

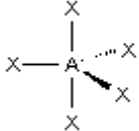
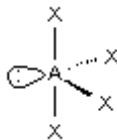
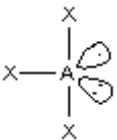
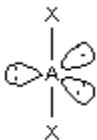



VSEPR THEORY (MOLECULAR SHAPES)

A = the central atom, X = an atom bonded to A, E = a lone pair on A

Note: There are lone pairs on X or other atoms, but we don't care. We are interested in only the electron densities or domains around atom A.

Total Domains	Generic Formula	Picture	Bonded Atoms	Lone Pairs	Molecular Shape	Electron Geometry	Example	Hybridization	Bond Angles
1	AX		1	0	Linear	Linear	H ₂	s	180
2	AX ₂		2	0	Linear	Linear	CO ₂	sp	180
	AXE		1	1	Linear	Linear	CN ⁻		
3	AX ₃		3	0	Trigonal planar	Trigonal planar	AlBr ₃	sp ²	120
	AX ₂ E		2	1	Bent	Trigonal planar	SnCl ₂		
	AXE ₂		1	2	Linear	Trigonal planar	O ₂		
4	AX ₄		4	0	Tetrahedral	Tetrahedral	SiCl ₄	sp ³	109.5
	AX ₃ E		3	1	Trigonal pyramid	Tetrahedral	PH ₃		
	AX ₂ E ₂		2	2	Bent	Tetrahedral	SeBr ₂		
	AXE ₃		1	3	Linear	Tetrahedral	Cl ₂		



Total Domains	Generic Formula	Picture	Bonded Atoms	Lone Pairs	Molecular Shape	Electron Geometry	Example	Hybridization	Bond Angles
5	AX ₅		5	0	Trigonal bipyramid	Trigonal bipyramid	AsF ₅	sp ³ d	90 and 120
	AX ₄ E		4	1	See Saw	Trigonal bipyramid	SeH ₄		
	AX ₃ E ₂		3	2	T shape	Trigonal bipyramid	ICl ₃		
	AX ₂ E ₃		2	3	Linear	Trigonal bipyramid	BrF ₂ ⁻		
6	AX ₆		6	0	Octahedral	Octahedral	SeCl ₆	sp ³ d ²	90
	AX ₅ E		5	1	Square pyramid	Octahedral	IF ₅		
	AX ₄ E ₂		4	2	Square planar	Octahedral	XeF ₄		

- Notes
- There are no stable AX₄E₄, AX₃E₃, AX₂E₄ or AXE₅ molecules.
 - All bonds are represented in this table as a line whether the bond is single, double, or triple.
 - Any atom bonded to the center atom counts as one domain, even if it is bonded by a double or triple bond. Count atoms and lone pairs to determine the number of domains, do not count bonds.
 - The number of bonded atoms plus lone pairs always adds up to the total number of domains.

Handout created by Dr. Kimberly Smith, Glendale Community College, Glendale, AZ.

