

Potassium (K) - Student Datasheet

Atomic number 19 - Alkali metal - Group 1 - Period 4 - s-block

Potassium is a soft Group 1 alkali metal whose single 4s valence electron explains the strong tendency to form K^+ . In nature it occurs in compounds, while potassium ions are essential in cells and potassium salts are central to fertilizers.

Quick reference

Atomic number	19
Relative atomic mass	39.0983
Electron configuration	[Ar] 4s ¹
Common ion	K^+
Density	0.89 g/cm ³
Melting point	336.7 K
Boiling point	1032 K
Crystal near room temperature	BCC

Structure & orbitals

Reference isotope: ³⁹K - 19 protons + 20 neutrons. Ground-state electron configuration: [Ar] 4s¹.

The 4s view represents the occupied valence orbital and includes three radial nodes in a hydrogen-like teaching approximation. The 3p view represents an occupied core subshell with one radial node and selectable p orientation. These are probability models, not electron paths.

Material / molecular structure: Body-centred cubic potassium metal near room temperature (Im-3m teaching cell)

Phase / temperature context

On this approximately standard-pressure teaching path, potassium is solid below 336.7 K, liquid between 336.7 K and 1032 K, and gaseous above 1032 K.

Five things to remember

1. Atomic number 19 means every potassium nucleus contains 19 protons.
2. Neutral potassium has one outer 4s electron and commonly forms K^+ by losing it.
3. ³⁹K is the most abundant natural potassium isotope; ⁴⁰K is a naturally occurring radioactive isotope.
4. Potassium metal is body-centred cubic near room temperature.
5. Most commercial "potash" statistics describe potassium-bearing fertilizer commodities, commonly reported as K₂O equivalent - not elemental potassium metal.

Real-world context

Fertilizers

Potassium compounds are one of the three major fertilizer nutrient families; potash commodities replenish potassium removed from agricultural soils.

Cells

K⁺ is a major intracellular ion and is central to membrane potentials, fluid balance and many physiological processes.

Potassium salts

Potassium chloride, carbonate, hydroxide and other salts have broad industrial, laboratory and consumer uses.

Glass & soaps

Potassium carbonate is used in some glassmaking and potassium hydroxide is used in chemical manufacture including certain soaps.

Natural ⁴⁰K

A tiny fraction of natural potassium is radioactive ⁴⁰K, which is important in geochronology and contributes to natural background radioactivity.

Where on Earth? / geography modes

Potash mine production - 2025 · K₂O equivalent

Where major potash mine output is concentrated

Examples/context: Canada; Russia; China; Belarus

K⁺ in living systems - Global biology

Potassium ions are distributed through cells and ecosystems, not geological country “deposits”

Examples/context: Cells; Soils; Plants; Food webs

Fertilizer material cycle - Global flow

Potash moves through mining, fertilizer manufacture, agriculture and nutrient recycling

Examples/context: Mining; Fertilizer; Crops; Soils

Isotopes

Isotope	Status / timescale	Why it matters
³⁹ K	Stable · ≈93.258% natural abundance	The dominant naturally occurring isotope; 19 protons and 20 neutrons.
⁴⁰ K	Radioactive · ≈0.0117% natural abundance	A long-lived natural radionuclide important in geochronology and natural background radioactivity.
⁴¹ K	Stable · ≈6.730% natural abundance	The second stable naturally occurring isotope.

Evidence note

Atomic/isotopic and ordinary physical data are measured/evaluated. Potash production geography is explicitly time-stamped and commodity-labelled; it must not be presented as elemental-potassium production.

Safety: Elemental potassium is highly reactive. Element Lookup keeps demonstrations conceptual and does not provide handling or preparation instructions.

Review questions

How many valence electrons does neutral potassium have?

Answer: 1. The ground-state configuration ends $4s^1$.

Which ion does potassium most commonly form?

Answer: K^+ . Losing the single 4s valence electron gives K^+ .

What crystal structure does potassium metal have near room temperature?

Answer: Body-centred cubic (BCC). Potassium metal is BCC near room temperature.

Which isotope is naturally radioactive?

Answer: ^{40}K . ^{40}K is a naturally occurring radioactive isotope present at a very small abundance.

What does “potash production” usually describe?

Answer: Potassium-bearing fertilizer commodities, often reported as K_2O equivalent. Potash statistics concern fertilizer/mineral commodities, not elemental potassium metal.

Frequently asked questions

Is potassium a metal?

Yes. Potassium is a Group 1 alkali metal. The familiar K^+ ions in foods, cells and salts are potassium in ionic form, not pieces of potassium metal.

How many valence electrons does potassium have?

One. Its neutral ground-state configuration ends $[Ar] 4s^1$.

How many protons, neutrons and electrons are in potassium?

Every potassium atom has 19 protons. A neutral atom has 19 electrons. The common isotope ^{39}K has 20 neutrons; other isotopes have different neutron counts.

What is potassium's atomic number and symbol?

Atomic number 19 and symbol K. The K comes from kalium.

Where is potassium found?

Potassium is widespread in minerals, soils, seawater and living organisms, but its reactivity means it is normally found in compounds rather than as native metal.

Why is potassium important to plants and people?

K^+ is an essential ion in cells. Plants require potassium as a major nutrient, and human physiology uses potassium gradients in processes such as nerve and muscle function.

Sources used for this guide

- Royal Society of Chemistry - Potassium
<https://periodic-table.rsc.org/element/19/potassium>
- NIST - Atomic Data for Potassium
<https://physics.nist.gov/PhysRefData/Handbook/Tables/potassiumtable1.htm>
- USGS - Mineral Commodity Summaries 2026
<https://pubs.usgs.gov/publication/mcs2026>
- WebElements - Potassium crystal structure
https://www.webelements.com/potassium/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.