

26
Fe
Iron
55.845

Key Properties

Atomic Mass	55.845
Category	Transition Metals
State at 20°C	solid
Melting Point	1538°C
Boiling Point	2861°C
Density	7.874
Electron Config	[Ar] 3d64s2
Electronegativity	1.83
Year Discovered	Ancient
Discovered By	Unknown

Did You Know?

- 1 It is the most common element on Earth by mass, forming much of Earth's outer and inner core.
- 2 The red color of human blood comes from the interaction between iron and oxygen in the hemoglobin molecule.
- 3 Pure iron is actually quite soft and rusts very quickly, but when combined with carbon and other elements, it forms super-strong steel.
- 4 Meteorites that fall to Earth are often rich in iron, and for ancient civilizations, this \
- 5 The Earth's magnetic field is generated by the movement of molten iron in the planet's outer core.

APPEARANCE

Iron is a strong, lustrous, silvery-gray metal that rusts easily.

SUPERHERO PERSONA

"The Iron Avenger, providing the strong, reliable backbone for everything from skyscrapers to superheroes' suits."

EVERYDAY CONNECTION

Iron is found in the steel frame of a car or a cast-iron skillet.

POP CULTURE

Iron is the basis of Iron Man's suit and the material of the Iron Throne in Game of Thrones.

Overview of Iron

Iron is a shiny, greyish transition metal with atomic number 26. Although it rusts easily in damp air, iron is the most important metal in the world, making up about 90% of all refined metal today. Its dominance comes from being abundant, affordable, and easily transformed into steels with a wide variety of properties.

Uses of Iron

The primary use of iron is in the production of steel, a strong, versatile alloy that underpins modern civilization.

Carbon steels: Alloys of iron and carbon.

Mild steel (low carbon) is used in items like bicycle chains and car bodies.

High-carbon steels are harder and used for tools, springs, and rifle barrels.

Alloy steels: Steels with added elements such as chromium, nickel, or vanadium, which increase strength and durability. Common in bridges, skyscrapers, and pylons.

Stainless steel: Contains at least 10.5% chromium, making it resistant to rust. Used in cutlery, surgical instruments, kitchenware, and jewelry.

Cast iron: High in carbon (3–5%), cast iron is cheap and used for pipes, pumps, and valves.

Catalysis: Iron compounds are used in the Haber process for making ammonia (fertilizers) and in converting syngas into liquid fuels.

Biological Role of Iron

Iron is essential for life and non-toxic in normal amounts. The average human body contains about 4 grams of iron, mostly in hemoglobin, the molecule that carries oxygen in red blood cells.

Deficiency: Lack of iron causes anemia, leading to fatigue and weakness.

Dietary needs: Humans require about 10–18 mg daily, obtainable from foods like liver, molasses, leafy greens, and cocoa.

Other roles: Iron is also found in enzymes and proteins essential for energy transfer and metabolism.

Natural Occurrence and Production of Iron

Iron is the fourth most abundant element in Earth's crust, and the planet's core is believed to be mostly iron. The main ores are hematite (Fe₂O₃) and magnetite (Fe₃O₄).

Commercial production is carried out in blast furnaces, where iron ore is smelted with carbon (coke) and limestone to produce pig iron, which is then refined into steel.

History of Iron

~3500 BC – Early artifacts: The earliest iron objects, found in Egypt, were made from meteoric iron, identified by their high nickel content.

~1500 BC – The Iron Age: The Hittites of Anatolia (modern-day Turkey) were the first to smelt iron from ores, sparking the Iron Age and giving them military and economic power.

1722 – Scientific understanding: French scientist René Antoine Ferchault de Réaumur explained how carbon content affects the properties of iron, laying the foundation for modern steelmaking and the Industrial Revolution.

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