Stable isotopes of iron available from ISOFLEX

Isotope	Z(p)	N(n)	Atomic Mass	Natural Abundance	Enrichment Level	Chemical Form
Fe-54	26	28	53.939613	5.85%	94.30-99.90%	Metal
Fe-54	26	28	53.939613	5.85%	>99.80%	Oxide
Fe-56	26	30	55.934941	91.75%	≥99.90%	Metal
Fe-56	26	30	55.934941	91.75%	≥99.70%	Oxide
Fe-57	26	31	56.935398	2.12%	>95.00%	Metal
Fe-57	26	31	56.935398	2.12%	>95.00%	Oxide
Fe-58	26	32	57.933280	0.28%	92.80-99.80%	Metal
Fe-58	26	32	57.933280	0.28%	92.80-99.80%	Oxide

Iron has been known since prehistoric times. Genesis says that Tubal-Cain, seven generations from Adam, was “an instructor of every artificer in brass and iron.” Smelted iron artifacts have been identified from as early as 3000 BC. The name “iron” derives from the Anglo-Saxon word *iron* or *iren,* and the symbol *Fe* comes from the Latin word *ferrum,* meaning “iron.”

Iron is a soft, white, ductile metal, and the fourth most abundant element in earth’s crust. It is the only metal that can be tempered. Its body-centered cubic form is stable to 910 ºC; from 910 ºC to 1390 ºC it has a face-centered cubic form; and above 1390 ºC it returns to the body-centered form. Its mechanical properties are altered by impurities, especially carbon. Iron is highly reactive chemically, it is a strong reducing agent, and it oxidizes readily in moist air and reacts with steam when hot to yield hydrogen and iron oxides. It is attracted by magnets and rapidly loses its magnetism. It is ferromagnetic at ordinary temperatures but becomes paramagnetic when heated to its Curie point of 768 ºC.

Iron exhibits single-replacement reactions, precipitating less electropositive metals out of their salt solutions. Thus, solid iron can reduce many metals, such as copper, silver, gold, mercury, tin and nickel. Solid iron undergoes rusting by reacting with oxygen in the presence of water; in moist air, it rapidly converts to rust.

Iron occurs in every mammalian cell and is vital for life processes. It is bound to various proteins and is found in blood tissues. Industrial uses of iron as carbon steels are numerous, surpassing the uses of any other alloys (carbon steels are alloys of iron containing carbon in varying proportions). Non-steel iron alloys such as cast iron, wrought iron, nickel iron and silicon iron have many important applications as well. Another important application of iron is as an industrial catalyst: it is used in catalyst compositions in the Haber process for synthesis of ammonia, and in the Fischer-Tropsch process for producing synthetic gasoline.

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Isotopes for Science, Medicine and Industry

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Properties of Iron

Name	Iron
Symbol	Fe
Atomic number	26
Atomic weight	55.847
Standard state	Solid at 298 °K
CAS Registry ID	7439-89-6
Group in periodic table	8
Group name	None
Period in periodic table	4
Block in periodic table	d-block
Color	Lustrous, metallic, grayish tinge
Classification	Metallic
Melting point	1535 °C
Boiling point	2750 °C
Thermal conductivity	79.5 W/(m·K)
Electrical resistivity	4.71 μΩ·cm at 0 °C
Electronegativity	1.83
Heat of vaporization	347 $kJ \cdot mol^{-1}$ at 2750 °C
Heat of fusion	13.8 $kJ \cdot mol^{-1}$
Density of liquid	7.00 g/cm^3 at 1564 ºF
Density of solid	7.873 g/cm^3
Electron configuration	$[Ar]3d^6 4s^2$
Atomic radius	1.24 Å
Most common oxidation states	+2, +3
Other oxidation states	-1, 0, +1, +4, +6

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