

Arsenic (As) - Student Datasheet

Element 33 · Metalloid · source-reviewed learning reference

Arsenic is element 33, a Group 15 metalloid with multiple allotropes and oxidation states. Gray arsenic is a layered solid, while yellow arsenic contains As₄ molecules; arsenic compounds also require careful species-specific toxicity language.

Quick reference

Atomic number	33
Relative atomic mass	74.922
Electron configuration	[Ar] 3d ¹⁰ 4s ² 4p ³
Period / group / block	4 / 15 / p
State context	Gray arsenic is a brittle metalloid solid at 20 °C
Density	5.75 g/cm ³ (gray arsenic)
Melting / transition	Sublimes near 889 K at ordinary pressure
Boiling / gas reference	No ordinary-pressure liquid/boiling path; arsenic sublimes
Oxidation states	−3, +3, +5
Electronegativity	2.18

Structure & orbitals

Stable gray arsenic has a layered rhombohedral A7-type structure. The viewer is a simplified rhombohedral teaching cell; yellow arsenic is molecular As₄ and is a different allotrope.

The 4s/4p clouds describe an isolated arsenic atom. They are not a model of gray-arsenic bands, As₄ molecular orbitals or arsenic compounds.

Phase behavior

At ordinary pressure gray arsenic is solid over the displayed low-temperature range and sublimes to vapor near 889 K. A normal liquid interval is not fabricated for this path.

Five things to remember

- Atomic number 33 means 33 protons.
- Natural arsenic is essentially ⁷⁵As.
- Gray arsenic is the stable ordinary allotrope and has a rhombohedral layered structure.
- At ordinary pressure arsenic sublimes rather than following a simple solid→liquid→gas path.
- Chemical species matters critically when discussing arsenic toxicity and uses.

Arsenic: Real World & Signature Science

Element-specific science, uses and history

Big idea

“Arsenic” is not one exposure species. Elemental arsenic, arsenite/arsenate compounds, organoarsenic species and semiconductor compounds can have very different chemistry and hazards.

Why this element is scientifically distinctive

Rotate a ^{75}As nucleus and gray-arsenic rhombohedral teaching cell, inspect 4s/4p probability clouds, then compare gray-network arsenic with molecular As_4 and the ordinary-pressure sublimation path.

Allotropes	Gray arsenic is a layered rhombohedral solid; yellow arsenic is molecular As_4 and less stable under ordinary conditions.
Semiconductor compounds	Gallium arsenide and related compounds are technologically important, but they are not equivalent to elemental arsenic.
Metallurgical by-product	Arsenic can be recovered or managed in processing of copper, lead and other ores where arsenic-bearing minerals occur.
Historical uses	Arsenic compounds had historical uses in pigments, pesticides and medicines, many of which were abandoned or tightly controlled because of toxicity.
Species-specific safety	Health effects depend on chemical form, dose and exposure route; the page does not reduce all arsenic chemistry to a single hazard label.

Arsenic in mineral processing: high-level context

1. Arsenic occurs in minerals such as arsenopyrite and in polymetallic ore systems.
2. During mining and smelting, arsenic-bearing phases may enter concentrates, off-gases, residues or controlled products.
3. Modern operations manage arsenic chemistry under strict environmental and occupational controls; this page does not provide extraction or treatment procedures.
4. Specialty semiconductor supply uses highly controlled purified arsenic feedstocks.

History checkpoints

Ancient world	Arsenic-containing minerals and compounds were known long before the element was isolated.
Medieval/early modern period	Methods for obtaining elemental arsenic from minerals became known in Europe.
19th–20th centuries	Arsenic compounds saw broad industrial and agricultural use alongside growing recognition of toxicity.
Today	Arsenic is managed as both a useful chemical constituent and a major environmental/public-health contaminant depending on species and exposure.

Arsenic: Isotopes, Questions & Evidence

Evidence status and learner self-check

Isotope context

⁷⁵ As	Stable natural isotope	Reference teaching nucleus with 33 protons and 42 neutrons.
Arsenic isotope context	One stable natural isotope	Natural arsenic is essentially monoisotopic.
Radioarsenic isotopes	Research/medical tracer context	Specialized radioactive isotopes exist but are distinct from natural bulk arsenic.

Common questions

What is arsenic?

Arsenic is element 33, a Group 15 metalloid with several allotropes and many compounds.

Is arsenic a metal?

It is usually classified as a metalloid rather than an ordinary metal.

What is arsenic used for?

Modern uses include specialized semiconductor compounds; many historical pesticide/pigment uses are restricted or obsolete.

Does arsenic melt at ordinary pressure?

The common teaching path is sublimation near 889 K rather than a normal liquid interval at ordinary pressure.

Quick self-check

Q: What is arsenic's atomic number? | Answer: 33. Atomic number equals proton count.

Q: How is arsenic commonly classified? | Answer: Metalloid. Arsenic lies in the metalloid region.

Q: What happens near 889 K at ordinary pressure? | Answer: Gray arsenic sublimates. The simple ambient-pressure path goes from solid to vapor.

Evidence & safety

Atomic and gray-arsenic bulk values are evaluated. The ordinary-pressure phase path explicitly uses sublimation rather than inventing a liquid range. Commodity points are selected current contexts, not a global exposure map.

Arsenic and many inorganic arsenic compounds are toxic. This page provides chemistry education only, not exposure, treatment, remediation or handling instructions.

Core sources

Royal Society of Chemistry - Arsenic

<https://periodic-table.rsc.org/element/33/arsenic>

NIST - Atomic Data for Arsenic

<https://physics.nist.gov/PhysRefData/Handbook/Tables/arsenictable1.htm>

USGS - Mineral Commodity Summaries 2026

<https://pubs.usgs.gov/publication/mcs2026>