

### Nomenclature #3: Polyatomic Ionic Compounds

Recall that “poly” means \_\_\_\_\_. Polyatomic ions are ions that are made of \_\_\_\_\_ different types of atoms chemically bonded together. They often (but not always) contain \_\_\_\_\_.

**1. The most common form of the polyatomic ion is given the “\_\_\_\_\_” ending:**

- |                                      |   |
|--------------------------------------|---|
| $\text{NO}_3^{1-}$ is the _____ ion  | $\text{SO}_4^{2-}$ is the _____ ion           |
| $\text{PO}_4^{3-}$ is the _____ ion  | $\text{CO}_3^{2-}$ is the _____ ion           |
| $\text{ClO}_3^{1-}$ is the _____ ion | $\text{IO}_3^{1-}$ is the _____ ion           |
| $\text{BO}_3^{3-}$ is the _____ ion  | $\text{CH}_3\text{COO}^{1-}$ is the _____ ion |

**2. If the ion contains \_\_\_\_\_ than the most common (“\_\_\_\_\_”) form, then it is given the “\_\_\_\_\_” ending:**

- |                                     |                                      |
|-------------------------------------|--------------------------------------|
| $\text{NO}_2^{1-}$ is the _____ ion | $\text{SO}_3^{2-}$ is the _____ ion  |
| $\text{PO}_3^{3-}$ is the _____ ion | $\text{ClO}_2^{1-}$ is the _____ ion |
| $\text{IO}_2^{1-}$ is the _____ ion | $\text{BO}_2^{3-}$ is the _____ ion  |

The carbonite ion, \_\_\_\_\_, does not exist.

**3. If the ion contains \_\_\_\_\_ than the “\_\_\_\_\_” ion, then it is given the prefix “\_\_\_\_\_” with the “\_\_\_\_\_” ending:**

- |                                     |                                     |
|-------------------------------------|-------------------------------------|
| $\text{SO}_2^{2-}$ is the _____ ion | $\text{PO}_2^{3-}$ is the _____ ion |
| $\text{ClO}^{1-}$ is the _____ ion  | $\text{IO}^{1-}$ is the _____ ion   |

**4. If the ion contains \_\_\_\_\_ than the most common (“\_\_\_\_\_”) form, then it is given the prefix “\_\_\_\_\_” with the “\_\_\_\_\_” ending**

- |                                      |
|--------------------------------------|
| $\text{ClO}_4^{1-}$ is the _____ ion |
| $\text{IO}_4^{1-}$ is the _____ ion  |
| $\text{MnO}_4^{1-}$ is the _____ ion |

**Summary example:**

- |                           |
|---------------------------|
| $\text{Cl}^{1-}$ _____    |
| $\text{ClO}^{1-}$ _____   |
| $\text{ClO}_2^{1-}$ _____ |
| $\text{ClO}_3^{1-}$ _____ |
| $\text{ClO}_4^{1-}$ _____ |



Notice that all of these ions have a valence (charge) of 1-. The “ate/ite” naming system does not tell us the charge of the ion, it tells only how many oxygen atoms are present.

### The Rules for writing chemical formulas of compounds containing polyatomic ions

Never change or “reduce” the chemical formula of a polyatomic ion.

eg. the oxalate ion,  $C_2O_4^{2-}$  CANNOT be reduced to lower terms! The oxalate ion contains 2 carbon and 4 oxygen atoms covalently bonded together, that never changes!!

It may help to keep things straight if you write the chemical formula of polyatomic ion in brackets, and write its charge outside the brackets. You CANNOT change what is inside of the brackets!!

If, after you criss-cross the charges, the sub-script outside the brackets is one (1), you MUST remove the brackets. If the subscript is greater than one, the brackets MUST remain.

#### 1. Name the following compounds (include Roman Numerals when necessary):

$Na_2SO_4$	$AlPO_4$
$Al(ClO_4)_3$	$AsPO_3$
$Ni(OH)_3$	$AgBrO_3$
$Pb(IO_3)_2$	$K_3P$
$HgCN$	$Mg(IO_4)_2$
$Cd(BrO)_2$	$Au_2S_2O_3$
$KSCN$	$Bi(IO_2)_3$
$Co(BrO_4)_3$	$Si(NO_3)_4$
$CuCH_3COO$	$NH_4ClO_3$
$P(BrO_2)_3$	$NiBO_3$
$Fe(MnO_4)_2$	$SnCrO_4$
$Cr_2(Cr_2O_7)_3$	$Ba(ClO)_2$
$Pb(ClO_2)_4$	$Pb(SO_3)_2$

**2. Write the chemical formula for the following ionic compounds:**

zinc carbonate	aluminum hypochlorite
calcium phosphate	cadmium phosphate
iron (III) sulfate	mercury (II) chlorite
potassium phosphite	magnesium hydroxide
iron (II) chlorate	cobalt (II) carbonate
tin (IV) nitrite	lithium thiocyanate
lead (IV) dichromate	silver sulfite
ammonium sulfite	arsenic (III) perbromate
nickel (III) acetate	nickel (II) chromate
antimony (V) cyanide	iron (II) carbide
mercury (I) permanganate	gold (III) hypoiodite
zinc chloride	copper (II) oxalate
manganese (II) thiosulfate	chromium (III) phosphide