

## Section 6-4 Metallic Bonding

**Metallic Bonding**

Chemical bonding that results from the attraction between metal atoms and the surrounding sea of electrons

**Delocalized**

Electrons do not belong to any one atom and move freely throughout the metal's network of empty orbitals.

**Malleability**

The ability of a substance to be hammered or beaten into thin sheets

**Ductility**

The ability of a substance to be drawn, pulled, or extruded through a small opening to produce a wire

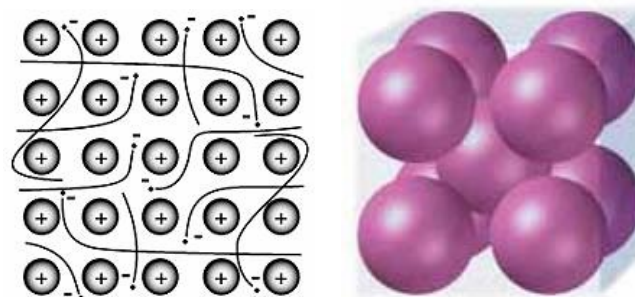
**Heat of Vaporization**

The amount of heat required to vaporize a metal. This is dependent on the strength of bonds.

1

## Structure of Metallic Bonding

Metals have a crystal structure surrounded by a sea of electrons. The atoms are relatively fixed while the electrons are free to move around.



2

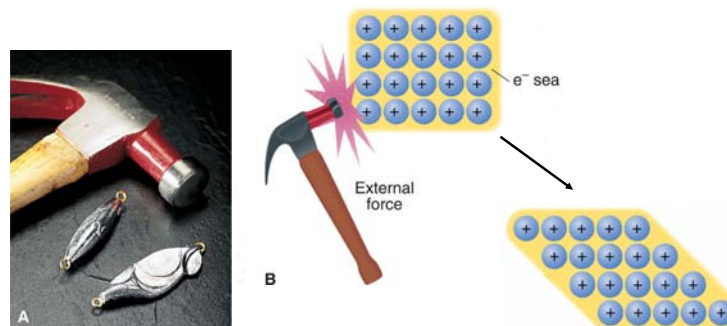
## Section 6-4 Metallic Properties

- Metals have very few highest occupied energy level electrons and have many empty orbitals. This allows electrons to move freely through empty orbitals.
- Electrons in metals can become delocalized and move freely throughout the metal's network of empty orbitals.
- Metals can be deformed as seen in properties such as malleability and ductility.
- Thermal and electrical conductivity result from the free moving sea of electrons.
- Photon emission from excited electrons returning to ground state are the reason for the shiny appearance of metals

3

## Deformation of Metal – Malleability and Ductility

Metallic bonds are the same in every direction throughout an entire solid. One plane of atoms in a metal can slide past another without breaking any bonds.



4