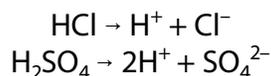


## Naming Inorganic Acids

Acids are important hydrogen-containing molecular compounds, whose names follow special rules. For the moment, we can define an acid as a compound that in water can produce electrically equivalent numbers of hydrogen ions and anions; e.g.,



In general, the formulas of inorganic acids have H written first, whereas hydrogen-containing inorganic compounds that are not acids do not have H written first.

Acids: HCl, HCN, HNO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>, H<sub>3</sub>PO<sub>4</sub>  
Not acids: LiH, BeH<sub>2</sub>, NH<sub>3</sub>, PH<sub>3</sub>

An **oxoacid** is an acid containing hydrogen, oxygen, and another element. The anion produced when an oxoacid dissolves in water is an **oxoanion**. The names of oxoacids follow the following rules:

1. If a central atom can form two different oxoanions, the one with more oxygen atoms is named with the *-ate* suffix, and the one with fewer oxygen atoms is named with the *-ite* suffix.

Anion	Name	Anion	Name
NO <sub>3</sub> <sup>-</sup>	nitrate ion	NO <sub>2</sub> <sup>-</sup>	nitrite ion
SO <sub>4</sub> <sup>2-</sup>	sulfate ion	SO <sub>3</sub> <sup>2-</sup>	sulfite ion

2. If the anion name ends in *-ate*, the corresponding acid name ends in *-ic*.

Anion	Name	Acid	Name
NO <sub>3</sub> <sup>-</sup>	nitrate ion	HNO <sub>3</sub>	nitric acid
SO <sub>4</sub> <sup>2-</sup>	sulfate ion	H <sub>2</sub> SO <sub>4</sub>	sulfuric acid

3. If the anion name ends in *-ite*, the corresponding acid name ends in *-ous*.

Anion	Name	Acid	Name
NO <sub>2</sub> <sup>-</sup>	nitrite ion	HNO <sub>2</sub>	nitrous acid
SO <sub>3</sub> <sup>2-</sup>	sulfite ion	H <sub>2</sub> SO <sub>3</sub>	sulfurous acid

4. When a central atom can form three or four oxoacids, both the anions and the oxoacids are distinguished with the prefix *hypo-* and *per-* for the species with the fewest and most oxygen atoms, respectively.

Anion	Name	Acid	Name
$\text{ClO}^-$	<i>hypochlorite ion</i>	$\text{HClO}$	<i>hypochlorous acid</i>
$\text{ClO}_2^-$	<i>chlorite ion</i>	$\text{HClO}_2$	<i>chlorous acid</i>
$\text{ClO}_3^-$	<i>chlorate ion</i>	$\text{HClO}_3$	<i>chloric acid</i>
$\text{ClO}_4^-$	<i>perchlorate</i>	$\text{HClO}_4$	<i>perchloric acid</i>

**Acid anions** have H atoms that they can lose as  $\text{H}^+$  in water. The names of these ions add *hydrogen* in front of the name of the corresponding ion that does not have H in it. If the acid anion has two or more hydrogen atoms capable to forming  $\text{H}^+$ , the appropriate Greek prefix is used to indicate the number. *Mono-* is omitted if only one acid anion is possible.

Acid Ion	Name
$\text{HCO}_3^-$	hydrogen carbonate ion
$\text{HSO}_4^-$	hydrogen sulfate ion
$\text{HPO}_4^{2-}$	monohydrogen phosphate ion
$\text{H}_2\text{PO}_4^-$	dihydrogen phosphate ion

**Binary hydrogen compounds** with nonmetals may form  $\text{H}^+$  and an anion when dissolved in water. The acidic solutions are named as if they were molecular acids, using the usual name for the compound itself, replacing *hydrogen* with *hydro-* and the suffix *-ide* with *-ic*. The word *acid* is then added. The formula for such a compound in water is often distinguished from the compound itself by *(aq)*, indicating water (aqueous) solution.

Compound	Name	Acid Solution	Name
$\text{HCl}$	hydrogen chloride	$\text{HCl}(aq)$	hydrochloric acid
$\text{HCN}$	hydrogen cyanide	$\text{HCN}(aq)$	hydrocyanic acid
$\text{H}_2\text{S}$	hydrogen sulfide	$\text{H}_2\text{S}(aq)$	hydrosulfuric acid

$\text{HCN}$ , although not a binary compound, is analogous to the binary hydrogen halides ( $\text{HCl}$ ,  $\text{HBr}$ ,  $\text{HI}$ ), and so as an acid is named in a similar manner. The name of  $\text{H}_2\text{S}(aq)$  as an acid is slightly irregular in using the full stem name of the element.