Worksheet: Molecular Geometry and Intermolecular Forces **Name** *KEY*

Molecular Geometry

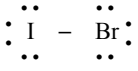
A molecule consisting of only two atoms has a _____*linear*_____ shape. A molecule with _____*two*_____ atoms bonded to the central atom with _____*zero*_____ unshared pair(s) of electrons has a **linear** shape. A molecule with _____*three*_____ atoms bonded to the central atom with _____*zero*_____ unshared pair(s) of electrons has a **trigonal planar** shape. A molecule with _____*four*_____ atoms bonded to the central atom with _____*zero*_____ unshared pair(s) of electrons has a **tetrahedral** shape. A molecule with _____*two*_____ atoms bonded to the central atom with _____*two*_____ unshared pair(s) of electrons has a **bent** shape. A molecule with _____*three*_____ atoms bonded to the central atom with _____*one*_____ unshared pair(s) of electrons has a **trigonal pyramidal** shape.

Predicting Molecular Shapes

Draw each molecule and predict the shape each molecule will form.

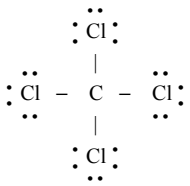
IBr

linear



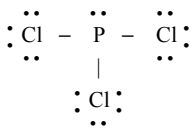
CCl_4

tetrahedral



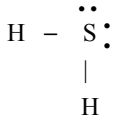
PCl_3

trigonal pyramidal



H_2S

bent

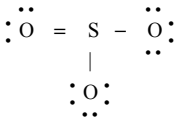


C_2H_2

linear

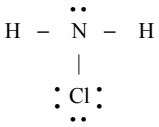
SO_3

trigonal planar



NH_2Cl

trigonal pyramidal



Polarity in Molecules

Determine the type of bonds in each of these molecules using the "Table of Electronegativities." Then, determine whether each of these molecules will be polar or nonpolar. Explain your reasoning.

IBr *2.8 – 2.5 = 0.3*
nonpolar – has nonpolar bonds

PCl_3 *3.0 – 2.1 = 0.4*
polar – has polar bonds and can be divided into + and – ends

C_2H_2 *2.5 – 2.1 = 0.4*
nonpolar – has polar bonds, but can't be divided into + and – ends

NH_2Cl *3.0 – 2.1 = 0.9 3.0 – 3.0 = 0.0*
polar – has polar bonds and can be divided into + and – ends

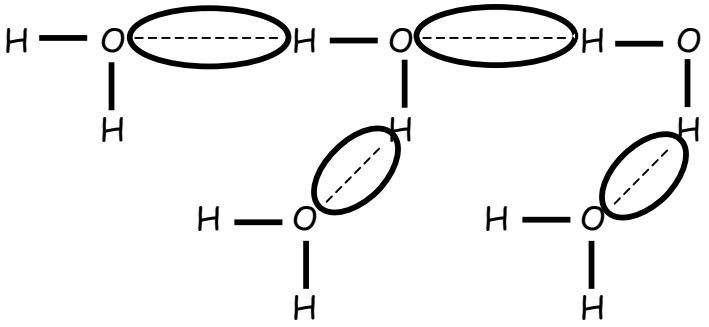
CCl_4 *3.0 – 2.5 = 0.5*
nonpolar – has polar bonds, but can't be divided into + and – ends

H_2S *2.5 – 2.1 = 0.4*
polar – has polar bonds and can be divided into + and – ends

SO_3 *3.5 – 2.5 = 1.0*
nonpolar – has polar bonds, but can't be divided into + and – ends

Intermolecular Forces

While bonding is the force of attraction WITHIN molecules, _____*intermolecular forces*_____ are the forces of attraction BETWEEN molecules. Circle these forces in the following diagram.



Define "Dipole-dipole Forces."

force of attraction between the positive end of one molecule and the negative end of another; this is the strongest intermolecular force

Define "Hydrogen Bonding."

occurs in molecules with H—F, H—O, and H—N bonds; positive charge on hydrogen is attracted to unshared pair of electrons on a neighboring molecule; strongest type of Dipole-dipole forces

Define "London-Dispersion Forces."

weakest intermolecular force that results from the constant motion of electrons; occurs in all molecules