

Shapes (Geometries) of Molecules

- Lewis structures do not necessarily show correct 3D shape (geometry).
- To determine geometry, consider the number of “electron regions” around the *central* atom.
- #Electron Regions (on central atom) = #outer-atoms + #lone-pairs (on central atom)
- Electron regions repel each other. VSEPR (valence shell electron pair repulsion).

e ⁻ regions	Electronic Geometry and bond angles	Outer atoms	Molecular Geometry	Example
2		2		H-Be-H H-B=O: :O=C=O:
3		3		H-B-H H H-C-H :O:
		2		:O=N: H
4		4		H H-C-H H
		3		H H-N: H
		2		H-O: H
5		5		PH ₅
		4		SF ₄
		3		ClF ₃
		2		XeF ₂
6		6		SF ₆
		5		BrH ₅
		4		XeH ₄

Polarity of Molecules

- If a molecule has polar bonds, it is a polar molecule UNLESS all the polarity arrows cancel.
- Polarity arrows will cancel if all outer atoms are the same element AND arranged symmetrically.
- Determine whether each molecule from the first page is polar or non-polar.

Valence Bond Theory

Electron Regions	Hybridization
2	sp
3	sp^2
4	sp^3
5	sp^3d
6	sp^3d^2

Review

Compound	Electronic Geometry	Molecular Geometry	Hybridization	Bond Angles	Polar?
CS ₂					
FCI			–	–	
ArF ₄					
BCl ₃					
NCl ₃					
BeFCI					
AsH ₅					
COF ₂					

For more information on VB theory, go to...

http://www.wwnorton.com/chemistry/tutorials/interface.swf?chapter=chapter_07&folder=hybridization

Practice Problems for Chapter 8

9, 13, 14, 18, 22a-c, 23abde, 24a, 25a, 29, 30, 32b-d, 35, 36b-e, 37b-e, 38, 43ab, 46acd, 52a-c, 65, 86