**Chapter 16 Notes**

**VSPER:**

Stands for: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Predicts \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ geometry of molecules.
* The name tells you the theory:
  + Valence shell - outside electrons
* Electron Pair repulsion - electron pairs try to get as far \_\_\_\_\_\_\_\_\_\_\_\_ as possible.
* Can determine the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of bonds.
* Based on the number of pairs of valence electrons both bonded and unbonded.
* Unbonded pair are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* CH4 - draw the structural formula
* Has:
* Wants:
* (16-8)/2 = \_\_\_\_\_\_\_\_\_\_bonds

**4 Atoms Bonded**

* Basic shape is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* A pyramid with a triangular base.
* Same shape for everything with \_\_\_\_\_\_\_\_\_\_\_\_ pairs.

**Bond Polarity**

* Covalent bonding = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ electrons
  + but, do they share equally?
* Electrons are pulled, as in a tug-of-war, between the atoms \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* In equal sharing (such as diatomic molecules), the bond that results is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ covalent bond
* When two different atoms bond covalently, there is an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sharing
  + the more electronegative atom will have a stronger attraction, and will acquire a slightly negative charge
  + called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ covalent bond, or simply polar bond.
* Consider HCl
* H = electronegativity of 2.1
* Cl = electronegativity of 3.0
  + the bond is polar
  + the chlorine acquires a slight ­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ charge, and the hydrogen a slight \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ charge
* Written as:
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* The positive and minus signs (with the lower case delta) denote partial charges.
* Can also be shown:
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* The arrow points to the more electronegative atom.

**Polar Molecules**

* A polar bond tends to make the entire molecule “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_”
  + areas of “difference”
* HCl has polar bonds, thus is a polar molecule.
* A molecule that has two poles is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* The effect of polar bonds on the polarity of the entire molecule depends on the molecule shape
  + Carbon dioxide has two polar bonds, but is linear:
* The effect of polar bonds on the polarity of the entire molecule depends on the molecule shape
  + Water also has two polar bonds, but the highly electronegative oxygen pulls the e**-** away from H:

**Attractions between molecules:**

* They are what make solid and liquid molecular compounds possible.
* The weakest called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + - there are two kinds:

**1. Dispersion forces**

* Weakest of all, caused by motion of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Increases as # e**-** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:
* Halogens start as gases; bromine is liquid; iodine is solid

**2. Dipole Interactions**

* Occur when polar \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are attracted to each other.
* Slightly stronger than dispersion forces.
* Opposites \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ but not completely hooked like in \_\_\_\_\_\_\_\_\_\_\_\_\_\_ solids.

**Hydrogen Bonding**

* Are the attractive force caused by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ bonded to F, O, or N.
* F, O, and N are very electronegative so it is a very strong dipole.
* The hydrogen partially share with the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the molecule next to it.
* The strongest of the intermolecular forces.

**CFU:**

1.When atoms are bonded together, we talk about Bond Polarity. Using H and F, which one has a higher electronegativity and which direction does the arrow go? (DRAW IT OUT)

2.What is H2O’s molecular shape? Which direction do the arrows go to show bond polarity? (DRAW IT OUT)

3.When do dipole interactions occur? What causes a dipole attraction?

4.Hydrogen bonding is the bond that occurs when hydrogen bonds with which 3 atoms?