CHEM 103 Naming Compounds

Lecture Notes February 9, 2006 Prof. Sevian



Chem 103

Please sit with your groups today. We will be doing a group problem at the end of class.



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Agenda

- How we name compounds depends on what kind of compounds they are
- Naming ionic compounds
- Naming molecular compounds
- Acids are molecular compounds that sometimes behave like ionic compounds, and the positive ion is always H⁺

You need to be able to...



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... distinguish between ionic and molecular compounds so that you can name them.



 Molecular compounds have only nonmetals in them



Common lons

- Monatomic
 - Group A elements have only one possible charge
 - Group B elements (transition metals) usually have more than one possible charge
- Polyatomic
 - See pp. 62 and 64 for lists of ions you need to memorize (name, formula, charge)



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Naming Conventions

1. Ionic compounds

NaCl Na₂CO₃ NH₄Br FeCl₃ FeCl₂ Mg(C₂H₃O₂)₂ Agl CuSO₄



Naming Conventions

1. Ionic compounds - binary NaCl sodium chloride

FeCl ₃	iron (III) chloride
FeCl ₂	iron (II) chloride

Agl

silver iodide







Naming Conventions

1. Ionic compounds - contains polyatomic

Na ₂ CO ₃	sodium carbonate
NH₄Br	ammonium bromide

 $Mg(C_2H_3O_2)_2$ magnesium acetate

CuSO₄ copper (II) sulfate



No

Transition metal

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Molecular





Naming Conventions

- 2. Molecular compounds
 - NO₂ nitrogen dioxide
 - NO₃ nitrogen trioxide
 - N₂O₄ dinitrogen tetroxide
 - CO carbon monoxide
 - CO₂ carbon dioxide
 - P₂O₅ diphosphorus pentoxide
 - CH₄ methane
 - C_2H_6 ethane

Read section 2.9 in your text – you will be responsible for knowing how to name simple organic compounds

Counting to 10 in Greek to name binary molecular compounds



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- 1. Mono
- 2. Bi
- з. **Тгі**
- 4. Tetr(a)-
- 5. Pent(a)-
- 6. Hex(a)-
- 7. Hept(a)-
- 8. Oct(a)-
- 9. Non(a)-
- 10. Dec(a)-







Writing Formulas

- Formulas to names
 - Determine whether ionic or molecular
 - If ionic, name = (positive ion) (negative ion)
 - If molecular, use prefixes
 - Acids are special (name them backwards)
- Names to formulas
 - Translate the formula
 - If ionic, find ions, then balance charges
 - If molecular, read the prefixes
 - Acids are special (translate backwards)









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Naming Conventions

3.	Acids	They look like ionic
	HCI	compounds, except that the
	H ₂ CO ₃	positive ion is always H+
	HBr	
	HOCI	What would you name them if
	HCIO	they were forfic compounds?
	$HC_2H_3O_2$	
	$C_2H_3O_2H$	
	HNO ₂	
	HNO ₃	



If acids were ionic compounds...

3.	Acids
3.	ACIUS

Hydrogen chloride
Hydrogen carbonate
Hydrogen bromide
Hydrogen hypochlorite
Hydrogen hypochlorite
Hydrogen acetate
Hydrogen acetate
Hydrogen nitrite
Hydrogen nitrate

But they're not, so here's how to name acids properly



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3. Acids

HCI	-Hydrogen chloride-	Hydrochloric acid
H_2CO_3	-Hydrogen carbonate	Carbonic acid
HBr	Hydrogen bromide	Hydrobromic acid
HOCI	Hydrogen hypochlorite	Hypochlorous acid
HCIO	Hydrogen hypochlorite	
$HC_2H_3O_2$	Hydrogen acetate	Acetic acid
$C_2H_3O_2H$	Hydrogen acetate	
HNO ₂	Hydrogen nitrite	Nitrous acid
HNO ₃	Hydrogen nitrate	Nitric acid





Naming Conventions Summary

First determine if the compound is ionic, molecular, or acid.

- 1. Ionic compounds \rightarrow name is (+ ion name)(- ion name)
 - a) Binary or contain polyatomic ion(s)?
 - b) Can the metal cation have more than one oxidation state? If so, then
 (+ ion name) must contain info about which oxidation state
- 2. Molecular compounds
 - a) Binary (except not C and H) \rightarrow name is (prefix)name1 (prefix)name2
 - b) Hydrocarbons (contains C and H) \rightarrow name by organic naming system
- 3. Acids
 - a) Binary, anion ends in "-ide" \rightarrow name is hydro____ic acid
 - b) Anion ends in "-ate" \rightarrow name is <u>ic acid</u>
 - c) Anion ends in "-ite" \rightarrow name is <u>ous acid</u>



What you need to be able to do

- Given a chemical formula, write the name of the compound
 - · First figure out if it's ionic, molecular or an acid
- Given a compound name, write the chemical formula
 - · First figure out if it's ionic, molecular or an acid
 - If it is ionic or an acid, you also have to figure out the correct ratio of + to – charges that makes the compound neutral

Methods of determining ratios of charges to make a neutral compound



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1. Least common multiples method





Practice

Name these compounds

sodium nitrate
ammonium sulfide
nitric acid
chromium (III) phosphate
dinitrogen monoxide
nitrous acid

Write formulas

Calcium iodide	Cal ₂
Hydroionic acid	HI
Selenium trioxide	SeO ₃
Strontium hypochlorite	Sr(OCI) ₂
Iron (III) oxalate	$Fe_2(C_2O_4)_3$
Magnesium permanganate	Mg(MnO ₄) ₂
Chlorous acid	HCIO ₂

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What you can do to practice

- List cations on one page and anions on another.
- Choose one cation and one anion.
- Write the name of the ionic compound or acid.
- Determine the correct neutral formula.