

Yttrium (Y) - Student Datasheet

Element 39 · Transition metal / rare-earth element · source-reviewed learning reference

Yttrium is element 39, a Group 3 metal commonly grouped with the rare earths. Its stable ^{89}Y nucleus and Y^{3+} chemistry connect the periodic table to YAG lasers, phosphors, advanced ceramics and superconducting materials.

Quick reference

Atomic number	39
Relative atomic mass	88.906
Electron configuration	$[\text{Kr}] 4d^1 5s^2$
Period / group / block	5 / 3 / d
State context	Soft silvery metal
Density	4.47 g/cm^3
Melting / transition	1795 K
Boiling / gas reference	3618 K
Oxidation states	+3
Electronegativity	1.22

Structure & orbitals

Ordinary yttrium metal is HCP. The material viewer is a conventional HCP teaching cell and does not represent YAG, YBCO or yttrium oxide crystal structures.

The 4d_z2, 5s visuals are isolated-atom probability teaching models. They do not depict electron bands, bonding orbitals or the crystal electronic structure of Yttrium materials.

Phase behavior

At approximately standard pressure, yttrium is a solid metal below 1795 K, liquid to about 3618 K, and gaseous above the boiling reference.

Five things to remember

- Atomic number 39 means 39 protons.
- Neutral Yttrium has $[\text{Kr}] 4d^1 5s^2$.
- Its representative teaching isotope is ^{89}Y .
- Yttrium metal, yttrium compounds and the isotope ^{90}Y are different chemical/nuclear contexts.
- The ordinary material reference is hexagonal close-packed.

Yttrium: Real World & Signature Science

Element-specific science, uses and history

Big idea

Yttrium metal, yttrium compounds and the isotope ^{90}Y are different chemical/nuclear contexts. The page keeps YAG, YBCO and medical isotope uses tied to their actual materials instead of assigning every behavior to elemental Y.

Why this element is scientifically distinctive

Explore Y 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.

YAG	Yttrium aluminium garnet is a distinct crystalline compound used in lasers and optical materials.
Phosphors	Yttrium-containing host materials have long supported red and other phosphor systems.
Superconductors	YBCO is a copper-oxide compound containing yttrium, not elemental yttrium metal.
Alloys & ceramics	Yttrium additions and oxides can improve selected alloys and high-temperature ceramics.
Medical isotope	^{90}Y is a radioactive isotope used in regulated medical contexts, distinct from stable natural ^{89}Y .

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

1. Yttrium enters rare-earth processing through minerals such as xenotime, monazite or bastnäsite.
2. Closely related rare-earth ions are separated using industrial chemical separation trains.
3. Refined yttrium compounds become oxides, garnets, ceramics, phosphors or metal feedstocks.
4. End-use products may be recycled through broader rare-earth/material recovery routes.

History checkpoints

1794	Johan Gadolin identified a new rare-earth oxide from a mineral from Ytterby, Sweden.
Early 1800s	The material and element name became linked to Ytterby.
1828	Friedrich Wöhler obtained an impure form of yttrium metal.
Modern era	Yttrium compounds became important in lasers, phosphors, ceramics and superconductors.

Yttrium: Isotopes, Questions & Evidence

Evidence status and learner self-check

Isotope context

⁸⁹ Y	Stable natural isotope	Essentially all naturally occurring yttrium.
⁹⁰ Y	Radioactive isotope	Used in regulated medical/nuclear applications; not natural bulk yttrium.
Natural yttrium	Single stable-isotope element	Its relative atomic mass is close to ⁸⁹ Y.

Common questions

What is yttrium?

Yttrium is chemical element 39, a Group 3 metal commonly grouped with the rare earths.

Is yttrium a metal?

Yes. It is a soft, silvery metal.

What is yttrium used for?

Yttrium compounds are important in YAG lasers, phosphors, ceramics and some superconducting materials.

Where is yttrium found?

It occurs in rare-earth minerals such as xenotime, monazite and bastnäsite rather than as native metal.

Quick self-check

Q: What is Yttrium's atomic number? | Answer: 39. Atomic number equals proton count.

Q: Which classification best fits Yttrium? | Answer: Transition metal / rare-earth element. Periodic position and chemistry define the classification.

Q: What is the representative teaching isotope? | Answer: ⁸⁹Y. 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.

Yttrium metal, soluble salts and radioactive yttrium isotopes require different safety controls; this page does not provide handling or medical-use instructions.

Core sources

Royal Society of Chemistry - Yttrium

<https://periodic-table.rsc.org/element/39/yttrium>

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>