Notes on Chapter 5
Atoms and Bonding

5.4 Bonding in Metals

Metals:

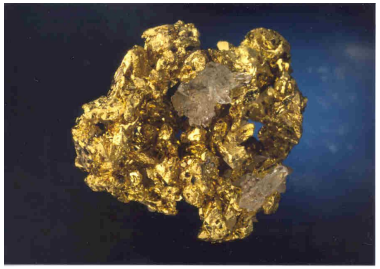
- hard and shiny
- solids at room temperature
- malleable
- ductile
- conduct heat and electricity

Few of the metals that we use are from just one element - most are made of two or more. These are called alloys.

Alloys have the same properties as a metal, but are generally stronger and less likely to react with air or water than the pure metals from which they are made.

Physical Properties of Alloys

Alloys can differ greatly from those of its individual elements, but can also retain many of the physical properties of metals.



Pure gold is shiny , but is soft and easily bent.

Gold jewelry is mixed with harder elements, such as silver and copper, so that it can retain its beauty and shine.

Chemical Properties of Alloys

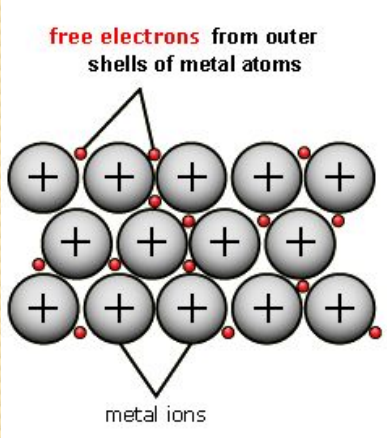
Iron is extremely strong, but it rusts when exposed to air and water.

So, iron is mixed with other elements to create steel, which is nearly as strong as iron but resists rust better.

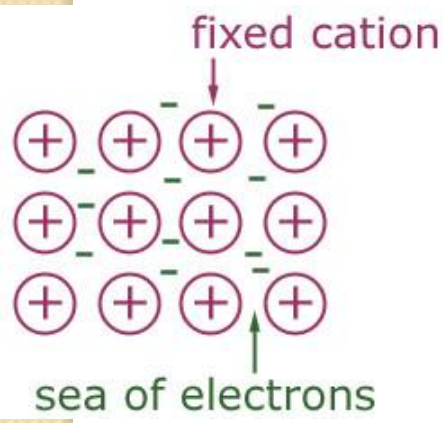
Stainless steel is an allow or iron, carbon, nickel, and chromium.

Metallic Bonding

Remember how metals become positive ions because they lose their valence electrons to other elements? This happens because their valence electrons are held loosely.



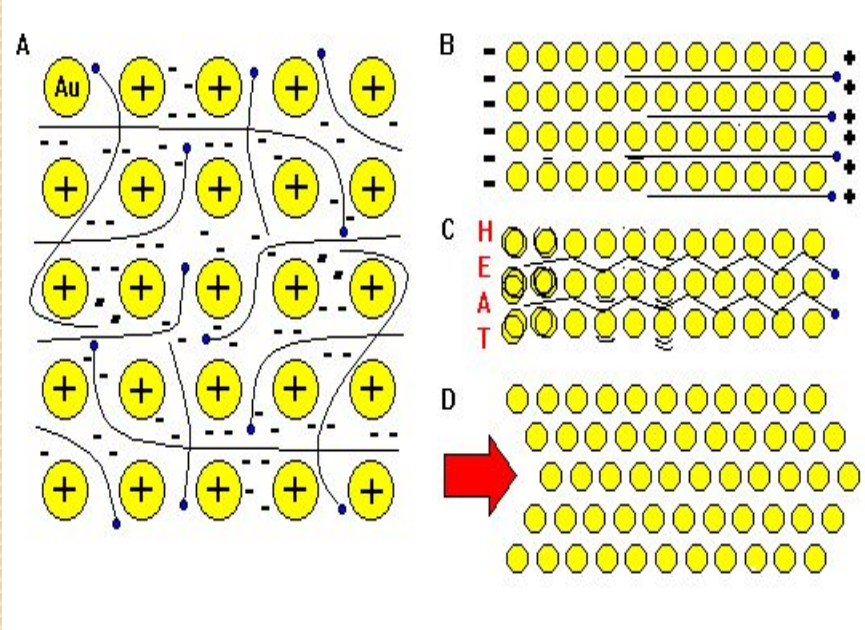
Metals exist as crystals. Metals are actually positively charged ions. The valence electrons are free to drift among the ions. Each metal ion is held in the crystal by a metallic bond, which is the attraction between a positive metal ion and the electrons surrounding it.



A metal or metal alloy consists of positively charged metal ions embedded in a "sea" of valence electrons.

This "sea of electrons" model explains the ease that metals can change shape, conduct electric current, their luster, and their ability to conduct heat.

Metallic Properties



When light strikes the valence electrons, they absorb the light and then give it off again.

When charged particles are free to move, an electric current is possible.

The freely moving valence electrons transfer energy to nearby atoms and other electrons, allowing heat to travel easily through the metal.

Metals can be stretched, pushed, or compressed into different shapes without breaking because the positive ions are attracted to the loose electrons all around them rather than to other metal ions.

The bonds between the ion and the surrounding electrons keep the metal from breaking.