

Stable Isotopes of Iodine

Isotope	Z(p)	N(n)	Atomic Mass	Natural Abundance	Nuclear Spin
I-127	53	74	126.904468	100.00%	5/2+



Iodine was discovered in 1811 by Bernard Courtois. Its name comes from the Greek word *iodēs*, meaning “violet.” It appears as bluish-black orthorhombic crystals.

Slightly soluble in water, iodine is also soluble in ethanol, carbon disulfide, benzene and chloroform (forming brown solutions). Sulfur, selenium, metal iodides and many organic compounds dissolve in liquid iodine. The chemical properties of iodine are quite similar to those of other halogens, especially chlorine and bromine, although it is less electronegative. All iodine reactions occur in vapor phase or aqueous media; vapor-phase reactions require elevated temperatures. Iodine vapors combine with metals, forming their iodides. In acid solutions, iodine reduces powerful oxidizing agents and is itself oxidized. Iodine combines with fluorine, chlorine and bromine, forming interhalogen compounds. Among organic compounds, alkenes readily react with iodine; substitution reactions occur at high temperatures.

Iodine is used in many dyes and as a colorant for foods and cosmetics. Its silver salt is used in photographic negative emulsions. Other industrial applications include the dehydrogenation of butane and butylenes, serving as a catalyst in organic reactions, in the treatment of naphtha to yield high-octane motor fuel, and in the preparation of many metals in high-purity grade. Radioactive isotopes of iodine are used for treating thyroid cancer and heart diseases (including tachycardia) and as a tracer for diagnosing certain diseases. An important application of iodine is in water purification and sanitation. It is used as a disinfectant in food-processing plants, dairies and restaurants. It is applied to disinfect municipal and other water supplies and swimming pools.

Iodine vapors are an irritant to eyes, nose and mucous membranes. Inhalation can cause headache, irritation and congestion of lungs. Oral intake can produce burning of the mouth, vomiting, diarrhea and abdominal cramps. Skin contact can cause rashes.

Properties of Iodine

Name	Iodine
Symbol	I
Atomic number	53
Atomic weight	126.905
Standard state	Solid at 298 °K
CAS Registry ID	7553-56-2
Group in periodic table	17
Group name	Halogen

Properties of Iodine (continued)

Period in periodic table	5
Block in periodic table	p-block
Color	Violet-dark gray, lustrous
Classification	Non-metallic
Melting point	113.7 °C
Boiling point	184.3 °C
Thermal conductivity	0.449 W/(m·K)
Electrical resistivity	> 1015 x 10 ⁻⁸ Ω m
Electronegativity	2.66
Heat of vaporization	20.90 (per mole I atoms) kJ·mol ⁻¹
Heat of fusion	7.76 (per mole I atoms) kJ·mol ⁻¹
Density of vapor	6.75 g/L
Density of liquid	3.96 g/cm ³ at 120 °C
Density of solid	4.933 g/cm ³ at 20 °C
Electron configuration	[Kr]4d ¹⁰ 5s ² 5p ⁶
Atomic radius	1.33 Å
Ionic (I-) radius	2.20 Å
Common oxidation state	-1
Other oxidation states	+1, +3, +5, +7
Vapor pressure of solid	0.3075 torr at 25 °C and 90.5 torr at 113.6 °C
Critical temperature	545.80 °C
Critical pressure	48.90 atm
Critical volume	155.00 cm ³ /mol