

Stable isotopes of lead available from ISOFLEX

Isotope	Z(p)	N(n)	Atomic Mass	Natural Abundance	Enrichment Level	Chemical Form
Pb-204	82	122	203.973028	1.40%	99.90%	Metal
Pb-204	82	122	203.973028	1.40%	99.90%	Oxide
Pb-206	82	124	205.974449	24.10%	>99.00%	Metal
Pb-206	82	124	205.974449	24.10%	>99.00%	Oxide
Pb-207	82	125	206.975880	22.10%	72.00->99.00%	Metal
Pb-207	82	125	206.975880	22.10%	72.00->99.00%	Oxide
Pb-208	82	126	207.976636	52.40%	97.80->99.50%	Metal
Pb-208	82	126	207.976636	52.40%	97.80->99.50%	Oxide

82

Pb

Lead has been known and used throughout history — ancient alchemists believed it was the world's oldest metal and devoted a great deal of time attempting to transmute it into gold. Its name originates with the Anglo-Saxon word *lead*, and its symbol — *Pb* — with the Latin word *plumbum*, meaning “liquid silver.”

Lead is a heavy, very soft, malleable, ductile solid with face-centered cubic crystals. It is soluble in dilute nitric acid and insoluble in water (but dissolves slowly in water containing a weak acid). It resists corrosion and is relatively impenetrable to radiation. It is a poor electrical conductor. Lead forms amphoteric compounds in +2 and +4 valence states, forming plumbous and plumbic salts, as well as plumbites and plumbates. Its divalent compounds are far more numerous than its tetravalent compounds. In its very finely divided form, lead is pyrophoric. The metal is not attacked by hot water; in hard water, however, the presence of small amounts of carbonate, sulfate or silicate ions forms a protective film on the metal's surface. Lead does not evolve hydrogen readily with acids. At ordinary temperatures, it is not readily attacked by sulfuric acid. Hydrofluoric acid also has little action on the metal. Organic acids in the presence of oxygen react slowly with lead, forming their soluble salts; thus acetic acid in the presence of oxygen forms lead(II) acetate. Lead combines with fluorine, chlorine and bromine, forming bivalent lead halides.

There are numerous applications for lead in all its forms: metal, alloys and compounds. It is useful in the construction of pipelines, plumbing fixtures, wires, ammunition, containers for corrosive acids, and as a shield against short-wavelength radiation. Both the metal and its dioxide are used in storage batteries. Several lead compounds — such as lead chromate, lead sulfate, lead tetroxide and the basic carbonate — have been used in paint.

Considered an acute and chronic toxicant, lead can cause acute ataxia, headache, vomiting, stupor, hallucination, tremors and convulsions, along with chronic symptoms including weight loss, anemia, kidney damage, memory loss and brain damage.

Properties of Lead

Name	Lead
Symbol	Pb
Atomic number	82
Atomic weight	207.2
Standard state	Solid at 298 °K
CAS Registry ID	7439-92-1
Group in periodic table	14
Group name	None
Period in periodic table	6
Block in periodic table	p-block
Color	Bluish white
Classification	Metallic
Melting point	327.46 °C
Boiling point	1740 °C
Thermal conductivity	35.30 W/(m·K) at 298.2 °K
Electrical resistivity	20.65 $\mu\Omega\cdot\text{cm}$ at 20 °C
Electronegativity	1.8
Specific heat	0.128 J/(g·K) at 20 °C
Heat of vaporization	178 kJ·mol ⁻¹ at 1740 °C
Heat of fusion	4.77 kJ·mol ⁻¹
Density of liquid	10.66 g/cm ³ at 327.46 °C
Density of solid	11.30 g/cm ³
Mohs hardness scale	1
Electron configuration	[Xe]4f ¹⁴ 5d ¹⁰ 6s ² 6p ²
Atomic radius	1.75 Å
Covalent radius (sp³)	1.44 Å
Ionic radius	Pb ²⁺ : 1.18 Å; Pb ⁴⁺ : 0.70 Å
Oxidation states	+2, +4