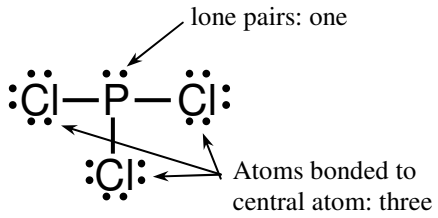
Molecular Shapes
Chem Worksheet 9-6

Name _____

The shape of a molecule is determined by the number of electron groups located around the central atom. Since electrons are negatively charged, one pair of electrons repels another pair of electrons. This repulsion causes molecules to take a shape with the maximum distance between electron pairs. The **VSEPR theory** states it this way: the best arrangement for a molecule is one that minimizes the electron pair repulsions.

To determine the shape of a molecule we examine the central atom. There are two questions we must answer. First, how many atoms are bonded to the central atom. In the example to the right there are three. Second, how many lone pairs are on the central atom. In this case there is one. Using this information and the table below, we can see that phosphorus trichloride has a trigonal pyramid shape.



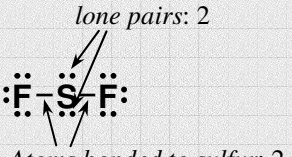
Some **Molecular Shapes**

Atoms bonded to central atom	lone pairs	shape	bond angle
2	0	linear	180º
3	0	trigonal planar	120º
4	0	tetrahedral	109.5º
3	1	trigonal pyramid	109.5º
2	2	bent	109.5º
5	0	trigonal bipyramid	120º, 90º
6	0	octahedral	90º

example

Draw the Lewis structure and give the molecular shape for sulfur difluoride, SF_2.

- draw the Lewis structure : val. e^- : 6 + 2(7) = 20
- count atoms bonded to central atom and lone pairs on central atom:
- use table above to determine molecular shape:



BENT

Draw a Lewis structure for the following. Give the name of the molecular shape.

1. nitrogen triiodide, NI_3
2. silane, SiH_4
3. hydrogen sulfide, H_2S
4. arsenic pentachloride, $AsCl_5$
5. phosphorus tribromide, PBr_3
6. hexafluoro antimonite anion, SbF_6^-
7. sulfur trioxide, SO_3
8. hydrogen cyanide, HCN
9. carbon tetrachloride, CCl_4
10. sulfur hexafluoride, SF_6
11. beryllium chloride, $BeCl_2$
12. chloric acid, $HClO_3$
13. arsenic pentafluoride, AsF_5
14. phosphate ion, PO_4^{3-}
15. oxygen dichloride, OCl_2
16. nitryl fluoride, NO_2F (N is central atom)