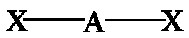
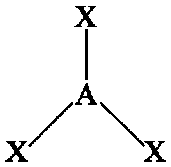
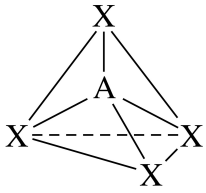
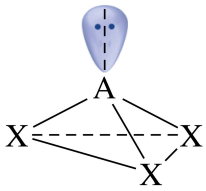
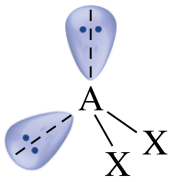
One Page Lesson: Determining Electron-Group & Molecular Geometry

The repulsive forces between bonding and non-bonding electrons determine the three-dimensional geometry of the *"groups"* of electrons around a central atom. Because the negative charges *repel* one another, the electron groups arrange themselves so they are *as far apart as possible*. This is the "Valence Shell Electron Pair Repulsion" (VSEPR) Theory.

Thus, the *"Electron Group"* geometry of *each* central atom in a structure can be determined by simply counting the number of *"groups"* of electrons around the atom, then considering how those groups would arrange themselves to be as far apart as possible. A "*group*" of electrons can be a *single bond*, *double bond*, *triple bond*, or a *lone pair of electrons.*

The table below indicates the *"Molecular Geometry"* of the central atom depending on whether the *groups of electrons* around it are *covalent bonds to other atoms* or simply *lone pairs of electrons. IF* the electron groups are *covalent bonds*, then *ATOMS* are present to *"Mark the Corners"* of each spatial arrangement: the two ends of the linear geometry, the three corners of the trigonal planar geometry, or the four corners of the tetrahedral geometry. *But – IF* an electron group is a *LONE PAIR, there is NO ATOM VISIBLE* to "*Mark that Corner"*of the geometry. ***Remember*** – You can only *"see" the ATOMS*; you *CANNOT "see" the ELECTRONS.*

# of Groups of Electrons	*Electron Group Geometry*	*Number of Lone Pairs*	*Molecular Geometry*	*Approximate Bond Angles*	*Example Compound*
2	**Linear**	**0**	**Linear** 	**180°**	**carbon dioxide, CO_2**
3	**Trigonal Planar**	**0**	**Trigonal Planar** 	**120°**	**formaldehyde, CH_2O**
4	**Tetrahedral**	**0**	**Tetrahedral** 	**109.5°**	**methane, CH_4**
4	**Tetrahedral**	**1**	**Trigonal Pyramid** 	**107°**	**ammonia, NH_3**
4	**Tetrahedral**	**2**	**Angular (Bent)** 	**104.5°**	**water, H_2O**