Molecular Geometry Model Lab; SC1d, SC3e

Introduction: Explaining the shapes of molecules is important in understanding how molecules react. The valence shell electron pair repulsion (VSEPR) model is based on the premise that in order to attain the lowest energy scenario, electron pairs around the central atom will position themselves to allow for maximum separation. The purpose of this lab is to construct a series of compounds using the VSEPR model and to use your model to determine the type of bonding and the geometry around each central atom. During this lab you will 1). Construct a series of compounds, using the VSEPR model, 2). Relate each constructed model to the electron dot structure around the central atom, 3). Describe and name the molecular geometry of each model. 4). Work to complete a table that details the intermolecular forces between different compounds.

Procedure: 1). For each of the molecules or ions, determine the number of lone pairs and bonded pairs around the central atom by drawing the Lewis Dot Structure. Remember that double and triple bonds count as one effective pair (or cloud) each around the central atom. 2). Build a model for each compound or ion using the Molymod sets. Arrange the atoms to maximize the distance between all the electron pairs. Remember that lone pair electrons cause more repulsion than electrons between atoms. 3). Describe the structure you have created based on your "shape sheet". 4). Estimate the angle between the atoms attached to the central atom.

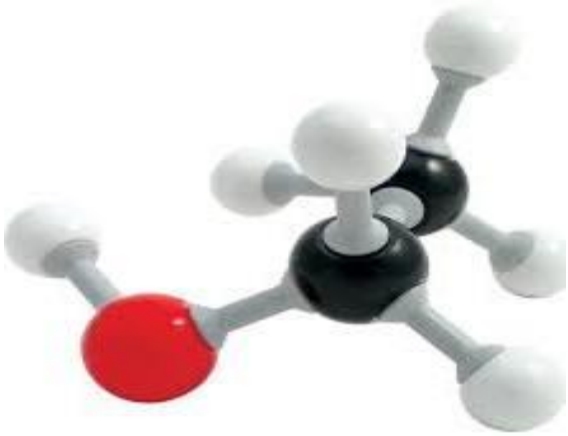
Molymod Instructions:

1). Please do not open bags that contain items that will not be utilized during this lab.

2). Make sure that you read the table to the right to determine the color scheme for various elements and bond types. Note that elements may vary in the number of holes they have depending on the bond types.

3). It is imperative that you do not misplace any of these contents. Make sure to check the floors and sinks to ensure all materials are returned upon completion of the lab.

4). The medium grey links are single covalent bonds. The long, flexible grey links are used for double or triple bonds. You will not be using the purple bonds during this lab.



Qty.	Element	Colour	Holes
6	Carbon (C)	Black	4
14	Hydrogen (H)	White	1
1	Boron (B)	Beige	3
1	Nitrogen (N)	Blue	3
2	Nitrogen (N)	Blue	4
6	Oxygen (O)	Red	2
1	Oxygen (O)	Red	4
1	Sulphur (S)	Yellow	2
1	Sulphur (S)	Yellow	6
1	Phosphorus (P)	Purple	5
1	Phosphorus (P)	Purple	3
6	Halogen (Cl,F)	Green	1
2	Metal (Na)	Grey	1
2	Metal (Ca,Mg)	Grey	2
1	Metal (Be)	Grey	2
1	Metal (Al)	Grey	3
1	Metal (Si, Cu)	Grey	4
1	Metal	Grey	6
1	** sp3	Beige	4
1	** dsp3	Beige	5
1	** d2sp3	Beige	6
3	Lone pair electron cloud		
Qty.	**Links**		
20	Medium	Grey	
12	Long flex.	Grey	
5	Medium	Purple	

Molecular Geometry Model Lab; SC1d, SC3e **Name**_____

Purpose: to construct a series of compounds using the VSEPR model and to use your model to determine the type of bonding and the geometry around each central atom.

Data Table: Molecular Geometry of Molecules and Ions
***Remember that when counting effective pairs around the central atom, single, double, and triple bonds count as one each. (Example: A central atom that has one triple bond and one single bond would have a total of 2 effective pairs.)

Molecule or Ion	Number of lone pairs on central atom	Total number of effective pairs around central atom	Arrangement of electrons based on number of effective pairs	Angle between bonds around central atom	Geometry (shape) of molecule
HCN					
CO_2					
H_2O					
NH_3					
O_3					
CCl_4					
PH_3					
NO_3^-					
SO_2					
NH_4^+					

Intermolecular Forces (Podcast Bonding 8-9)

Substance #1	**Predominant Intermolecular Force**	**Substance #2**	**Predominant Intermolecular Force**	**Substance with Higher Boiling Point**
(a) HCl(g)		I_2		
(b) CH_3F		CH_3OH		
(c) H_2O		H_2S		
(d) SiO_2		SO_2		
(e) Fe		Kr		
(f) CH_3OH		CuO		
(g) NH_3		CH_4		

Draw the Lewis dot structures in the spaces provided. Additionally, you may choose to place each built model into the spaces provided, or create your own table and then take a picture to insert into your final lab report.

HCN	CO_2
H_2O	NH_3
O_3	CCl_4
PH_3	NO_3^-
SO_2	NH_4^+