

Krypton (Kr) - Student Datasheet

Atomic number 36 - Noble gas - Group 18 - Period 4 - p-block

Krypton is element 36, a rare atmospheric noble gas with a closed 4p shell. It is colorless as an ordinary gas, produces distinctive emission when excited, forms rare fluorine compounds, and once helped define the metre through 86Kr spectroscopy.

Quick reference

Atomic number	36
Relative atomic mass	83.798
Electron configuration	[Ar] 3d10 4s2 4p6
State at 20 C	Colorless monatomic gas at 20 deg C
Density	0.003425 g/cm3
Melting point	115.78 K
Boiling point	119.735 K
Common oxidation state	+2 in rare compounds; 0 as elemental gas
Electronegativity	Unknown

Structure & orbitals

Solid krypton adopts a stable FCC rare-gas structure under ordinary low-pressure conditions. The viewer is a teaching cell; metastable structures under special growth conditions are outside this basic model.

Atomic 4p clouds visualize occupancy. The glow in a discharge is an excited-state spectrum, and KrF2 bonding is a molecular electronic-structure problem rather than a colored orbital picture.

Temperature / phase context

At approximately standard pressure, krypton is solid below about 115.78 K, liquid to about 119.735 K, and gaseous above. Its normal liquid interval is narrow.

Five things to remember

- Atomic number 36 means 36 protons.
- Neutral krypton has a closed [Ar]3d104s24p6 configuration.
- Krypton is only about one part per million of the atmosphere.
- Krypton can form compounds such as KrF2 under suitable conditions.
- From 1960 to 1983, a spectral line of 86Kr was used in the definition of the metre.

Krypton: Real World & Signature Science

Krypton is chemically quiet, not chemically impossible. KrF₂ is a real compound, while most everyday krypton use still relies on the physical properties of the elemental noble gas.

Why this element matters

Lighting Krypton is used in selected high-performance lamps and flash lamps.	Excimer lasers Krypton-fluorine excimer systems produce ultraviolet light for specialized applications.
Insulating windows Krypton can be used in high-performance glazing, especially where narrow cavities make its lower thermal conductivity useful.	Spectroscopy & metrology 86Kr emission historically provided the optical definition of the metre from 1960 to 1983.
Atmospheric trace gas Krypton is recovered by fractional distillation of liquid air; it is not mined from ore.	

From trace atmospheric gas to purified krypton: high-level context

1. Krypton is a trace atmospheric constituent, so the atmosphere is the meaningful global reservoir rather than a mine map.
2. Large cryogenic air-separation systems concentrate noble-gas fractions during oxygen/nitrogen production.
3. Further fractional separation and purification isolate krypton for specialty markets.
4. Finished gas is used in lamps, lasers, glazing and scientific applications; rare krypton chemistry requires specialized laboratory conditions.

Where on Earth?

Atmospheric reservoir

Krypton is a trace gas recovered from air; London is relevant to discovery history, not a natural deposit.

History

1898 - William Ramsay and Morris Travers discovered krypton in the residue left after evaporating liquid air in London.

Early 20th century - Spectroscopy and isotope research established krypton's noble-gas identity and isotopic mixture.

1960-1983 - The metre was defined using a precise wavelength of radiation from krypton-86.

Today - Krypton is used in specialty lighting, lasers, glazing and scientific instrumentation.

Uses

Lighting & flash lamps Krypton is used in selected high-intensity and high-efficiency light sources.	Excimer lasers KrF excimer lasers are important ultraviolet sources in specialized industrial/scientific systems.
High-performance glazing Krypton gas can improve thermal performance in narrow insulating-glass cavities.	Scientific instruments Krypton isotopes and spectra are used in analytical, atmospheric and nuclear-science measurements.

Krypton: Isotopes, Questions & Evidence

Isotopes

84Kr - Stable - most abundant natural isotope

Reference teaching nucleus: 36 protons and 48 neutrons.

86Kr - Stable natural isotope

Historically central to the 1960-1983 metre definition.

82Kr and 83Kr - Stable natural isotopes

Important parts of the natural mixture used in spectroscopy and analytical work.

85Kr - Radioactive trace isotope

A fission-product noble gas used in atmospheric/nuclear monitoring contexts.

Common questions

What is krypton's atomic number?

36.

How many valence electrons does krypton have?

Eight in the 4s24p6 outer shell.

What is krypton used for?

Specialty lighting, flash lamps, excimer lasers, high-performance glazing and scientific measurement.

Is krypton a metal?

No. It is a noble gas.

Can krypton form compounds?

Yes. Krypton difluoride, KrF₂, is a well-established example under suitable conditions.

How was krypton connected to the metre?

From 1960 to 1983, the metre was defined by a specified number of wavelengths of a krypton-86 spectral line.

Quick self-check

1. Atomic number? Answer: 36

2. Outer shell? Answer: 4s² 4p⁶

3. Can krypton form a compound? Answer: Yes, for example KrF₂

4. Industrial source? Answer: Air separation

5. Historical isotope-metrology link? Answer: 86Kr metre definition

Evidence & provenance

Atomic, phase, atmospheric and isotope values are evaluated/measured. KrF₂ is experimentally established chemistry. Atmospheric occurrence is conceptual; country pins would falsely imply deposits.

Core sources

Royal Society of Chemistry - Krypton	https://periodic-table.rsc.org/element/36/krypton
NIST - Atomic Data for Krypton	https://physics.nist.gov/PhysRefData/Handbook/Tables/kryptontable1.htm
CIAAW - Krypton isotopic/atomic-weight context	https://ciaaw.org/krypton.htm