Chemical Bonding Review 2

**Chapter 8**: Covalent Bonding Pages 213-244

**Section 8.1 Molecular Compounds 213-216**

Define the following:

* Covalent Bond
* Molecule
* Diatomic Molecule
* Molecular Compound
* Molecular formula

Questions:

1. How is covalent bonding different then ionic bonding?

2. How do the melting and boiling points in molecular compounds compare to those in ionic compounds?

3. Which elements in nature exist as uncombined elements? What are they called?

**Section 8.2 The Nature of Covalent Bonding Pages 217-225**

Define the following:

* Single covalent bond
* Structural formula
* Unshared pair
* Double covalent bond
* Triple covalent bond
* Coordinate covalent bond

Questions:

1. In covalent bond, electron sharing usually occurs so that atoms attain the electron configuration of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

2. **Single covalent** bond examples: Draw the electron dot and structural formula of the following:

a) H2 b) F2 c) H2O d) NH3 e) CH4

3. **Double covalent** bond examples: Draw the electron dot and structural formula of the following:

a) O2 b) CO2

4. **Triple covalent** bond examples: Draw the electron dot and structural formula of the following:

a) N2

5. Coordinate covalent bond examples: Draw the electron dot and structural formula of the following:

a) CO b) NH4+ c) SO32-

Some other examples of covalent bonds:

a) H2O2 b) HCN c) HBr d) HCO3- e) CO32-  f) H2S g) PH3

**Section 8.3 Bonding Theories Pages 230-236**

Define the following:

* Atomic Orbital
* Molecular Orbital
* Bonding Orbital
* Sigma Bond
* Pi Bond
* VSEPR Theory
* Hybrid Orbitals

Questions:

1. What is the difference between a sigma bond and a pi bond?

2. Explain what is meant by VSEPR Theory. Explain how the VSEPR Theory can be applied to predict the geometry of CF4.

3. Complete the structural formula for each of the following and state what VSEPR shapes they will have:

a) CH4 b) NH3 c) H2O d) CO2

4. What does orbital hybridization provide that VSEPR theory does not?

**Hybridization Involving Single Bonds**

**\*\*Remember carbon has an outer electron configuration of 2s22p2 but one of the 2s electrons goes into the third p orbital. This means it can make four (4) bonds. All the bonds are identical.**

**The one 2s orbital and three 2p orbitals of a carbon atom mix to form four sp3 hybridizedorbitals (tetrahedral shape, 109.50 angle, pyramidal 1070, bent 1050). Each sp3 extends farther into space then the s or p orbital on their own.**

Ex: CH4  (methane)

1) Draw the structural diagram, VSEPR diagram and hybridized orbital diagram. Show the angle measurement.

**Hybridization Involving Double Bonds**

**The one 2s orbital and two 2p orbitals of carbon mix to form three sp2 hybridized orbitals (trigonal planar, 1200). One p orbital remains non-hybridized and will be involved in pi bonding.**

Example: C2H4 (ethene)

1) Draw the structural diagram, VSEPR diagram and hybridized orbital diagram. Show the angle measurement.

**Hybridization Involving Triple Bonds**

**The one 2s orbital and one 2p orbital mix to form two sp hybridized orbitals. Two p orbitals remain non-hybridized and will be involved in pi bonding.**

Example: C2H2 (ethyne)

1) Draw the structural diagram, VSEPR diagram and hybridized orbital diagram. Show the angle measurement.

2) How many sigma bonds and how many pi bonds in ethyne?

**Section 8.4 Bonding Theories Pages 230-236**

Define the following:

* Nonpolar covalent bond
* Polar covalent bond
* Polar molecule
* dipole
* van der Waals forces
* Dipole interactions
* Dispersion forces (London Dispersion forces)
* Hydrogen bonds
* Network solids