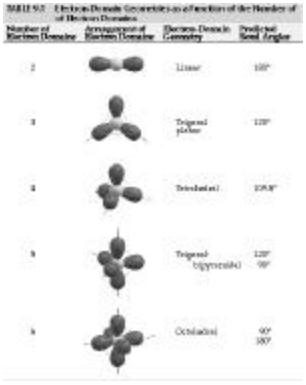
SHAPES OF MOLECULES

The shapes of molecules can be described and predicted using a simple model based largely on Lewis structures.

Valence shell electron pair repulsion (VSEPR) theory states that the electron pairs surrounding an atom tend to repel each other.

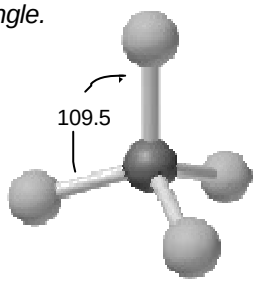
The best arrangement of a given number of electron domains is the one that minimizes the repulsions among them.

Electron-domain geometry indicates the arrangement of electron pairs about the central atom AB_n.



Molecular geometry of a molecule (or ion) indicates the arrangement of atoms in space about the central atom.

The angle formed by any two atoms bonded to the central atom is referred to as the *bond angle.*

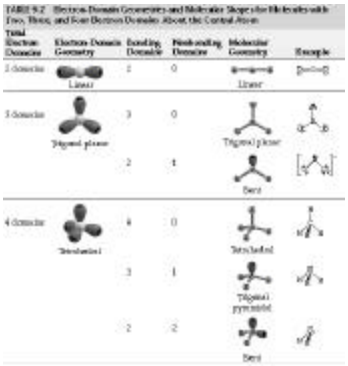


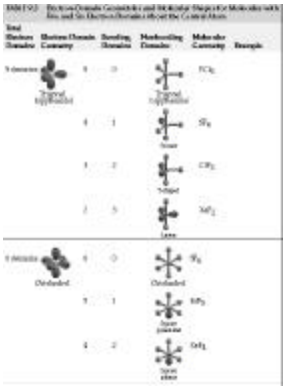
Summary of VSEPR Geometries

Bonding Domains	Nonbonding Domains	e⁻ domain Geometry	Molecular Shape	Bond Angle
4	0	tetrahedral	tetrahedral	109.5°
3	0	equilateral triangle planer	triangular	120°
3	1	tetrahedral	triangular pyramidal	107°
2	2	tetrahedral	angular	104.5°
2	0	linear	linear	180°
1	3	tetrahedral	linear	-----
2	1	equilateral triangle	bent	-----

MOLECULES WITH EXPANDED VALENCE SHELLS

Bonding Domains	Nonbonding Domains	Molecular Geometry
5	0	Trigonal bipyramidal
4	1	Seesaw
3	2	T-shaped
2	3	Linear
6	0	Octahedral
5	1	Square pyramidal
4	2	Square planar





In terms of the volume occupied by electron domains:

lone pairs > triple bonds > double bonds > single bonds