



Key Properties

Atomic Mass	63.546
Category	Transition Metals
State at 20°C	solid
Melting Point	1084.62°C
Boiling Point	2560°C
Density	8.96
Electron Config	[Ar] 3d104s1
Electronegativity	1.9
Year Discovered	Ancient
Discovered By	Unknown

Did You Know?

- 1 It was one of the first metals ever used by humans, starting more than 10,000 years ago, ushering in the Copper Age and later the Bronze Age.
- 2 The Statue of Liberty is covered in over 179,000 pounds of copper, which has turned its characteristic green color due to oxidation.
- 3 Copper has natural antimicrobial properties, meaning it can kill bacteria and viruses on contact.
- 4 The blood of some invertebrates, like horseshoe crabs and octopuses, is blue because it uses a copper-based molecule called hemocyanin to transport oxygen, instead of iron-based hemoglobin.
- 5 Brass (copper and zinc) and bronze (copper and tin) are two of the most important alloys ever created.

APPEARANCE

Copper is a soft, malleable, reddish-brown metal.

SUPERHERO PERSONA

"The Conductor, the ancient hero who ushers in new ages of technology and conducts the power of the world."

EVERYDAY CONNECTION

Copper is found in the electrical wiring in your home's walls.

POP CULTURE

Copper defines steampunk aesthetics, with its brass and copper machinery.

Overview of Copper

Copper is a reddish-gold transition metal that is soft, malleable, and highly conductive. It was one of the first metals used by humans, and its discovery marked the beginning of the Bronze Age, when copper was alloyed with tin to produce bronze tools and weapons. Today, copper remains essential for electricity, heat transfer, and countless modern technologies.

Uses of Copper

Copper's combination of conductivity, malleability, and durability makes it indispensable across industries:

Electrical conductor: Copper is the best non-precious conductor of electricity. It is used in wires, motors, power generation, and telecommunications cables, making it a foundation of modern infrastructure.

Heat conductor: Copper conducts heat efficiently, which is why it is used in heat exchangers, industrial machinery, and plumbing systems.

Bronze (copper + tin): One of humanity's earliest alloys, lending its name to the Bronze Age.

Brass (copper + zinc): Widely used in instruments, fittings, and decorative items.

Coinage alloys: Many coins throughout history have been minted from copper or copper alloys.

Compounds: Copper sulfate is used as an algicide and agricultural pesticide, while solutions such as Fehling's solution are used in chemical tests for sugars.

Biological Role of Copper

Copper is an essential trace element in humans, required in tiny amounts (about 1–2 mg per day). It plays a vital role in enzyme activity, energy transfer, blood vessel formation, and neurotransmitter production. Deficiency or genetic disorders such as Wilson's disease and Menkes' disease affect the body's ability to process copper properly. In the animal kingdom, some crustaceans use copper-based molecules instead of iron to transport oxygen.

Natural Occurrence and Production of Copper

Copper occurs naturally as a native metal, one of the few elements to be found in pure form. However, most copper is extracted from sulfide minerals such as chalcopyrite (CuFeS₂) and bornite (Cu₅FeS₄). Industrial processes like smelting and electrolysis are used to refine copper for use.

Today, the largest copper producers are Chile, Peru, and China, with significant mining operations supplying global demand.

History of Copper

~10,000 years ago – Early use: Archaeological evidence shows copper was among the first metals worked by humans, with artifacts found in the Middle East and Mediterranean.

Bronze Age: The alloying of copper with tin to create bronze marked a major leap in human civilization.

Roman era: Much of Rome's copper supply came from the island of Cyprus, which gave rise to the Latin name cuprum—the origin of the symbol Cu.

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