

# POLYATOMIC IONS

## REVIEW

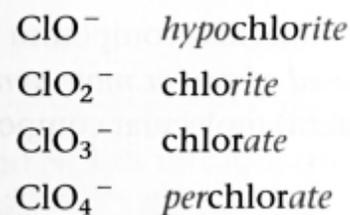
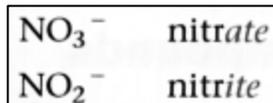
- Many common ionic compounds contain ions that are themselves composed of a group of covalently bonded atoms with an overall charge.
- For example, the active ingredient in household bleach is sodium hypochlorite, which acts to chemically alter color causing molecules in clothes (bleaching action) and to kill bacteria (disinfection).
- Hypochlorite is a polyatomic ion—an ion composed of two or more atoms—with the formula  $\text{ClO}^-$ . (Note that the charge on the hypochlorite ion is a property of the whole ion, not just the oxygen atom; this is true for all polyatomic ions.)
- The hypochlorite ion is often found as a unit in other compounds as well (such as  $\text{KClO}$  and  $\text{Mg}(\text{ClO})_2$ ).
- Other common compounds that contain polyatomic ions include sodium bicarbonate ( $\text{NaHCO}_3$ ), also known as baking soda; sodium nitrite ( $\text{NaNO}_2$ ), an inhibitor of bacterial growth in packaged meats; and calcium carbonate ( $\text{CaCO}_3$ ), the active ingredient in antacids such as TUMS®.

## NAMING

- We name ionic compounds that contain a polyatomic ion in the same way as other ionic compounds, except that we use the name of the polyatomic ion whenever it occurs.
- For example,  $\text{NaNO}_2$  is named according to its cation,  $\text{Na}^+$  (sodium), and its polyatomic anion,  $\text{NO}_2^-$  (nitrite). Its full name is sodium nitrite.
- $\text{FeSO}_4$  is named according to its cation iron, its charge (II), and its polyatomic ion, sulfate.
- Its full name is iron (II) sulfate.
- If the compound contains both a polyatomic cation and a polyatomic anion, use the names of both polyatomic ions.
- For example,  $\text{NH}_4\text{NO}_3$  is ammonium nitrate.

## OXYANIONS

- Most polyatomic ions are oxyanions, anions containing oxygen and another element.
- Notice that when a series of oxyanions contains different numbers of oxygen atoms, they are named systematically according to the number of oxygen atoms in the ion.
- If there are only two ions in the series, the one with more oxygen atoms has the ending -ate and the one with fewer has the ending -ite.
- For example,  $\text{NO}_3^-$  is nitrate and  $\text{NO}_2^-$  is nitrite.
- If there are more than two ions in the series, then the prefixes hypo-, meaning less than, and per-, meaning more than, are used.
- So  $\text{ClO}^-$  is hypochlorite (less oxygen than chlorite), and  $\text{ClO}_4^-$  is perchlorate (more oxygen than Chlorate).



## SOME COMMON POLYATOMIC IONS

- The chart below contains several common polyatomic ions as well as their formulas and their charges

### POLYATOMIC IONS: NAMES, FORMULAE & CHARGES

A polyatomic ion is a charged species consisting of two or more atoms covalently bonded together. Here's a guide to some of the most common examples!

<b>ACETATE</b> Formula: $C_2H_3O_2^-$	<b>CARBONATE</b> Formula: $CO_3^{2-}$	<b>HYDROGEN CARBONATE</b> Formula: $HCO_3^-$	<b>CYANIDE</b> Formula: $CN^-$	<b>NITRATE</b> Formula: $NO_3^-$	<b>NITRITE</b> Formula: $NO_2^-$	<b>AMMONIUM</b> Formula: $NH_4^+$
<b>HYDROXIDE</b> Formula: $OH^-$	<b>PEROXIDE</b> Formula: $O_2^{2-}$	<b>SULFITE</b> Formula: $SO_3^{2-}$	<b>SULFATE</b> Formula: $SO_4^{2-}$	<b>HYDROGEN SULFATE</b> Formula: $HSO_4^-$	<b>THIOSULFATE</b> Formula: $S_2O_3^{2-}$	<b>PHOSPHATE</b> Formula: $PO_4^{3-}$
<b>HYPOCHLORITE</b> Formula: $ClO^-$	<b>CHLORITE</b> Formula: $ClO_2^-$	<b>CHLORATE</b> Formula: $ClO_3^-$	<b>PERCHLORATE</b> Formula: $ClO_4^-$	<b>CHROMATE</b> Formula: $CrO_4^{2-}$	<b>DICHROMATE</b> Formula: $Cr_2O_7^{2-}$	<b>PERMANGANATE</b> Formula: $MnO_4^-$

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