

Radium (Ra) - Student Datasheet

Atomic number 88 - Radioactive alkaline-earth metal - Group 2 - Period 7 - s-block

Radium is element 88, a highly radioactive Group 2 metal discovered by Marie and Pierre Curie in 1898. It occurs naturally in uranium decay chains in trace amounts, and its isotopes connect chemistry to radioactivity, environmental monitoring and carefully controlled medical use.

Quick reference

Atomic number	88
Reference mass	[226]
Electron configuration	[Rn] 7s ²
Common oxidation state	+2
Density	≈5 g/cm ³
Melting point	969 K
Boiling point	1773 K
Crystal	BCC (reported)

Structure & orbitals

Reference isotope: ²²⁶Ra - 88 protons + 138 neutrons. Ground-state electron configuration: [Rn] 7s².

The 7s view represents the occupied outer s orbital in a nonrelativistic hydrogen-like teaching approximation; 6p is an occupied core-region representative. For Z = 88, relativistic and many-electron effects matter, so the page labels these as qualitative orbital-shape models rather than scale-accurate electron densities.

Material / molecular structure: Body-centred cubic radium metal is commonly reported; bulk data are limited because radium is highly radioactive and scarce

Phase / temperature context

A simplified approximately standard-pressure path uses 969 K as the melting reference and 1773 K as the boiling reference. These bulk values are far less experimentally routine than data for common stable metals.

Five things to remember

1. Atomic number 88 means every radium nucleus contains 88 protons.
2. The ground-state reference configuration is [Rn] 7s² and +2 is the characteristic oxidation state.
3. All radium isotopes are radioactive; ²²⁶Ra is a key long-lived natural isotope.
4. Radium occurs only in trace quantities as part of uranium/thorium decay series, not as large native-metal deposits.
5. Radium-223 has a regulated medical role in certain prostate-cancer settings involving bone metastases.

Real-world context

Decay chains

Natural radium isotopes appear as daughter products in uranium/thorium radioactive decay series and occur only in trace concentrations.

Discovery history

The Curies identified radium through extraordinary radiochemical work on pitchblende residues and its distinctive radioactivity/spectrum.

Environmental monitoring

Radium in groundwater and drinking water is monitored because ingestion of radioactive radium can pose health risks.

Ra-223 medicine

Radium-223 dichloride is a regulated alpha-emitting radiopharmaceutical used in specific prostate-cancer bone-metastasis settings.

Luminous-paint history

Radium was once used in luminous paints; severe occupational harms helped establish major lessons in radiation protection.

Where on Earth? / geography modes

Natural occurrence - Trace decay product

Radium is generated within uranium/thorium decay chains and can enter minerals and groundwater; a “radium mine production” map would be misleading

Examples/context: U-bearing rocks; Groundwater; Decay series

Discovery geography - Paris + Jáchymov context

The discovery story links Curie laboratory work in Paris with pitchblende residues sourced historically from Joachimsthal/Jáchymov

Examples/context: Paris; Jáchymov

Medical context - Regulated therapy

Ra-223 medicine is a regulated healthcare use; Element Lookup does not map operational radioactive-material inventories

Examples/context: Oncology; Bone targeting; Radiopharmaceutical controls

Isotopes

Isotope	Status / timescale	Why it matters
²²⁶ Ra	Radioactive · half-life ≈1600 years	A major natural radium isotope in the ²³⁸ U decay series and a key environmental-radiological reference.
²²³ Ra	Radioactive · half-life ≈11.4 days	An alpha-emitting isotope used as radium-223 dichloride in specific regulated cancer therapy.
²²⁴ Ra	Radioactive · half-life ≈3.66 days	A naturally occurring radium isotope in the thorium decay series.

Evidence note

All radium isotopes are radioactive. Atomic/nuclear values are source-reviewed, while scarce bulk-metal properties carry more uncertainty than common stable metals. Medical statements are descriptive, not treatment advice.

Safety: Radium is highly radioactive. This page deliberately avoids extraction, concentration, source fabrication or other operational radioactive-material instructions.

Review questions

What is radium's atomic number?

Answer: 88. Radium is element 88.

Does radium have stable isotopes?

Answer: No. All known radium isotopes are radioactive.

Which oxidation state is characteristic for radium chemistry?

Answer: +2. As a Group 2 alkaline-earth metal, radium commonly forms Ra^{2+} .

Which radium isotope has a modern regulated medical use?

Answer: ^{223}Ra . Radium-223 dichloride is used in specific prostate-cancer bone-metastasis settings.

Why is a "radium mine-production map" misleading?

Answer: Natural radium occurs mainly as trace decay products rather than a large commodity metal. Radium is present in trace amounts within radioactive decay series.

Frequently asked questions

What is radium?

Radium is chemical element 88, a highly radioactive alkaline-earth metal in Group 2.

Is radium radioactive?

Yes. Radium has no stable isotopes; its isotopes decay radioactively.

Where is radium found?

In nature it occurs only in trace amounts as part of uranium and thorium decay series, including in some rocks and groundwater.

What is radium used for today?

Modern uses are limited. Radium-223 dichloride has a regulated medical role in certain prostate-cancer bone-metastasis settings.

Why was radium used in old watch dials?

Radium compounds were historically mixed with phosphors to make self-luminous paint. The serious radiation hazards were not initially understood, and this use was abandoned.

Who discovered radium?

Marie Curie and Pierre Curie announced the discovery in 1898 while studying pitchblende residues.

Sources used for this guide

- Royal Society of Chemistry - Radium
<https://periodic-table.rsc.org/element/88/radium>
- NIST - Atomic Data for Radium
<https://physics.nist.gov/PhysRefData/Handbook/Tables/radiumtable1.htm>
- NCI - Radium-223 and advanced prostate cancer
<https://www.cancer.gov/types/prostate/research/radium-223-improves-survival>
- EPA - Radium in drinking water
<https://www.epa.gov/radtown/radium>
- WebElements - Radium crystal structure
https://www.webelements.com/radium/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.