

Barium (Ba) - Student Datasheet

Element 56 · Alkaline earth metal · source-reviewed learning reference

Barium is element 56, a reactive Group 2 metal whose chemistry is encountered far more often in compounds than as exposed metal. Its story connects $6s^2$ electrons, Ba^{2+} chemistry, barite resources, green emission and the special insolubility of barium sulfate.

Quick reference

Atomic number	56
Relative atomic mass	137.327
Electron configuration	[Xe] $6s^2$
Period / group / block	6 / 2 / s
Ordinary state	Soft silvery solid at 20 °C
Density	3.62 g/cm ³
Melting point	1000 K
Boiling point	2118 K
Oxidation states	+2
Electronegativity	0.89

Structure & orbitals

Barium is represented with a body-centred-cubic teaching cell for the ordinary metallic phase. The model is a conventional cell, not a full diffraction refinement.

The occupied $6s$ orbital is shown as a spherical probability distribution in a hydrogen-like teaching approximation. It is not an electron orbit or a metallic band calculation.

Phase behavior

At approximately standard pressure, barium is a BCC solid below about 1000 K, liquid to about 2118 K, and gaseous above the boiling reference.

Five things to remember

- Atomic number 56 means every barium nucleus has 56 protons.
- Neutral barium has the ground-state configuration [Xe] $6s^2$.
- Barium commonly forms Ba^{2+} compounds.
- Elemental barium is reactive; it is not the same material as barite or barium sulfate.
- $BaSO_4$ is exceptionally insoluble, which is central to its contrast-imaging use.

Barium: Real World & Signature Science

Big idea

“Barium” can mean the element, Ba^{2+} in compounds, barite (BaSO_4), or a medical barium-sulfate suspension. Those are not interchangeable: chemical form and solubility matter.

Why this element is scientifically distinctive

Compare Ba with Ba^{2+} , rotate a ^{138}Ba teaching nucleus and BCC metal cell, inspect the 6s probability model, then connect atomic structure to barite, drilling fluids, green emission and barium-sulfate contrast media.

Barite and drilling	Most commercial barium demand is tied to barite (BaSO_4), especially as a high-density drilling-fluid additive.
Medical contrast	Very insoluble BaSO_4 can provide X-ray/CT contrast in the digestive tract under medical supervision; this is not elemental barium.
Green emission	Excited barium species can contribute green spectral/flame colours used in analytical and pyrotechnic contexts.
Glass and ceramics	Barium compounds are used in selected glasses, ceramics and electronic materials.
Chemical-form safety	Soluble barium salts and reactive barium metal have different hazards from insoluble BaSO_4 ; “barium” alone is not a safety description.

From barite to barium products: a high-level supply path

1. Barium occurs mainly in minerals such as barite (BaSO_4), not as native metal.
2. Mining and beneficiation concentrate barite for industrial markets.
3. Chemical processing can convert selected feedstocks into barium compounds; this page does not provide preparation procedures.
4. Applications depend strongly on chemical form, from dense barite to specialty salts, ceramics and highly insoluble BaSO_4 contrast media.

History checkpoints

1774	Carl Wilhelm Scheele distinguished a new “heavy spar” earth in barite-related material.
1808	Humphry Davy isolated barium by electrolysis, establishing the metal as an element.
19th–20th centuries	Barite became an important industrial mineral, particularly as a dense drilling-fluid material.
Today	Barium chemistry spans industrial minerals, glass/ceramics, spectroscopy and medically supervised BaSO_4 contrast.

Barium: Isotopes, Questions & Evidence

Isotope context

¹³⁸Ba	Stable · most abundant natural isotope	Reference teaching nucleus with 56 protons and 82 neutrons.
¹³⁷Ba	Stable natural isotope	One of several stable natural barium isotopes.
¹³³Ba	Radioactive tracer/calibration isotope	Used in controlled research/metrology contexts; distinct from stable bulk barium.

Common questions

What is barium's atomic number?

56. Every barium nucleus contains 56 protons.

Is barium a metal?

Yes. Elemental barium is a reactive Group 2 alkaline-earth metal.

What is barium used for?

Most commercial barium is used as compounds, especially barite in drilling fluids; BaSO₄ also has medical contrast uses.

How many valence electrons does barium have?

Two in the neutral atom, from the 6s² outer configuration.

Quick self-check

Q: What is barium's atomic number? | Answer: 56. Atomic number equals proton count.

Q: What is the common barium ion? | Answer: Ba²⁺. Group 2 barium commonly loses two outer electrons.

Q: Which compound is central to barite and medical contrast? | Answer: BaSO₄. Barium sulfate is both the mineral chemistry of barite and a highly insoluble contrast material.

Evidence & safety

Atomic and ordinary physical values are evaluated references. The BCC material view is a teaching conventional cell. Commodity geography is dated and selective; chemical-form safety statements distinguish insoluble BaSO₄ from other barium materials.

Elemental barium is reactive and many soluble barium compounds can be hazardous. Medical BaSO₄ use occurs under professional control and is not a general statement that all barium compounds are safe.

Core sources

Royal Society of Chemistry - Barium

<https://periodic-table.rsc.org/element/56/barium>

NIST - Atomic Data for Barium

<https://physics.nist.gov/PhysRefData/Handbook/Tables/bariumtable1.htm>

USGS - Mineral Commodity Summaries 2026

<https://pubs.usgs.gov/publication/mcs2026>