

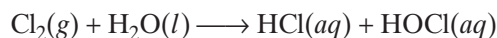
## PROPERTIES OF THE GROUP 17 ELEMENTS

	F	Cl	Br	I	At
Melting point (°C)	-219.62	-100.98	-7.2	113.5	302
Boiling point (°C)	-188.14	-34.6	58.78	184.35	337
Density (g/cm <sup>3</sup> )	$1.69 \times 10^{-3}$	$3.214 \times 10^{-3}$	3.119	4.93	not known
Ionization energy (kJ/mol)	1681	1251	1140	1008	—
Atomic radius (pm)	72	100	114	133	140
Ionic radius (pm)	133	181	196	220	—
Common oxidation number in compounds	-1	-1, +1, +3, +5, +7	-1, +1, +3, +5, +7	-1, +1, +3, +5, +7	-1, +5
Crystal structure	cubic	orthorhombic	orthorhombic	orthorhombic	not known

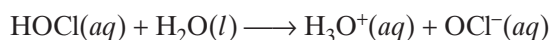
APPLICATION *The Environment***Chlorine in Water Treatment**

For more than a century, communities have treated their water to prevent disease. A treatment process widely used in the United States is chlorination. All halogens kill bacteria and other microorganisms. Chlorine, however, is the only halogen acceptable for large-scale treatment of public water supplies.

When chlorine is added to water, the following reaction produces HCl and hypochlorous acid, HOCl.



Hypochlorous acid is a weak acid that ionizes to give hydrogen ions and hypochlorite ions,  $\text{OCl}^-$ .



NaClO

Ca(ClO)<sub>2</sub>

*Swimming pools are routinely tested to be sure the chlorine level is safe.*

The “chlorine” used in swimming pools is really the compounds shown above and not chlorine at all.