VSEPR

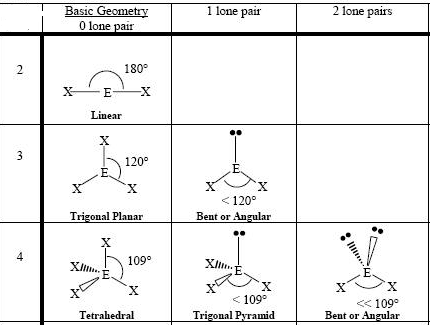
(Valence Shell Electron Pair Repulsion Theory)

Lewis structures look at molecules in a two dimensional way; however molecules are NOT two dimensional. Many of the properties of molecular compounds depend on the three dimensional shape of the molecule. The shape of a molecule is predicted by using the VSEPR theory:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the electrostatic repulsion between the valence level electron pairs surrounding an atom causes these pairs to be oriented as far apart as possible.

To use VSEPR theory:

1. Draw the lewis structure for the molecule.
2. Determine the areas of electron density
3. Of the areas of electron density, determine the number of lone pairs on the central atom.



Areas of

electron density

What do lone pairs of electrons on the central atom do to the bonds?

|  |  |  |
| --- | --- | --- |
| Number of Links on Central Atom | Number of Lone Pairs  **on Central Atom** | Shape of Molecule |
| 2 | 0 | Linear |
| 3 | 0 | Trigonal Planar |
| 2 | 1 | Bent |
| 2 | 2 | Bent |
| 4 | 0 | Tetrahedral |
| 3 | 1 | Trigonal Pyramidal |

*Determine the lewis structure and the VSEPR shape of the following:*

1. **PH3**  Lewis Structure

|  |  |  |
| --- | --- | --- |
| N |  |  |
| A |  |  |
| S |  |  | bonds |
| L |  |  | Lone Pairs |

Shape:

**2. CCl4** Lewis Structure

|  |  |  |
| --- | --- | --- |
| N |  |  |
| A |  |  |
| S |  |  | bonds |
| L |  |  | Lone Pairs |

Shape:

**3. ClO2-1** Lewis Structure

|  |  |  |
| --- | --- | --- |
| N |  |  |
| A |  |  |
| S |  |  | bonds |
| L |  |  | Lone Pairs |

Shape:

**Homework: VSEPR and Molecular Geometry**

*NASL, Draw the Lewis Structure for each compound or ion, and give its shape for the following below:*

|  |  |
| --- | --- |
| 1. Br2  Shape: | 5. SO3  Shape: |
| 2. CS2  Shape: | 6. SF2  Shape: |
| 3. FO3-  Shape: | 7. HF  Shape: |
| 4. SiH4  Shape: | 8. H2CO  Shape: |