

Astatine (At) - Student Datasheet

Element 85 · Radioactive halogen · evidence-limited bulk element · source-reviewed learning reference

Astatine is element 85, an extremely rare radioactive halogen. Its nuclear identity and selected atom-scale chemistry are experimental, but macroscopic density, crystal structure and ordinary bulk appearance are not measured facts.

Quick reference

Atomic number	85
Relative atomic mass	[210]
Electron configuration	[Xe] 4f ¹⁴ 5d ¹⁰ 6s ² 6p ⁵
Period / group / block	6 / 17 / p
State context	Expected condensed element near room temperature; no macroscopic sample has been measured
Density	Unknown
Melting / transition	Estimated ≈ 573 K
Boiling / gas reference	Estimated ≈ 623 K
Oxidation states	-1, +1, +3, +5, +7 reported/predicted in sparse chemistry
Electronegativity	≈ 2.2 (estimate)

Structure & orbitals

Only extremely small quantities of astatine have been produced or occur transiently. No measured bulk crystal lattice is rendered; the Structure panel is an evidence panel rather than an invented halogen lattice.

The 6s/6p clouds are nonrelativistic teaching shapes tied to the reference configuration. Superheavy/very-heavy atomic chemistry requires relativistic treatment beyond this visual.

Phase behavior

No measured macroscopic astatine phase diagram exists. The teaching slider may show literature estimates near 573 K and 623 K, but every boundary is explicitly predicted/estimated rather than measured.

Five things to remember

- Atomic number 85 means 85 protons.
- Astatine has no stable isotopes and exists only in tiny transient quantities.
- ²¹¹At is an important research isotope in targeted-alpha therapy studies.
- Bulk density and crystal structure are not measured.
- Estimated melting/boiling values must remain labeled estimates rather than measurements.

Astatine: Real World & Signature Science

Element-specific science, uses and history

Big idea

Astatine is where an Evidence Lens matters more than a glossy periodic-table square. Search queries asking what it “looks like” should be answered with the limitation: no macroscopic sample has established a bulk appearance.

Why this element is scientifically distinctive

Rotate a ^{211}At teaching nucleus and 6s/6p probability models, then use the Evidence Lens to separate measured decay/chemistry from estimated phase boundaries and unknown bulk structure.

Natural trace occurrence	Astatine appears only fleetingly in natural radioactive decay chains; there is no mineable astatine resource.
Discovery	Astatine was first produced in 1940 at Berkeley by Dale Corson, Kenneth MacKenzie and Emilio Segrè.
^{211}At research	Astatine-211 is studied for targeted-alpha radionuclide therapy because of its nuclear decay properties.
Sparse chemistry	Experiments with extremely small atom counts probe halogen-like and more metallic tendencies; evidence is limited.
Unknown bulk material	No legitimate bulk appearance, density or crystal lattice can be inferred from a macroscopic sample that does not exist.

How astatine knowledge is built: trace atoms, decay and chemistry

1. Natural astatine exists only transiently in radioactive decay chains and never accumulates as a resource.
2. Research produces tiny amounts for nuclear/chemical study; this guide gives no production settings or separation procedures.
3. Decay measurements establish isotope identity and half-life information.
4. Chemical experiments and theory constrain behavior, while unmeasured bulk properties remain explicitly unknown.

History checkpoints

1940	Corson, MacKenzie and Segrè produced astatine at the University of California, Berkeley.
Mid-20th century	Tracer-scale chemistry established several halogen-like behaviors.
Modern research	^{211}At is studied in targeted-alpha radionuclide therapy research.
Evidence boundary	Because quantities are minute and short-lived, many bulk properties remain estimated or unknown.

Astatine: Isotopes, Questions & Evidence

Evidence status and learner self-check

Isotope context

²¹¹ At	Radioactive isotope · research-important	Reference teaching nucleus with 85 protons and 126 neutrons.
²¹⁰ At	Radioactive isotope	One of several short-lived astatine isotopes.
Astatine isotope context	No stable isotopes	All known astatine isotopes are radioactive.

Common questions

What is astatine?

Astatine is element 85, a rare radioactive member of Group 17.

Is astatine a metalloid?

Simple metal/nonmetal labels are evidence-limited here; it is placed in the halogen group but heavy-atom effects make its chemistry unusual.

What is astatine used for?

Fundamental research and ²¹¹At targeted-alpha therapy research; there is no bulk commercial use.

What does astatine look like?

No experimentally established macroscopic appearance exists because macroscopic samples have not been measured.

Quick self-check

Q: What is astatine's atomic number? | Answer: 85. Atomic number equals proton count.

Q: What is its measured macroscopic density? | Answer: Unknown. No macroscopic density measurement is established.

Q: How should the ~573 K melting value be labelled? | Answer: Estimated / predicted. The evidence status is part of the answer.

Evidence & safety

Atomic number, isotope identity and decay are experimental/evaluated. Selected tracer chemistry is experimental. Density and crystal structure are unknown; displayed phase temperatures are estimates and are labelled predicted.

Astatine is radioactive and exists only in specialized research contexts. This page provides no synthesis, separation, dose, access or handling instructions.

Core sources

Royal Society of Chemistry - Astatine

<https://periodic-table.rsc.org/element/85/astatine>

NIST - Atomic Data for Astatine

<https://physics.nist.gov/PhysRefData/Handbook/Tables/astatinetable1.htm>