

## Ionic Compounds – A Primer

### Ions that every citizen should know:

Monocations:  $\text{Li}^+$ ,  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Rb}^+$ ,  $\text{Cs}^+$ ,  $\text{Ag}^+$ ,  $\text{NH}_4^+$  (ammonium),  $\text{H}_3\text{O}^+$  (hydronium)

Dications:  $\text{Be}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Cd}^{2+}$

Others:  $\text{Al}^{3+}$ ,  $\text{Si}^{4+}$  (well, not really ever free in solution  
, but a helpful charge to know...)

Monoanions:  $\text{F}^-$  (fluoride),  $\text{Cl}^-$  (chloride),  $\text{Br}^-$  (bromide),  $\text{I}^-$  (iodide),  $\text{HO}^-$  (hydroxide),  $\text{NO}_3^-$  (nitrate),  
bicarbonate ( $\text{HCO}_3^-$ )

Dianions:  $\text{O}^{2-}$  (oxide),  $\text{S}^{2-}$  (sulfide),  $\text{CO}_3^{2-}$  (carbonate),  $\text{SO}_4^{2-}$  (sulfate)

Trianions:  $\text{N}^{3-}$  (nitride),  $\text{PO}_4^{3-}$  (phosphate),  $\text{AsO}_4^{3-}$  (arsenate)

### Some ions that a pedant will take pleasure in knowing (I know I do):

$\text{VO}_4^{3-}$  (vanadate)

$\text{Cr}^{2+}$ ,  $\text{Cr}^{3+}$ ,  $\text{CrO}_4^{2-}$ ,  $\text{Cr}_2\text{O}_7^{2-}$  (chromous/chromic/chromate/dichromate)

$\text{Mn}^{2+}$ ,  $\text{Mn}^{3+}$ ,  $\text{MnO}_4^-$  (manganous/manganic/permanganate)

$\text{Fe}^{2+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Fe}^{4+}$  (ferrous/ferric/ferryl)

$\text{Co}^{2+}/\text{Co}^{3+}$  (cobaltous/cobaltic)

$\text{Pt}^{2+}/\text{Pt}^{4+}$  (platinous/platinic)

$\text{Cu}^+/\text{Cu}^{2+}$  (cuprous/cupric)

$\text{Au}^+/\text{Au}^{3+}$  (aurous, auric)

$\text{Hg}_2^{2+}/\text{Hg}^{2+}$  (mercurous/mercuric)

$\text{Pb}^{2+}/\text{Pb}^{4+}$  (plumbous/plumbic)

$\text{SO}_3^{2-}$ ,  $\text{S}_2\text{O}_3^{2-}$ ,  $\text{S}_2\text{O}_8^{2-}$  (sulfite/thiosulfate/persulfate)

$\text{ClO}^-$ ,  $\text{ClO}_2^-$ ,  $\text{ClO}_3^-$ ,  $\text{ClO}_4^-$  (hypochlorite/chlorite/chlorate/perchlorate)

$\text{N}_3^-$  (azide)

$\text{SiO}_4^{4-}$  (silicate)

### Naming binary ionic compounds:

*For those who lack pedantry:*

Give the name of the cation and the name of the anion, and allow others to figure out what the ratio of the two must be. If it is a metal cation that has multiple possible ionic charges, specify the charge with a Roman numeral in parentheses:

Examples:

$\text{MgSO}_4$  - magnesium sulfate

$\text{Na}_3\text{PO}_4$  - sodium phosphate

$\text{ZnO}$  - zinc oxide

$\text{Fe}_2\text{O}_3$  - iron(III) oxide

$\text{CuI}$  - copper(I) iodide

*For pedants!*

Just name the two ions, using obscure, outdated terms for the metal cation when possible:

Examples:

Ferrous arsenate -  $\text{Fe}_3\text{AsO}_4$

Mercurous chloride -  $\text{Hg}_2\text{Cl}_2$

Chromic oxide -  $\text{Cr}_2\text{O}_3$