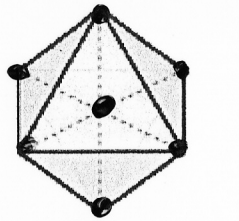
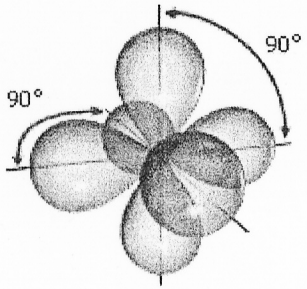
Molecular Geometry = Electron Pair Geometry, *ignoring lone pairs*

6

Octahedral

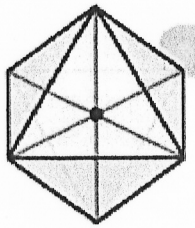


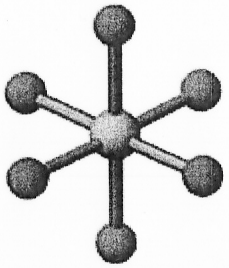


SIX ELECTRON PAIRS

Electron-Pair Geometry = octahedron

Octahedral



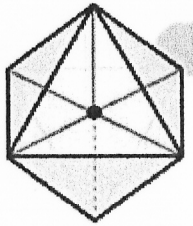


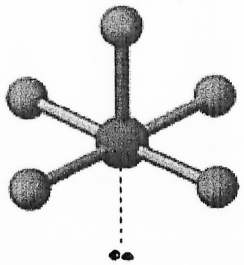
SF_6

6 bond pairs

No lone pairs

Square-pyramidal



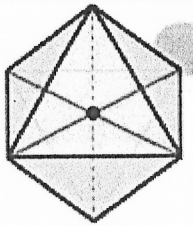


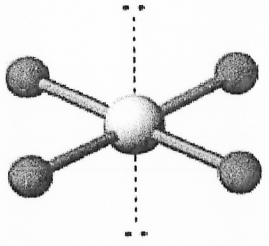
BrF_5

5 bond pairs

1 lone pair

Square-planar



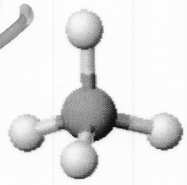


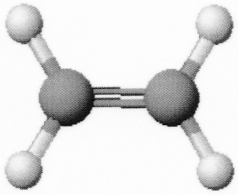
XeF_4

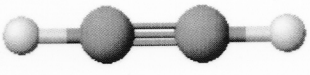
4 bond pairs

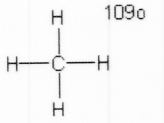
2 lone pairs

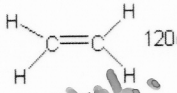
Methane

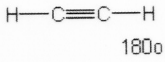




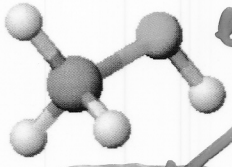


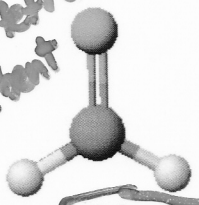




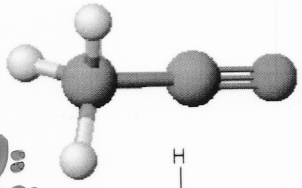


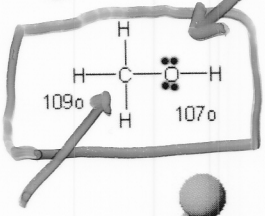
Methanol

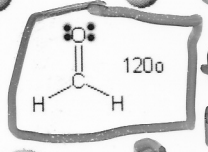




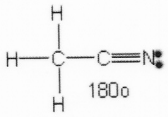
epg: tetrah.
mg: bent

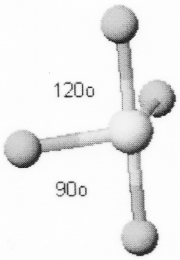




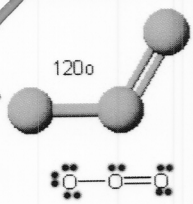


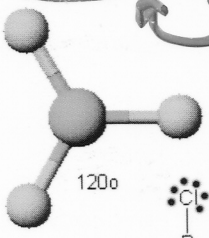
mg: epg: trig. planer

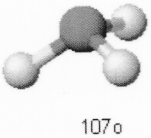


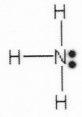


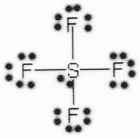
C
epg: tetrah.
mg: tetrah.

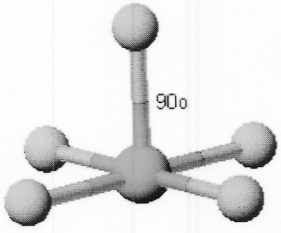


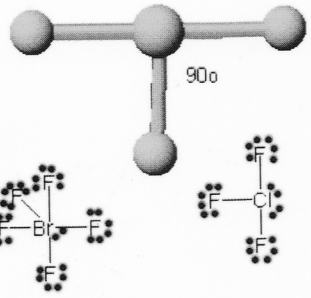


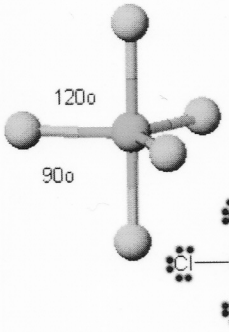


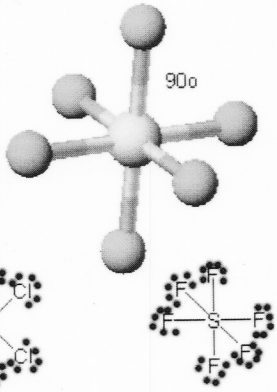


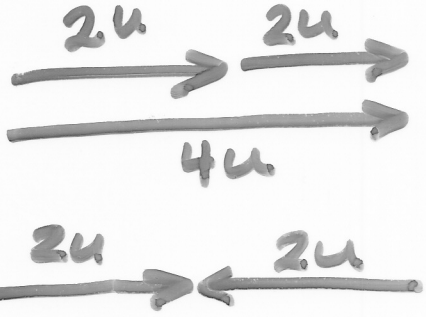








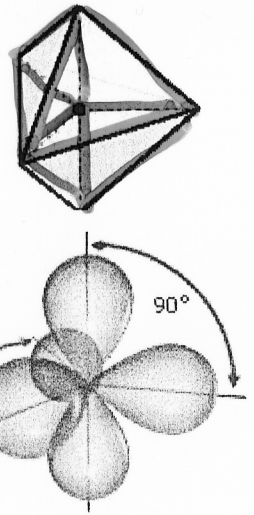




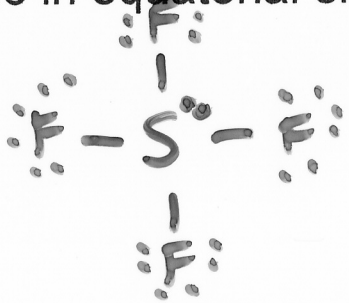
Molecular Geometry = Electron Pair Geometry, *ignoring lone pairs*

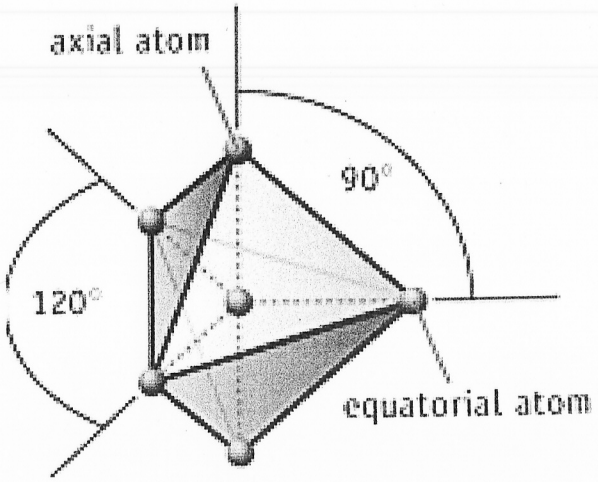
5

Trigonal-bipyramidal



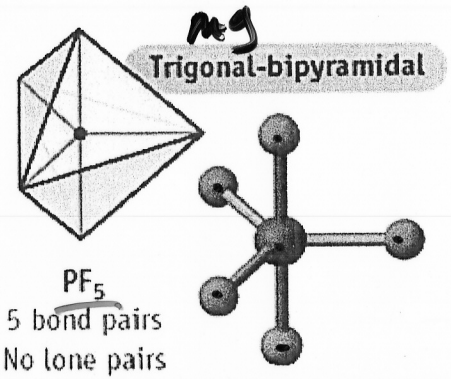
Lone pairs always go in equatorial sites





FIVE ELECTRON PAIRS

Electron-Pair Geometry = trigonal bipyramid

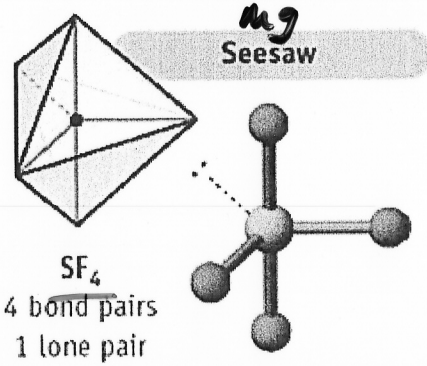


Trigonal-bipyramidal

PF_5

5 bond pairs

No lone pairs

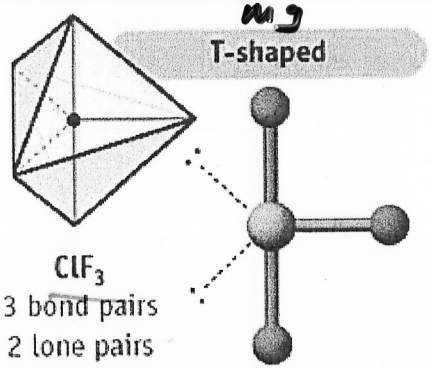


Seesaw

SF_4

4 bond pairs

1 lone pair

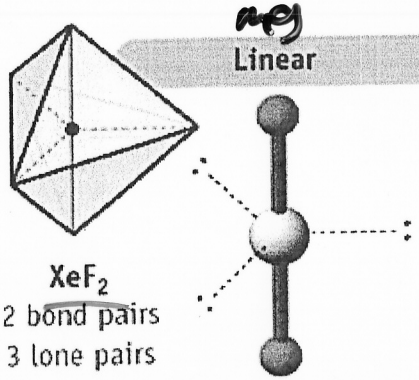


T-shaped

ClF_3

3 bond pairs

2 lone pairs



Linear

XeF_2

2 bond pairs

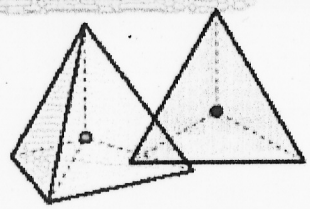
3 lone pairs

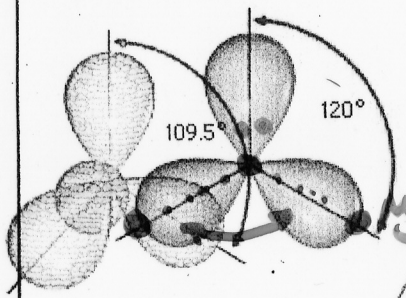
Molecular Geometry, Electron Pair Geometry, ring/lone pairs

4 3

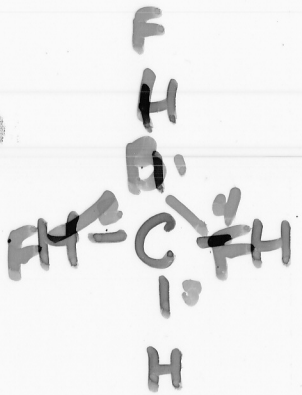
Trigonal-planar

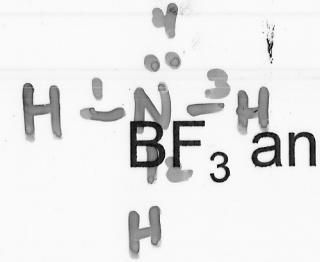
Tetrahedral

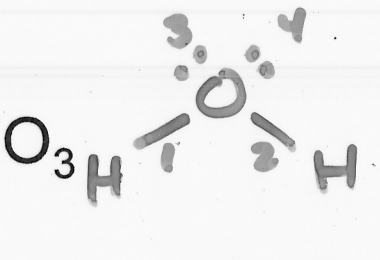




BF_3 and O_3



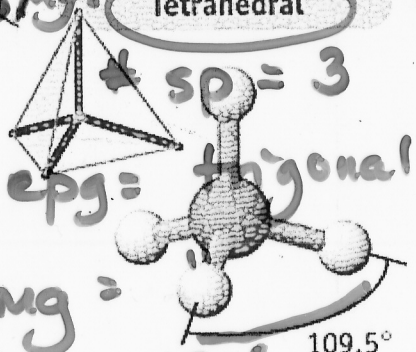




FOUR ELECTRON PAIRS

Electron Pair Geometry = tetrahedral

Tetrahedral

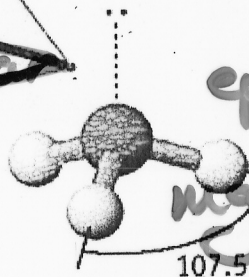


Methane, CH_4

4 bond pairs

no lone pairs

Trigonal-pyramidal

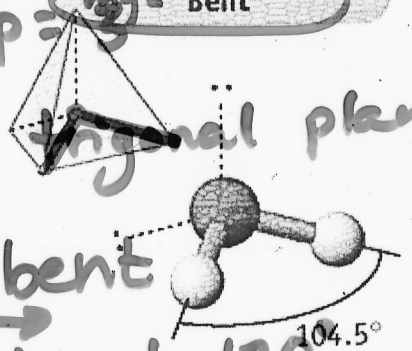


Ammonia, NH_3

3 bond pairs

1 lone pair

Bent



Water, H_2O

2 bond pairs

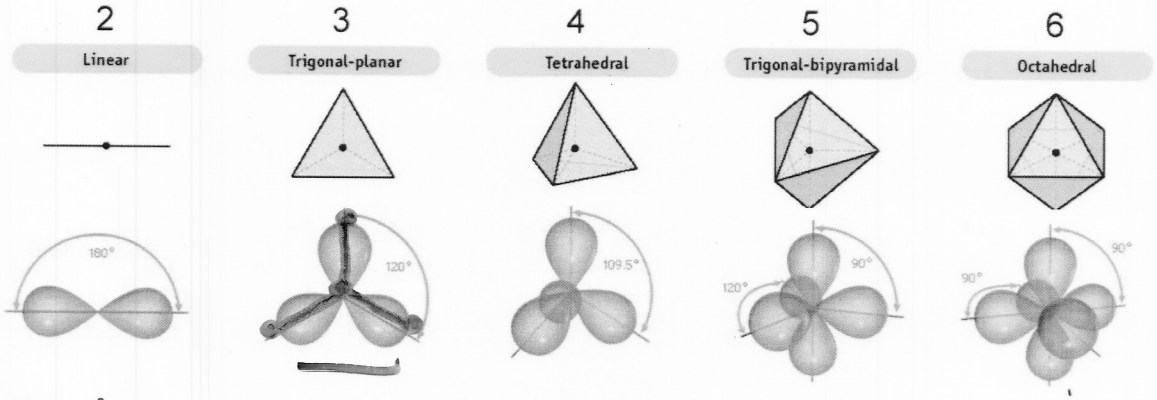
2 lone pairs

Molecular Structure

Ideal Electron Repulsion Shapes

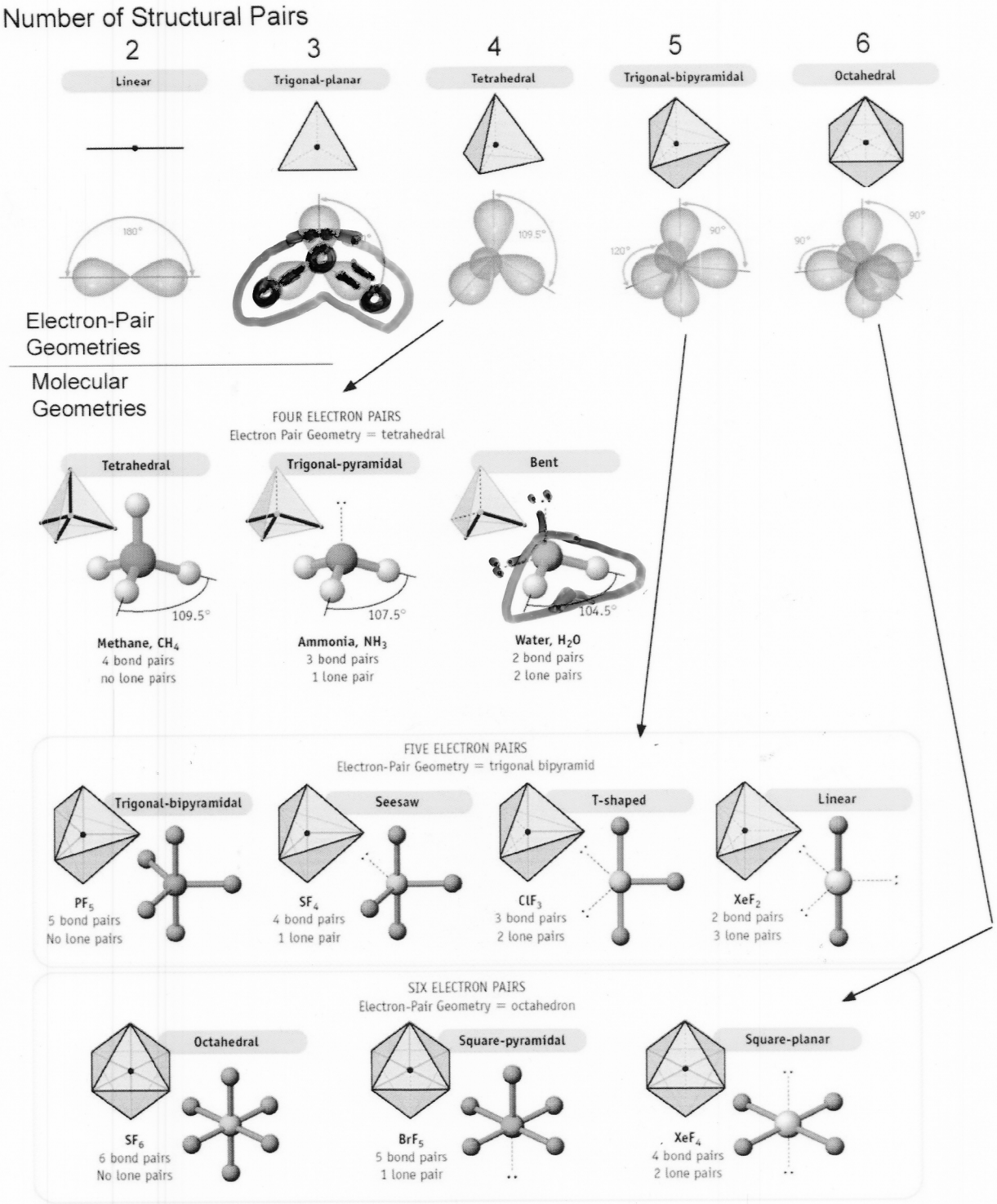
Number of Pairs*	Electron-Pair Geometry	Bond Angles
2	linear	180°
3	trigonal planar	120°
4	tetrahedral	109.5°
5	trigonal bipyramidal	90° and 120°
6	octahedral	90°

*Add number of lone pairs and bonded atoms

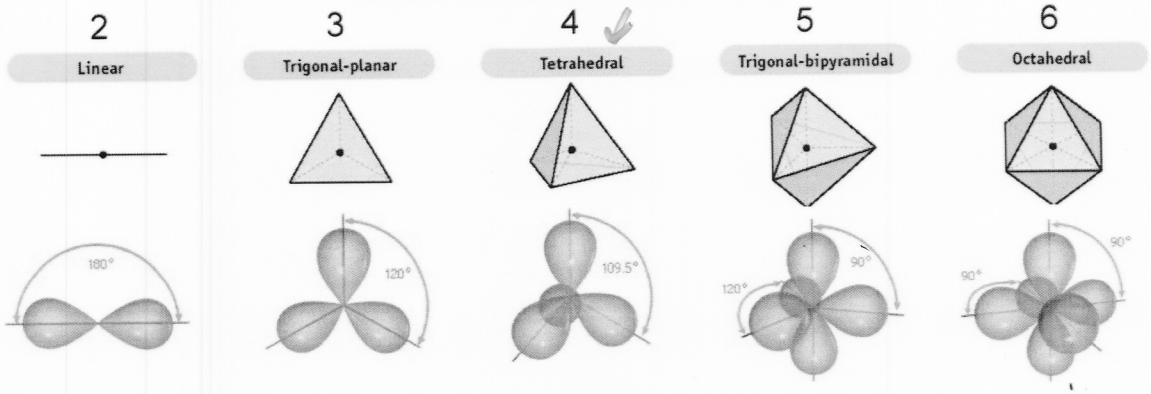


Structural pairs EPG MG

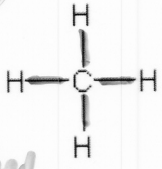
Number of Pairs	Electron-Pair Geometry	Molecular Geometry Number of Lone Pairs 0	1	2	3
2	Linear	Linear			
3	trigonal planar	trigonal planar	bent		
4	tetrahedral	tetrahedral	trigonal pyramidal	bent	
5	trigonal bipyramidal	trigonal bipyramidal	see-saw	T-shaped	Linear
6	octahedral	octahedral	square pyramidal	square planar	


Number of Structural Pairs
2
3
4
5
6
Linear
Trigonal-planar
Tetrahedral
Trigonal-bipyramidal
Octahedral
180°
109.5°
120°
90°
90°
Electron-Pair Geometries
Molecular Geometries
FOUR ELECTRON PAIRS
Electron Pair Geometry = tetrahedral
Tetrahedral
Trigonal-pyramidal
Bent
109.5°
107.5°
104.5°
Methane, CH4
4 bond pairs
no lone pairs
Ammonia, NH3
3 bond pairs
1 lone pair
Water, H2O
2 bond pairs
2 lone pairs
FIVE ELECTRON PAIRS
Electron-Pair Geometry = trigonal bipyramid
Trigonal-bipyramidal
Seesaw
T-shaped
Linear
PF5
5 bond pairs
No lone pairs
SF4
4 bond pairs
1 lone pair
ClF3
3 bond pairs
2 lone pairs
XeF2
2 bond pairs
3 lone pairs
SIX ELECTRON PAIRS
Electron-Pair Geometry = octahedron
Octahedral
Square-pyramidal
Square-planar
SF6
6 bond pairs
No lone pairs
BrF5
5 bond pairs
1 lone pair
XeF4
4 bond pairs
2 lone pairs

Electron Pair Geometry (EPG)

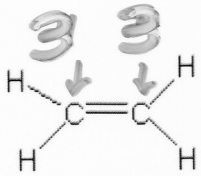


S.P. = 4

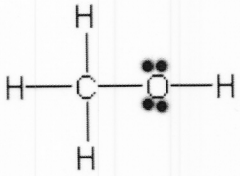


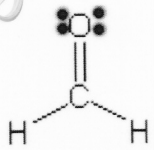
EPG = Tetrahedral

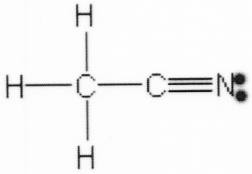
3 3

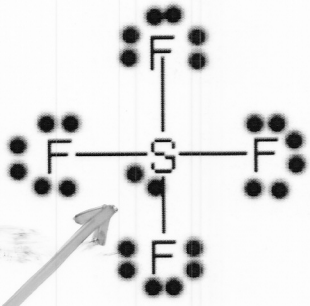


EPG = Trigonal planar



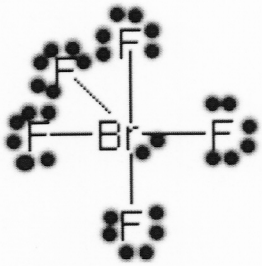


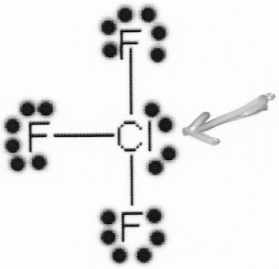




S.P. = 5

EPG = Trigonal Bipyramidal



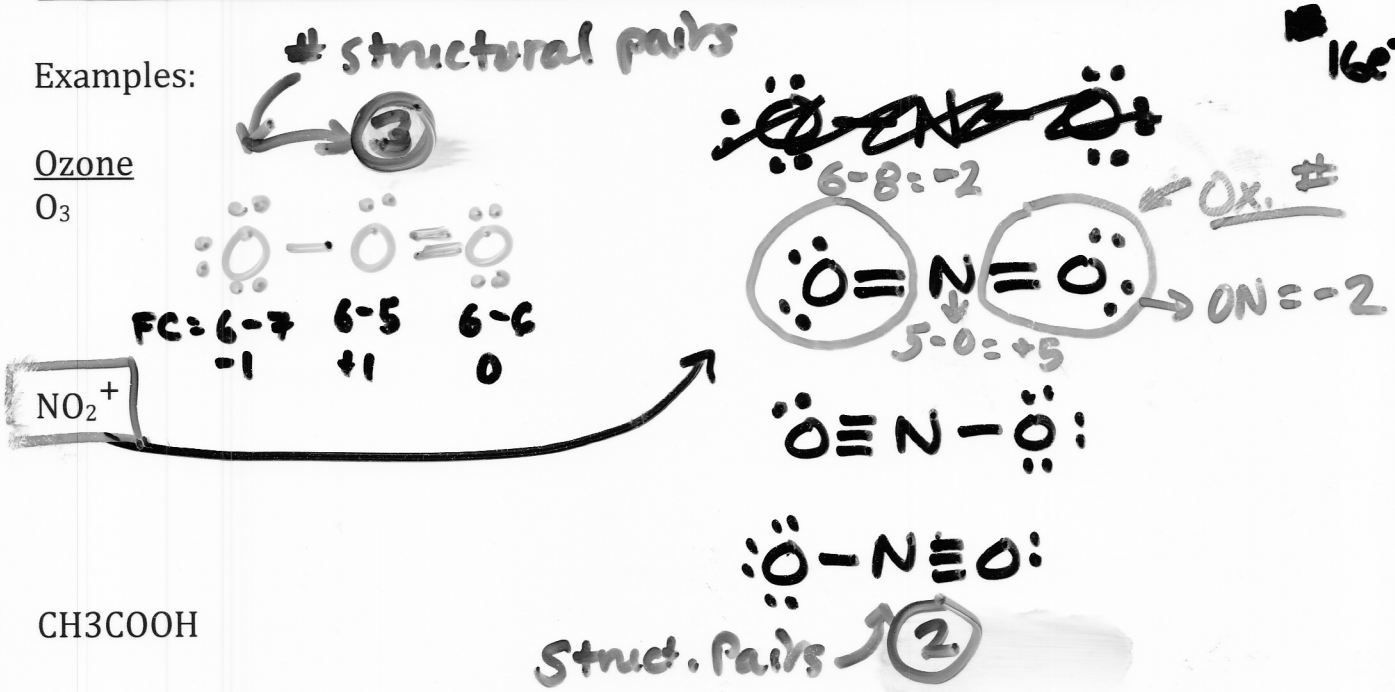


S.P. = 5

EPG = Trig. bipy.

- Formal charge (FC)
  - Electrons are shared evenly throughout molecule
  - Closer to "real" charge than oxidation number
  - Use to determine which nonequivalent resonance structure is more likely
- Oxidation Number
  - Bonding electrons "belong" to more electronegative atom
  - Quick and easy to determine without Lewis structure
  - Doesn't really reflect actual charges on atoms
  - Use to determine whether compounds are oxidized/reduced in chemical reactions
- Partial Charges
  - How electrons are really distributed in a molecule
  - Need computer to calculate
  - Used only when you need very accurate description- molecular modeling

Examples:



SCN⁻