Molecular Geometry
A molecule consisting of only two atoms has a __________ 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

\[ \text{IBr} \quad \text{linear} \quad :\text{I} - \text{Br}: \]

CCl₄

\[ \text{CCl}_4 \quad \text{tetrahedral} \quad :\text{Cl} - \text{C} - \text{Cl} - \text{Cl} : \]

PCl₃

\[ \text{PCl}_3 \quad \text{trigonal pyramidal} \quad :\text{Cl} - \text{P} - \text{Cl} - \text{Cl} : \]

H₂S

\[ \text{H}_2\text{S} \quad \text{bent} \quad \text{H} - \text{S} - \text{H} : \]

C₂H₂

\[ \text{C}_2\text{H}_2 \quad \text{linear} \quad \text{H} - \text{C} = \text{C} - \text{H} \]

SO₃

\[ \text{SO}_3 \quad \text{trigonal planar} \quad :\text{O} = \text{S} - \text{O} - \text{O} : \]

NH₂Cl

\[ \text{NH}_2\text{Cl} \quad \text{trigonal pyramidal} \quad \text{H} - \text{N} - \text{H} : \]

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\(_2\)H\(_2\)  \[ 2.5 - 2.1 = 0.4 \]
nonpolar – has polar bonds, but can’t be divided into + and – ends

NH\(_2\)Cl  \[ 3.0 - 2.1 = 0.9 \]  \[ 3.0 - 3.0 = 0.0 \]
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\(_2\)S  \[ 2.5 - 2.1 = 0.4 \]
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, \[ \text{intermolecular forces} \] 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