

Tennessine (Ts) - Student Datasheet

Atomic number 117 - Superheavy synthetic Group 17 element - Group 17 - Period 7 - p-block

Tennessine is element 117, a synthetic superheavy Group 17 element known only from atom-at-a-time nuclear experiments. Its identity and decay are experimental; most ordinary bulk physical properties remain unmeasured and theoretical chemistry must include strong relativistic effects.

Quick reference

Property	Value
Atomic number	117
Reference mass number	[294]
Predicted electron configuration	[Rn] 5f ¹⁴ 6d ¹⁰ 7s ² 7p ⁵
Group / period	17 / 7
Melting point	Unknown
Boiling point	Unknown
Density	Unknown
Bulk crystal structure	Unknown

Structure & orbitals

Reference isotope: ²⁹⁴Ts - 117 protons + 177 neutrons. Electron configuration: [Rn] 5f¹⁴ 6d¹⁰ 7s² 7p⁵.

Qualitative 7s and 7p atomic-orbital teaching views only. The nonrelativistic shapes help explain orbital labels and nodes, but for element 117 strong relativistic and spin-orbit effects make them incomplete descriptions of the real superheavy atom.

Phase / temperature context

Element Lookup shows a temperature context track for tennessine but no fake melting or boiling markers. No macroscopic sample exists, so ordinary bulk phase boundaries are not experimentally established.

Five things to remember

1. Atomic number 117 is experimentally established.
2. Tennessine is synthetic; only tiny numbers of atoms have been produced.
3. The name honors Tennessee and the institutions in that region involved in the discovery collaboration.
4. Melting point, boiling point and bulk density are not experimentally measured.
5. Group 17 placement is meaningful, but predicted chemistry is strongly shaped by relativistic effects.

Real-world context

Synthesis

Tennessine is created in heavy-ion fusion experiments; there is no natural-resource industry.

Decay chains

Identification depends on correlated radioactive decay chains and nuclear data.

Relativistic theory

Predictions of chemistry require relativistic many-electron calculations.

International collaboration

JINR, ORNL, LLNL and Vanderbilt were among institutions associated with the discovery collaboration.

Naming

IUPAC approved the name tennessine and symbol Ts in 2016.

Where on Earth? / geography modes

Discovery collaboration - International

The discovery claim involved the Joint Institute for Nuclear Research with collaborators including Oak Ridge National Laboratory, Lawrence Livermore National Laboratory and Vanderbilt University.

Examples/context: Dubna, Russia; Tennessee, USA; California, USA

Target-material contribution - Berkelium

Oak Ridge produced and supplied berkelium target material used in the element-117 experiment.

Examples/context: Oak Ridge, Tennessee; Dubna experiment; International logistics

Naming geography - Tennessee

The name tennessine honors the region and its scientific institutions; it is a naming connection, not natural occurrence.

Examples/context: Tennessee; ORNL; Vanderbilt

Isotopes

Isotope	Status / timescale	Why it matters
^{294}Ts	~tens of ms	short-lived superheavy isotope identified through decay chains
^{293}Ts	~tens of ms	short-lived isotope reported in element-117 experiments

Evidence note

Identity, naming and decay-chain evidence are experimental. Bulk state, density, melting, boiling and ordinary chemistry are unknown or theoretical and must remain visibly labeled as such.

Review questions

What is tennessine's atomic number?

Answer: 117. Atomic number 117 is experimentally established.

Which periodic-table group contains tennessine?

Answer: Group 17. Tennessine is placed in Group 17, below astatine.

Do we have an experimentally measured bulk melting point for tennessine?

Answer: No. No macroscopic sample exists, so Element Lookup must not invent a measured bulk melting point.

What does the name tennessine honor?

Answer: Tennessee and its scientific institutions. IUPAC approved the name in recognition of contributions associated with Tennessee.

How was the identity of element 117 established?

Answer: Through production and correlated radioactive decay chains. Superheavy-element identification relies on nuclear-production experiments and decay-chain evidence.

Reviewed sources

- IUPAC — official names of elements 113, 115, 117 and 118:

<https://iupac.org/iupac-announces-the-names-of-the-elements-113-115-117-and-118/>

- Royal Society of Chemistry — Tennessine: <https://periodic-table.rsc.org/element/117/tennessine>

- Oak Ridge National Laboratory — International team discovers element 117:

<https://www.ornl.gov/news/international-team-discovers-element-117>

- IAEA / AMDC via PubChem — tennessine nuclide data: <https://pubchem.ncbi.nlm.nih.gov/element/117>

ElementLookup.com - educational reference sheet. Interactive visualizations on the website include additional model/evidence notes.