

CHM 1045
HANDOUT #1 – Naming chemical compounds

1) **Names and symbols of the elements.** You are expected to know the names and symbols for the elements of the first six periods of the periodic table, including transition metals (elements from 1-56, 72-86), and uranium (element 92).

2) **Naming ionic compounds.**

a) [Main group metal (1A, 2A, aluminum (3A)), or Ag^+ , Cd^{2+} , Zn^{2+}] + [main group nonmetal]:

name of metal + name of nonmetal + ide

Example: CaF_2 is calcium fluoride, Li_3P is lithium phosphide, Al_2S_3 is aluminum sulfide, AgCl is silver chloride, KH is potassium hydride

b) [Transition group metal (or group 4A metal)] + [main group nonmetal]:

name of metal (charge of metal) + name of nonmetal + ide

Example: Cu_2O is copper (I) oxide, CuO is copper (II) oxide, SnF_2 is tin (II) fluoride, Fe_2O_3 is iron (III) oxide

c) Cation group (NH_4^+ (ammonium) and Hg_2^{2+} (mercury (I))) are the only common cation groups.

Example: NH_4Br is ammonium bromide, Hg_2Cl_2 is mercury (I) chloride, $(\text{NH}_4)_2\text{S}$ is ammonium sulfide

d) Anion group

$\text{C}_2\text{H}_3\text{O}_2^-$ is acetate ion

CN^- is cyanide ion

OH^- is hydroxide ion

N_3^- is azide ion

CrO_4^{2-} is chromate ion

MnO_4^- is permanganate ion

CO_3^{2-} is carbonate ion

SCN^- is thiocyanate ion

$\text{C}_2\text{O}_4^{2-}$ is oxalate ion

O_2^{2-} is peroxide ion

$\text{Cr}_2\text{O}_7^{2-}$ is dichromate ion

ClO_3^- is chlorate ion

BrO_3^- is bromate ion

IO_3^- is iodate ion

NO_3^- is nitrate ion

SO_4^{2-} is sulfate ion

PO_4^{3-} is phosphate ion

+1 oxygen changes the name to per _____ ate

-1 oxygen changes the name to _____ ite

-2 oxygen changes the name to hypo _____ ite

HPO_4^{2-} is hydrogen phosphate ion

HCO_3^- is hydrogen carbonate ion

HSO_4^- is hydrogen sulfate ion

H_2PO_4^- is dihydrogen phosphate ion

Example: NaNO_3 is sodium nitrate, FeSO_3 is iron (II) sulfite, $\text{Mg}(\text{IO}_4)_2$ is magnesium periodate, $\text{Co}(\text{C}_2\text{H}_3\text{O}_2)_2$ is cobalt (II) acetate, KMnO_4 is potassium permanganate, $\text{Cu}(\text{ClO})_2$ is copper (II) hypochlorite, $\text{Ca}(\text{OH})_2$ is calcium hydroxide, KH_2PO_4 is potassium dihydrogen phosphate, NaN_3 is sodium azide

3) Naming acids.

a) Binary acids (hydrogen + nonmetal)

hydro + nonmetal + ic acid

Example: HI is hydroiodic acid, H₂S is hydrosulfuric acid

b) Ternary acids (hydrogen + oxygen + nonmetal)

hypo _____ ion becomes hypo _____ ous acid

_____ ite ion becomes _____ ous acid

_____ ate ion becomes _____ ic acid

per _____ ate ion becomes per _____ ic acid

Example: HBrO₃ is bromic acid, HBrO₂ is bromous acid, H₃PO₄ is phosphoric acid, HClO is hypochlorous acid, H₂SO₄ is sulfuric acid, HNO₂ is nitrous acid

4) Naming binary molecular compounds (compounds are usually two nonmetals)

a) Left or lower element is named first, second element is given an ide ending, prefix is used to indicate the number of atoms per molecule (but the prefix mono is never used for the first element)

mono = 1

tri = 3

penta = 5

hepta = 7

di = 2

tetra = 4

hexa = 6

octa = 8

Example: CO is carbon monoxide, CO₂ is carbon dioxide, SF₆ is sulfur hexafluoride, N₂O₄ is dinitrogen tetroxide

b) A few molecules have common names: H₂O is water, NH₃ is ammonia, CH₄ is methane.

c) If a binary molecular compound forms an acid when added to water the naming of the compound depends on whether it is in the gas phase or aqueous phase

Example: HCl(g) is hydrogen chloride, HCl(aq) is hydrochloric acid

Handout #1 Homework

1) Name the following elements or compounds

a) Ag

g) SrI₂

m) AgHCO₃

b) W

h) KH

n) NH₄Br

c) Se

i) CoO

o) HBr

d) P

j) LiOH

p) HClO₂

e) K

k) Fe(NO₂)₃

q) PCl₅

f) Cr

l) PbSO₄

r) BrF₃

2) Give the formula for the following elements or compounds

a) sodium

g) potassium selenide

m) sodium hydrogen sulfite

b) nitrogen

h) iron (III) bromate

n) nitrogen dioxide

c) gold

i) copper (I) cyanide

o) carbon tetrachloride

d) strontium

j) lead (IV) oxide

p) xenon hexafluoride

e) arsenic

k) sulfurous acid

q) ammonia

f) calcium sulfide

l) hydroiodic acid

r) dinitrogen pentoxide