Calcium (Ca)

Element 20 — Complete Summary

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20
Ca
Calcium
40.078

Key Properties

Atomic Mass	40.078
Category	Alkaline Earth Metals
State at 20°C	solid
Melting Point	842°C
Boiling Point	1484°C
Density	1.55
Electron Config	[Ar] 4s2
Electronegativity	1.0
Year Discovered	1808
Discovered By	Humphry Davy

✨ Did You Know?

1. **Body's Big Boss:** Calcium is the most abundant mineral in your entire body, making up about 1.5% of your total weight, mostly in your bones and teeth!
2. **Beyond Bones:** It's not just for skeletal strength! Calcium is absolutely crucial for muscle contraction, nerve signal transmission, and even blood clotting.
3. **Nature's Shy Guy:** You'll never find pure calcium hanging out solo in nature because it's super reactive and always bonds with other elements.
4. **Plant Power-Up:** Plants need calcium too! It's vital for building strong cell walls and helping them grow big, healthy, and structurally sound.
5. **Chalk It Up:** That chalk you use to write on blackboards? It's primarily calcium carbonate, a common compound of calcium!
6. **Rock Solid:** Limestone, marble, and dazzling coral reefs are all massive structures built predominantly from different forms of calcium carbonate.
7. **Construction King:** Calcium compounds are key ingredients in cement, concrete, and plaster, literally holding our homes and cities together.
8. **Heart's Helper:** This amazing element plays a critical role in regulating your heartbeat, ensuring your ticker keeps going strong and steady.
9. **Fiery Flair:** When added to fireworks, calcium compounds burn with a brilliant orange-red glow, lighting up the night sky with vibrant colors!
10. **Egg-cellent Strength:** Birds rely heavily on calcium to form strong, protective eggshells, safeguarding their future chicks.
11. **Early Discoverer:** Sir Humphry Davy first isolated calcium in 1808 using electrolysis, a groundbreaking method to separate elements from their compounds.
12. **The Reactant Rockstar:** As an alkaline earth metal, calcium is highly reactive, always eager to give away its outer electrons to form stable compounds.

👁 APPEARANCE
A soft, silvery-white metal that instantly tarnishes when exposed to air, quickly losing its shine.

🦸 SUPERHERO PERSONA
"Meet Captain Cal, the unsung hero powering your body's framework! He builds super-strong bones and teeth, making sure every muscle flexes and every nerve fires with precision."

🔗 EVERYDAY CONNECTION
The secret ingredient in your morning glass of milk, making your bones rock solid!

🎬 POP CULTURE
The invisible force behind every skeleton you've ever seen in a spooky movie or historical exhibit, giving them their rigid, iconic structure.

Overview of Calcium

Calcium is a soft, silvery-white alkaline earth metal that tarnishes quickly in air and reacts with water. While the pure element is rarely encountered outside laboratories, its compounds are abundant and indispensable. From construction materials to biological processes, calcium is one of the most important elements for both industry and life.

Uses of Calcium

Most uses of calcium come from its compounds rather than the pure metal:

Construction: Limestone ($CaCO_3$) is a key building material. When heated, it forms quicklime (CaO), which reacts with water to make slaked lime ($Ca(OH)_2$). Slaked lime is crucial for making cement, and when mixed with sand it creates traditional lime plaster.

Medicine: Gypsum ($CaSO_4 \cdot 2H_2O$), also known as plaster of Paris, is used for casts that set broken bones.

Agriculture and water treatment: Slaked lime is applied to farmland to neutralize acidic soil and used in water treatment to adjust pH levels.

Metallurgy: Calcium compounds are employed in steelmaking to remove impurities from molten iron.

Metal production: Pure calcium serves as a reducing agent in extracting reactive metals such as uranium, zirconium, and thorium.

Natural Occurrence and Production of Calcium

Calcium makes up about 4.1% of Earth's crust, making it the fifth most abundant element. It is never found in pure form but occurs in minerals such as limestone, gypsum, and fluorite.

Pure calcium was first isolated in 1808 by Sir Humphry Davy, who used electrolysis on a mixture of lime and mercury oxide to separate the element.

History of Calcium

18th century: French chemist Antoine Lavoisier classified lime as an "earth" but suspected it was an oxide of an unknown element.

1808 – Isolation: English chemist Humphry Davy successfully isolated calcium metal using electrolysis, confirming it as a new element.

Biological Role of Calcium

Calcium is essential to life. In humans, it is the primary component of bones and teeth, with the average adult body containing about 1 kilogram of calcium, mostly as calcium phosphate in the skeleton. Adequate calcium intake is critical for children, teenagers, and pregnant women to support growth and development. Calcium also plays a vital role in muscle contraction, blood clotting, and nerve signaling.