

Zinc (Zn) - Student Datasheet

Atomic number 30 - Group 12 metal - Group 12 - Period 4 - d-block

Zinc is element 30, a Group 12 metal with a filled 3d subshell and a dominant Zn²⁺ chemistry. Its signature materials story is galvanizing: a zinc coating can protect steel not only as a barrier but also electrochemically.

Quick reference

Atomic number	30
Relative atomic mass	65.38
Electron configuration	[Ar] 3d ¹⁰ 4s ²
State at 20 C	Bluish-silver solid metal at 20 deg C
Density	7.134 g/cm ³
Melting point	692.677 K
Boiling point	1180 K
Common oxidation state	+2 dominant
Electronegativity	1.65

Structure & orbitals

Zinc has a hexagonal structure near room temperature, often described in the HCP family with a comparatively large c/a ratio. The viewer is a close-packed teaching cell, not an exact crystallographic coordinate set.

The 4s model is spherical; the 3d z² model is one representative d-orbital angular form. Zinc's 3d subshell is filled. These isolated-atom probability models do not show electrons literally flowing through galvanized steel.

Temperature / phase context

At approximately standard pressure, zinc is solid below about 692.677 K, liquid up to about 1180 K, and gaseous above the boiling reference.

Five things to remember

- Atomic number 30 means every zinc nucleus contains 30 protons.
- Neutral zinc has the ground-state configuration [Ar] 3d¹⁰ 4s².
- Zn²⁺ is the dominant simple ion because the two 4s electrons are removed.
- Zinc metal has a hexagonal structure near room temperature.
- Galvanizing protects steel with a zinc coating; it does not turn the steel into zinc.

Zinc: Real World & Signature Science

Zinc metal, Zn^{2+} in biology and zinc compounds in batteries or coatings are chemically distinct. Galvanized steel is mostly iron or steel covered by zinc.

Why this element matters

Galvanizing Zinc coatings protect steel by providing a physical barrier and by preferential electrochemical oxidation when the coating is damaged.	Brass & alloys Copper-zinc brass combines useful formability, corrosion behavior and appearance.
Batteries Zinc metal and zinc compounds participate in several primary and rechargeable battery chemistries.	Biology Zn^{2+} is an essential biological ion in enzymes and proteins, but biological zinc is not metallic zinc.
Ore & recycling Zinc is commonly produced from sphalerite-rich ores and is also recovered from recycled materials and industrial residues.	

From sphalerite to zinc products: a high-level path

1. Zinc ores are mined and concentrated, commonly by separating sphalerite from surrounding minerals.
2. Industrial processing converts concentrates through hydrometallurgical or pyrometallurgical routes; this guide intentionally omits operating details.
3. Refined zinc is cast or used for galvanizing, alloys, batteries and chemical manufacture.
4. Secondary zinc can be recovered from galvanized scrap, brass, dusts and other zinc-bearing materials.

Where on Earth?

Zinc mine production - 2025 commodity context

Selected major zinc-producing countries are shown as dated commodity examples

Sphalerite systems - Conceptual geology

Zinc is commonly concentrated in sulfide deposits where sphalerite (ZnS) is the principal ore mineral

Zinc material cycle - Galvanizing + recycling

Zinc moves through metal production, galvanizing/alloys, use and recovery from scrap or residues

History

Ancient metallurgy - Zinc compounds and zinc-bearing copper alloys were used long before metallic zinc was understood as a distinct element.

Early modern period - Controlled production of metallic zinc developed in Asia and later Europe.

Industrial era - Galvanizing and brass made zinc a major engineering material.

Today - Zinc is used in corrosion protection, alloys, batteries, chemicals and nutrition, with significant recycling.

Uses

Galvanized steel Zinc coatings protect steel infrastructure, vehicles and products from corrosion.	Brass Zinc is a major alloying element with copper.
Batteries Zinc participates in alkaline, zinc-carbon, zinc-air and other electrochemical systems.	Zinc compounds ZnO and other compounds are used in rubber, ceramics, coatings and specialized products.

Zinc: Isotopes, Questions & Evidence

Isotopes

⁶⁴Zn - Stable - most abundant natural isotope

Teaching nucleus contains 30 protons and 34 neutrons.

⁶⁶Zn - Stable - major natural isotope

One of five naturally occurring stable or very long-lived zinc isotopes.

⁶⁸Zn - Stable - major natural isotope

Another important component of natural zinc.

Zinc isotope family - Multiple stable natural isotopes

Natural zinc has a multi-isotope abundance pattern rather than one dominant isotope alone.

Common questions

What is zinc's atomic number?

Zinc is atomic number 30.

What is zinc's symbol?

Zn.

What is zinc's electron configuration?

[Ar] 3d¹⁰ 4s².

What is zinc used for?

A major use is galvanizing steel; zinc is also used in brass, batteries and many zinc compounds.

Why does zinc usually form Zn²⁺?

The two outer 4s electrons are removed, leaving a filled 3d¹⁰ shell.

How does galvanizing protect steel?

The zinc layer acts as a barrier and can also oxidize preferentially, helping protect exposed steel electrochemically.

Quick self-check

1. What is zinc's atomic number? Answer: 30
2. What is the common zinc ion? Answer: Zn²⁺
3. What is galvanizing? Answer: Coating steel or iron with zinc for corrosion protection
4. What is zinc's ground-state electron configuration? Answer: [Ar] 3d¹⁰ 4s²
5. What is the principal zinc ore mineral? Answer: Sphalerite (ZnS)

Evidence & provenance

Atomic and bulk values are measured/evaluated. The HCP-family viewer is a simplified teaching cell. Current production geography is dated commodity context. SEO targeting for zinc remains provisional until its two dedicated Semrush exports are supplied.

Core sources

Royal Society of Chemistry - Zinc	https://periodic-table.rsc.org/element/30/zinc
NIST - Atomic Data for Zinc	https://physics.nist.gov/PhysRefData/Handbook/Tables/zinctable1.htm
USGS - Mineral Commodity Summaries 2026	https://pubs.usgs.gov/publication/mcs2026