

Chapter 9: Chemical Bonding

9.2 Types of Chemical Bonds

There are three main types of bonding (Figure 9.1):

1. **Ionic** – between metal and nonmetal atoms.

➤ Electrons are transferred.

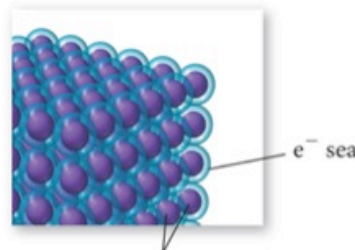
2. **Covalent** – between nonmetal atoms

➤ Electrons are shared.

3. **Metallic Bonding** (Section 9.11)

➤ Metal atoms become surrounded by an “electron sea” (Figure 9.13).

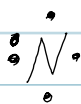
➤ Explains properties of metals, such as conductivity.



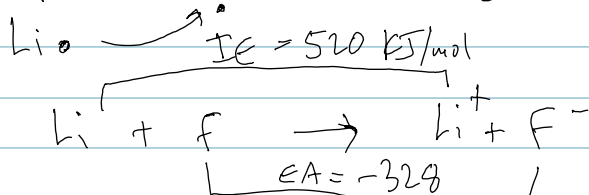
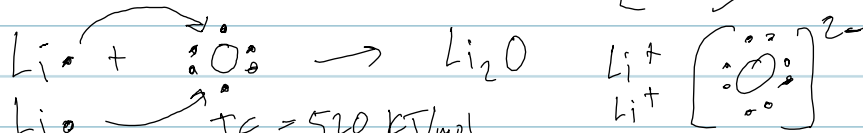
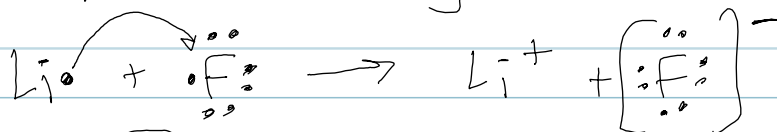
9.3 Lewis Dot Symbols

- Dot symbols depict an element's valence electrons.
- Place one dot per valence (**outer shell**) electron on each of the four sides of the element symbol.
- Pair dots to represent additional valence electrons.
- The number of **unpaired** dots shows the number of electrons an element generally gains or loses, or the **number of bonds** it usually forms.

Nitrogen: 5 V.E.



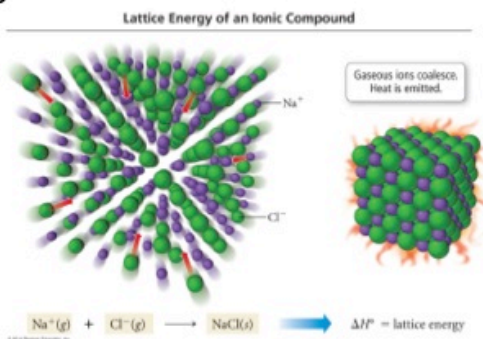
9-4 Ionic Bonding



$$\Delta H = 520 \text{ kJ} - 328 \text{ kJ} = +192 \text{ kJ (endothermic)}$$

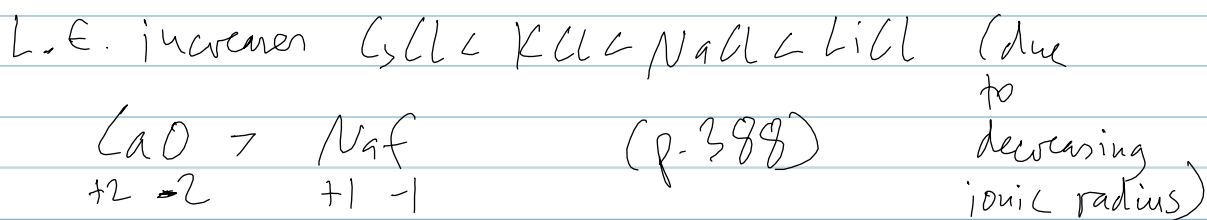
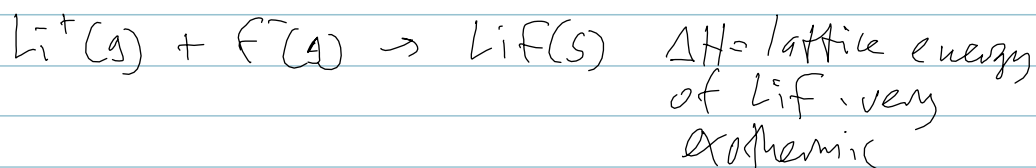
Lattice Energy

- Ionic compounds form because of the release of energy on forming a solid, called the **lattice energy**.
- The lattice energy is the energy that is released (ΔH is negative) when individual gaseous ions come together to form a solid lattice (Figure 9.3).
- A very negative lattice energy corresponds to strong ionic bonding.

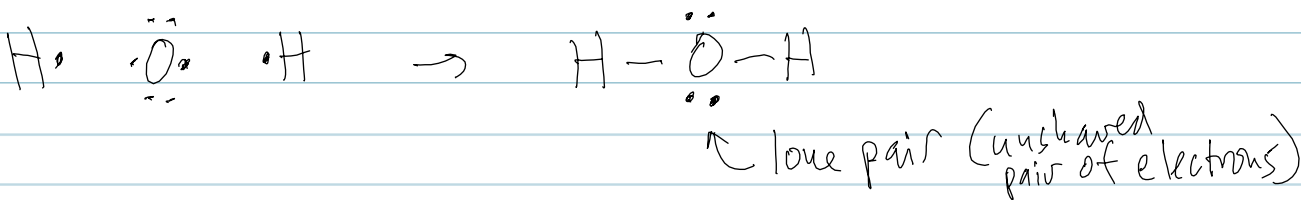
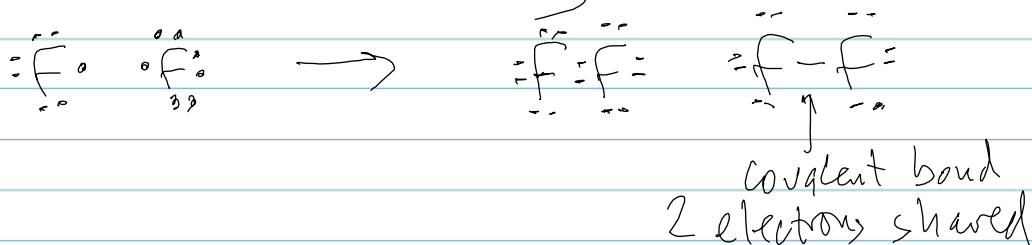


Trends in lattice energy:

- As ionic radii **decrease**, lattice energy increases.
- As charges **increase**, lattice energy increases



9.5 Covalent Bonding



The Octet Rule

Atoms will usually share electrons so that they are surrounded by **8 electrons**, since this gives a noble gas configuration (except hydrogen – needs only 2 electrons to have same configuration as He).

