

Osmium (Os)

Element 76 | Transition metal | Period 6 | d-block

Atomic number	76
Atomic mass	190.23
Electron configuration	[Xe] 4f14 5d6 6s2
Reference isotope	192Os
Density	22.5872 g/cm3
Melting point	3306 K
Boiling point	5281 K
Structure	Hexagonal close-packed (HCP)

Big idea

Osmium is famous for extreme density, but the most important safety distinction is chemical form: elemental Os metal is not the same substance as volatile, hazardous OsO₄.

Five things to remember

- Atomic number 76 means every osmium nucleus has 76 protons.
- The ground-state/reference electron configuration is [Xe] 4f14 5d6 6s2.
- The representative teaching isotope is 192Os.
- Osmium is famous for extreme density, but the most important safety distinction is chemical form: elemental Os metal is not the same substance as volatile, hazardous OsO₄.
- Material structure status: Hexagonal close-packed (HCP).

Structure, evidence and real-world context

The viewer represents the reviewed Hexagonal close-packed (HCP) material reference for elemental Osmium. It is a teaching model, not a refined crystallographic coordinate set or a model of every compound.

Evidence boundary

Atomic identity and source-reviewed reference values are separated from predictions. Search demand shapes headings and FAQs but never overrides scientific evidence; unknown bulk structure/density/phase values remain visibly unknown.

Where is it used?

Very hard wear-resistant alloys - Element-specific use context; compounds/alloys are distinguished from pure metal.

Specialized electrical contacts and instrument pivots - Element-specific use context; compounds/alloys are distinguished from pure metal.

Catalytic chemistry in selected applications - Element-specific use context; compounds/alloys are distinguished from pure metal.

Discovery and history

1803 - Smithson Tennant identified osmium in residues left after dissolving platinum ores in London.

Naming / context - The element name and discovery story are part of the historical record; search-led questions are answered without turning history into scientific evidence for bulk properties.

Today - Current use is described at the level supported by the element's availability and evidence, with research-only elements kept research-only.

Safety / interpretation

Osmium hazards depend strongly on chemical form; volatile osmium tetroxide requires compound-specific safety information.

Search-led questions and review

The questions below reflect genuine learner/search intent. Answers remain source- and evidence-led.

What is osmium?

Osmium is chemical element 76, symbol Os, classified here as transition metal.

What is the atomic number of osmium?

The atomic number is 76, meaning every osmium nucleus has 76 protons.

What is the symbol for osmium?

The chemical symbol is Os.

Why is osmium so dense?

Osmium has an exceptionally high room-temperature density, about 22.59 g/cm³ in the cited reference data.

What is osmium used for?

Uses are limited and specialized, including hard alloys, contacts, pivots and some catalytic chemistry.

Is osmium toxic?

Risk depends on chemical form. Osmium tetroxide is a highly hazardous volatile compound and must not be treated as equivalent to bulk osmium metal.

Quick review

What is Osmium's atomic number?

Answer: 76

Atomic number 76 defines Osmium by its proton count.

Which statement best describes the material evidence for Osmium?

Answer: Hexagonal close-packed (HCP)

The Structure view follows measured/reviewed evidence; unknown bulk structures remain unknown.

What is the safest rule for Osmium uses?

Answer: Distinguish the element from its isotopes, compounds and engineered materials

Elemental, isotope-specific and compound properties must not be conflated.

Sources

Royal Society of Chemistry - Osmium: <https://periodic-table.rsc.org/element/76/>

NIST - Atomic Weights and Isotopic Compositions: https://physics.nist.gov/cgi-bin/Compositions/stand_alone.pl

IUPAC - Periodic Table of Elements: <https://iupac.org/what-we-do/periodic-table-of-elements/>