

Terbium (Tb) - Student Datasheet

Element 65 · Lanthanide · source-reviewed learning reference

Terbium is element 65, a lanthanide whose Tb³⁺ emission and strong magnetic response connect the periodic table to green phosphors, solid-state devices and magnetostrictive materials.

Quick reference

Atomic number	65
Relative atomic mass	158.925
Electron configuration	[Xe] 4f ⁹ 6s ²
Period / group / block	6 / Lanthanide / f
State context	Soft silvery lanthanide metal
Density	8.23 g/cm ³
Melting / transition	1632 K
Boiling / gas reference	3503 K
Oxidation states	+3, +4
Electronegativity	1.20

Structure & orbitals

Ordinary terbium metal is HCP. The viewer is a conventional teaching cell; terbium phosphors and magnetostrictive alloys have their own host/intermetallic structures.

The displayed 4f_xyz orbital is one representative real f cubic harmonic. It is not a picture of the whole 4f subshell or the electronic bands in the bulk material.

Phase behavior

At approximately standard pressure, terbium is treated as a solid below 1632 K, liquid between melting and approximately 3503 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 65 means every terbium nucleus has 65 protons.
- Neutral Terbium has the ground-state configuration [Xe] 4f⁹ 6s².
- The representative teaching isotope is ¹⁵⁹Tb.
- The familiar green light associated with terbium comes from Tb³⁺ ions in host materials, not from metallic terbium glowing green.
- The ordinary material reference is Hexagonal close-packed (HCP).

Terbium: Real World & Signature Science

Element-specific science, uses and history

Big idea

The familiar green light associated with terbium comes from Tb³⁺ ions in host materials, not from metallic terbium glowing green. Terbium metal, phosphors and Tb-Dy-Fe magnetostrictive alloys must be kept separate.

Why this element is scientifically distinctive

Explore Tb 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.

Green phosphors	Tb ³⁺ ions provide strong green emission in selected phosphor hosts used in lighting and displays.
Magnetostriction	Tb-Dy-Fe intermetallic alloys can change dimensions in a magnetic field and are used in transducers/actuators.
Solid-state devices	Terbium is used as a dopant in selected crystals and functional materials.
Laser materials	Tb salts and doped hosts appear in specialized optical and laser systems.
Compound boundary	The color and magnetostrictive behavior belong to specific ions and host/alloy phases, not to pure Tb metal alone.

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

1. Terbium 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

1843	Carl Gustaf Mosander separated terbium-containing oxide while studying yttria-derived rare-earth mixtures.
19th century	Early erbium/terbium names and fractions were historically confused as rare-earth chemistry developed.
20th century	Phosphor and magnetic applications grew with high-purity rare-earth separation.
Today	Tb is a high-value specialty element in phosphors and magnetostrictive materials.

Use contexts

- ['Green phosphors', 'Tb³⁺ is an important green-emitting activator in selected phosphor hosts.']
- ['Magnetostrictive alloys', 'Terbium contributes to large magnetostriction in Tb-Dy-Fe materials.']
- ['Optical materials', 'Tb-doped crystals and salts are used in specialized optical systems.']
- ['X-ray/lighting phosphors', 'Terbium-containing phosphors have roles in efficient luminescent materials.']

Terbium: Isotopes, Questions & Evidence

Evidence status and learner self-check

Isotope context

¹⁵⁹ Tb	Natural isotope	Essentially all natural terbium is ¹⁵⁹ Tb.
Radioisotopes	Artificial isotopes	Used primarily in research and isotope-specific applications.
Natural terbium	Single-isotope natural element	Relative atomic mass is therefore close to the ¹⁵⁹ Tb isotope mass.

Common questions

What is terbium?

Terbium is chemical element 65, symbol Tb, a soft silvery lanthanide metal.

What is terbium used for?

It is used in green phosphors, magnetostrictive alloys, solid-state devices and specialized optical materials.

Where is terbium found?

It occurs in rare-earth minerals such as monazite, bastnäsite and euxenite and is separated from other lanthanides.

What is the chemical symbol for terbium?

Tb. Its atomic number is 65.

Who discovered terbium?

Carl Gustaf Mosander identified terbium in 1843 during rare-earth separation work.

Is terbium a metal?

Yes. It is a lanthanide metal.

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 - Terbium - <https://periodic-table.rsc.org/element/65/terbium>

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/>