

Platinum (Pt) - Student Datasheet

Atomic number 78 - Transition metal · platinum-group metal - Group 10 - Period 6 - d-block

Platinum is a dense, corrosion-resistant Group 10 transition metal whose d-electron chemistry, catalytic surfaces and scarce geological supply make it important in catalysts, jewellery, laboratory equipment and advanced technologies.

Quick reference

Property	Value
Atomic number	78
Relative atomic mass	195.084
Electron configuration	[Xe] 4f ¹⁴ 5d ⁹ 6s ¹
Common oxidation states	+2, +4
Density	21.5 g/cm ³
Melting point	2041.4 K
Boiling point	4098 K
Crystal	FCC

Structure & orbitals

Reference isotope: ¹⁹⁵Pt - 78 protons + 117 neutrons. Electron configuration: [Xe] 4f¹⁴ 5d⁹ 6s¹.

Selected 6s and specifically named 5d orbital views. Platinum's reference ground-state configuration is [Xe] 4f¹⁴ 5d⁹ 6s¹. The 5d subshell contains five spatial orbitals; 5d_{z²} and 5d_{xy} are shown as representative members rather than treating "5d" as one unique shape.

Phase / temperature context

Platinum remains solid to about 2041.4 K on the simplified standard-pressure path, then liquid until its boiling reference near 4098 K.

Five things to remember

1. Atomic number 78 means 78 protons.
2. The reference ground-state configuration is [Xe] 4f¹⁴ 5d⁹ 6s¹.
3. Platinum is a dense FCC metal and a member of the platinum-group metals.
4. Several stable isotopes occur naturally; ¹⁹⁵Pt is the most abundant.
5. Mine supply and reserves are geographically concentrated, especially in southern Africa.

Real-world context

Catalysts

Platinum surfaces catalyze many industrial and emissions-control reactions.

Jewellery

Corrosion resistance, density and appearance support jewellery use.

Fuel cells

Platinum-group catalysts are used in selected fuel-cell and hydrogen technologies.

Laboratory

Chemical resistance and high-temperature performance support specialized lab equipment.

Recycling

PGM recycling from catalysts and industrial materials is strategically important because primary supply is concentrated.

Where on Earth? / geography modes

Mine production - Concentrated supply

Platinum-group metal mine supply is highly concentrated, especially in South Africa, with additional production in Russia, Zimbabwe and North America.

Examples/context: South Africa; Russia; Zimbabwe

Reserves/resources - Geological concentration

Major PGM resources are associated with large layered mafic-ultramafic complexes and selected nickel-copper systems.

Examples/context: Bushveld Complex; Great Dyke; Norilsk region

Recycling - Secondary supply

Catalytic converters, industrial catalysts and other PGM-bearing materials are important secondary sources.

Examples/context: Vehicle catalysts; Industrial catalysts; Urban recycling

Isotopes

Isotope	Status / timescale	Why it matters
^{195}Pt	Stable	about one-third of natural platinum
^{194}Pt	Stable	major natural isotope
^{196}Pt	Stable	major natural isotope
^{190}Pt	Very long-lived α emitter	minor natural isotope

Evidence note

Atomic and bulk values are measured/evaluated; mine-production statements are date-sensitive and must retain their source year.

Review questions

What is platinum's atomic number?

Answer: 78. Atomic number 78 defines platinum.

What crystal structure does platinum have near room temperature?

Answer: Face-centred cubic (FCC). Platinum is an FCC metal.

Why is platinum important in catalytic converters?

Answer: Its surface can catalyse key exhaust reactions. Platinum-group metal surfaces can accelerate selected oxidation/reduction reactions without being consumed stoichiometrically.

Where is much of world platinum mine supply concentrated?

Answer: Southern Africa. Platinum-group mine supply is strongly concentrated in southern Africa, especially South Africa and Zimbabwe, with Russia also important.

Which platinum isotope is the most abundant naturally?

Answer: ^{195}Pt . ^{195}Pt is the most abundant natural platinum isotope.

Reviewed sources

- Royal Society of Chemistry — Platinum: <https://periodic-table.rsc.org/element/78/platinum>

- NIST — Platinum atomic data: https://physics.nist.gov/PhysRefData/Handbook/Tables/platinumtable1_a.htm

- USGS — Platinum-Group Metals Statistics and Information:

<https://www.usgs.gov/centers/national-minerals-information-center/platinum-group-metals-statistics-and-information>

- USGS — Mineral Commodity Summaries 2026: <https://pubs.usgs.gov/periodicals/mcs2026/mcs2026.pdf>

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