen <u>sulfite</u>	<u>sulfurous</u> acid
	HBrO	hydrogen <u>hypobromite</u>	<u>hypobromous</u> acid
		hydrogen _____ate	_____ic acid
	HNO ₃	hydrogen <u>nitrate</u>	<u>nitric</u> acid
H ₃ PO ₄	hydrogen <u>phosphate</u>	<u>phosphoric</u> acid	
HClO ₄	hydrogen <u>perchlorate</u>	<u>perchloric</u> acid	

5. Writing Formulas from Aqueous Acid Names



II. PROCEDURE

A. Writing Formulas for Ionic Compounds

1. Write formulas for the following ionic compounds. In each of these compounds both the cation and the anion are monatomic, and the metal cation is one of those that occurs in only one form.

a. barium oxide _____

b. potassium chloride _____

c. aluminum bromide _____

d. calcium sulfide _____

e. strontium nitride _____

f. aluminum iodide _____

g. cadmium phosphide _____

h. silver fluoride _____

2. Write formulas for the following ionic compounds. In each of these compounds both the cation and the anion are monatomic, and the metal cation is one for which there is more than one form.

a. cuprous fluoride _____

b. ferric chloride _____

c. mercury (I) sulfide _____

d. nickelous oxide _____

e. iron (II) bromide _____

f. stannic nitride _____

g. plumbic iodide _____

h. lead (IV) sulfide _____

i. auric phosphide _____

3. Write formulas for the following ionic compounds. In each of these compounds one or both of the ions is a polyatomic ion.

a. cadmium chlorate _____

b. calcium dichromate _____

c. sodium phosphate _____

d. aluminum thiosulfate _____

e. cupric acetate _____

f. iron (III) nitrate _____

g. ammonium oxalate _____

h. silver carbonate _____

B. Writing Names for Ionic Compounds

1. Write names for the following ionic compounds, each of which is composed of only monatomic ions.

a. MgI_2 _____

b. NiF_3 _____

c. $MnCl_2$ _____

d. LiI _____

e. FeO _____

f. SbN _____

g. ZnS _____

2. Write names for the following ionic compounds, each of which contains a polyatomic ion.

- a. $\text{Mg}(\text{C}_2\text{H}_3\text{O}_2)_2$ _____
- b. $\text{Al}(\text{OH})_3$ _____
- c. NH_4SCN _____
- d. $\text{Fe}_2(\text{Cr}_2\text{O}_7)_3$ _____
- e. Li_3BO_3 _____
- f. SrSO_4 _____
- g. $\text{Cd}(\text{MnO}_4)_2$ _____

C. Writing Systematic & Aqueous Names of Acids

	Systematic Name	Aqueous Acid Name
a. HCl	_____	_____
b. H_3PO_4	_____	_____
c. H_2SO_3	_____	_____
d. $\text{HC}_2\text{H}_3\text{O}_2$	_____	_____
e. HIO	_____	_____
f. HOCN	_____	_____
g. HIO_4	_____	_____
h. $\text{H}_2\text{C}_2\text{O}_4$	_____	_____

D. Writing Formulas of Acids

	Systematic Name	Formula
a.	sulfuric acid	
b.	nitric acid	
c.	carbonic acid	
d.	perchloric acid	
e.	hydrobromic acid	
f.	perbromic acid	
g.	hydrofluoric acid	
h.	chlorous acid	
i.	nitrous acid	
j.	phosphorous acid	

E. Writing Formulas of Covalent Compounds

- a. carbon dioxide _____
- b. trisulfur hexafluoride _____
- c. tetraiodine nonachloride _____
- d. diphosphorus pentasulfide _____

F. Naming Covalent Compounds

- a. N_2O _____
- b. BF_3 _____
- c. F_2Br_7 _____
- d. P_2I_4 _____

Report Experiment 6

NOMENCLATURE OF INORGANIC COMPOUNDS

Chem 110

Name _____ Date _____
(last) (first)

Instructor's Initials _____

Complete the following table by writing names or formulas. Also, indicate the type of compound using "I" for ionic or "M" for molecular.

I or M	Name	Formula	I or M	Formula	Name
	sodium nitrite			CaBr_2	
	aluminum bisulfite			BiAsO_4	
	nitrous acid			$\text{Zn}(\text{NO}_3)_2$	
	ferrous oxide			$\text{Cu}(\text{ClO}_3)_2$	
	silver oxalate			PbCr_2O_7	
	iodic acid			P_4O_9	
	fluorine monobromide			AgBrO_2	
	stannous phosphate			Na_3N	
	hydrocyanic acid			$\text{Sb}_2(\text{SO}_3)_5$	
	copper (II) hydroxide			$\text{Hg}_2(\text{ClO})_2$	
	boric acid			$\text{Mg}(\text{OH})_2$	
	sulfuric acid			I_2Br_6	
	hypobromous acid			CsCl	
	periodic acid			FeS	
	dichlorine monoxide			$\text{Mn}(\text{OCN})_2$	
	sulfur hexafluoride			$\text{HF}(\text{aq})$	
	ammonium phosphite			CdI_2	
	ammonia			Cl_2O_7	