Name Mr. Shank

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Period AP 1, 2, 3

Lab 3 - Molecular Models

Construct a model of and complete the tables on for each molecule on the following pages.
Use the following guide in helping you determine the geometry of each molecule.

Electron Groups	Electron Group Geometry	Lone Pairs	Molecular Geometry	Bond Angles
2	linear	0	linear	180
3	trigonal planar	0	trigonal planar	120
3	trigonal planar	1	bent	< 120
4	tetrahedral	0	tetrahedral	109.5
4	tetrahedral	1	trigonal pyramidal	107.5
4	tetrahedral	2	bent	< 107.5
5	trigonal bipyramidal	0	trigonal bipyramidal	90, 120
5	trigonal bipyramidal	1	seesaw	< 90, <180, < 120
5	trigonal bipyramidal	2	T-shaped	90, 180
5	trigonal bipyramidal	3	linear	180
6	octahedral	0	octahedral	90
6	octahedral	1	square pyramidal	< 90
6	octahedral	2	square planar	90

Answer the following questions before you begin:

+3

1. VSEPR theory says that electrons in molecules try to be

   as close to other electrons as possible

   as far away from other electrons as possible

2. Which are more repulsive or 'bulkier'?

   lone pair electrons

   electrons in bonds

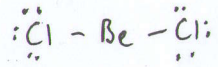
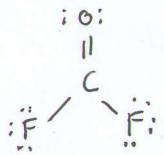
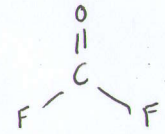
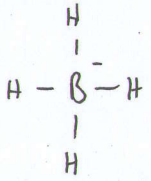
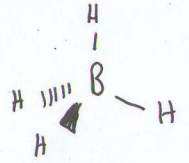
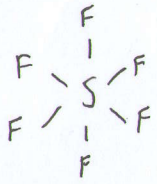
3. Atoms of elements can hold an 'expanded octet' of more than eight valence electrons if they have

   n > 2

   n < 3

Helpful Abbreviations:

lp = lone pair of electrons
bp = bonding pair of electrons

Molecule	Lewis Structure	Central Atom	Electron Groups	Lone Pairs	Geometry	3D Drawing	Bond Angle(s)
$BeCl_2$		Be	2	0	linear	Cl – Be – Cl	180°
F_2CO		C	3	0	trigonal planar		120°
BH_4^-		B	4	0	tetrahedral		109.5°
PF_5		P	5	0	trigonal bipyramidal		90° 120°
SF_6		S	6	0	octahedral		90°

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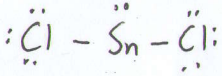
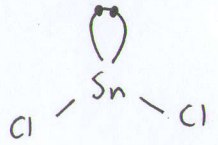
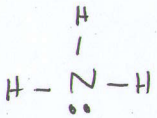
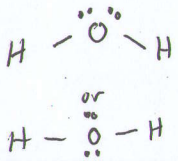
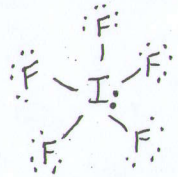
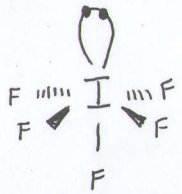
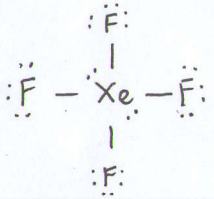
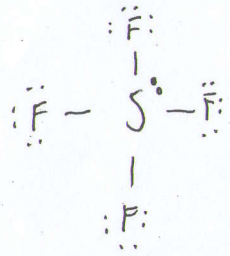
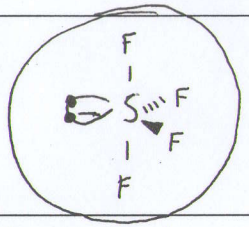
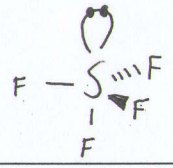
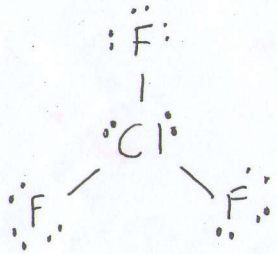
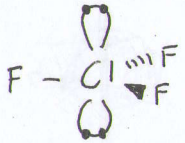
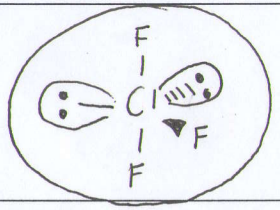
Molecule	Lewis Structure	Central Atom	Electron Groups	Lone Pairs	Geometry	3D Drawing	Bond Angle(s)
$SnCl_2$		Sn	3	1	bent (trigonal planar)		< 120°
NH_3		N	4	1	trigonal pyramidal		< 109.5°
H_2O		O	4	2	bent (tetrahedral)		< 109.5° (104.5°)
IF_5		I	6	1	square pyramidal		< 90°
XeF_4		Xe	6	2	square planar		90°

x35

For each of the compounds below, there are multiple ways in which to place the lone pair(s) of electrons. Complete the table by drawing all possible ways. For each compound, circle the molecule with the most likely placement of electrons. Only count interactions between electron groups that are 90° apart or less.

Compound and Lewis Structure	3D Drawings	lp-lp interactions	lp-bp interactions	bp-bp interactions
SF_4 		0	2	4
		0	3	3
ClF_3 		0	6	0
		1	3	2
		0	4	2

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