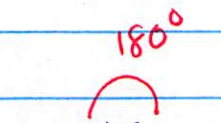
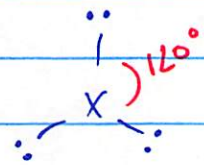
11/30/2018 VSEPR

2 repulsions



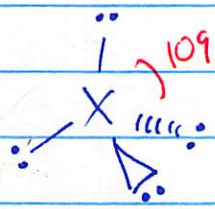
linear

3 repulsions



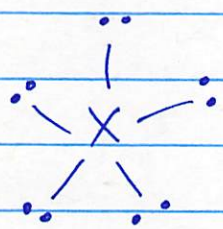
trigonal planar

4 repulsions

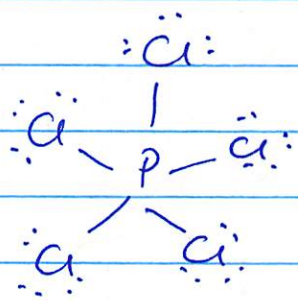


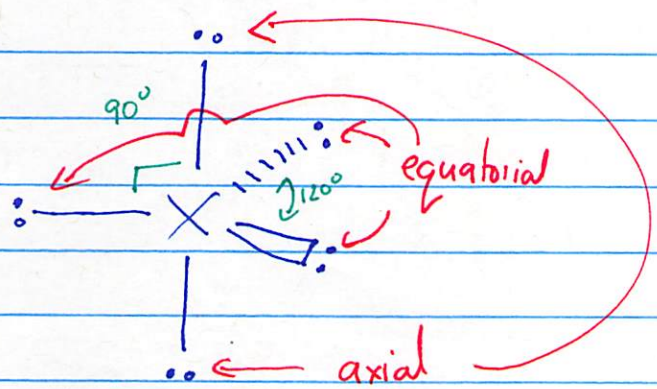
tetrahedral

5-repulsions

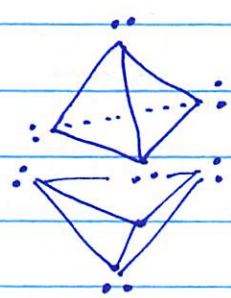


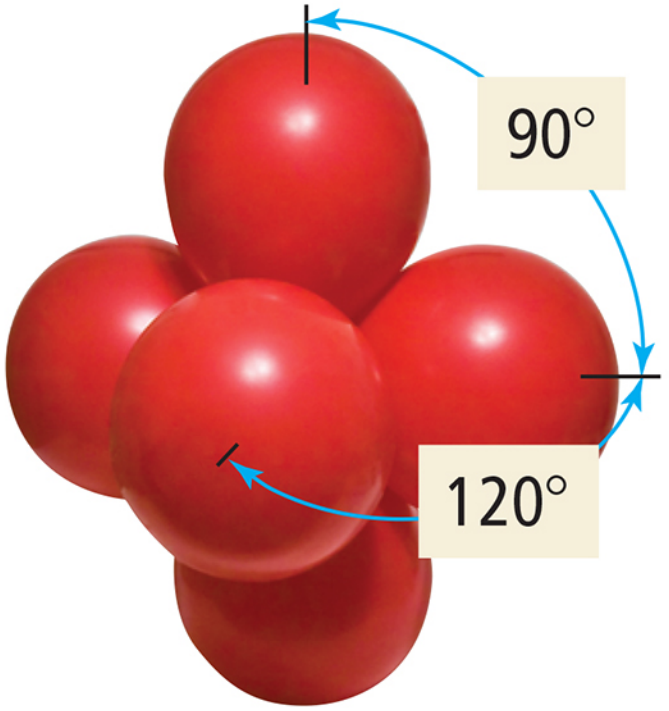
such as PCl_5

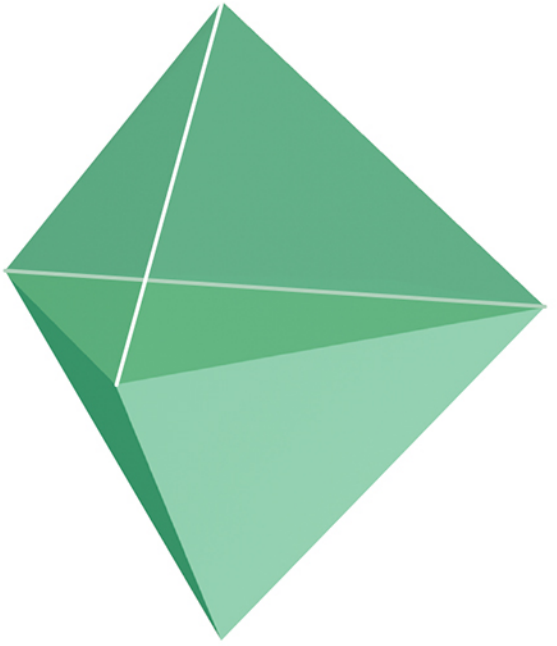




trigonal bipyramidal

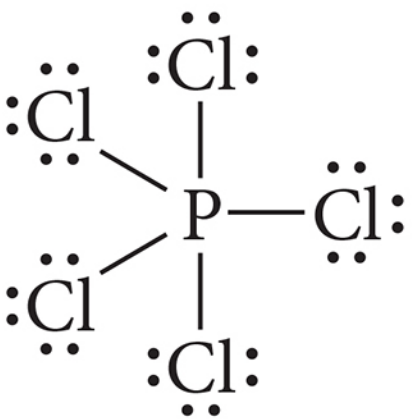


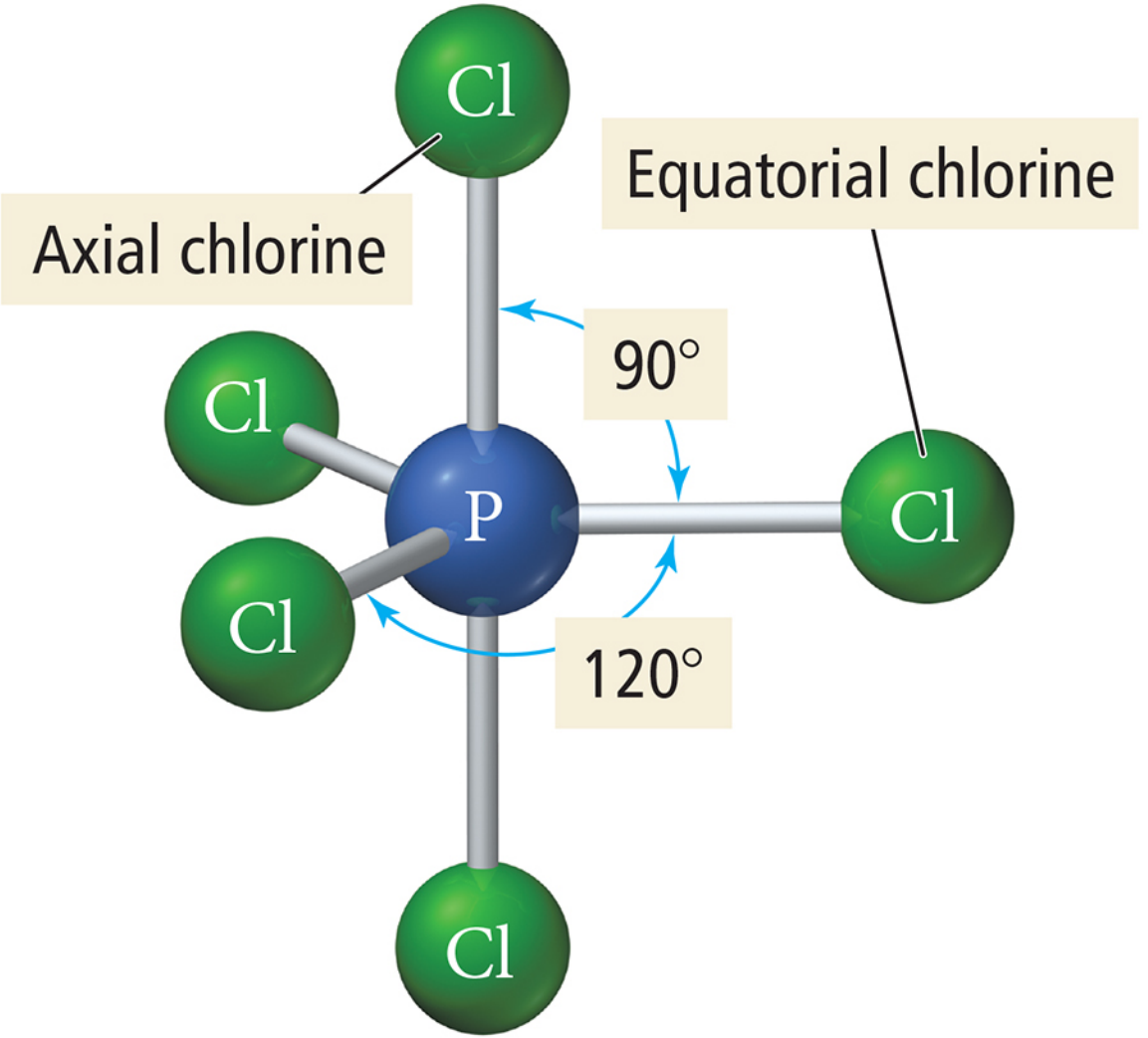




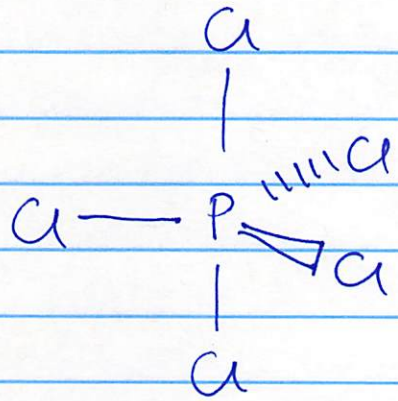
Trigonal bipyramidal geometry

Trigonal bipyramid

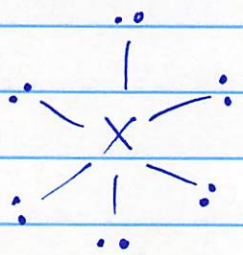




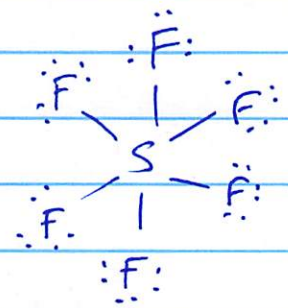
Trigonal bipyramidal geometry



6-repulsions

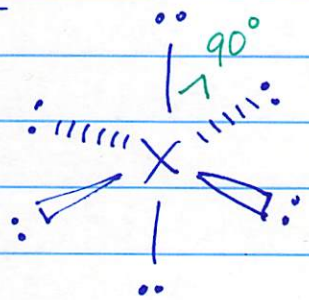


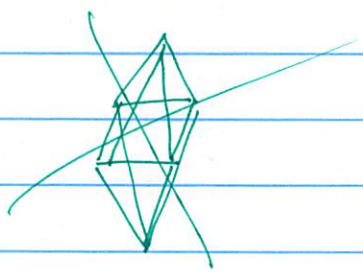
such as: SF_6

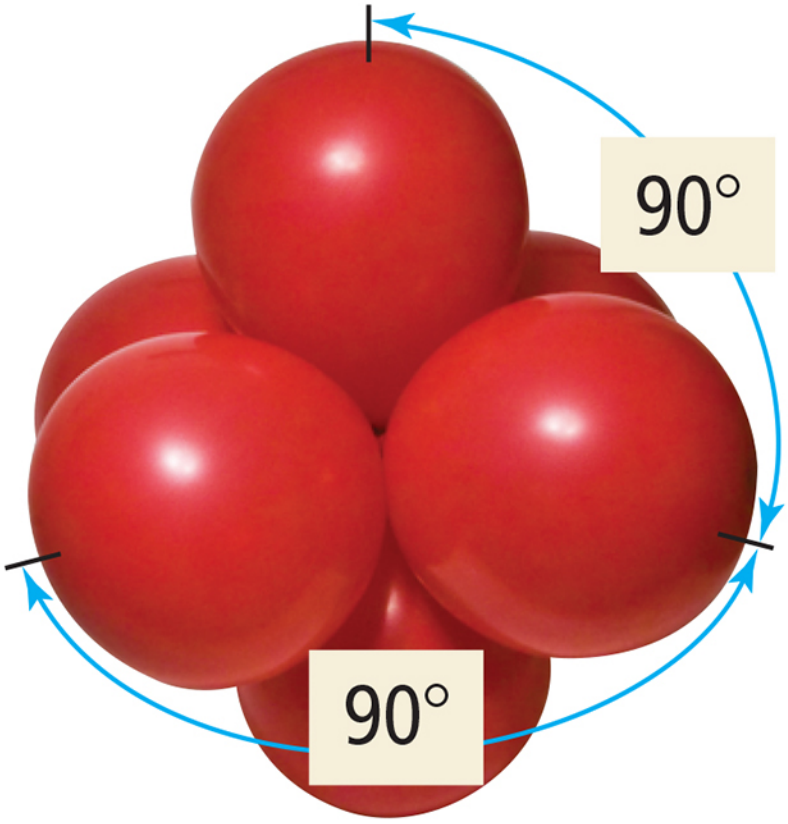


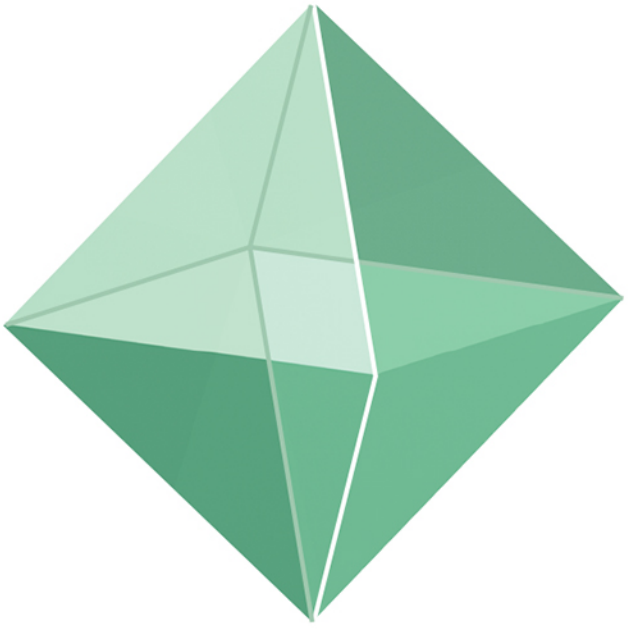
octahedral

cube



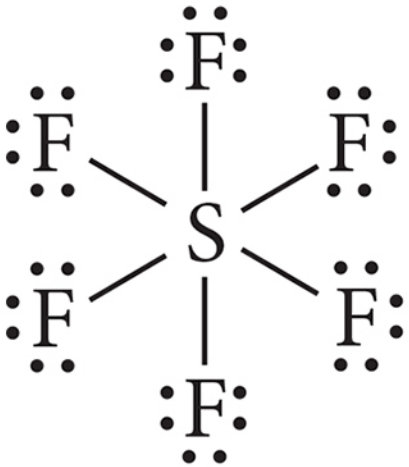


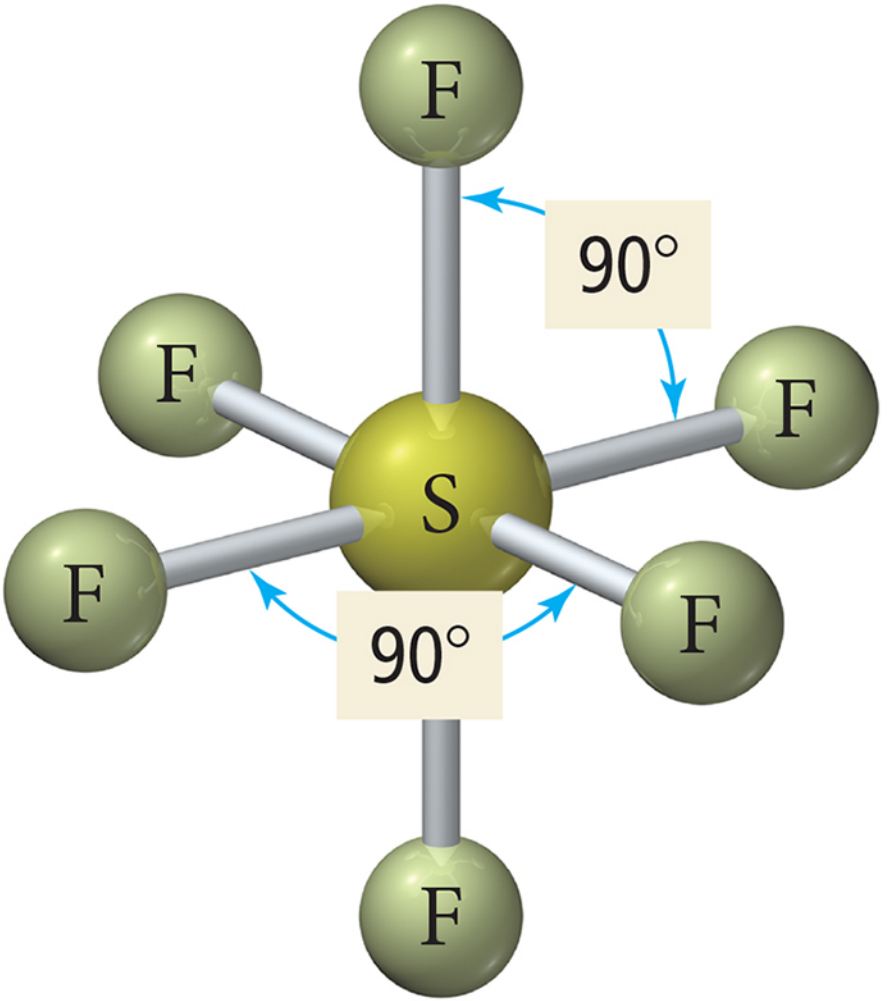




Octahedral geometry

Octahedron





Octahedral geometry

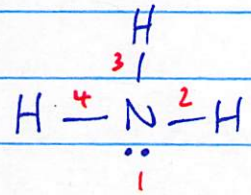
VSEPR

The affect of lp on shapes!

So far, we've only looked @ e^- geom (where e^-s are)
but, molecular geom is where the atoms are!

ex: NH_3

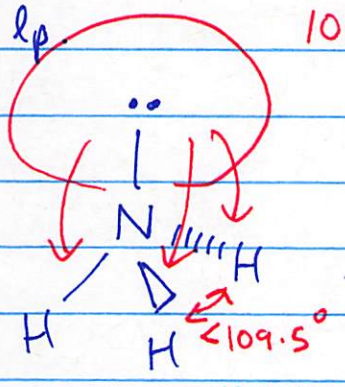
Lewis:



VSEPR:

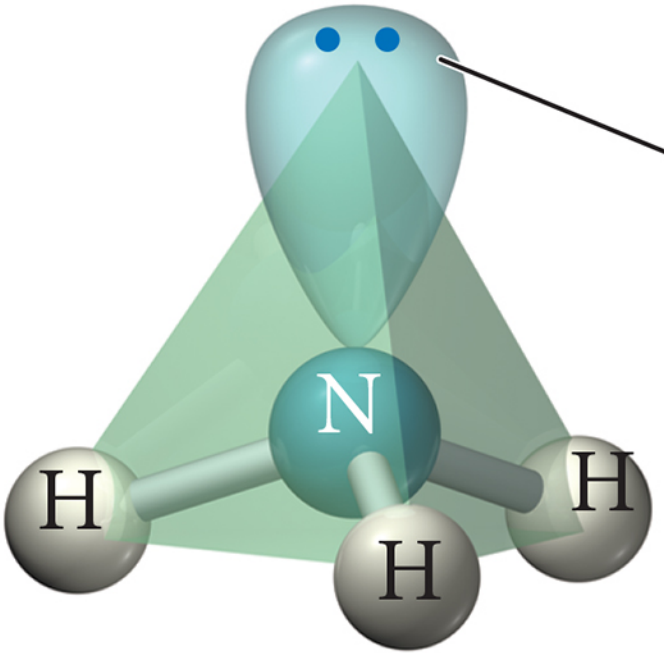
count - repulsions. 4 rnps
- any bond
- all lp

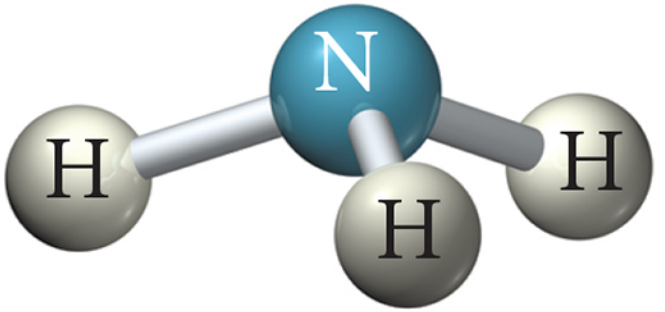
- tetrahedral arrangement } e^- geom.
109.5°



mol geom = trigonal pyramidal

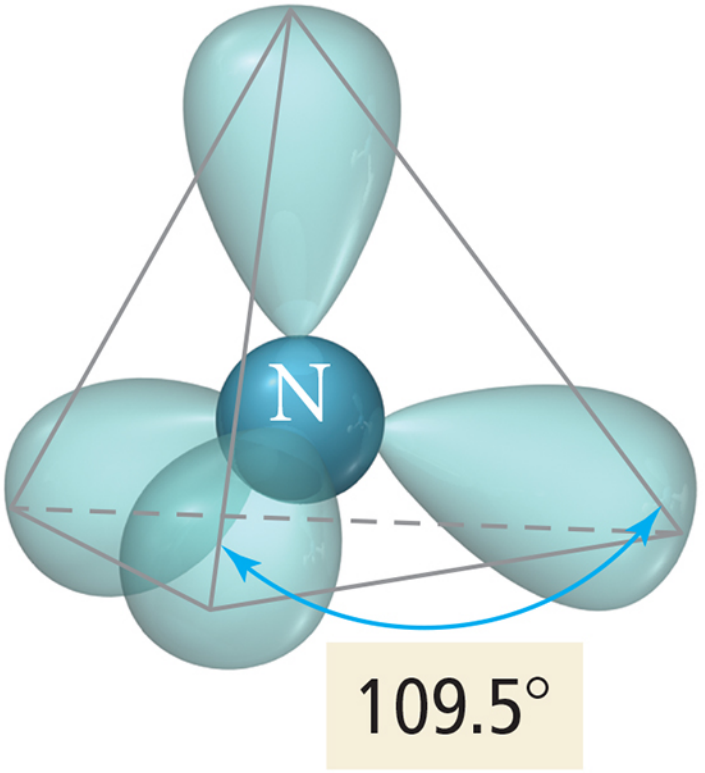
XPT: 107.0°



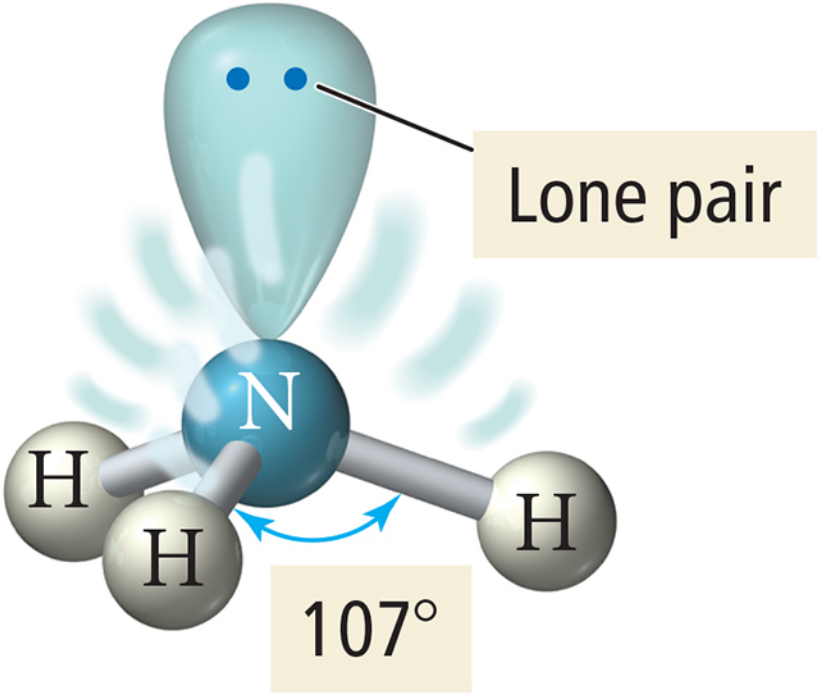


Electron geometry: tetrahedral

Molecular geometry: trigonal pyramidal

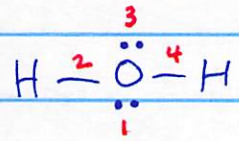


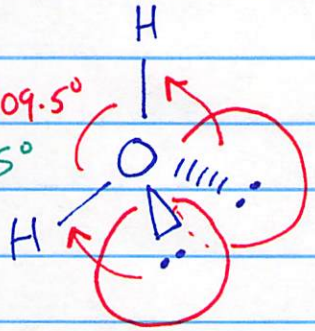
Ideal tetrahedral geometry



Actual molecular geometry

ex: H_2O

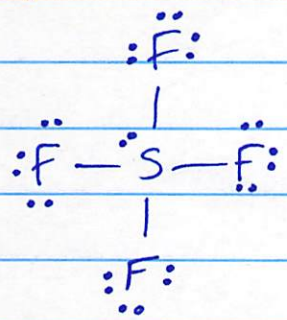
Lewis 

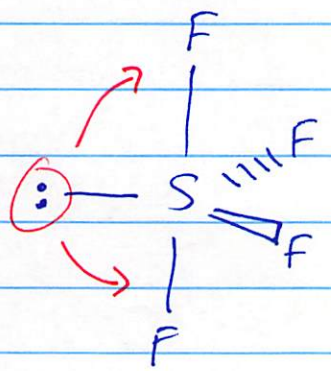
VSEPR: 

e^- geom = tetrahedral, 109.5°

mol. geom = Bent

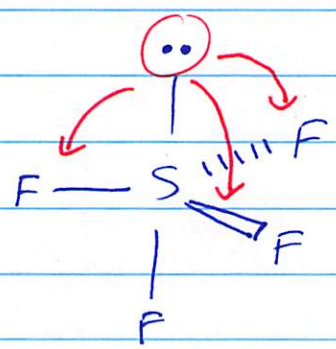
ex: SF_4

Lewis: 

VSEPR 

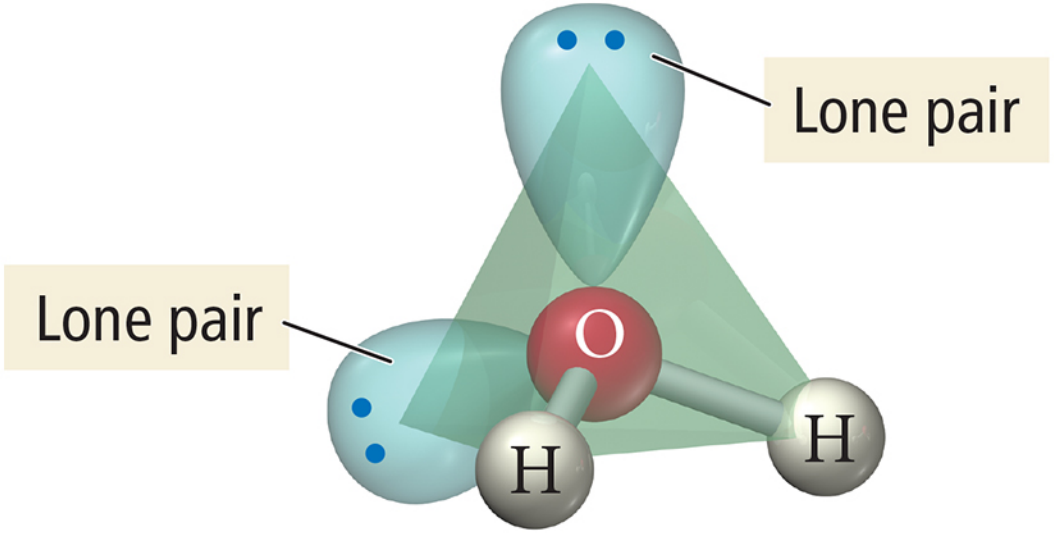
2 lp-bp
@ 90°

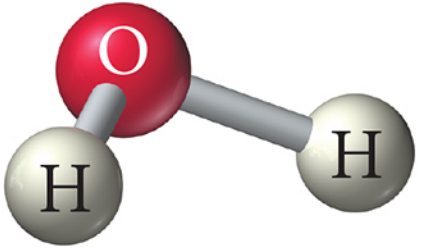
lowest E



3 lp-bp
@ 90°

higher E

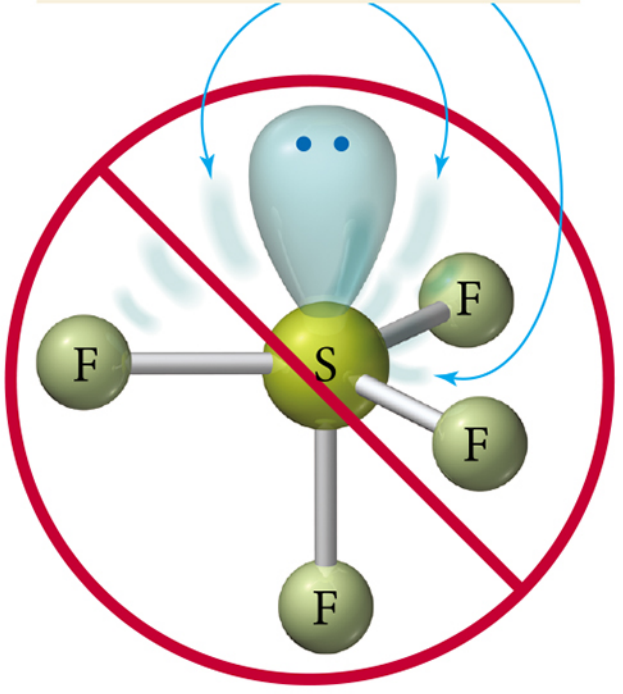




Electron geometry: tetrahedral

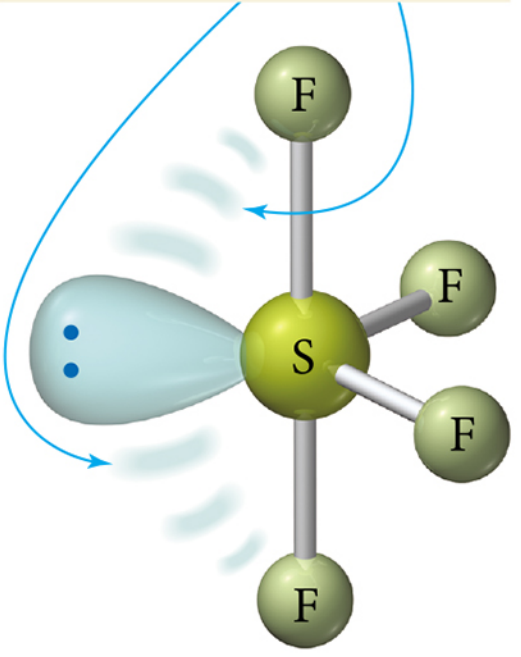
Molecular geometry: bent

Three 90° lone pair–bonding pair repulsions

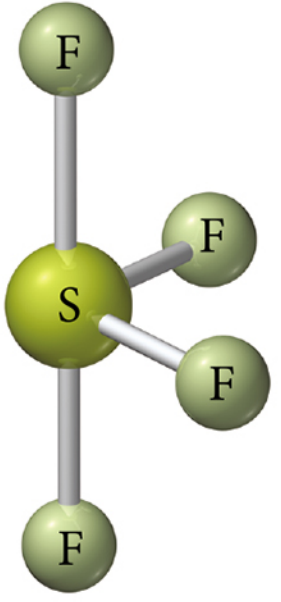


Axial lone pair
Does not occur

Two 90° lone pair–bonding pair repulsions

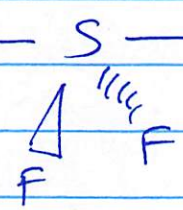


Equatorial lone pair



Molecular geometry: seesaw

or:



Mol. geom

See-Saw.

table 10-1

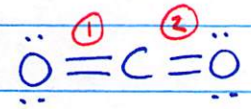
- lists all structures you need to know!

Molecular shape + polarity

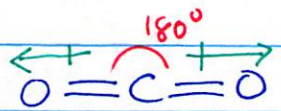
For molecules w/ >1 bond, we add up all the bond dipoles to get molecular (overall, total) dipole.

ex: CO_2

Lewis



VSEPR:

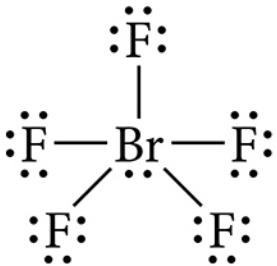


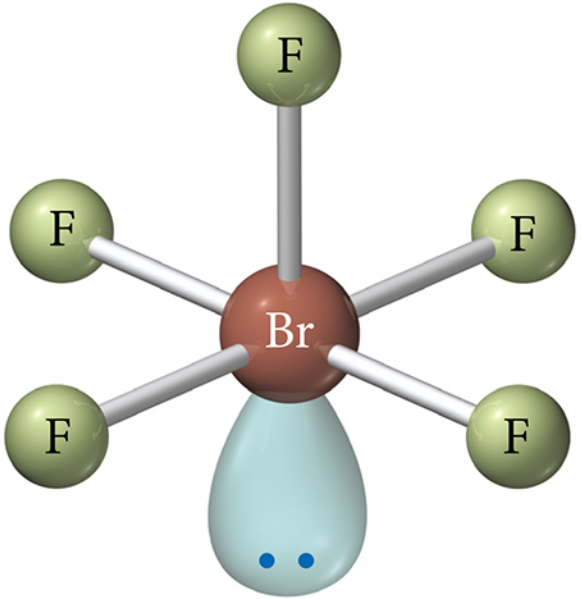
linear

overall:

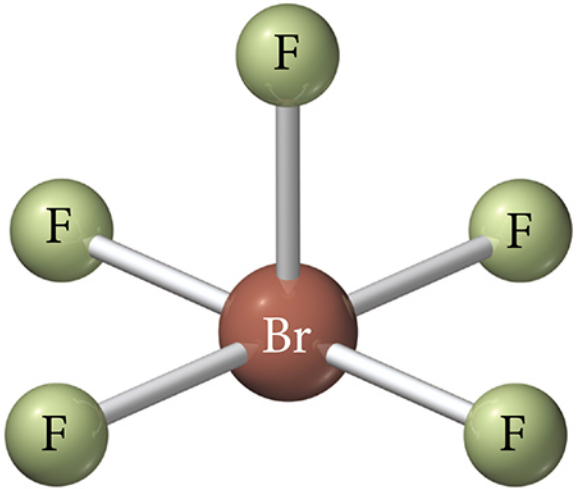
overall dipole = 0

⇒ non-polar.

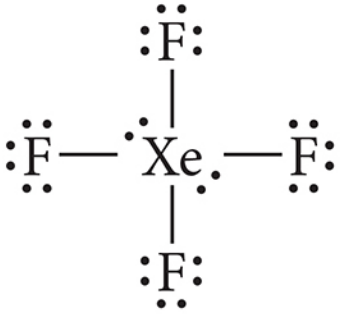


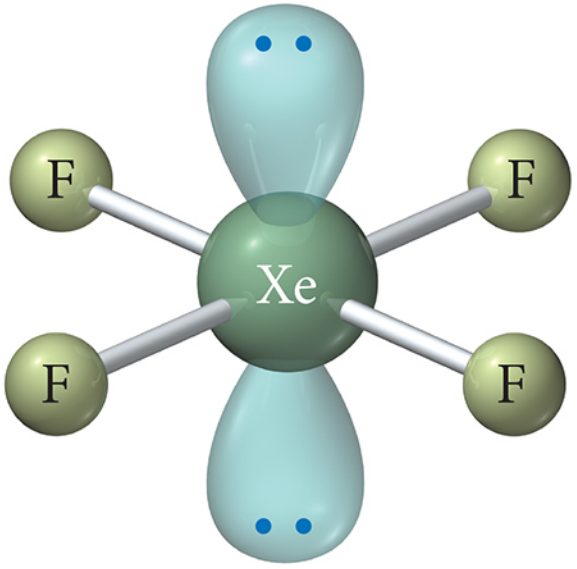


Electron geometry:
octahedral

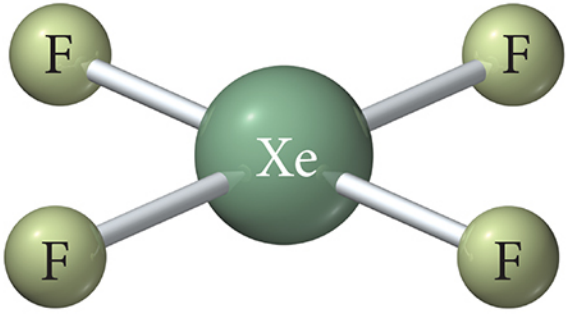


Molecular geometry:
square pyramidal



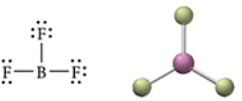
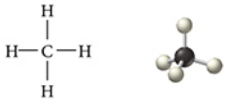
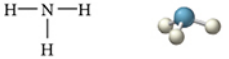
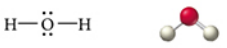
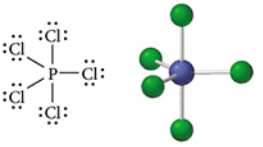
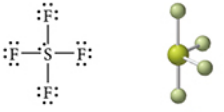
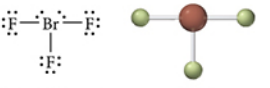
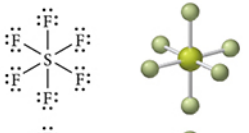
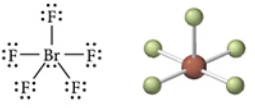
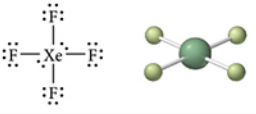


Electron geometry:
octahedral



Molecular geometry:
square planar

TABLE 10.1 Electron and Molecular Geometries

Electron Groups*	Bonding Groups	Lone Pairs	Electron Geometry	Molecular Geometry	Approximate Bond Angles	Example
2	2	0	Linear	Linear	180°	
3	3	0	Trigonal planar	Trigonal planar	120°	
3	2	1	Trigonal planar	Bent	<120°	
4	4	0	Tetrahedral	Tetrahedral	109.5°	
4	3	1	Tetrahedral	Trigonal pyramidal	<109.5°	
4	2	2	Tetrahedral	Bent	<109.5°	
5	5	0	Trigonal bipyramidal	Trigonal bipyramidal	120° (equatorial) 90° (axial)	
5	4	1	Trigonal bipyramidal	Seesaw	<120° (equatorial) <90° (axial)	
5	3	2	Trigonal bipyramidal	T-shaped	<90°	
5	2	3	Trigonal bipyramidal	Linear	180°	
6	6	0	Octahedral	Octahedral	90°	
6	5	1	Octahedral	Square pyramidal	<90°	
6	4	2	Octahedral	Square planar	90°	

*Count only electron groups around the central atom. Each of the following is considered one electron group: a lone pair, a single bond, a double bond, a triple bond, or a single electron.

No net dipole moment