
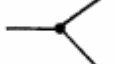
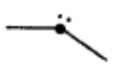



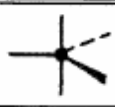
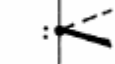
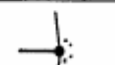






## Molecular Geometry

## Van Koppen/Offen

Steric Number, SN	# of bonded atoms	# of lone pairs	Molecular Geometry	Bond Angle (°)	Schematic	Examples	Hybridization
2	2	0	linear	180		BeCl <sub>2</sub> CO <sub>2</sub>	sp
3	3	0	trigonal planar	120		BF <sub>3</sub> NO <sub>3</sub> <sup>-</sup>	sp <sup>2</sup>
3	2	1	bent	<120		GeF <sub>2</sub> SO <sub>2</sub>	sp <sup>2</sup>
4	4	0	tetrahedral	109.5		CH <sub>4</sub> ClO <sub>4</sub> <sup>-</sup>	sp <sup>3</sup>
4	3	1	trigonal pyramid	< 109.5		NH <sub>3</sub> ClO <sub>3</sub> <sup>-</sup>	sp <sup>3</sup>
4	2	2	bent	< 109.5		H <sub>2</sub> O SCl <sub>2</sub>	sp <sup>3</sup>
5	5	0	trigonal bipyramid	90, 120		PCl <sub>5</sub>	dsp <sup>3</sup>
5	4	1	See-saw	> 180 < 120		SF <sub>4</sub>	dsp <sup>3</sup>
5	3	2	T-shaped	< 90		ClF <sub>3</sub>	dsp <sup>3</sup>
5	2	3	linear	180		XeF <sub>2</sub> I <sub>3</sub> <sup>-</sup>	dsp <sup>3</sup>
6	6	0	octahedral	90		SF <sub>6</sub>	d <sup>2</sup> sp <sup>3</sup>
6	5	1	square pyramid	90 < 90		BrF <sub>5</sub>	d <sup>2</sup> sp <sup>3</sup>
6	4	2	square planar	90		XeF <sub>4</sub>	d <sup>2</sup> sp <sup>3</sup>

Procedure: draw Lewis Structure, determine Steric Number (SN), Molecular Geometry and Hybridization

SN = # of atoms bonded to the central atom **plus** # of lone pairs on the central atom (SN = the effective number of electron pairs surrounding a central atom).

Note: If one s and one p orbital hybridize, they form two sp hybrid orbitals. The number of orbitals is always conserved. For sp<sup>2</sup> hybridization, one s and two p orbitals are hybridized to form three equivalent sp<sup>2</sup> hybrid orbitals. The steric number (SN) is equal to the number of hybrid orbitals formed.

Note also that a double bond consists of one σ-bond and one π-bond and a triple bond consists of one σ-bond and two π-bonds. What is the difference between σ-bonds and π-bonds?