Chapter 9 Models of Chemical Bonding

Lewis dot structures are covered in this chapter, as well as the intramolecular forces holding compounds together. This is a foundational section of the AP curriculum needed to understand the following chapters. Several types of bonding that need to be thoroughly understood by AP students for the AP Exam are discussed.

Ionic bonds have electrostatic forces between ions (coulombic charge), so ionic compounds are solid at room temperature and have high melting points. Most dissolve in water to form strong electrolytes. The most important aspect of an ionic solid is its lattice energy, since multiple ions bond to create an extensive lattice. The Born-Habor cycle quantifies each step in determination of lattice energy. There is more force holding a lattice together than just the bond between a single pair of ions.

Covalent bonds are held together by the sharing of electrons. This can happen in a variety of ways to form single or multiple bonds, molecular substances, or hard network solids. In polar covalent bonds, the electrons are not equally shared and the electron will spend more time in the vicinity of one of the atoms. An alternative description is that the electron density of the bonding electrons is located more on one atom than the other in a bonded pair. Electronegativity values represent the ability of an atom to attract electrons toward itself in a chemical bond and the higher the electronegativity value, the greater the pull on the bonding electrons. The properties of conductivity and thermal conductivity as well as other physical properties for ionic, network covalent, and covalently bonded substances are presented.

Metallic bonds have electrons that are highly delocalized over many atoms which enables good electrical conductivity. Other properties of metals result from the highly order arrangement of atoms in a metal.