

### 3.3 Metals

Metal –

Reactivity –

Luster –

Corrosion –

Malleable –

Alkali metal –

Ductile –

Alkaline earth metal –

Thermal conductivity –

Transition metal -

Electrical conductivity –

Metals are elements that are good conductors of electric current and heat. They also tend to be shiny and bendable – like copper wire. The majority of elements in the periodic table are metals. They begin on the left side and extend across the periodic table.

The physical properties of metals include luster, malleability, ductility, and conductivity.

Luster – shiny and reflective

Malleable – can be hammered or rolled into flat sheets or other shapes

<https://www.youtube.com/watch?v=f4OTj9yNOak> – aluminum foil, start at 1:50

Ductile – can be pulled out into long wires

Example – copper is both malleable and ductile

Thermal conductivity - ability of an object to transfer heat

Electrical conductivity – ability to carry electric current.

Most metals are good thermal AND electrical conductors. Metals also generally have low specific heat (which means they heat up quickly). Only a small amount of thermal energy is required to raise the temperature of metal.

Some metals are magnetic. Iron (Fe), cobalt (Co), and nickel (Ni) are attracted to magnets and can be made into magnets. Most metals are solid at room temperature. Only mercury (Hg) is a liquid at room temperature.

Chemical Properties – the ease and speed with which an element combines, or reacts, with other substances is called its reactivity. Metals usually react by losing electrons to other atoms.

Sodium (Na), as mentioned before, explodes in water, but gold (Au) and platinum (Pt) do not react with other substances.

The reactivity of other metals fall somewhere between those of sodium and gold.

For example, iron reacts slowly with oxygen in the air, forming iron oxide (rust). **The deterioration of a metal due to a chemical reaction in the environment is called corrosion.**

### How are metals classified?

**In the periodic table, metals are classified as alkali metals, alkaline earth metals, transition metals, metals in mixed groups, lanthanides, and actinides.** The reactivity of metals tends to decrease from left to right across the table.

#### Group I The Alkali Metals

		Electronic configuration	
Li	Lithium	<b>2,1</b>	
Na	Sodium	<b>2,8,1</b>	
K	Potassium	<b>2,8,8,1</b>	
Rb	Rubidium	2,8,8,18,1	
Cs	Cesium	2,8,8,18,18,1	
Fr	Francium	2,8,8,18,18,32,1	

The alkali metals are the most reactive metals in the periodic table. Alkali metals are so reactive that they are never found alone in nature. They are only found in compounds. In a laboratory, scientists can separate alkali metals from their compounds. Some are so soft, you can cut them with a plastic knife. They have low densities and low melting points. Sodium melts at 98°C. Compounds that contain potassium (K) are used in fireworks.

<https://www.youtube.com/watch?v=UOOCKJ0ubwM>

Alkali metals in water video



### The Mixed Groups

- Families containing both metals and nonmetals
- The aluminum family
- The the six metals (and more) under the staircase

Only some of the elements in groups 13-16 are metals. Aluminum (Al), tin (Sn), and lead (Pb) are in this group. Aluminum is durable, but light. A thin coating of tin protects steel from corrosion in some cans of food. Lead was once used in paints and water pipes, but no longer since it was found to be poisonous. Now it is most commonly used in car batteries.

### Lanthanides and Actinides

19 K	20 Ca	21 Sc	22 Ti
37 Rb	38 Sr	39 Y	40 Zr
55 Cs	56 Ba	71 Lu	72 Hf
87 Fr	88 Ra	103 Lr	104

*(N.B. This is the arrangement indicated by Werner in his 1905 Periodic Table!)*

57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb
89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No

Lanthanides are shiny, reactive metals. Sometimes called “laser metals” compounds containing neodymium are used to make laser lights used for surgery, or for cutting metals. Actinides are unstable and radioactive, and many are not found in nature – they are made artificially in laboratories.

