

# 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 <sub>2</sub>	s	180
2	AX <sub>2</sub>		2	0	Linear	Linear	CO <sub>2</sub>	sp	180
	AXE		1	1	Linear	Linear	CN <sup>-</sup>		
3	AX <sub>3</sub>		3	0	Trigonal planar	Trigonal planar	AlBr <sub>3</sub>	sp <sup>2</sup>	120
	AX <sub>2</sub> E		2	1	Bent	Trigonal planar	SnCl <sub>2</sub>		
	AXE <sub>2</sub>		1	2	Linear	Trigonal planar	O <sub>2</sub>		
4	AX <sub>4</sub>		4	0	Tetrahedral	Tetrahedral	SiCl <sub>4</sub>	sp <sup>3</sup>	109.5
	AX <sub>3</sub> E		3	1	Trigonal pyramid	Tetrahedral	PH <sub>3</sub>		
	AX <sub>2</sub> E <sub>2</sub>		2	2	Bent	Tetrahedral	SeBr <sub>2</sub>		
	AXE <sub>3</sub>		1	3	Linear	Tetrahedral	Cl <sub>2</sub>		

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	$AsF_5$	$sp^3d$	90 and 120
	$AX_4E$		4	1	See Saw	Trigonal bipyramid	$SeH_4$		
	$AX_3E_2$		3	2	T shape	Trigonal bipyramid	$ICl_3$		
	$AX_2E_3$		2	3	Linear	Trigonal bipyramid	$BrF_2^-$		
6	$AX_6$		6	0	Octahedral	Octahedral	$SeCl_6$	$sp^3d^2$	90
	$AX_5E$		5	1	Square pyramid	Octahedral	$IF_5$		
	$AX_4E_2$		4	2	Square planar	Octahedral	$XeF_4$		

- Notes
1. There are no stable  $AXE_4$ ,  $AX_3E_3$ ,  $AX_2E_4$  or  $AXE_5$  molecules.
  2. All bonds are represented in this table as a line whether the bond is single, double, or triple.
  3. 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.
  4. The number of bonded atoms plus lone pairs always adds up to the total number of domains.