

# Chlorine

**Cl**

## **General Information**

### **Discovery**

Chlorine was discovered in 1774 by C.W. Scheele in Uppsala, Sweden. He thought it contained oxygen and it was Davy who recognised it as an element and named it chlorine in 1810.

### **Appearance**

Chlorine is a greenish-yellow, dense gas with a sharp smell.

### **Source**

Chlorine is not found free in nature but combined chiefly with sodium as sodium chloride in common salt and the minerals carnallite and sylvite.

Chlorine is produced commercially by the electrolysis of sodium chloride.

### **Uses**

Chlorine is widely used in many different areas. It is used in the production of safe drinking water and many consumer products such as paper, dyestuffs, textiles, petroleum products, medicines, antiseptics, insecticides, foodstuffs, solvents, paints and plastics. It is also used to produce chlorates, chloroform, carbon tetrachloride and bromine. A further substantial use for this element is in organic chemistry, both as an oxidising agent and in substitution reactions.

### **Biological Role**

The chloride ion is essential to life. Chlorine gas is a respiratory irritant, which can be fatal after a few deep breaths. It was used as a war gas in 1915. Chlorine liquid corrodes the skin.

## Physical Information

Atomic Number	17
Relative Atomic Mass ( $^{12}\text{C}=12.000$ )	35.453
Melting Point/K	172
Boiling Point/K	239
Density/kg m <sup>-3</sup>	3.214 (273K)
Ground State Electron Configuration	[Ne]3s <sup>2</sup> 3p <sup>5</sup>
Electron Affinity (M-M <sup>-</sup> )/kJ mol <sup>-1</sup>	-348

## Key Isotopes

Nuclide	<sup>35</sup> Cl	<sup>36</sup> Cl	<sup>37</sup> Cl
Atomic mass	34.969	35.980	36.966
Natural abundance	75.77%	0%	24.23%
Half-life	stable	3.1x10 <sup>5</sup> yrs	stable

## Ionisation Energies/kJ mol<sup>-1</sup>

M - M <sup>+</sup>	1251.1
M <sup>+</sup> - M <sup>2+</sup>	2297
M <sup>2+</sup> - M <sup>3+</sup>	3826
M <sup>3+</sup> - M <sup>4+</sup>	5158
M <sup>4+</sup> - M <sup>5+</sup>	6540
M <sup>5+</sup> - M <sup>6+</sup>	9362
M <sup>6+</sup> - M <sup>7+</sup>	11020
M <sup>7+</sup> - M <sup>8+</sup>	33610
M <sup>8+</sup> - M <sup>9+</sup>	38600
M <sup>9+</sup> - M <sup>10+</sup>	43960

## Other Information

Enthalpy of Fusion/kJ mol <sup>-1</sup>	6.41
Enthalpy of Vaporisation/kJ mol <sup>-1</sup>	20.403

### Oxidation States

Main	Cl <sup>-1</sup> , Cl <sup>+7</sup>
Others	Cl <sup>+1</sup> , Cl <sup>+3</sup> , C <sup>+4</sup> , C <sup>+5</sup> , Cl <sup>+6</sup>

### Covalent Bonds/kJ mol<sup>-1</sup>

Cl - O	206
Cl - Cl	242
Cl - F	257
Cl - H	431