Name _____ Section _____

Experiment 12
Molecular Architecture

PRE-LABORATORY QUESTIONS

The following preparatory questions should be answered before coming to laboratory. They are intended to introduce you to several ideas that are important to aspects of the experiment. You must complete and turn in your work to your instructor before you will be able to begin the experiment.

Be sure to bring your textbook with you for this experiment. Material in Chapters 8 and 9 will be very useful for questions you will have while doing this experiment.

1. Give the total number of electrons and write the electron configuration for the following elements.

a) N

b) Mg

c) Ge

d) Re

e) Es

2. Indicate the number of valence electrons and draw/write the Lewis structure for each of the following atoms.

a) N

b) Mg

c) Ge

3. In your own words, write the list of steps that must be followed in drawing a Lewis structure.

Name _____ Section _____

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EQUIPMENT NEEDED

FROM THE STOREROOM

One molecular-model kit (per pair of students)

FROM YOUR INSTRUCTOR

Another molecular-model kit

PROCEDURE:

1. Each pair of students should obtain a molecular model kit from the storeroom.

2. Remove the pieces from the bag and make sure that the following tetrahedral centers are present

2 black	carbon
6 green	chlorine
4 blue	nitrogen
2 red	oxygen
1 yellow	sulfur

There should also be 8 white, single-bonded atoms representing hydrogen and 18 1–inch plastic tubes that represent a pair of electrons (either a lone pair or a bonding pair).

3. Your instructor will assign you one of the Molecular Species Lists (on the next page). During the laboratory time you are to build each of the compounds/species in your list using the Molecular Model kit from the Storeroom or from your TA and to complete each of the following;

a) Determine the number of valence electrons in the molecule;
b) Draw a picture depicting a 2-dimensional Lewis structure of the compound;
c) Determine the number of lone pairs of electrons and bonding groups of electrons on the central atom;
d) Draw a picture depicting the 3-dimensional structure of the compound;
e) Determine the geometry around each central atom in the molecule and clearly identify this geometry in both the 2-d Lewis structure and 3-d structure.

Name _____ Section _____

Molecular Species List

List #1

1.	$SiCl_4$	6.	IF_3	*
2.	PCl_3	7.	XeF_5^+	*
3.	NO_3^-	8.	SO_4^{2-}	
4.	PCl_5 *	9.	C_4H_8O	**
5.	SF_6 *	10.	C_5H_{12}	**

List #2

1.	CH_3Cl	6.	$SbCl_5$	*
2.	ICl_2^+ *	7.	BrF_3	*
3.	NO_2^-	8.	ICl_4^-	*
4.	BF_3	9.	$CH_3CH_2O_2^-$	
5.	HOOH	10.	C_5H_{10}	**

List #3

1.	PO_4^{3-}	6.	PCl_6^-	*
2.	H_2NNH_2	7.	ClF_5	*
3.	CS_2	8.	XeF_2	*
4.	BCl_3	9.	C_3H_5Cl	**
5.	SbF_5 *	10.	C_6H_{12}	**

List #4

1.	NH_4^+	6.	$TeCl_4$	*
2.	SF_2	7.	XeF_4	*
3.	COF_2	8.	ClO_4^-	
4.	SO_2	9.	C_3H_8O**	
5.	PBr_5 *	10.	C_6H_6	** (C's in a ring)

* You will need the Molecular Model Kit from the instructor. Note there are only five of these MMKs for each lab. These kits contain different types of connectors please do not mix these with the MMK from the Storeroom.

** You may need to work with another pair of students to do these compounds.

Name _____ Section _____

Molecular Architecture

Molecular Species List # _____

1. 2-dimensional Lewis structure 3-dimensional structure	Number of valence electrons _____ Number of lone-pairs (central atom) _____ Number of bonding groups (CA) _____ Molecular geometry (be sure to clearly label.)

2. 2-dimensional Lewis structure 3-dimensional structure	Number of valence electrons _____ Number of lone-pairs (central atom) _____ Number of bonding groups (CA) _____ Molecular geometry (be sure to clearly label.)

3. 2-dimensional Lewis structure	Number of valence electrons _____
	Number of lone-pairs (central atom) _____
3-dimensional structure	Number of bonding groups (CA) _____
	Molecular geometry (be sure to clearly label.)

4. 2-dimensional Lewis structure	Number of valence electrons _____
	Number of lone-pairs (central atom) _____
3-dimensional structure	Number of bonding groups (CA) _____
	Molecular geometry (be sure to clearly label.)

5. 2-dimensional Lewis structure	Number of valence electrons _____
	Number of lone-pairs (central atom) _____
3-dimensional structure	Number of bonding groups (CA) _____
	Molecular geometry (be sure to clearly label.)

6. 2-dimensional Lewis structure	Number of valence electrons _____
	Number of lone-pairs (central atom) _____
3-dimensional structure	Number of bonding groups (CA) _____
	Molecular geometry (be sure to clearly label.)

7. 2-dimensional Lewis structure	Number of valence electrons _____
	Number of lone-pairs (central atom) _____
3-dimensional structure	Number of bonding groups (CA) _____
	Molecular geometry (be sure to clearly label.)

8. 2-dimensional Lewis structure	Number of valence electrons _____
	Number of lone-pairs (central atom) _____
3-dimensional structure	Number of bonding groups (CA) _____
	Molecular geometry (be sure to clearly label.)

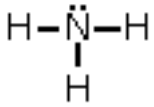
9. 2-dimensional Lewis structure	Number of valence electrons _____
	Number of lone-pairs (central atom) _____
3-dimensional structure	Number of bonding groups (CA) _____
	Molecular geometry (be sure to clearly label.)

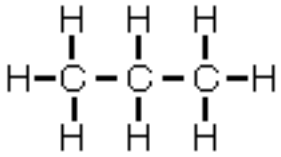
10. 2-dimensional Lewis structure	Number of valence electrons _____
	Number of lone-pairs (central atom) _____
3-dimensional structure	Number of bonding groups (CA) _____
	Molecular geometry (be sure to clearly label.)

Name _____ Section _____

Example of work to be done in the laboratory

The compounds assigned were NH_3 and C_3H_8.

1. 2-dimensional Lewis structure  3-dimensional structure	Number of valence electrons **8** Number of lone-pairs (central atom) **1** Number of bonding groups (CA) **3** Molecular geometry (be sure to clearly label.) **Trigonal pyramidal around the nitrogen atom.**

10. 2-dimensional Lewis structure  3-dimensional structure	Number of valence electrons **26** Number of lone-pairs (central atoms) **0** Number of bonding groups (CA) **4** Molecular geometry (be sure to clearly label.) **Tetrahedral around each of the carbon atoms**