Chapter 9: Chemical Bonds

· Lewis dot symbols · Octet rule

Ionic and covalent bonding

Ionic compounds

- Transfer of electrons. Metals give e- to form cations and non metals accept e- to form anions.
- Nomenclature of ionic compounds (metal and non-metal- ide)
- Ionic bonding also occurs in transition metals. (using roman numeral to designate the valency of transition metal in the name)

Covalent compounds

- Sharing of electrons.
- Lewis structures: single, double and triple bonds.
- Lone pair of electrons have to be shown.
- Nomenclature: using mono, di, tri etc to indicate number of atoms in molecule.
- Polar and non-polar covalent bonds
  - **Electronegativity** (EN): pull of electrons in a covalent bond.
  - Increases across the PT and decreases down PT.

Things to remember when writing Lewis structures of covalent compounds:

1) hydrogens and halogens are always terminal atoms
2) central atom usually has the lowest EN (or on the left of the PT)
3) in oxo-acids the hydrogens are usually bonded to oxygens
4) molecules and polyatomic molecules are usually compact and symmetrical.

Exceptions to octet rule

1. Odd number of electrons: when one e- is left unpaired: e.g. NO_2
2. Incomplete octets: when the atom does not have 8e- but is still stable: e.g. BF_3
3. Expanded valence shells: when atoms can have more than 8e-, for atoms that have the 3rd shell (n=3), e.g. SF_6

Bond lengths and bond energy: The more electrons are shared the tighter the atoms are held together hence short bond and high bond energy. E.g. bond length: single > double > triple; bond energy: triple > double > single.

Bond dissociation energy: energy required to break one mole of covalent bond in gas phase. Formation and breaking are opposite processes hence in one energy is released and in the other the same amount of energy is absorbed.

Resonance: movement of electrons in a bond. Delocalization, resonance hybrid

Formal Charge: (electronic book keeping) difference between the number of valence e in a free atom and number of e assigned to that atom when bonded.

FC= # of valence electrons in atom
- – # of lone pair electrons on the bound atom
- – ½ # of electrons in the bonds to the atom (or number of bonds on the atom)

in a neutral compound/molecule the FC should be zero.