

Indium (In) - Student Datasheet

Element 49 · Post-transition metal · source-reviewed learning reference

Indium is element 49, a soft post-transition metal whose low melting point and transparent-conductor compounds connect periodic chemistry to touchscreens, displays and specialty semiconductors.

Quick reference

Atomic number	49
Relative atomic mass	114.818
Electron configuration	[Kr] 4d ¹⁰ 5s ² 5p ¹
Period / group / block	5 / 13 / p
State context	Soft silvery metal
Density	7.31 g/cm ³
Melting / transition	429.75 K
Boiling / gas reference	2300 K
Oxidation states	+3, +1
Electronegativity	1.78

Structure & orbitals

Ordinary indium is tetragonal. The viewer uses a body-centred tetragonal teaching cell to show anisotropic cell proportions without claiming a crystallographic coordinate reconstruction.

5s and 5p clouds are isolated-atom probability models. They do not depict electron bands in indium metal or indium-containing semiconductors.

Phase behavior

At approximately standard pressure, indium is solid below 429.75 K, liquid to about 2300 K, and gaseous above the boiling reference.

Five things to remember

- Atomic number 49 means 49 protons.
- Neutral indium has [Kr] 4d¹⁰ 5s² 5p¹.
- Indium is a soft post-transition metal with a 429.75 K melting point.
- ITO is a compound material, not elemental indium.
- Natural indium is mostly very long-lived radioactive ¹¹⁵In, alongside stable ¹¹³In.

Indium: Real World & Signature Science

Element-specific science, uses and history

Big idea

Indium metal is not the same material as indium tin oxide (ITO). The element provides the In atoms, while ITO is a distinct oxide material whose electrical and optical behavior comes from a compound solid.

Why this element is scientifically distinctive

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

Transparent conductors	Indium tin oxide is widely used where electrical conductivity and optical transparency are both needed.
Low-melting materials	Indium participates in low-melting alloys and specialty joining materials.
Semiconductors	Indium compounds such as InP and InGaN are important in optoelectronics and high-speed electronics.
By-product supply	Indium is usually recovered as a by-product, especially from zinc-processing streams.
Isotope nuance	¹¹⁵ In is naturally abundant but radioactive with an extraordinarily long half-life.

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

1. Indium is commonly recovered from residues and process streams generated while producing other metals, especially zinc.
2. Refining produces high-purity indium metal or chemical feedstocks.
3. Manufacturing converts those feedstocks into distinct compounds and coatings such as ITO or indium phosphide.
4. Recovery from manufacturing scrap and end-of-life products can supplement primary supply.

History checkpoints

1863	Ferdinand Reich and Hieronymous Richter identified indium spectroscopically by its indigo-blue line.
1864	Richter isolated metallic indium.
20th century	Indium compounds and transparent conductive oxides became technologically important.
Today	Electronics demand is closely tied to by-product recovery and recycling.

Indium: Isotopes, Questions & Evidence

Evidence status and learner self-check

Isotope context

¹¹³ In	Stable natural isotope	Minor natural isotope.
¹¹⁵ In	Very long-lived radioactive natural isotope	Dominant natural isotope; its decay is so slow that ordinary samples are effectively persistent on human timescales.
Natural indium	Two-isotope mixture	Relative atomic mass reflects the terrestrial isotope mixture.

Common questions

What is indium?

Indium is chemical element 49, a soft post-transition metal in Group 13.

Is indium a metal?

Yes. It is generally classified as a post-transition metal.

What is the symbol for indium?

In.

What is indium used for?

A major use is in indium-containing transparent conductive oxides; indium compounds are also used in semiconductors and specialty alloys.

Quick self-check

Q: What is indium's atomic number? | Answer: 49. Atomic number equals proton count.

Q: What is its simple outer pattern? | Answer: 5s²5p¹. Indium is a Group 13 p-block element.

Q: Which material is distinct from indium metal? | Answer: Indium tin oxide (ITO). ITO is an oxide material containing indium.

Evidence & safety

Atomic and phase values are evaluated references. The tetragonal viewer is a topology-level teaching cell. Supply geography is selective and by-product-focused rather than a map of native indium deposits.

Elemental indium and indium compounds do not share identical hazards. Workplace exposure questions require substance-specific safety information.

Core sources

Royal Society of Chemistry - Indium

<https://periodic-table.rsc.org/element/49/indium>

NIST - Atomic Data / Indium

<https://physics.nist.gov/PhysRefData/Handbook/Tables/indiumtable1.htm>

USGS - Mineral Commodity Summaries 2026

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