

Calcium (Ca)

Calcium is a reactive Group 2 metal whose two outer 4s electrons connect periodic position to Ca^{2+} chemistry. In nature it occurs mainly in compounds such as limestone, gypsum and silicate minerals.

20	Ca	40.078
Atomic number	Calcium	Relative atomic mass / mass display

1. Quick facts

Property	Value	Meaning for a student
Atomic number	20	20 protons
Electrons	20	neutral Ca atom
Electron configuration	[Ar] 4s ²	two outer 4s electrons
Relative atomic mass	40.078	natural isotope-weighted value
Key isotope	Ca-40	dominant natural isotope
Group / period	2 / 4	s-block alkaline-earth metal

2. Atomic structure and electron configuration

Atomic feature	Value	How to read it
Protons	20	Atomic number fixes the proton count.
Electron configuration	[Ar] 4s ²	Ground-state orbital bookkeeping.
Shell arrangement	2, 8, 8, 2	Compact shell-count view.
Common oxidation state	+2	Ca^{2+} chemistry dominates many compounds.

3. Signature idea

Why does calcium usually form Ca^{2+} ?

The [Ar] 4s² configuration places two electrons outside an argon-like core. Losing both produces the familiar Ca^{2+} ion used to describe much of calcium chemistry.

Solid-state exception

At approximately ambient pressure, calcium changes from an alpha-FCC solid to a beta-BCC solid near 721 K before melting at 1115 K. The structure change is distinct from melting.

4. Properties, phase behavior and evidence

Property	Value	Meaning for a student
Non-bonded radius	2.31 Å	RSC reference definition.
Electron affinity	2.369 kJ/mol	Gaseous neutral-atom reference.
Electronegativity	1.00	Pauling scale.
1st ionization energy	589.83 kJ/mol	Gaseous atom.

Evidence context

Use values with their stated definitions, conditions and evidence status. Phase-transition temperatures describe a chosen pressure path; predicted or unknown properties are never presented as direct measurements.

5. Where on Earth?

Calcium is widespread in crustal minerals

RSC gives a crustal abundance of about 4.1% by mass. Limestone, gypsum, fluorite and apatite are important calcium-bearing materials; dissolved Ca^{2+} is also common in natural waters.

Geography rule

The full interactive guide distinguishes natural occurrence from modern production, reserves or research locations. A map layer is labeled by what it actually represents.

6. Representative compounds / forms

Calcium carbonate / CaCO_3	Major component of limestone and many shells.
Calcium sulfate / CaSO_4	Occurs in gypsum and related minerals.

7. Isotope snapshot

Isotope	Nucleus	Natural abundance / status
Ca-40	20 p / 20 n	96.941% - stable
Ca-42	20 p / 22 n	0.647% - stable
Ca-44	20 p / 24 n	2.086% - stable
Ca-48	20 p / 28 n	0.187% - very long-lived double-beta decay

8. Questions to ask next

Why does calcium usually form Ca^{2+} ? Two outer 4s electrons can be removed to leave an argon-like electron configuration.

Why can calcium change crystal structure while remaining solid? A solid-solid phase transition changes the lattice without producing a liquid.

Sources

Royal Society of Chemistry - Calcium element data

NIST Chemistry WebBook / JANAF - Calcium phase transitions

NIST - Calcium atomic/isotopic data

Full interactive guide: <https://elementlookup.com/calcium/>