4. Conductivity: The Flow of Heat and Electricity

Metals are excellent conductors of heat and electricity. This is due to the “sea of electrons” in their atomic structure, which allows energy to flow freely. For example, in the video, a copper rod was heated at one end, and within seconds, the heat traveled to the other end. Similarly, a simple circuit with a copper wire lit up a bulb instantly, demonstrating electrical conductivity.

5. Density: Heavy but Strong

Metals are generally dense, meaning they have a high mass per unit volume. This is why a small block of lead feels so heavy in your hand. In the video, a comparison was made between a wooden block and a metal block of the same size. The metal block sank in water, while the wooden one floated, illustrating the difference in density.

6. Melting and Boiling Points: Stability Under Heat

Highly Reactive Metals: Sodium (Na) and Potassium (K) react explosively with water. In one of the videos, a small piece of sodium was dropped into water, and it fizzed violently, producing hydrogen gas and heat. The reaction can be represented as:

$2Na + 2H_2O \rightarrow 2NaOH + H_2\uparrow$

The hydrogen gas produced can even ignite, creating a small flame—a dramatic demonstration of reactivity!

Less Reactive Metals: Copper (Cu) and Gold (Au) are far less reactive. Copper, for example, reacts slowly with oxygen to form a greenish layer of copper carbonate (patina) over time, as seen in the Statue of Liberty.

2. <u>Reaction with Acids</u>

Metals react with acids to produce hydrogen gas and a salt. The reactivity series helps predict which metals will react:

mineral-rich fluids cool and deposit their metal content.

One of the most captivating examples of metal occurrence is gold veins in quartz. These veins form when gold-rich hydrothermal fluids seep into cracks in rocks and cool, leaving behind gold embedded in quartz. Miners often follow these veins deep into the Earth, a process that has been romanticized in countless stories and films.

Finally, let's not forget the role of alloys. While not naturally occurring, alloys like bronze (copper and tin) and steel (iron and carbon) have shaped human civilization. The discovery of bronze marked the beginning of the Bronze Age, a period of significant technological advancement.

Metals are everywhere, from the depths of the Earth to the devices we use daily. Their occurrence and

extraction are a testament to human ingenuity and the intricate processes of nature.

Sr. No.	Property	Metals	Non-Metals
1	Physical State	Metals are solid at room temperature. Except mercury and gallium.	Non-metals generally exist as solids and gases, except Bromine.
2	Melting and boiling points	Metals generally have high m.pt and b.pt except gallium and cesium.	Non-metals have low m.pt and b.pt except diamond and graphite.
3	Density	Generally high	Generally low.
4	Malleability and Ductility	Malleable and ductile.	Neither malleable nor ductile.
5	Electrical and thermal conductivity	Good conductors of heat and electricity.	Generally poor conductors of heat and electricity except graphite.
6	Luster	Poses shining luster.	Do not have luster except iodine.
7	Sonorous sound	Give sonorous sound when struck.	Does not give sonorous sound.
8	Hardness	Generally hard except Na, K	Solid non-metals are generally soft except diamond.

Properties of Ionic Compounds

This technique is used for ultra-pure metals required in semiconductors and electronics. It involves melting a narrow zone of the metal and moving it along the length of the metal rod. Impurities concentrate in the molten zone and are carried to the end of the rod.

Example: The video shows a silicon refining process. A rod of silicon is slowly passed through a heating coil, creating a molten zone. As the zone moves, impurities like boron and phosphorus are pushed to one end, leaving behind ultra-pure silicon.

c. Distillation

This method is used for metals with low boiling points, such as zinc and mercury. The impure metal is heated to its boiling point, and the vapor is condensed to obtain the pure metal.

Example: In the zinc refining demonstration, impure zinc is heated in a furnace. The zinc vapor rises and is condensed in a separate chamber, leaving behind impurities like lead and iron.