Name: _____

Period:_____

Molecular Modeling Activity

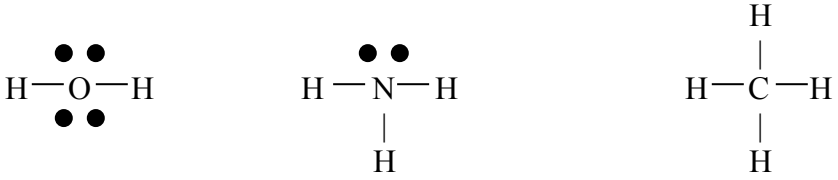
Essential question: Does the electrons in a molecule have any effect on the over all shape of the molecule?

Introduction:

A molecule can be represented on paper by either a formula or a dot structure. A molecular formula indicates the number and kind of each atom present in a molecule. Some molecular formula's are:

H_2O NH_3 CH_4

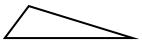
These molecular formulas do not provide any information concerning the actual arrangement of the atoms in a molecule. Such information is given by (Lewis) dot structures, such as the following



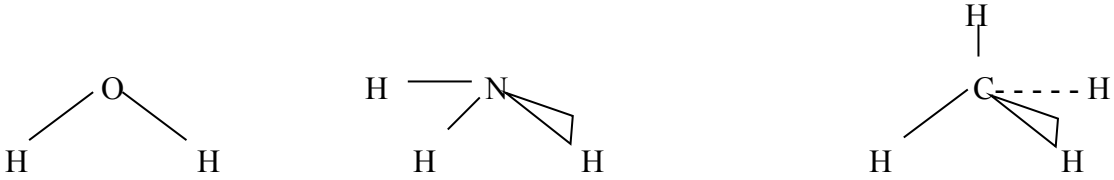
These dot structures are two-dimensional. The angles shown are not true to the shape of the molecule. Dot structures can be made to convey more information by using the following symbolism.

_____ For a bond in the plane of the paper

--------- For a bond below the plane of the paper (going into the paper)

 For a bond above the plane of the paper (coming out of the paper)

Using this symbolism, the structural formulas shown above can be redrawn in the following fashion.



In this experiment, you will construct three dimensional models to help you visualize shapes of molecules. You will use ball and stick model kits, in which painted plastic balls represent atoms and short plastic sticks represent the bonds. Double and triple bonds are represented by the bendable sticks. The wooden balls are drilled with holes to accept the sticks. The number of holes in the ball represents the maximum number of bonds that a given atom can have. The balls are also color coded so that elements of different groups can be distinguished.

Objective:

1. Determine the correct Lewis structures and number of valence electrons.
2. To construct molecular models, using a ball and stick model set.

Procedure:

1. Construct the following 14 compounds:

1. H_2O	5. NH_3	9. CH_4	12. C_2H_6
2. H_2S	6. CCl_4	10. CCl_2F_2	13. $CO(NH_2)_2$
3. O_2	7. CO_2	11. N_2	14. F_2
4. Cl_2	8. Br_2		

2. As you build the models, draw structural formulas of the molecules you study using the symbolism discussed in the introduction. **Include the Lewis dot structure for each atom, Lewis structure of the molecule, number of valence electrons in the atom, the 3D structure, and the VSEPR shapes.**
3. Once you are completed the charts below except for VSEPR see me to get it checked off before you start the box titled VSEPR theory.
4. After getting your table checked off use the chart on the 4th page of your packet to determine the correct VSEPR. **IT MAY BE HELPFUL TO USE THE MODEL KITS TO VISUALIZE THE 3D STRUCTURE.**
5. Once the chart below is completed answer the analysis questions.

Data:

Lewis Dot Structure for each atom	Lewis structure of the molecule	# of val. e- in the atom. (does the # number of val. e- = the # of val. e- in the Lewis structure)	3D structure using correct symbolism	VSEPR Shapes (the name, not a drawing)
1				
2				
3				
4				
5				

6				
7				
8				
9				
10				
11				

12				
13				
14				

Analysis Questions:

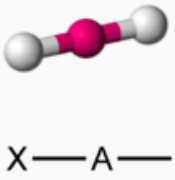
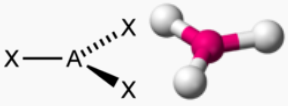
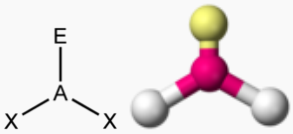
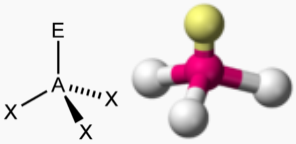
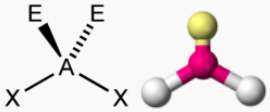
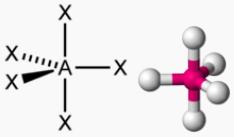
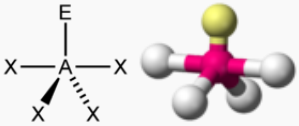
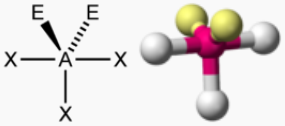
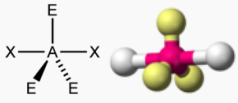
1. Explain how the VSEPR theory can be used to predict the shapes of molecules? (Use the following words, electrons, 3D, and repulsion)

2. How do electrons help determine the 3D shape of a chemical?

Valence shell electron pair repulsion (VSEPR) theory

A system used by chemists to explain and predict the 3D shape of molecules based on several important rules or guidelines. Your task is to build the molecules on your chart using a model kit, determine their shape and tell me why they are that shape (think about electrons). Use the chart below to help you determine the shape of the each molecule.

A= element 1, X= element 2, E= lone pairs of electrons

Steric No.	Basic Geometry 0 lone pair	1 lone pair	2 lone pairs	3 lone pairs
2	 linear			
3	 trigonal planar	 bent		
4	 tetrahedral	 trigonal pyramid	 bent	
5	 trigonal bipyramid	 seesaw	 T-shaped	 linear