## Cheatography

### General Chemistry I UIUC Cheat Sheet by jash24 via cheatography.com/20424/cs/8784/

ewis Str	uctures			Lewis Structure Info
	Molecular	Key Strue		
= central a Electron	tom; X = ligand Molecular	is; E = lone pa Name	irs Shape	<ul> <li>Valence Shell: Electrons i involved in bonding.</li> </ul>
Regions	Formula	1 in easy		• Lewis Structure: A 2D re
2	AX <sub>2</sub>	Linear	0	its bonds.
	(BeCl <sub>2</sub> , CO <sub>2</sub> )			Lone Pair: Pair of electron
3	AX <sub>3</sub>	Trigonal Planar		<ul> <li>Bonding Pair: Pair of elec Both atoms sharing the ele valence shell.</li> </ul>
	(BF <sub>3</sub> , CO <sub>3</sub> <sup>2-</sup> , NO <sub>3</sub> <sup>-</sup> , SO <sub>3</sub> )			Single bond: One pair of a
	AX <sub>2</sub> E	Bent		Double bond: Two pairs of stronger than a single bond
	(NO2 <sup>-</sup> , SO2, O3)		-	<ul> <li>Triple bond: Three pairs of stronger than a double bond</li> </ul>
4	AX4	Tetrahedron		Valence Shell Electron P
5	(CH <sub>4</sub> , NH <sub>4</sub> <sup>+</sup> , PO <sub>4</sub> <sup>3-</sup> , SO <sub>4</sub> <sup>2-</sup> , CIO <sub>4</sub> <sup>-</sup> )			(VSEPR): Bonds and lone are negative, negative thin therefore all bonds and lon
	AX <sub>3</sub> E	Trigonal		as far away from each othe
	(NH <sub>3</sub> , H <sub>3</sub> O <sup>+</sup> , PCl <sub>3</sub> , SO <sub>3</sub> <sup>2-</sup> )	pyramidal	1	<ul> <li>Electron Geometry: 3D s determined by counting the central atom (bonds and lo</li> </ul>
	AX <sub>2</sub> E <sub>2</sub>	Bent		Electron Region: Each bo
	(H <sub>2</sub> O, ClO <sub>2</sub> <sup>-</sup> , OF <sub>2</sub> , SCl <sub>2</sub> )		and a	<ul> <li>Ione pair count as "1" elect</li> <li>Molecular Geometry: 3D</li> </ul>
	AXs	Trigonal		atoms bonded to the centre
		bipyramidal		<ul> <li>Ligand: Atoms bonded to</li> </ul>
	(PCI <sub>5</sub> )			VSEPR Theor
	AX₄E	See-saw		Electron geometry is deter of electron regions around the
	(SF4, SCI4)			Molecular geometry is det number of atoms bonded to the number of lone pairs aro
	AX <sub>3</sub> E <sub>2</sub>	T-shaped	9	
	(CIF <sub>3</sub> , ICl <sub>3</sub> )		-	Electronic Geometry Mner Planar(3) – Tetrahedral (4) – Octahedron(6) = "Long Trip
	AX <sub>2</sub> E <sub>3</sub>	Linear	1	Examples:
	(XeF <sub>2</sub> , I <sub>3</sub> <sup>-</sup> )			H
6	AX <sub>6</sub>	Octahedron	1	H:C:H
	(SF <sub>6</sub> , PCl <sub>6</sub> <sup>-</sup> )		- <b>T</b>	H
	AXsE	Square		Electron geometry Molecular geomet
	(BrFs, IFs)	pyramidal	-	••
	AX <sub>4</sub> E <sub>2</sub>	Square		HINIH
	(XeF <sub>4</sub> )	planar		H
			•	Electron geometr Molecular geomet

**Key Structure Terms**  Valence Shell: Electrons in the outermost shell that are involved in bonding. Lewis Structure: A 2D representation of a molecule and its bonds. · Lone Pair: Pair of electrons not being shared in a bond. Bonding Pair: Pair of electrons used to make a bond. Both atoms sharing the electrons can "count" them in their valence shell. Single bond: One pair of shared electrons. · Double bond: Two pairs of shared electrons. Shorter and stronger than a single bond. Triple bond: Three pairs of shared electrons. Shorter and stronger than a double bond. Valence Shell Electron Pair Repulsion Theory (VSEPR): Bonds and lone pairs are electrons, all electrons are negative, negative things repel other negative things, therefore all bonds and lone pairs arrange themselves in 3D as far away from each other as possible. Electron Geometry: 3D structure of a molecule determined by counting the electron regions around a central atom (bonds and lone pairs). Electron Region: Each bond (single, double or triple) and lone pair count as "1" electron region. Molecular Geometry: 3D structure determined by the atoms bonded to the central atom. · Ligand: Atoms bonded to the central atom. VSEPR Theory and Geometry Electron geometry is determined by looking at the number of electron regions around the central atom. Molecular geometry is determined by looking at the number of atoms bonded to the central atom (ligand) and the number of lone pairs around the central atom. Electronic Geometry Mnemonic: Linear(2) – Irigonal Planar(3) – Ietrahedral (4) – Irigonal Bipyramidal(5) – Octahedron(6) = "Long Irip To Iri<u>B</u>e Overseas." Examples: H H:C:H Н Electron geometry: Tetrahedron Molecular geometry: Tetrahedron H:N:H • 1

Electron geometry: Tetrahedron Molecular geometry: Trigonal pyramidal

Concepts		Concepts	
State Function	Energy, Entropy, Enthalpy	Formatio n of a bond	Exothermic
Extensive Property	Heat of a reaction	Breaking of a bond	Endothermic
Intensive Property	Comperature Q will be	Triple Bond	strongest but shortest
products are at a	negative	Single Bond	weakest but longest
higher temp, heat flows out of system		Periodic Trend	As the ions get bigger (down a group) the distance between them does as well and the magnitude of the lattice energy decreases which means that less energy is released when the lattice forms.
If the volume increases during the reaction, the system does work	W is negative		
Phase Change	7 times more energy needed to convert liquid water to steam than ice to liquid water because of hydrogen bonding. Specific Heat capacity for liquid water is higher than that of ice and steam.	If reaction is reversed, the new equilibriu m constant:	K' = 1/K

Electron Geometry = Shape Molecular Geometry = Geometry

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Concepts (cont)	
If reaction is multiplied by m, the new equilibrium constant:	K'' = K^m
Q <ksp< td=""><td>No precipitate; shift right</td></ksp<>	No precipitate; shift right
Q = Ksp	Saturated Solution
Q>Ksp	Precipitate Formed

### Lewis Structure Info+Other

B and Be often have fewer than eight electrons

Period 3 and heavier elements often satisfy, but can exceed the octet rule using their empty d orbitals

Copper Config [Ar]:4s1 3d10

Chromium Config [Ar]: 4s1 3d5

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