

Scandium (Sc) - Student Datasheet

Element 21 · Transition metal · source-reviewed learning reference

Scandium is element 21, a light Group 3 transition metal whose $3d^1 4s^2$ atom, stable ^{45}Sc isotope and high-temperature HCP-to-BCC transition connect periodic trends to aluminium-scandium alloys and specialty lighting.

Quick reference

Atomic number	21
Relative atomic mass	44.956
Electron configuration	[Ar] $3d^1 4s^2$
Period / group / block	4 / 3 / d
State context	Silvery transition metal
Density	2.99 g/cm ³
Melting / transition	1814 K
Boiling / gas reference	3109 K
Oxidation states	+3
Electronegativity	1.36

Structure & orbitals

Scandium is HCP near room temperature and transforms to BCC at high temperature before melting. The viewer shows the ordinary HCP teaching cell; the phase track carries the high-temperature transition.

The $3d_{z^2}$, $4s$ visuals are isolated-atom probability teaching models. They do not depict electron bands, bonding orbitals or the crystal electronic structure of Scandium materials.

Phase behavior

At approximately standard pressure, scandium is HCP solid near room temperature, changes to a BCC solid near 1609 K, melts at 1814 K, and boils near 3109 K.

Five things to remember

- Atomic number 21 means 21 protons.
- Neutral Scandium has [Ar] $3d^1 4s^2$.
- Its representative teaching isotope is ^{45}Sc .
- Scandium is a metal, but its practical story is mostly about small additions and compounds rather than bulk scandium objects.
- The ordinary material reference is hexagonal close-packed at room temperature.

Scandium: Real World & Signature Science

Element-specific science, uses and history

Big idea

Scandium is a metal, but its practical story is mostly about small additions and compounds rather than bulk scandium objects. Its dominant +3 chemistry follows loss of the 4s and 3d valence electrons.

Why this element is scientifically distinctive

Explore Sc 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.

Alloys	Small scandium additions can strengthen selected aluminium alloys and influence grain structure.
Lighting	Scandium iodide has been used in metal-halide lamps; that use belongs to a compound, not bare Sc metal.
Research	Scandium chemistry supports catalyst, materials and spectroscopy research.
Rare-earth context	Scandium is often discussed with rare-earth elements even though it is a d-block Group 3 element.
Stable isotope	Natural scandium is essentially ^{45}Sc , a stable isotope.

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

1. Scandium is recovered from selected scandium-rich ores, tailings or process streams rather than from native scandium metal.
2. Separation/refining produces scandium compounds or high-purity metal feedstock.
3. Small scandium additions or compounds are converted into alloy, lighting or research materials.
4. Recycling opportunities depend on the host material and economics; no extraction recipe is provided.

History checkpoints

1869	Mendeleev predicted an element he called eka-boron from periodic trends.
1879	Lars Fredrik Nilson identified scandium in Scandinavian mineral material.
Late 19th century	Per Teodor Cleve recognized that scandium closely matched Mendeleev's eka-boron prediction.
Today	Scandium is used in small-volume, high-value alloy and specialty-material applications.

Scandium: Isotopes, Questions & Evidence

Evidence status and learner self-check

Isotope context

⁴⁵ Sc	Stable natural isotope	Essentially all natural scandium.
Radioisotopes	Research/medical tracers	Artificial isotopes exist for research contexts.
Natural scandium	Single stable-isotope element	Relative atomic mass is therefore close to the ⁴⁵ Sc isotope mass.

Common questions

What is scandium?

Scandium is chemical element 21, a Group 3 transition metal.

What is scandium used for?

It is used mainly in small additions to selected aluminium alloys and in specialized scandium compounds.

Is scandium a metal?

Yes. It is a silvery transition metal.

Where is scandium found?

Scandium is dispersed in many minerals and is usually recovered from specialized ores or process streams rather than mined as a native metal.

Quick self-check

Q: What is Scandium's atomic number? | Answer: 21. Atomic number equals proton count.

Q: Which classification best fits Scandium? | Answer: Transition metal. Periodic position and chemistry define the classification.

Q: What is the representative teaching isotope? | Answer: ⁴⁵Sc. An isotope mass number is not the same thing as relative atomic mass.

Evidence & safety

Atomic identity, reference values and ordinary structures are source-reviewed. Material viewers are teaching representations, not crystallographic refinements. Search demand never overrides measured/evaluated evidence or compound-vs-element distinctions.

Elemental scandium and scandium compounds can have different hazards; use substance-specific safety documentation for real materials.

Core sources

Royal Society of Chemistry - Scandium

<https://periodic-table.rsc.org/element/21/scandium>

NIST - Atomic Weights and Isotopic Compositions

https://physics.nist.gov/cgi-bin/Compositions/stand_alone.pl

USGS - Mineral Commodity Summaries 2026

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