

Chlorine (Cl) - Student Datasheet

Atomic number 17 - Halogen · nonmetal - Group 17 - Period 3 - p-block

Chlorine is a Group 17 halogen with seven valence electrons. Elemental chlorine is normally the diatomic molecule Cl_2 , while chloride Cl^- is the much more familiar form in salts, seawater, biology and many materials.

Quick reference

Atomic number	17
Relative atomic mass	35.45
Electron configuration	$[\text{Ne}] 3s^2 3p^5$
Common ion	Cl^-
Density	0.002898 g/cm ³
Melting point	171.7 K
Boiling point	239.11 K
Ordinary molecular form	Cl_2

Structure & orbitals

Reference isotope: ^{35}Cl - 17 protons + 18 neutrons. Ground-state electron configuration: $[\text{Ne}] 3s^2 3p^5$.

The 3s probability model has two radial nodes; the occupied 3p model has one radial node and a selectable p orientation. The buttons show representative atomic orbitals, while Cl_2 bonding requires molecular-orbital/bonding ideas beyond an isolated-atom picture.

Material / molecular structure: Diatomic chlorine molecule at ordinary conditions; low-temperature solid chlorine is a molecular solid

Phase / temperature context

At approximately standard pressure, chlorine is solid below about 171.7 K, liquid from about 171.7 K to 239.11 K, and gaseous above about 239.11 K.

Five things to remember

1. Atomic number 17 means every chlorine nucleus has 17 protons.
2. The neutral configuration $[\text{Ne}] 3s^2 3p^5$ gives seven valence electrons.
3. Elemental chlorine at ordinary conditions is Cl_2 , a green-yellow gas.
4. Natural chlorine is dominated by stable ^{35}Cl and ^{37}Cl .
5. Chloride ions are widespread in salts, seawater and biology and must not be confused with Cl_2 gas.

Real-world context

Water treatment

Controlled chlorine chemistry is widely used to disinfect drinking water and swimming-pool water.

Chloride salts

Chloride ions occur widely in seawater, minerals, food and biological fluids; chloride is chemically different from Cl_2 gas.

PVC & materials

Chlorine chemistry is used in making polyvinyl chloride and many other industrial materials and intermediates.

Bleaching & sanitation

Hypochlorite and related chlorine compounds are used in bleaching and sanitation; they are not the same substance as elemental chlorine gas.

Biology

Chloride is an important electrolyte in living systems, whereas elemental Cl_2 is toxic and strongly reactive.

Where on Earth? / geography modes

Natural chloride reservoirs - Global oceans

Most familiar natural chlorine is chemically bound as chloride in seawater, evaporites and other minerals

Examples/context: Oceans; Evaporites; Minerals

Chlor-alkali network - Brine → products

Industrial chlorine is produced within chemical-manufacturing networks rather than mined as Cl_2

Examples/context: Brine; Electrolysis; Chlorine & co-products

Water disinfection - Treatment systems

Water-treatment use follows infrastructure and public-health systems, not a natural deposit map

Examples/context: Drinking water; Pools; Sanitation

Isotopes

Isotope	Status / timescale	Why it matters
^{35}Cl	Stable · $\approx 75.77\%$ natural abundance	The more abundant stable isotope; 17 protons and 18 neutrons.
^{37}Cl	Stable · $\approx 24.23\%$ natural abundance	The second stable natural isotope; its abundance contributes strongly to chlorine's standard atomic weight.

Evidence note

Atomic/isotope and phase data are measured/evaluated. Geography distinguishes natural chloride reservoirs from industrial chlorine networks. Elemental chlorine hazards are described at a high level only.

Safety: Elemental chlorine gas is toxic and reactive. This educational page does not provide instructions for generating, concentrating or handling chlorine gas.

Review questions

How many valence electrons does neutral chlorine have?

Answer: 7. The neutral ground-state configuration ends $3s^2 3p^5$.

What is the ordinary elemental form of chlorine?

Answer: Cl_2 . Elemental chlorine is normally a diatomic molecule, Cl_2 .

Which statement is correct?

Answer: Chloride ions and chlorine gas have very different properties. Chloride is an ion; Cl_2 is elemental molecular chlorine.

Which two stable isotopes dominate natural chlorine?

Answer: ^{35}Cl and ^{37}Cl . Natural chlorine is dominated by stable ^{35}Cl and ^{37}Cl .

Where is chlorine placed in the periodic table?

Answer: Group 17 · halogen. Chlorine is a Group 17 halogen.

Frequently asked questions

Is chlorine a metal or nonmetal?

Chlorine is a nonmetal and a halogen in Group 17.

How many valence electrons does chlorine have?

Seven. The neutral configuration ends $3s^2 3p^5$.

How many protons, neutrons and electrons does chlorine have?

All chlorine atoms have 17 protons. A neutral atom has 17 electrons. The common isotope ^{35}Cl has 18 neutrons, while ^{37}Cl has 20.

What color is chlorine?

Elemental chlorine gas is yellow-green. Chloride salts can be colorless or have colors determined by other ions; they should not be confused with Cl_2 .

Is chlorine a gas?

At ordinary room conditions elemental chlorine is a diatomic gas, Cl_2 . It can be liquefied or frozen at sufficiently low temperatures.

What is chlorine used for?

Major uses include water disinfection and manufacture of many chemicals and materials, including PVC.

Sources used for this guide

- Royal Society of Chemistry - Chlorine
<https://periodic-table.rsc.org/element/17/chlorine>
- NIST - Atomic Data for Chlorine
<https://physics.nist.gov/PhysRefData/Handbook/Tables/chlorinetable1.htm>
- CDC/ATSDR - Chlorine toxicological context
<https://wwwn.cdc.gov/TSP/ToxFAQs/ToxFAQsDetails.aspx?faqid=200&toxid=36>

This datasheet is a learning aid. Interactive 3D models are teaching models; uncertainty and predicted values must remain labelled. Search-demand data may guide explanation, but scientific values come from cited scientific sources.