

**Key Properties**

Atomic Mass	15.999
Category	Nonmetals
State at 20°C	gas
Melting Point	-218.79°C
Boiling Point	-182.962°C
Density	1.429 g/L
Electron Config	[He] 2s22p4
Electronegativity	3.44
Year Discovered	1774
Discovered By	Carl Wilhelm Scheele & Joseph Priestley

Did You Know?

- 1 It is the most abundant element in the Earth's crust, making up almost half of its mass.
- 2 While essential for life, pure oxygen was a toxic pollutant for early life on Earth before organisms evolved to use it.
- 3 Liquid and solid oxygen are a pale blue color.
- 4 The brilliant red and green colors of the aurora borealis are caused by energized oxygen atoms in the upper atmosphere.
- 5 An oxygen molecule (O₂) is paramagnetic, meaning it is weakly attracted to magnetic fields.

APPEARANCE

A colorless, odorless, tasteless diatomic gas.

SUPERHERO PERSONA

"The Life-Giver, the hero essential for all respiration and the fuel for every fire."

EVERYDAY CONNECTION

The air we breathe to live.

POP CULTURE

The vital gas supplied in space suits and medical tanks in countless movies.

Oxygen: The Life-Giving Element

Oxygen is a colorless, odorless gas that is absolutely essential for life on Earth. It makes up about 21% of our atmosphere and is so reactive that, when combined with other elements, it accounts for almost half of Earth's crust by mass.

Uses of Oxygen

Oxygen is one of the most widely used elements in industry, medicine, and daily life.

Industrial Production: Oxygen is used to make chemicals like nitric acid and hydrogen peroxide, as well as epoxyethane (for antifreeze) and chloroethene (the raw material for PVC plastics).

Welding & Cutting: Oxygen mixed with acetylene creates an extremely hot flame, perfect for welding metals and cutting through steel.

Waste Treatment: Extra oxygen is pumped into sewage and industrial wastewater to help microbes break down waste faster.

Medical Uses: Pure oxygen is vital in hospitals—used in incubators for newborns and to help patients with breathing problems.

Oxygen in Living Things

Oxygen first appeared in Earth's atmosphere about 2 billion years ago, released by photosynthetic bacteria (blue-green algae).

Photosynthesis: Plants and algae split water molecules using sunlight, releasing oxygen into the air.

Respiration: Animals and humans breathe in oxygen and use it to release energy from food, producing carbon dioxide as a waste gas.

In Water: Because oxygen dissolves in water, fish and other aquatic organisms can breathe too.

Oxygen is also the most abundant element in the human body, making up about two-thirds of our mass.

Natural Abundance & History

Oxygen is the most abundant element in Earth's crust (49.2% by mass) and is produced commercially by distilling liquid air or by removing nitrogen from air with special materials.

1771: Swedish chemist Carl Wilhelm Scheele produced oxygen but didn't publish his results.

1774: English chemist Joseph Priestley heated mercuric oxide and released oxygen gas. He noticed it made candles burn brighter and breathing easier.

Later: French chemist Antoine Lavoisier studied the gas, gave it the name oxygène ("acid-forming"), and explained its true role in respiration and combustion.

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