

**Chapter 9 – Models of Chemical Bonding
(All Sections-no Born-Haber Cycle, pp. 364-365)**

Chapters 9, 10, and 11 all involve chemical bonding, and will be covered on Test 3.

There are three major types of bonding:

- (1) metallic**
- (2) ionic**
- (3) covalent**

Metallic Bonding

Metallic bonding is the type that we will spend the least time discussing.

Metal atoms tend to be relatively large in size and to lose valence (and possibly “d”) electrons readily. So, in a metal sample, we have metal ions immersed in a sea of mobile electrons that have been donated by the atoms.

Since the electrons permeate the metal sample and are mobile, we would expect metals to be good conductors of an electrical current.

(Recall that if an electrolyte is dissolved in water, there are ions present, and conduction of an electrical current in an electrolyte solution is due to movement of these ions.)

Solid electrolytes (e.g., NaCl) – do not conduct – ions are not mobile. Molten (melted) NaCl and NaCl in water do conduct because now we have mobile ions.

Metals – do conduct in the solid state because of the free movement of electrons.

Metals are solids at normal temperatures except for Hg, which is liquid.

A rather crude trend for melting point of metals in Groups 1 and 2 is that it increases as we go up in a group (atoms get smaller) and as we go the right in a period (ionic charges and free electrons per atom increase).

Transition metals (except in Group 12) have very high melting points. Those in Groups 13, 14, 15 are relatively low.

So, what are we saying? There is no reliable trend. If you need to compare melting points of metals, look them up.

Alloys are “solid solutions” (homogeneous mixtures of one metal in another). Examples are brass (which contains Cu and Zn), sterling silver, stainless steel, and dental amalgam.

Ionic Bonding

Ionic bonding occurs between atoms of metals and non-metals. Electrons are transferred from the metal to the non-metal (or to a group of non-metals in the case of a polyatomic ion.) The + metal ion is the cation. The - ion, which can be a simple monatomic ion or a polyatomic ion, is the anion.

