

Names of Ions

Naming Positive Ions (Cations)

With few exceptions (like NH_4^+), the positive ions in this course are metal ions. We name them by the following rules:

1. For a monatomic positive ion (e.g. a metal cation) the name is that of the metal plus the word “cation.”

Ex. Mg^+ is magnesium cation

2. Some cases occur, especially in the transition series, in which a metal can form more than one type of positive ion. In these cases the charge of the ion is indicated by a Roman numeral in parentheses immediately following the ion’s name.

Ex. Fe^{2+} is iron (II) cation and Fe^{3+} is iron (III) cation.

Finally, you will encounter the ammonium cation, NH_4^+ many times in this course. *Do not* confuse ammonium cation with the ammonia molecule, NH_3 .

Naming Negative Ions (Anions)

There are 2 types of negative ions; those only have one atom (monatomic) and those having several atoms (polyatomic)

1. A monatomic negative ion is named by adding *-ide* to the stem of the name of the nonmetal element from which the ion is derived.

Ex. F^- is fluoride. Se^{2-} is selenide. P^{3-} is phosphide.

2. Polyatomic negative ions are common, especially those containing oxygen (**called oxoanions**). The names of some of the most common are given on the back page. These must just be learned, however, there are some guidelines.

Ex. NO_3^- is the nitrate ion; NO_2^- is the nitrite ion
 SO_4^{2-} is the sulfate ion; SO_3^{2-} is the sulfite ion

The oxoanions having the greater number of oxygen atoms is given the suffix *-ate*, and the oxoanions having the smaller number of oxygen atoms is given the suffix *-ite*. For a series of oxoanions having more than 2 members the ion with the largest number of oxygen atoms has the prefix *per-* and the suffix *-ate*. The ion having the smallest number of oxygen atoms has the prefix *hypo-* and the suffix *-ite*.

Ex. ClO_4^- is the perchlorate ion; ClO_3^- is the chlorate ion; ClO_2^- is the chlorite ion and ClO is the hypochlorite ion.

Finally oxoanions that contain hydrogen are named by adding the word “hydrogen before the name of the oxoanions. If 2 hydrogen are in the compound we say “dihydrogen.”

Ex. HPO_4^{2-} is the hydrogen phosphate ion and the H_2PO_4^- is the dihydrogen phosphate ion.

Table 3.1 Formulas and Names of Some Common Polyatomic Ions

Formula	Name	Formula	Name
CATION: Positive Ion			
NH_4^+	ammonium ion		
ANIONS: Negative Ions			
Based on a Group 4A element		Based on a Group 7A element	
CN^-	cyanide ion	ClO^-	hypochlorite ion
CH_3CO_2^-	acetate ion	ClO_2^-	chlorite ion
CO_3^{2-}	carbonate ion	ClO_3^-	chlorate ion
HCO_3^-	hydrogen carbonate ion (or bicarbonate ion)	ClO_4^-	perchlorate ion
Based on a Group 5A element		Based on a transition metal	
NO_2^-	nitrite ion	CrO_4^{2-}	chromate ion
NO_3^-	nitrate ion	$\text{Cr}_2\text{O}_7^{2-}$	dichromate ion
PO_4^{3-}	phosphate ion	MnO_4^-	permanganate ion
HPO_4^{2-}	hydrogen phosphate ion		
H_2PO_4^-	dihydrogen phosphate ion		
Based on a Group 6A element			
OH^-	hydroxide ion		
SO_3^{2-}	sulfite ion		
SO_4^{2-}	sulfate ion		
HSO_4^-	hydrogen sulfate ion (or bisulfate ion)		