

Gallium (Ga) - Student Datasheet

Element 31 · Post-transition metal · source-reviewed learning reference

Gallium is element 31, a soft metal famous for melting at only about 302.9 K (29.8 °C). Its real scientific story is richer than the melting trick: unusual α -Ga bonding, Ga^{3+} chemistry, and semiconductor compounds such as GaAs and GaN connect atomic structure to modern electronics.

Quick reference

Atomic number	31
Relative atomic mass	69.723
Electron configuration	[Ar] 3d ¹⁰ 4s ² 4p ¹
Period / group / block	4 / 13 / p
State context	Soft silvery metal; solid at 20 °C and melts just above typical room temperature
Density	5.91 g/cm ³
Melting / transition	302.9146 K
Boiling / gas reference	2502 K
Oxidation states	+3, +1
Electronegativity	1.81

Structure & orbitals

Ordinary α -gallium has an unusual orthorhombic structure with strongly paired Ga atoms. The viewer uses a paired-atom orthorhombic teaching motif, not a crystallographic coordinate file.

The 4s and 4p clouds are isolated-atom probability teaching models. They do not represent the electron density of α -gallium metal or GaAs/GaN bands.

Phase behavior

At approximately standard pressure, α -gallium is solid below 302.9146 K, liquid from the melting point to about 2502 K, and gaseous above the boiling reference.

Five things to remember

- Atomic number 31 means 31 protons.
- Neutral gallium has the configuration [Ar] 3d¹⁰ 4s² 4p¹.
- Gallium melts at about 302.9 K, only slightly above typical room temperature.
- Ordinary α -gallium has unusual paired-atom bonding rather than a simple close-packed metal lattice.
- GaAs and GaN are compounds; their semiconductor properties are not properties of pure gallium metal.

Gallium: Real World & Signature Science

Element-specific science, uses and history

Big idea

A spoon-melting demonstration is memorable, but it should not become the whole gallium page. Pure gallium, Ga^{3+} compounds and gallium-based semiconductors are different material contexts with different structures and properties.

Why this element is scientifically distinctive

Compare Ga with Ga^{3+} , rotate a ^{69}Ga teaching nucleus and α -Ga paired-atom motif, inspect 4s/4p probability clouds, then use the temperature explorer to cross the near-room-temperature melting point.

Low melting point	Gallium melts near 29.8 °C, so modest warming can turn the metal liquid; the phase slider makes this boundary explicit.
GaAs & GaN	Gallium arsenide and gallium nitride are important compound semiconductors used in optoelectronics, radio-frequency devices and power/lighting technologies.
By-product supply	Commercial gallium is recovered mainly as a by-product of processing other ores, especially bauxite-related and zinc-related streams.
Thermometers & specialty alloys	Gallium-containing liquid-metal alloys can replace mercury in selected temperature and heat-transfer applications.
Evidence matters	A low melting point does not mean gallium is harmless or that every gallium compound behaves like the elemental metal.

From by-product recovery to gallium materials: high-level supply path

1. Gallium is widely dispersed and is commonly recovered from process streams associated with other mined materials rather than from dedicated gallium ore bodies.
2. Refining concentrates gallium into high-purity metal or chemical feedstocks.
3. Semiconductor manufacture converts high-purity feedstocks into compounds such as GaAs or GaN under tightly controlled industrial processes; this page does not provide fabrication recipes.
4. Recycling and recovery from manufacturing residues can supplement primary supply.

History checkpoints

1871	Mendeleev predicted an element below aluminium and called it eka-aluminium.
1875	Paul-Émile Lecoq de Boisbaudran detected gallium spectroscopically and isolated the new element.
20th century	Gallium compounds became important semiconductor materials.
Today	Gallium supply is strongly tied to by-product recovery and high-value semiconductor uses.

Gallium: Isotopes, Questions & Evidence

Evidence status and learner self-check

Isotope context

⁶⁹ Ga	Stable natural isotope	Reference teaching nucleus with 31 protons and 38 neutrons.
⁷¹ Ga	Stable natural isotope	The other stable natural gallium isotope.
Gallium isotope context	Two stable natural isotopes	Relative atomic mass reflects their terrestrial abundance mixture.

Common questions

What is gallium used for?

Gallium is especially important in compound semiconductors such as GaAs and GaN, and it is also used in specialty alloys and research.

Is gallium a metal?

Yes. Gallium is a post-transition metal.

What is gallium's melting point?

About 302.9146 K, or 29.8 °C.

How many valence electrons does gallium have?

Three in the simple outer-shell count: 4s²4p¹.

Quick self-check

Q: What is gallium's atomic number? | Answer: 31. Atomic number equals proton count.

Q: Why can gallium melt in a warm hand? | Answer: Its melting point is about 29.8 °C. The melting boundary lies only slightly above typical room temperature.

Q: What is the simple outer configuration? | Answer: 4s²4p¹. Gallium is a Group 13 p-block element.

Evidence & safety

Atomic and ordinary physical values are evaluated references. The α-Ga material viewer is a paired-atom orthorhombic teaching motif rather than a coordinate-accurate crystal. Commodity geography is dated and selective.

Do not infer safety from gallium's low melting point. Elemental gallium and gallium compounds can have different hazards and require context-specific safety information.

Core sources

Royal Society of Chemistry - Gallium

<https://periodic-table.rsc.org/element/31/gallium>

NIST - Atomic Data for Gallium

<https://physics.nist.gov/PhysRefData/Handbook/Tables/galliumtable1.htm>

USGS - Mineral Commodity Summaries 2026

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