

Lithium (Li) - Student Datasheet

Atomic number 3 - Alkali metal - Group 1 - Period 2 - s-block

Lithium is element 3, the lightest metal and a Group 1 element with one outer 2s electron. Its modern story connects atomic structure to Li⁺ ion chemistry, rechargeable batteries, mineral and brine resources, and a distinctive crimson flame emission.

Quick reference

Atomic number	3
Relative atomic mass	6.94
Electron configuration	[He] 2s ¹
State at 20 C	Soft silvery solid at 20 deg C
Density	0.534 g/cm ³
Melting point	453.65 K
Boiling point	1615 K
Common oxidation state	+1
Electronegativity	0.98

Structure & orbitals

Lithium is commonly represented as body-centred cubic near room temperature; the viewer is a conventional-cell teaching schematic, not a crystallographic coordinate file.

The occupied 2s cloud is a spherical probability model with one radial node in a hydrogen-like teaching approximation. It is not an electron orbit and it does not show the band structure of lithium metal.

Temperature / phase context

On an approximately standard-pressure teaching path, lithium is solid below about 453.65 K, liquid from melting to about 1615 K, and gaseous above the boiling reference. High-pressure phases are outside this introductory model.

Five things to remember

- Atomic number 3 means every lithium nucleus contains 3 protons.
- Neutral lithium has the ground-state configuration [He] 2s¹.
- Lithium usually forms Li⁺ by losing its single outer 2s electron.
- Lithium is the least-dense metal at ordinary conditions.
- Battery materials contain lithium in compounds and ions; a battery electrode is not a block of elemental lithium.

Lithium: Real World & Signature Science

Lithium metal and the lithium ions inside battery materials are not the same chemical object. Element Lookup keeps the neutral atom, Li⁺, minerals and engineered battery compounds separate.

Why this element matters

Rechargeable batteries Lithium ions move between host materials in many rechargeable batteries; the active materials are lithium compounds rather than pieces of lithium metal.	Light alloys & specialty materials Lithium additions and lithium compounds have specialized roles in alloys, glass, ceramics and greases.
Resources Commercial lithium comes from mineral concentrates and brines; resource geology and annual mine production are distinct datasets.	Flame emission Lithium compounds can produce a crimson-red flame emission, a useful link between atomic energy levels and spectroscopy.
Recycling Battery recycling is increasingly important for recovering lithium and other battery materials from end-of-life products.	

From lithium resource to engineered material: a high-level path

1. Lithium-bearing hard-rock ores or brines are extracted using region-specific methods.
2. Mineral processing or brine concentration separates lithium-bearing feed from much larger amounts of other material.
3. Chemical conversion produces lithium compounds such as carbonate or hydroxide to defined specifications; this page intentionally stays non-operational.
4. Battery, glass, ceramic and other manufacturers use those compounds, while recycling can return lithium-bearing material to the supply chain.

Where on Earth?

Lithium resources - Minerals + brines

Lithium supply comes from both hard-rock minerals and lithium-rich brines; these are different geological systems

Mine production - 2025 commodity context

Selected leading lithium-producing countries are shown as dated commodity examples rather than permanent rankings

Battery material cycle - Conceptual

Lithium moves through extraction, chemical conversion, cell materials, use and increasingly recycling

History

1817 - Johan August Arfwedson identified a new element while analyzing the mineral petalite in Sweden.

19th century - Lithium compounds became useful in glass, ceramics and chemical applications before large modern battery demand.

Late 20th century - Lithium-ion battery chemistry transformed portable electronics and later electric mobility and grid storage.

Today - Lithium is a strategic battery and materials commodity with active research in extraction, cathodes, electrolytes and recycling.

Uses

Batteries Lithium compounds and Li ⁺ transport are central to many rechargeable battery chemistries.	Glass & ceramics Lithium compounds can modify thermal expansion, melting behavior and other properties in specialty glasses and ceramics.
Greases Lithium soaps are widely used to formulate lubricating greases.	Lightweight alloys Lithium can be used in specialized aluminium and magnesium alloys where low density matters.

Lithium: Isotopes, Questions & Evidence

Isotopes

⁷Li - Stable - dominant natural isotope

The teaching nucleus shown here contains 3 protons and 4 neutrons.

⁶Li - Stable - minor natural isotope

A naturally occurring lithium isotope with important nuclear-science applications; natural abundance is much lower than ⁷Li.

Lithium isotope mixture - Two stable natural isotopes

Natural lithium is an evaluated mixture of ⁶Li and ⁷Li, so the relative atomic mass is not an integer.

Common questions

What is lithium's atomic number?

Lithium is atomic number 3, so every lithium nucleus contains three protons.

Is lithium a metal?

Yes. Lithium is an alkali metal in Group 1 and is the least-dense metal at ordinary conditions.

What is lithium's electron configuration?

The neutral ground-state configuration is [He] 2s¹.

Why does lithium form Li⁺?

Losing the single outer 2s electron leaves a closed 1s² shell, so +1 is lithium's characteristic oxidation state.

Is the lithium in a battery lithium metal?

Usually no. In conventional lithium-ion cells, lithium is present as ions within compounds and host materials; metallic lithium is used only in particular battery designs.

What color does lithium produce in a flame test?

Lithium compounds can give a crimson-red emission, although flame-test observations depend on conditions and contamination.

Quick self-check

1. What is lithium's atomic number? Answer: 3
2. How many outer-shell electrons does neutral lithium have? Answer: 1
3. Which ion is characteristic of lithium chemistry? Answer: Li⁺
4. Which statement about lithium-ion batteries is best? Answer: Lithium usually moves as ions within compounds and host materials
5. What crystal teaching model is used for room-temperature lithium? Answer: Body-centred cubic

Evidence & provenance

Atomic and ordinary physical values are measured/evaluated reference data. The BCC viewer is a conventional-cell teaching schematic. Resource and production geography is dated commodity context, not a permanent map of where lithium 'exists'.

Core sources

Royal Society of Chemistry - Lithium	https://periodic-table.rsc.org/element/3/lithium
NIST - Atomic Data for Lithium	https://physics.nist.gov/PhysRefData/Handbook/Tables/lithiumtable1.htm
USGS - Mineral Commodity Summaries 2026	https://pubs.usgs.gov/publication/mcs2026