

# NOMENCLATURE

# Oxidation Numbers

A hypothetical charge based on the number of electrons each atom would have if all the electrons within a bond were located on the most electronegative atom.

- The oxidation number of an atom of a free element is zero.
- The oxidation number of a monatomic ion is equal to its charge.
- The algebraic sum of the oxidation numbers of the atoms in the formula of a compound is zero.
- The oxidation number of hydrogen is +1 except when combined with metals; it is then -1.
- The oxidation number of oxygen is -2.

- Combinations with nonmetals; the oxidation number of the less electronegative element is positive and that of the more electronegative element is negative.
- The algebraic sum of the oxidation numbers of the atoms in the formula of a polyatomic ion is equal to its charge.

# Oxidation



An increase in the oxidation number  
for a given atom

# Reduction

A decrease in the oxidation number  
of a given atom.

# METALS & NONMETALS

- Name the positive metal
- Follow with the name of the negatively charged nonmetal
- Drop the ending of the nonmetal and replace with ide

# CaO

Calcium oxide



# Hydrogen & Nonmetals

- Use the name hydrogen
- Follow with the name of the nonmetal
- Drop the nonmetal's ending and replace with ide

# HCl

hydrogen chloride

# METALS & POLYATOMIC IONS

- Name the positive metal
- Name the polyatomic ion

Charge	Name	Formula
+ 1	<input checked="" type="checkbox"/> Ammonium	$\text{NH}_4^+$
- 1	<input checked="" type="checkbox"/> Acetate	$\text{C}_2\text{H}_3\text{O}_2^-$
- 1	<input checked="" type="checkbox"/> Cyanide	$\text{CN}^-$
- 1	Dihydrogen phosphate	$\text{H}_2\text{PO}_4^-$
- 1	Hydrogen carbonate	$\text{HCO}_3^-$
- 1	Hydrogen sulfate	$\text{HSO}_4^-$
- 1	<input checked="" type="checkbox"/> Hydroxide	$\text{OH}^-$
- 1	<input checked="" type="checkbox"/> Nitrate	$\text{NO}_3^-$
- 1	<input checked="" type="checkbox"/> Nitrite	$\text{NO}_2^-$
- 1	<input checked="" type="checkbox"/> Perchlorate	$\text{ClO}_4^-$
- 1	Permanganate	$\text{MnO}_4^-$
- 2	<input checked="" type="checkbox"/> Carbonate	$\text{CO}_3^{2-}$
- 2	Hydrogen phosphate	$\text{HPO}_4^{2-}$
- 2	Peroxide	$\text{O}_2^{2-}$
- 2	<input checked="" type="checkbox"/> Sulfate	$\text{SO}_4^{2-}$
- 2	<input checked="" type="checkbox"/> Sulfite	$\text{SO}_3^{2-}$
- 3	<input checked="" type="checkbox"/> Phosphate	$\text{PO}_4^{3-}$

# The Chlorine Family of Polyatomic Ions

$\text{ClO}^-$	Hypochlorite
$\text{ClO}_2^-$	Chlorite
$\text{ClO}_3^-$	Chlorate
$\text{ClO}_4^-$	Perchlorate



Zinc Hydroxide

# Two Nonmetals

- Use the name of the most electropositive element first
- Follow with the name of the most electronegative element
- Use the ide ending for the most electronegative element
- With more than one combination, use Greek prefixes

□ 1 - mono

□ 2 - di

□ 3 - tri

□ 4 - tetra

□ 5 - penta

□ 6 - hexa

□ 7 - hepta

□ 8 - octa

□ 9 - nona

□ 10-deca





Phosphorous **Trichloride**



Phosphorous **Pentachloride**

Ahh!  
An example



# Binary Nitrogen-Oxygen Compounds

$\text{N}_2\text{O}$  dinitrogen monoxide

$\text{NO}$  nitrogen monoxide

$\text{N}_2\text{O}_3$  dinitrogen trioxide

$\text{NO}_2$  nitrogen dioxide

$\text{N}_2\text{O}_5$  dinitrogen pentoxide

# Metals with more than one oxidation number & nonmetals

## □ Using Roman Numerals

- Use the name of the metal
- Use Roman Numerals in parenthesis to give the oxidation number of the metal
- Use the name of the nonmetal
- Use the ide ending with the nonmetals



Iron (III) Chloride



Iron (II) Chloride

# Metals with more than one oxidation number & nonmetals

## □ Using latin names

- Give the latin name root for the metal
  - For the lower oxidation state use the ous suffix
  - For the higher oxidation state use the ic suffix
- Use the name of the nonmetal
- Add the ide ending to the nonmetal





Ferric Chloride



Ferrous Chloride

## METALLIC ION NAME EQUIVALENTS

### *Old system*

### *New system*

chromic	$\text{Cr}^{+++}$	chromium(III)	$\text{Cr}^{+++}$
cobaltous	$\text{Co}^{++}$	cobalt(II)	$\text{Co}^{++}$
cobaltic	$\text{Co}^{+++}$	cobalt(III)	$\text{Co}^{+++}$
ferrous	$\text{Fe}^{++}$	iron(II)	$\text{Fe}^{++}$
ferric	$\text{Fe}^{+++}$	iron(III)	$\text{Fe}^{+++}$
cuprous	$\text{Cu}^{+}$	copper(I)	$\text{Cu}^{+}$
cupric	$\text{Cu}^{++}$	copper(II)	$\text{Cu}^{++}$
mercurous	$\text{Hg}^{+}$	mercury(I)	$\text{Hg}_2^{++}$
mercuric	$\text{Hg}^{++}$	mercury(II)	$\text{Hg}^{++}$
plumbous	$\text{Pb}^{++}$	lead(II)	$\text{Pb}^{++}$
plumbic	$\text{Pb}^{+++}$	lead(IV)	$\text{Pb}^{+++}$
stannous	$\text{Sn}^{++}$	tin(II)	$\text{Sn}^{++}$
stannic	$\text{Sn}^{+++}$	tin(IV)	$\text{Sn}^{+++}$

# Binary Acids

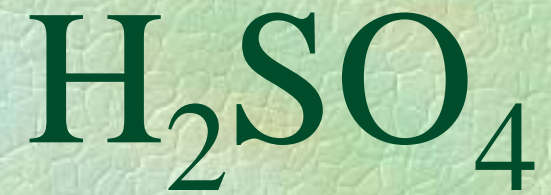
- Use the prefix of hydro
- Use the root from the parent element
- Add the ic ending
- Complete with the word acid



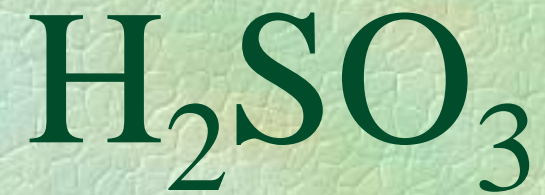
Hydrochloric Acid

# Oxyacids

- Use the root of the name of the polyatomic ion from which the acid is derived
- Use the appropriate suffix
  - ic is used if the polyatomic ion ends in ate
  - ous is used if the polyatomic ion ends in ite
- Complete with the word acid

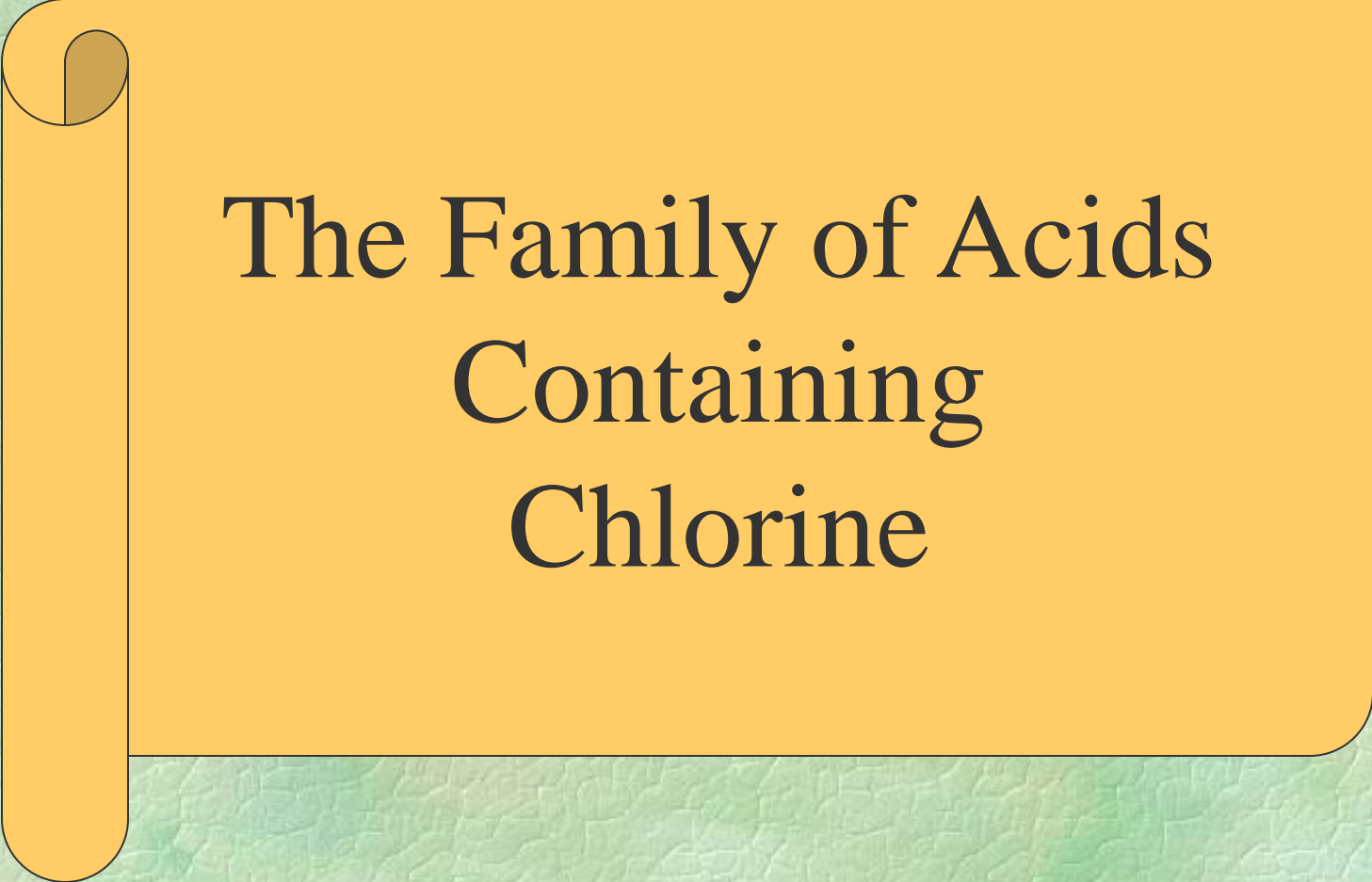


Sulfuric Acid



Sulfurous Acid





The Family of Acids  
Containing  
Chlorine

HCl

Hydrochloric

HClO

Hypochlorous

HClO<sub>2</sub>

Chlorous

HClO<sub>3</sub>

Chloric

HClO<sub>4</sub>

Perchloric

# Metals

- React with elemental nonmetals
- Form oxides that, if soluble, react with water to give hydroxides
- Form basic hydroxides
- React with hydrogen to form binary hydrides
- React with other metals forming metallic compounds

# Metals

- Exhibit lower electronegativity values
- Readily form cations by loss of electrons
- Good conductors of heat & electricity
- Malleable & ductile
- Metallic luster

# Nonmetals

- Form oxides that may react with water to give acids
- Form acidic hydroxides (oxyacids)
- React with nonmetals to form covalent compounds
- React with metals to form ionic compounds
- Form binary hydrides, which may be acidic

# Nonmetals

- Exhibit higher electronegativity values
- Readily form anions by accepting electrons to fill the outermost shell
- Poor conductors of heat & electricity
- Brittle
- Dull in appearance

# Metalloids

Elements which have characteristics that resemble both metals and nonmetals



THE

END