

Tungsten (W) - Student Datasheet

Element 74 · Transition metal · source-reviewed learning reference

Tungsten is element 74, a very dense BCC transition metal with the highest melting point of any metal. Its symbol W comes from the historical name wolfram, and its material story must distinguish tungsten metal from tungsten carbide.

Quick reference

Atomic number	74
Relative atomic mass	183.84
Electron configuration	[Xe] 4f ¹⁴ 5d ⁴ 6s ²
Period / group / block	6 / 6 / d
Ordinary state	Dense silvery-white solid at 20 °C
Density	19.3 g/cm ³
Melting point	3687 K
Boiling point	5828 K
Oxidation states	+6, +4
Electronegativity	2.36

Structure & orbitals

Tungsten is BCC under ordinary conditions. The conventional-cell viewer represents metallic W; tungsten carbide (WC) is a different compound and structure.

The 5d distributions are representative atomic probability models. They do not directly calculate the BCC metal's electronic band structure or WC bonding.

Phase behavior

At approximately standard pressure, tungsten remains BCC solid to about 3687 K, then liquid to about 5828 K before becoming gaseous—an exceptionally high-temperature phase range for a metal.

Five things to remember

- Atomic number 74 means 74 protons.
- Neutral tungsten has [Xe] 4f¹⁴ 5d⁴ 6s².
- Tungsten has the highest melting point of the metals: about 3687 K.
- The symbol W comes from “wolfram.”
- Tungsten carbide is WC, a compound; it is not the same structure or substance as elemental tungsten metal.

Tungsten: Real World & Signature Science

Big idea

“Hard tungsten” is often shorthand for tungsten carbide tools, but WC is a compound. Elemental W is exceptionally refractory and dense; carbide hardness comes from a different bonded structure.

Why this element is scientifically distinctive

Inspect 5d and 6s probability models, rotate a BCC tungsten cell, follow the unusually high melting/boiling range, then compare W metal with WC, ores such as wolframite/scheelite, and selected current production geography.

Refractory metal	Tungsten retains strength to high temperature and has the highest melting point among metals.
Tungsten carbide	WC and cemented carbides are hard engineering materials; they are compounds/composites, not pure W metal.
High-density applications	Tungsten's $\sim 19.3 \text{ g/cm}^3$ density is useful where compact high mass is required.
Electrical & thermal uses	Tungsten's high-temperature stability supported lamp filaments and remains valuable in electrodes and high-heat components.
Ore & supply	Scheelite and wolframite are major ore minerals; current mine supply is geographically concentrated.

From scheelite/wolframite to tungsten products: a high-level path

1. Tungsten occurs mainly in minerals such as scheelite and wolframite rather than as native metal.
2. Mining/beneficiation produce tungsten concentrates; deposit geology and production geography are distinct layers.
3. Industrial conversion produces tungsten chemicals/powders and metal under controlled high-temperature processes; no processing recipe is provided here.
4. Metal powder, alloys and carbides become high-temperature, cutting, wear and dense-engineering products; tungsten-bearing scrap can be recycled.

History checkpoints

1781	Carl Wilhelm Scheele identified a new acid from scheelite, pointing toward a new element.
1783	Juan José and Fausto Elhuyar isolated tungsten from wolframite.
20th century	Tungsten became central to lamp filaments, hardmetals, high-temperature alloys and specialized electrodes.
Today	China dominates mine production, while recycling and diversified supply remain strategically important.

Tungsten: Isotopes, Questions & Evidence

Isotope context

¹⁸⁴W	Stable natural isotope	Reference teaching nucleus with 74 protons and 110 neutrons.
¹⁸²W	Stable natural isotope	Important in isotope geochemistry and early Solar System chronology.
¹⁸⁶W	Stable natural isotope	Another abundant stable natural tungsten isotope.

Common questions

What is tungsten's atomic number?

74.

Why is tungsten's symbol W?

W comes from the historical name wolfram, still reflected in mineral names such as wolframite.

What is tungsten used for?

Hardmetals/carbides, high-temperature components, electrodes, dense parts and specialized alloys.

Why is tungsten's melting point so high?

Strong metallic bonding in its heavy transition-metal lattice gives unusually high cohesive energy; a simple one-factor explanation is incomplete.

Quick self-check

Q: What is tungsten's atomic number? | Answer: 74. Atomic number equals proton count.

Q: What does W stand for historically? | Answer: Wolfram. The symbol reflects the historical name wolfram.

Q: Which statement is correct? | Answer: WC is a tungsten-carbon compound. Tungsten carbide is chemically distinct from elemental W.

Evidence & safety

Atomic/phase values are evaluated. The BCC viewer represents pure metal only. 2025 commodity geography is dated to USGS MCS 2026 and shown as selected context, not a permanent ranking.

This page distinguishes tungsten metal, tungsten compounds and carbide/composite materials; their exposure profiles are not interchangeable. It gives no industrial processing instructions.

Core sources

Royal Society of Chemistry - Tungsten

<https://periodic-table.rsc.org/element/74/tungsten>

NIST - Atomic Data for Tungsten

<https://physics.nist.gov/PhysRefData/Handbook/Tables/tungstentable1.htm>

USGS - Mineral Commodity Summaries 2026

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