Take notes while watching the followng videos to prepare for the "Covalent Cpds: Lewis Structures & their 3-D Shapes Activity".

Compounds Part 2:

Lewis Structures & Molecular Compounds

Octet Rule for Covalent Bonds:

Atoms create compounds by sharing valence electrons to fill shells.

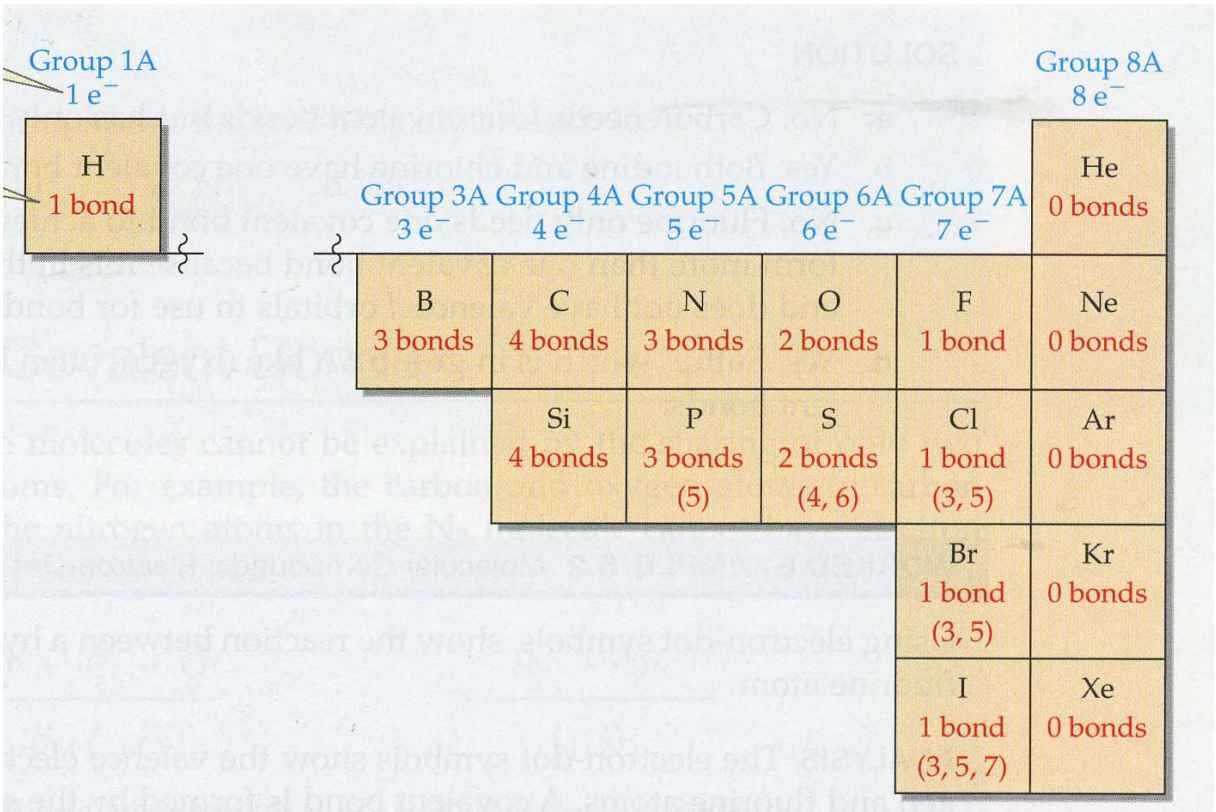
Lewis Structures

A diagram showing how the valence e⁻'s are arranged among atoms in compound

*Group # =

*If you do not understand this statement, then watch the "Valence electrons & the Octet Rule" Video first.

Bonding Patterns



Neutral Bonding Patterns for Organic Compounds

Periodic Table of the Elements

1 Group IA	2 Group IIA	3 Group IIIB	4 Group IVB	5 Group VB	6 Group VIB	7 Group VIIB	8 Group	9 Group VIIIB	10 Group	11 Group IB	12 Group IIB	13 Group IIIA	14 Group IVA	15 Group VA	16 Group VIA	17 Group VIIA	18 Group VIIIA
1 H 1.01																	2 He 4.00
3 Li 6.94	4 Be 9.01											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.30											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.84	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.64	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57 La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183,84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (269)	109 Mt (268)	110 – (271)	111 – (272)	112 – (277)		114 – (289)		116 – (289)		118 – (293)

$_{6}$C – Carbon

Because carbon atoms have 4 valence electrons, they will share these electrons to form 4 bonds.

$_{7}$N – Nitrogen

Because nitrogen atoms have 5 valence electrons, they will share these electrons to form 3 bonds and 1 lone pair.

$_{8}$O – Oxygen

Because oxygen atoms have 6 valence electrons, they will share these electrons to form 2 bonds and 2 lone pairs.

$_{1}$H – Hydrogen

Because hydrogen atoms have 1 valence electron, they form 1 bond.

Drawing Lewis Structures for Covalent Compounds

1) Determine the number of valence electrons for each atom.

2) Write the symbols for each atom in the molecule arranged around the central atom

3) Arrange the atoms so that there is a single covalent bond between each pair of bonded atoms (1 covalent bond = 1 e^- pair = 2 e^-'s)

4) Add remaining e^- pairs as lone pairs to create octets as needed

5) If an atom does not have an 'octet', shift lone pairs to form multiple bonds between atoms.

6) Verify each atom has an 'octet'

Examples of writing Lewis Structures

CH_3OH

CH_2CH_2

Your turn: Draw Lewis Structures for the following compounds.

CH_3NH_2

CH_3CHO

Polyatomic Ions

A group of atoms held together by covalent bonds that have a net charge

Add or remove e^- from total number of electrons available.

For Cations:

For Anions:

Neutral Bonding Patterns NO Longer Apply

Exceptions to the Octet Rule can occur for S and P

Draw the Lewis Structures for the following polyatomic ions.

CO_3^{2-}

HPO_4^{2-}

Shapes & Interactions Part 1:

Shapes of Molecules: VSEPR & Electron and Molecular Geometries

Shape of Molecules =

What is important about the shapes of molecules?

Cells rely on the shape and charge distribution of molecules to communicate with each other.

Examples: 1) hormones @ receptor cites on the surface of cells

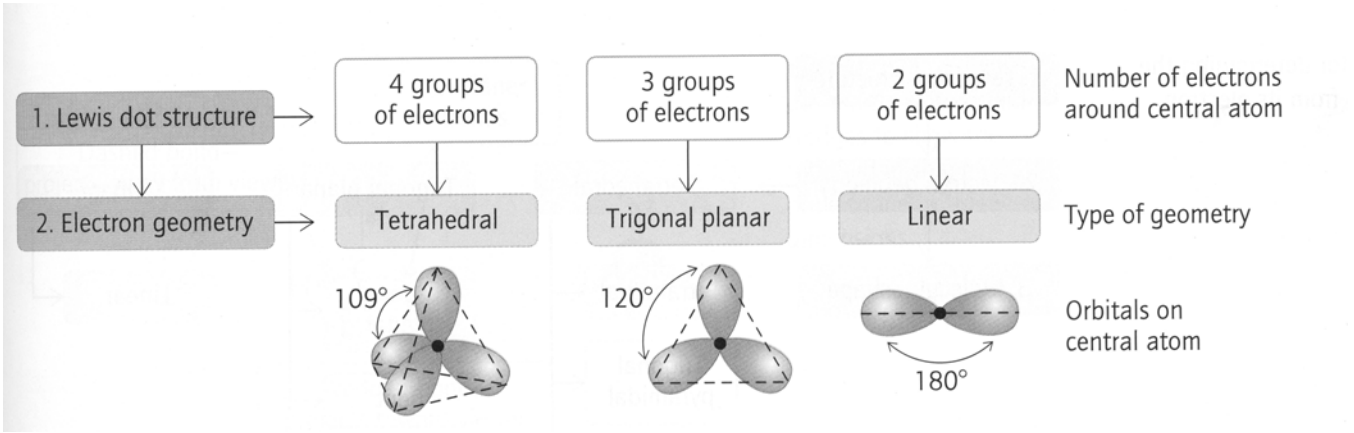
2) drug molecules interact w/ other molecules within cells

Electron Geometry: arrangement of electrons around a central atom

Molecular Shape: arrangement of atoms around a central atom

Only 1 Rule: Electrons stay as far apart as possible.

Look at central atom of Lewis Structure to predict electron geometry:

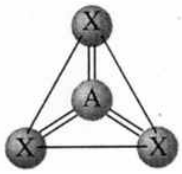
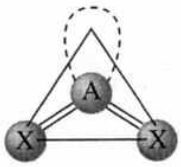


Electron Geometry vs Molecular Shape

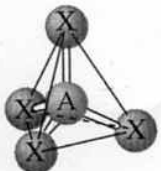
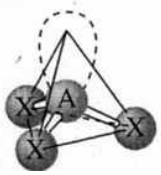
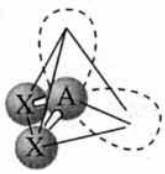
2 Groups of electrons = Linear Electron Geometry – 180° bond angles

	Two double bonds	One triple bond and one single bond
		
Molecular Shape	Linear	Linear

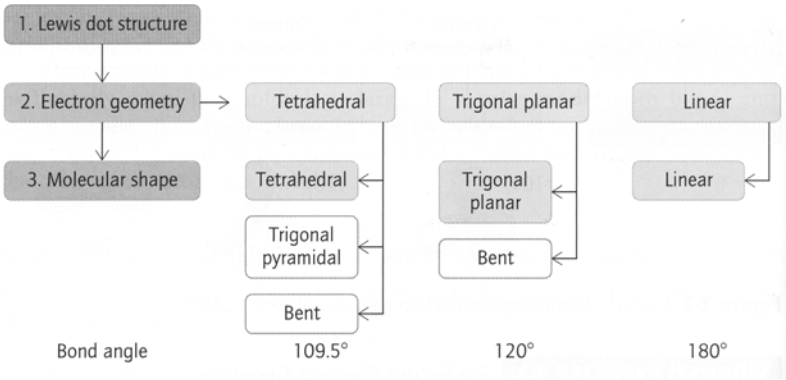
3 Groups of electrons = Trigonal Planar Electron Geometry – 120° bond angles

	One double bond and two single bonds	One double bond, one single bond, and one nonbonding pair
		
Molecular Shape	Trigonal planar	Bent or Angular

4 Groups of electrons = Tetrahedral Electron Geometry – 109° bond angles

	Four single bonds	Three single bonds and one nonbonding pair	Two single bonds and two nonbonding pairs
			
Molecular Shape	Tetrahedral	Trigonal pyramidal	Bent or Angular

Electron Geometry determines Molecular Shape



How to predict the electron geometry and molecular shape.

1) Start with Lewis Structures.
2) Look at the number of electron groups to determine the e^- geometry.
3) If there are no lone pairs around the central atom, then the molecular shape = e^- geometry
4) Lone pairs around the central atom will create variations to the molecular geometry.

Remember: e^- geometry determines bond angles

Compound	Lewis Structure	Electron Geometry	Molecular Shape	Bond Angle
PH_3				
CH_2O				