POLARITY and VSEPR

POLAR MOLECULES

A **polar molecule** is a molecule with one end having _____ electrical charge and the other end having negative electrical charge.

This requires two things to be true:

1) The molecule must contain polar _____.

2) Symmetry cannot _____ out the effects of the polar bonds.

VSEPR

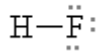
VSEPR stands for Valence Shell _____ _____ Repulsion. It predicts three-dimensional geometry of molecules. The valence shell includes the _____ electrons. The electron pairs try to get as far away as possible to _____ repulsion. VSEPR is based on the number of pairs of valence electrons, both bonded and non-bonded. An non-bonded pair of electrons is referred to as a _____ pair. Use the Wetter Way to calculate the number of bonds and then draw the dot-dash diagram. The shape of the molecule, bond angle and polarity can be determined from this diagram.

LINEAR

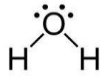
Perform the Wetter Way for H_2. How many bonds are in this molecule? Sketch the dot-dash diagram. Please include all electrons.

The electrons attempt to maximize their distance from one another by having bond angle of _____°.

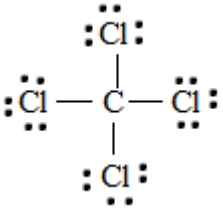
Linear compounds are NOT polar, unless the two elements are _____. The hydrogen molecule is (polar or nonpolar).



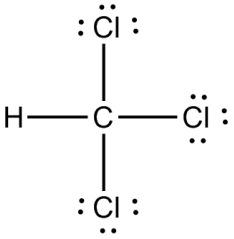
1) Is hydrogen fluoride (HF) polar? _____



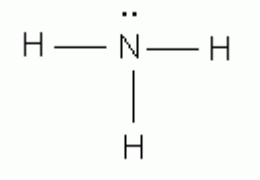
2) Is water (H_2O) polar? _____



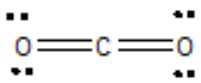
3) Is carbon tetrachloride (CCl_4) polar? _____



4) Is trichloromethane ($CHCl_3$) polar? _____



5) Is ammonia (NH_3) polar? _____



6) Is carbon dioxide (CO_2) polar? _____

TRIGONAL PLANAR

Perform the Wetter Way for H_2CO. How many bonds are in this molecule? Sketch the dot-dash diagram. Please include all electrons. (Carbon is the central atom.)

The farthest you can get the elements apart is _____°. The shape is flat and called trigonal planar. The H_2CO molecule is (polar or nonpolar).

BENT

Perform the Wetter Way for SO_2. How many bonds are in this molecule? Sketch the dot-dash diagram. Please include all electrons.

The electron pair forces the oxygen's closer together so the angle is _____ than 120°. The shape is flat and called bent. The SO_2 molecule is (polar or nonpolar).

TETRAHEDRAL

Perform the Wetter Way for CH_4. How many bonds are in this molecule? Sketch the dot-dash diagram. Please include all electrons.

The bonding electrons can maximize their distance from one another by forming a ____ shape. The furthest they can get away is _____°. This basic shape is a tetrahedral, a pyramid with a triangular base. The CH_4 molecule is (polar or nonpolar).

TRIGONAL PYRAMIDAL

Perform the Wetter Way for phosphorous trichloride (PCl_3). How many bonds are in this molecule? Sketch the dot-dash diagram. Please include all electrons.

The shape is a basic tetrahedral but you can't see the _____ pair. A tetrahedral-like shape that has 3 attached elements and one lone pair is called trigonal pyramidal. The bond angle is _____ than 109.5° between the chlorines because the electron pair forces the chlorine's closer to each other. The bond angle between chlorine's is _____°. The PCl_3 molecule is (polar or nonpolar).

BENT

Perform the Wetter Way for water (H_2O). How many bonds are in this molecule? Sketch the dot-dash diagram. Please include all electrons.

The shape is a basic tetrahedral but you can't see the _____ lone pairs. A tetrahedral-like shape that has 2 attached elements and two lone pairs is called bent. The two electron pairs force the hydrogen's even closer to each other. The bond angle between hydrogen's is _____°. The H_2O molecule is (polar or nonpolar).

7) Determine the number of bonds, draw the dot-dash diagram, state the VSEPR shape and provide the bond angle for CO_2.
8) Determine the number of bonds, draw the dot-dash diagram, state the VSEPR shape and provide the bond angle for BCl_3.
9) Determine the number of bonds, draw the dot-dash diagram, state the VSEPR shape and provide the bond angle for SCl_2.
10) Determine the number of bonds, draw the dot-dash diagram, state the VSEPR shape and provide the bond angle for SiF_4.

Although water dissolves an enormous variety of substances, both ionic and covalent, it does not dissolve everything. The phrase that scientists often use when predicting solubility is "_____ dissolves like."

Polar substances will dissolve in other substances that are _____. Nonpolar substances dissolve in other nonpolar substances.