

Tantalum (Ta) - Student Datasheet

Element 73 · Transition metal · source-reviewed learning reference

Tantalum is element 73, a dense refractory Group 5 metal whose BCC lattice, exceptional corrosion resistance and stable oxide connect the periodic table to compact capacitors, superalloys and specialized medical/material uses.

Quick reference

Atomic number	73
Relative atomic mass	180.948
Electron configuration	[Xe] 4f ¹⁴ 5d ³ 6s ²
Period / group / block	6 / 5 / d
State context	Dense blue-gray corrosion-resistant metal
Density	16.4 g/cm ³
Melting / transition	3290 K
Boiling / gas reference	5728 K
Oxidation states	+5
Electronegativity	1.5

Structure & orbitals

Ordinary tantalum is BCC. The material viewer is a conventional BCC teaching cell; capacitor oxides and tantalum compounds have their own structures.

The 5d_{z2}, 5d_{xy}, 6s visuals are isolated-atom probability teaching models. They do not depict electron bands, bonding orbitals or the crystal electronic structure of Tantalum materials.

Phase behavior

At approximately standard pressure, tantalum remains a BCC solid to its very high 3290 K melting point, is liquid to about 5728 K, then gaseous.

Five things to remember

- Atomic number 73 means 73 protons.
- Neutral Tantalum has [Xe] 4f¹⁴ 5d³ 6s².
- Its representative teaching isotope is ¹⁸¹Ta.
- “Tantalum capacitor” does not mean a capacitor is simply a chunk of elemental Ta.
- The ordinary material reference is body-centred cubic.

Tantalum: Real World & Signature Science

Element-specific science, uses and history

Big idea

“Tantalum capacitor” does not mean a capacitor is simply a chunk of elemental Ta. Its function depends on engineered tantalum metal and a very thin tantalum-oxide dielectric. Likewise, coltan is an ore/mineral concentrate term, not another name for tantalum.

Why this element is scientifically distinctive

Explore Ta 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.

Capacitors	Tantalum metal and its stable oxide enable high-capacitance components in compact electronics.
Corrosion resistance	Tantalum resists many chemical environments and is used in specialized process equipment.
Superalloys	Ta additions support high-temperature turbine and aerospace materials.
Medical materials	Biocompatible tantalum is used in selected implants and porous structures.
Ore distinction	Coltan commonly refers to columbite-tantalite mineral concentrates containing Nb and Ta; it is not pure tantalum.

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

1. Tantalum-bearing mineral concentrates commonly contain niobium as well and require industrial separation.
2. Refining produces tantalum compounds/powder/metal under controlled industrial conditions.
3. Engineered tantalum metal and oxide structures become capacitors, corrosion-resistant equipment or alloy additions.
4. Recycling from manufacturing scrap and electronics can supplement primary supply; no processing recipe is provided.

History checkpoints

1802	Anders Gustaf Ekeberg identified tantalum in mineral samples.
Early 1800s	Tantalum and niobium were repeatedly confused because of their similar chemistry and shared minerals.
1840s	Heinrich Rose clarified the distinction between niobium and tantalum chemistry.
20th century	High-purity tantalum and its oxide became important in electronics and corrosion-resistant engineering.

Tantalum: Isotopes, Questions & Evidence

Evidence status and learner self-check

Isotope context

^{181}Ta	Stable natural isotope	Overwhelmingly dominant natural tantalum isotope.
$^{180\text{m}}\text{Ta}$	Extremely rare long-lived metastable isotope	A remarkable naturally occurring nuclear isomer.
Natural tantalum	Two-nuclide mixture	Relative atomic mass is dominated by ^{181}Ta .

Common questions

What is tantalum?

Tantalum is chemical element 73, a dense refractory Group 5 transition metal.

What is tantalum used for?

Important uses include capacitors, corrosion-resistant equipment, superalloys and selected medical implants.

Is tantalum a metal?

Yes. It is a dense, corrosion-resistant transition metal.

Where is tantalum found?

It occurs in tantalum-bearing minerals, often together with niobium in columbite-tantalite ores.

Quick self-check

Q: What is Tantalum's atomic number? | Answer: 73. Atomic number equals proton count.

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

Q: What is the representative teaching isotope? | Answer: ^{181}Ta . 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.

Tantalum metal and tantalum compounds/fine powders have different hazards. This page gives no powder-processing or capacitor-manufacturing procedure.

Core sources

Royal Society of Chemistry - Tantalum

<https://periodic-table.rsc.org/element/73/tantalum>

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>