Chlorine (Cl)

Element 17 — Complete Summary

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17
Cl
Chlorine
35.45

Key Properties

Atomic Mass	35.45
Category	Halogens
State at 20°C	gas
Melting Point	−101.5°C
Boiling Point	−34.04°C
Density	3.214 g/L
Electron Config	[Ne] 3s23p5
Electronegativity	3.16
Year Discovered	1774
Discovered By	Carl Wilhelm Scheele

✨ Did You Know?

1. It was the first element to be used as a chemical weapon in modern warfare, deployed as a poison gas during World War I.
2. The familiar smell of a swimming pool is not from chlorine itself, but from chemical compounds called chloramines, which form when chlorine reacts with sweat and urine.
3. Household bleach is a solution of sodium hypochlorite, a chlorine compound.
4. Table salt is a compound of sodium and chlorine (NaCl).
5. Despite being toxic as a gas, chloride ions are essential for life, helping to maintain the body's fluid balance.

APPEARANCE
A dense, greenish-yellow gas with a sharp, bleach-like odor.

SUPERHERO PERSONA
"The Purifier, a hero who disinfects our water but has a toxic personality as a gas."

EVERYDAY CONNECTION
The bleach used for cleaning and laundry.

POP CULTURE
Used as a poison gas in war films set during World War I.

Overview of Chlorine

Chlorine is a dense, yellow-green gas with a sharp, choking odor. A highly reactive halogen, it does not occur in nature as a free element but is abundant in the form of chloride salts such as sodium chloride (common salt). Chlorine is both a vital industrial chemical and an important disinfectant, while its ions play an essential role in biological systems.

Uses of Chlorine

Chlorine's strong reactivity and disinfectant properties give it a wide range of applications:

Disinfectant: Chlorine is widely used to sanitize drinking water and swimming pools, killing harmful bacteria and pathogens.

Plastics: Roughly 20% of global chlorine production is used to manufacture polyvinyl chloride (PVC), a versatile plastic used in pipes, window frames, wiring insulation, and flooring.

Industrial chemistry: Chlorine is a major reagent in organic chemistry, used as an oxidizing agent and for substitution reactions in the production of paints, textiles, pharmaceuticals, and pesticides.

Historical uses: Chlorine was once used to make chloroform (an anesthetic) and carbon tetrachloride (a cleaning solvent), though both uses are now restricted. Unfortunately, chlorine gas was also deployed as a chemical weapon during World War I.

Natural Occurrence and Production of Chlorine

Chlorine is the 21st most abundant element in Earth's crust and is widespread in nature as chloride salts. Halite (NaCl, rock salt) is the most common mineral source, and vast quantities of chloride are dissolved in seawater.

Commercially, chlorine is produced by the electrolysis of brine, which also yields sodium hydroxide and hydrogen gas.

History of Chlorine

1774 – First production: Swedish chemist Carl Wilhelm Scheele produced chlorine gas by heating hydrochloric acid with manganese dioxide. He noted its pungent smell and bleaching power but did not recognize it as an element.

1810 – Element identified: English chemist Sir Humphry Davy demonstrated that chlorine was a distinct element, not a compound, though many chemists took years to accept this conclusion.

Biological Role of Chlorine

Chlorine in its ionic form, the chloride ion (Cl^-), is essential for life. Chloride helps maintain the body's fluid balance, nerve function, and acid–base equilibrium. Most dietary chloride comes from sodium chloride (table salt).