***Molecular Models and Shapes of Molecules***

Purpose and Procedure

For each molecule that you build you will do the following:

* Write the Lewis structure
* Use the number of bonds and lone pairs to determine the shape and use the modeling software at molview.org to measure all bond angles. For molecules with more than one central atom, identify the shape and bond angle around each central atom individually.
* Identify if the molecule is polar or non-polar covalent.

Using the Modeling Kits

Black = C; Red = O; White = H; Green = any halogen; Yellow = S; Blue = N

Shorter connectors are for single bonds; longer connectors can be bent making them suitable for double or triple bonds.

Use the following table to help you identify the shapes of each molecule in levels 1 and 2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Bonds** |  | **Lone Pairs** | **Angle (o)** | **Shape** | **3D** |
| **12** | C6H6 |  |  |  |  |
| **7** | C2H6 |  |  |  |  |
| **7** | CO(NH2)2 |  |  |  |  |
| **5** | C2H2Cl2  C2H4 | **6**  **0** |  |  |  |
| 4 | CH4  CCl4  CCl2F2 | 0 | 109.5 | Tetrahedral | Image result for tetrahedral |
| 3 | NH3 | 1 | 106 | Pyramidal |  |
| 3 | H2O2 | 4 |  |  |  |
| 2 | H2O  H2S | 2 | 104(H2O)  93.4(H2S) | Bent/Angular |  |
| 3 |  | 0 |  | Trigonal Planar |  |
| 2 |  | 1 |  | Non-linear |  |
| 2 | HCN  CO2 | 0 |  | Linear |  |

Molecules

*Level 1* – NH3; CH4; CCl­4; CCl2F2; C2H2Cl2;  H2O;  H2S; H2O2; C2H6;  C2H4

*Level 2* – HCN; CO2:  CO(NH2)2;  C6H6

Use the following table to help you identify the shapes for Level 3. This is an additional challenge if you’d like to try it out. Themore shapes you know, the more possibilities you have for molecular self-assembly.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Bonds | Lone Pairs | Angle (o) | Shape | 3D |
| 5 | 0 |  | Trigonal bipyramidal |  |
| 4 | 1 |  | “Saw Horse” |  |
| 3 | 2 |  | T-shaped |  |
| 2 | 3 |  | Linear |  |
| 6 | 0 |  | Octahedral |  |
| 5 | 1 |  | Square pyramidal | Image result for square pyramidal shape |
| 4 | 2 |  | Square planar |  |

*Level 3* – SO2; NH4+; PF5; SF4; ICl3; XeF2; SCl6; BrF5; XeF4; PO43-;

HCO3-; ClF3; SCN-; H3O+;

HL: You may need to go online and use the PhET simulation for molecular modeling in order to build some of the molecules/ions in Level 3.