

Lanthanum (La) - Student Datasheet

Element 57 · Lanthanide / rare-earth metal · source-reviewed learning reference

Lanthanum is element 57, a soft rare-earth metal whose La^{3+} chemistry connects the start of the lanthanide series to optical glass, catalysts, battery alloys and hydrogen-storage materials.

Quick reference

Atomic number	57
Relative atomic mass	138.905
Electron configuration	$[\text{Xe}] 5d^1 6s^2$
Period / group / block	6 / Lanthanide / d
State context	Soft silvery-white reactive rare-earth metal
Density	6.15 g/cm^3
Melting / transition	1193 K
Boiling / gas reference	3737 K
Oxidation states	+3
Electronegativity	1.10

Structure & orbitals

Lanthanum is commonly described by a DHCP ordinary-temperature structure. Temperature-dependent allotropy exists; this viewer shows only the ordinary structural reference rather than pretending one lattice persists to melting.

The displayed d and s orbitals are isolated-atom probability teaching models. They are not metallic bands, bonding orbitals or measured electron-density maps of the bulk material.

Phase behavior

At approximately standard pressure, lanthanum is treated as a solid below 1193 K, liquid between melting and approximately 3737 K, and gas above the boiling reference. The ordinary crystal label applies to the stated material reference; unmodeled solid allotropy is not fabricated.

Five things to remember

- Atomic number 57 means every lanthanum nucleus has 57 protons.
- Neutral Lanthanum has the ground-state configuration $[\text{Xe}] 5d^1 6s^2$.
- The representative teaching isotope is ^{139}La .
- Lanthanum metal, La^{3+} ions and lanthanum-containing glass, catalysts or battery alloys are different material contexts.
- The ordinary material reference is Double hexagonal close-packed (DHCP) reference.

Lanthanum: Real World & Signature Science

Element-specific science, uses and history

Big idea

Lanthanum metal, La^{3+} ions and lanthanum-containing glass, catalysts or battery alloys are different material contexts. “Rare earth” describes a chemical family and supply context, not a claim that the metal is literally rare everywhere.

Why this element is scientifically distinctive

Explore La across the teaching nucleus, isolated-atom orbitals, evidence-aware material structure and temperature/evidence views, then connect those models to uses, isotopes, search-led questions and source-backed context.

Optical glass	Lanthanum oxide is used in specialty optical glasses with high refractive index; the useful glass is a compound mixture, not La metal.
Battery alloys	Lanthanum-containing mischmetal and AB ₅ -type alloys are used in some nickel-metal-hydride battery electrodes.
Catalysts	Lanthanum compounds are used in selected petroleum and automotive catalyst formulations.
Hydrogen materials	Lanthanum-nickel intermetallics can reversibly absorb hydrogen and are studied/used as storage-electrode materials.
Rare-earth family	Lanthanum is chemically grouped with the lanthanides even though its ground-state differentiating electron is 5d.

From source material to Lanthanum applications: high-level material path

1. Lanthanum is obtained from mineral or metallurgical feedstocks in which it is chemically associated with other elements rather than mined as abundant native metal.
2. Industrial separation and refining produce element-specific compounds or metal feedstock; this guide does not provide operational extraction recipes.
3. The refined material is converted into the particular alloy, compound, doped host or component required by the application.
4. Recycling and recovery depend on the host product, concentration and economics; application materials must not be confused with pure element.

History checkpoints

1839	Carl Gustaf Mosander separated a new oxide from ceria and named the new element lanthanum.
19th century	Lanthanum was recognized as one member of a family of chemically similar rare-earth elements.
20th century	Optical glass, catalyst and alloy applications expanded as rare-earth separation improved.
Today	Lanthanum is used mainly through compounds and alloys rather than as bulk elemental metal.

Use contexts

- ['Optical glass', 'La-containing glasses are used where optical properties such as refractive index are important.']
- ['NiMH batteries', 'Lanthanum-rich rare-earth alloys can form hydrogen-storage electrode materials.']
- ['Catalysts', 'Lanthanum compounds modify selected refining and emissions-control catalysts.']
- ['Specialty alloys', 'Lanthanum-containing alloys and mischmetal support niche metallurgical and ignition applications.']

Lanthanum: Isotopes, Questions & Evidence

Evidence status and learner self-check

Isotope context

¹³⁹ La	Dominant natural isotope	Stable and overwhelmingly abundant in natural lanthanum.
¹³⁸ La	Trace natural radioisotope	Very long-lived and naturally occurring.
Natural lanthanum	Two-isotope natural mixture	The relative atomic mass is abundance-weighted.

Common questions

What is lanthanum?

Lanthanum is chemical element 57, a soft silvery rare-earth metal at the start of the lanthanide series.

What is lanthanum used for?

Lanthanum compounds and alloys are used in optical glass, catalysts, nickel-metal-hydride batteries and hydrogen-storage materials.

Where is lanthanum found?

It occurs mixed with other rare-earth elements in minerals such as bastnäsite and monazite and is separated during rare-earth processing.

Is lanthanum a metal?

Yes. It is a reactive rare-earth metal.

Is lanthanum a transition metal?

Lanthanum has a 5d electron and is sometimes discussed at the d-block/lanthanide boundary, but it is conventionally treated as the first lanthanide in this guide.

Who discovered lanthanum?

Carl Gustaf Mosander discovered lanthanum in 1839 while separating rare-earth oxides.

Evidence & safety

Atomic identity and reference values are source-reviewed. Material viewers are teaching representations, not crystallographic refinements. Search demand shapes headings and FAQs but never overrides measured/evaluated evidence or element-versus-compound distinctions.

This page is educational. Chemical, occupational, radiological or medical safety decisions require the specific material/isotope, its current safety data and qualified guidance.

Core sources

Royal Society of Chemistry - Lanthanum - <https://periodic-table.rsc.org/element/57/lanthanum>

NIST - Atomic Weights and Isotopic Compositions - https://physics.nist.gov/cgi-bin/Compositions/stand_alone.pl

IUPAC - Periodic Table of Elements - <https://iupac.org/what-we-do/periodic-table-of-elements/>