Arsenic (As)

Element 33 — Complete Summary

33
As
Arsenic
74.922

Key Properties

Atomic Mass	74.922
Category	Metalloids
State at 20°C	solid
Melting Point	Sublimes at 616°C
Boiling Point	Sublimes at 616°C
Density	5.727
Electron Config	[Ar] 3d104s24p3
Electronegativity	2.18
Year Discovered	1250
Discovered By	Albertus Magnus

✨ Did You Know?

1. It has been nicknamed the \
2. Despite its toxicity, arsenic-based compounds were historically used in medicines, including Salvarsan, the first effective treatment for syphilis.
3. A specific shade of green paint called Scheele's Green, made with arsenic, was very popular in the 19th century and is thought to have caused chronic poisoning, possibly even contributing to the death of Napoleon Bonaparte.
4. Some bacteria can 'breathe' arsenic, using it for respiration in the same way that humans use oxygen.
5. Arsenic is added to gallium to make gallium arsenide, a key semiconductor for high-speed electronics.

APPEARANCE
Arsenic is a brittle, steel-gray, semi-metallic solid.

SUPERHERO PERSONA
"The Perfect Poison, a notorious villain from history, odorless and tasteless."

EVERYDAY CONNECTION
Arsenic is found as an ingredient in some insecticides and wood preservatives.

POP CULTURE
Arsenic is the classic undetectable poison in many Agatha Christie mystery novels.

Overview of Arsenic

Arsenic is a silver-gray, brittle semi-metal (metalloid) known both for its toxicity and its wide range of uses. Historically infamous as a deadly poison, arsenic has also played important roles in medicine, agriculture, and modern technology. This contradictory nature has made arsenic one of the most studied and controversial elements in history.

Uses of Arsenic

Despite its toxic reputation, arsenic and its compounds are applied in several fields:

Pest control and medicine: Arsenic compounds have long been used as rat poisons and insecticides, though most uses are now tightly regulated. Historically, tonics such as “Fowler’s Solution” contained arsenic, and today certain organic arsenic compounds are used in poultry feed to prevent disease.

Semiconductors: Gallium arsenide (GaAs) is a vital material in the electronics industry, used to make transistors, integrated circuits, and solar cells. Arsenic acts as a doping agent, altering the electrical properties of semiconductors.

Other applications: Arsenic compounds are employed in pyrotechnics, for hardening lead shot, and in producing specialty glass.

Natural Occurrence and Production of Arsenic

Arsenic is rarely found in its pure elemental state. Instead, it commonly occurs in minerals such as arsenopyrite (FeAsS). It is typically obtained as a by-product of copper, lead, and gold refining. Extraction from arsenopyrite involves heating the mineral, which causes arsenic to sublimate (transform directly from solid to gas), separating it from iron sulfide.

History of Arsenic

Ancient knowledge: Arsenic sulfide minerals such as orpiment and realgar were used in ancient Egypt, Greece, and China for pigments, gilding, and pesticides. Their poisonous nature was also well known.

Discovery of the element: The German scholar Albertus Magnus is credited with isolating metallic arsenic in the 1200s. He did so by heating arsenic trioxide (“white arsenic”) with oils, producing a gray metallic form.

Biological Role of Arsenic

Arsenic has no essential biological role in humans and is considered toxic. Prolonged exposure can accumulate in the body, especially in hair and nails, where it binds to proteins. Some foods, such as seafood, contain arsenic in less harmful organic forms. Chronic exposure to inorganic arsenic compounds is a major health concern in contaminated groundwater.