

MOLECULAR SHAPE

Molecules formed by atoms do **NOT** all have the same shape. This is due to the arrangement of the e- pairs around the central atom(s). Electrons being negative (-) repel each other, so the atoms want to arrange themselves in a molecule in such a way as to reduce these repulsions and give the molecule better stability. The theory that explains and predicts these shapes is termed the **VALENCE SHELL ELECTRON PAIR REPULSION MODEL** or **VSEPR**.

The following shapes are predicted by VSEPR theory based upon the number of atoms present, number of bonding e- (those forming a bond between two atoms), and the number of non-bonding pairs of e- (those around the central atom but **NOT** forming a bond).

See pages 334 -337, and 340 of text for additional information.

Molecule	Number of e-pairs	e- pair arrangement	Molecular shape
CO₂	2 bonding, 0 non-bonding	Linear	Linear
NO₂⁻	2 bonding, 1 non-bonding	Trigonal Planar	Bent or Angular
H₂O	2 bonding, 2 non-bonding	Tetrahedral	Bent or Angular
XeF₂	2 bonding, 3 non-bonding	Trigonal Bipyramidal	Linear
AlBr₃	3 bonding, 0 non-bonding	Trigonal Planar	Trigonal Planar
NH₃	3 bonding, 1 non-bonding	Tetrahedral	Trigonal Pyramidal
ClF₃	3 bonding, 2 non-bonding	Trigonal Bipyramidal	T-shaped
CF₄	4 bonding, 0 non-bonding	Tetrahedral	Tetrahedral
SF₄	4 bonding, 1 non-bonding	Trigonal Bipyramidal	Seesaw
XeF₄	4 bonding, 2 non-bonding	Octahedral	Square Planar
PI₅	5 bonding, 0 non-bonding	Trigonal Bipyramidal	Trigonal Bipyramidal
BrF₅	5 bonding, 1 non-bonding	Octahedral	Square Pyramidal
SF₆	6 bonding, 0 non-bonding	Octahedral	Octahedral