MOLECULAR STRUCTURES USING VSEPR

In this lab session you will determine the Lewis structures and the three dimensional geometry of molecular species given only their molecular formulas. The time will be used to help you perfect your skill at drawing Lewis structures and to help you become better acquainted with molecular geometry by constructing physical models of the various geometries. You may work in groups, however, each student will be responsible for his/her own drawings. Each group will choose one of the lists of species from the next page.

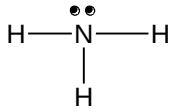
You should do the following for each species on your list (Tabulate 1,2,4 and 5).

1. Draw the Lewis structure. Indicate non-zero formal charges on atoms.
2. Determine the electron-pair geometry around each central atom.
3. Construct a model of the species using the kits provided.
4. Draw a 3-D representation of the molecule from the model and using the conventions discussed in your textbook and in class.
5. Give the name of the molecular geometry around the 'central' atom(s). Number central atoms where necessary.

Examples

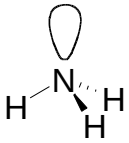
NH_3 ($1\times5 + 3\times1 = 8$ valence e^-s)

1. Lewis Structure



2. Electron-pair geometry: tetrahedral around N

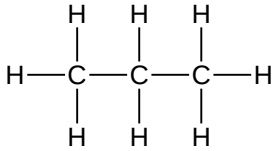
   Three bonding pairs (regions) + 1 non-bonding pair = 4 regions, ∴ tetrahedral e^- pair geometry
3. Construct the molecular model. DO NOT OMIT THIS STEP.
4. 3-D drawing



5. Molecular geometry: trigonal pyramidal

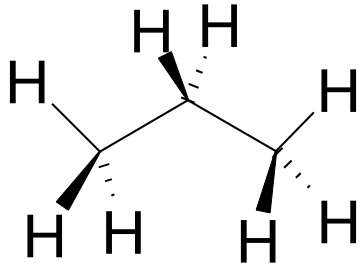
$CH_3CH_2CH_3$

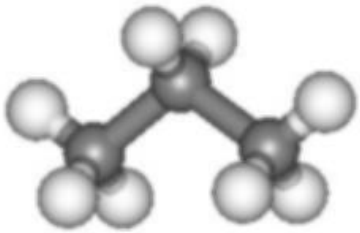
1. Lewis Structure



2. Electron-pair geometry: tetrahedral around each C

   Four bonding regions around each C, ∴ tetrahedral e^- pair geometry
3. Construct model. Orient the carbon chain so that as many atoms as possible lie in the same plane (in this case the three carbons and one H on each end carbon). This is an easier perspective to draw.
4. 3-D drawing





5. Molecular shape: tetrahedral around each C atom.

MOLECULAR SPECIES LISTS

List #1

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

List #2

1. CH_3Br
2. ICl_2^+
3. NO_2^-
4. BF_3
5. HOOH (bonding as in formula)
6. $SbCl_5$
7. BrF_3
8. ICl_4^-
9. $CH_3CH_2CO_2^-$ (bonding as in formula)
10. C_5H_{10} (pick one structure)

List #3

1. PO_4^{3-}
2. H_2NNH_2 (bonding as in formula)
3. CS_2
4. BCl_3
5. SbF_5
6. PCl_6^-
7. ClF_5
8. XeF_2
9. C_3H_5Cl (pick one structure)
10. C_6H_{12} (6 C's in a ring)

List #4

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

Suggested Table Format:

List # _____ Name _____

Molecular Formula	Lewis Structure	Electron Pair Geometry (3-D Structure and Name)	Molecular Structure (Name)