

Tin (Sn) - Student Datasheet

Atomic number 50 - Post-transition metal - Group 14 - Period 5 - p-block

Tin is element 50, a soft Group 14 metal best known for corrosion-resistant coatings, bronze and solder. Its most memorable structural lesson is allotropy: ordinary metallic white tin can transform to nonmetallic grey tin at low temperature.

Quick reference

Atomic number	50
Relative atomic mass	118.710
Electron configuration	[Kr] 4d ¹⁰ 5s ² 5p ²
Common oxidation state(s)	+2 and +4
Density	7.287 g/cm ³
Melting point	505.078 K
Boiling point	2859 K
Structure near room temperature	β-Sn · tetragonal

Structure & orbitals

Reference isotope: ¹²⁰Sn - 50 protons + 70 neutrons. Ground-state/reference electron configuration: [Kr] 4d¹⁰ 5s² 5p².

The occupied 5s model is spherically symmetric and has four radial nodes in a hydrogen-like teaching approximation. The occupied 5p model has the p-orbital angular shape and three radial nodes; x/y/z controls change orientation, not the underlying p shape. These are isolated-atom probability models, not metallic electron paths.

Material / molecular structure: White β-tin is tetragonal near room temperature (I4₁/amd); below about 286.35 K pure tin can transform slowly to grey α-tin

Phase / temperature context

On this approximate standard-pressure teaching path for pure tin, grey α-tin is favored below about 286.35 K, metallic β-tin above that transition until melting at 505.078 K, liquid tin extends to about 2859 K, and gas lies above. The α↔β conversion can be kinetically slow and impurity-sensitive.

Five things to remember

1. Atomic number 50 means every tin nucleus contains 50 protons.
2. Neutral tin has the ground-state configuration [Kr] 4d¹⁰ 5s² 5p².
3. White β-tin is the ordinary metallic form near room temperature; pure tin can transform to grey α-tin below about 13.2 °C.
4. Tin's common oxidation states are +2 and +4.
5. Cassiterite (SnO₂) is the principal tin ore; commodity production and recycling are separate from elemental occurrence.

Real-world context

Tinplate

A thin tin coating protects steel cans and other products from corrosion while keeping the strength of the steel substrate.

Bronze & solder

Tin is a key alloying element in bronze and in many solder systems used to join metals and electronics.

Float glass

Molten glass can be floated on molten tin to produce flat sheet glass with smooth surfaces.

Cassiterite

Tin is obtained mainly from cassiterite, SnO_2 ; ore geology and mine-production rankings are commodity questions that change with time.

Tin pest

Below about 13.2 °C, pure white β -tin can slowly convert to brittle grey α -tin. Impurities and kinetics strongly affect the transformation.

Where on Earth? / geography modes

Tin supply - 2026 commodity context

Cassiterite mining and refined-tin supply are concentrated geographically, but production rankings are dated commodity data

Examples/context: Cassiterite; Mining; Smelting; Refining

Tin geology - Cassiterite systems

Tin resources occur in hard-rock and placer systems associated with granitic geology and weathering

Examples/context: Granites; Veins; Placers; Cassiterite

Tin material cycle - Secondary supply

Tin returns through metal scrap, solder/electronics streams and coated products

Examples/context: Products; Collection; Recovery; Reuse

Isotopes

Isotope	Status / timescale	Why it matters
^{120}Sn	Stable · $\approx 32.6\%$ natural abundance	The most abundant natural tin isotope; 50 protons and 70 neutrons.
^{118}Sn	Stable · $\approx 24.2\%$	The second most abundant natural isotope.
Tin isotope family	Ten naturally occurring stable/very-long-lived isotopes	Tin has an unusually rich natural isotope pattern; abundance values are evaluated reference data.

Evidence note

Atomic, isotope and ordinary physical values are measured/evaluated reference data. The β -Sn viewer is a schematic conventional-cell teaching model based on the reviewed tetragonal structure, not a full crystallographic coordinate reconstruction. Commodity geography is dated and is not treated as elemental occurrence.

Review questions

What is tin's atomic number?

Answer: 50. Tin is element 50.

What is the ordinary metallic allotrope near room temperature?

Answer: β -tin (white tin). White β -tin is the metallic form near room temperature.

What is tin's symbol?

Answer: Sn. Sn comes from stannum.

What mineral is the principal tin ore?

Answer: Cassiterite (SnO_2). Cassiterite is the principal ore mineral for tin.

What can happen to pure tin below about 13.2 °C?

Answer: β -tin can slowly transform to grey α -tin. The structural transformation is the basis of 'tin pest'; kinetics and impurities matter.

Frequently asked questions

Is tin an element?

Yes. Tin is chemical element 50 with symbol Sn.

What is tin used for?

Major uses include tinplate coatings, solder, bronze and other alloys, and the float-glass process.

What is tin's electron configuration?

The neutral ground-state reference is $[\text{Kr}] 4d^{10} 5s^2 5p^2$.

Does tin rust?

Tin is relatively corrosion resistant and does not form iron-style rust. It can oxidize, but that is different from the red-brown iron oxides called rust.

Why is tin's symbol Sn?

Sn comes from the Latin name stannum.

What is tin pest?

It is the low-temperature transformation of metallic β -tin to grey α -tin in sufficiently pure tin; the rate depends strongly on temperature, purity and nucleation.

Sources used for this guide

- Royal Society of Chemistry - Tin

<https://periodic-table.rsc.org/element/50/tin>

- NIST - Atomic Data for Tin

<https://physics.nist.gov/PhysRefData/Handbook/Tables/tintable1.htm>

- USGS - Mineral Commodity Summaries 2026

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

- WebElements - Tin crystal structure

https://www.webelements.com/tin/crystal_structure.html

This datasheet is a learning aid. Interactive 3D models are teaching models; uncertainty and predicted values must remain labelled. Search-demand data may guide explanation, but scientific values come from cited scientific sources.