

MODEL BUILDING

OBJECTIVES FOR THE EXPERIMENT

The student will be able to do the following:

1. Given a molecular formula for a molecule or polyatomic ion, draw the Lewis structure for it.
2. Given a Lewis structure for a molecule or polyatomic ion;
 - a. predict the hybridization for each atom.
 - b. describe and sketch the molecular geometry for it.
 - c. describe each bond as either a sigma, a pi bond, or as part of a delocalized pi system.
 - d. describe how each bond forms in terms of the overlap of atomic orbitals to form molecular orbitals.
 - e. predict whether there is any bond rotation about each bond.
3. Write or identify the definitions for sigma bond, pi bond, and delocalized pi system.

BACKGROUND

To prepare yourself for the experiment, it is very important that you read the sections in the textbook and your lecture notes that deal with Lewis structures, hybridization, electron group and molecular geometry, sigma bonds, pi bonds, and delocalized pi bonds.

PRELAB ASSIGNMENT

1. Before coming to the lab, draw a reasonable Lewis structure for each molecular formula listed in the known section on the report sheet. Draw the resonance forms and the resonance hybrid if resonance is possible.
2. Find the hybridization and electron group geometry about each atom except hydrogen by counting the electron groups around each atom.
3. Describe each bond in the Lewis Structure as a sigma or pi bond and describe how each bond is formed in terms of the overlap of atomic orbitals to form covalent bonds.

IN-LAB PROCEDURE

1. Build a model of the structure using the following conventions. If there is resonance, build the model of the resonance hybrid. (This will be demonstrated in the prelab.)
 - a. Use RED toothpicks for lone pairs.
 - b. Use two UNCOLORED toothpicks for each p orbital.
 - c. Use BLUE toothpicks for sigma bonds.
 - d. Use two UNCOLORED rubber bands for each pi bond.
 - e. Use COLORED rubber bands for the delocalized pi bonds found in resonance hybrids.
2. Sketch the model on your report sheet. Suggestions for how to sketch the model will be given in the prelab.
3. Have your instructor check both your model and your sketch before you take the model apart.

NAME _____

REPORT SHEET FOR MODEL BUILDING**KNOWNs**1. CH₄

Lewis Structure	Description of Bonding	Sketch of the Molecular Geometry

2. NH₃

Lewis Structure	Description of Bonding	Sketch of the Molecular Geometry

3. H₂O

Lewis Structure	Description of Bonding	Sketch of the Molecular Geometry

4. CH_2Br_2

Lewis Structure	Description of Bonding	Sketch of the Molecular Geometry

5. $\text{C}_2\text{H}_4\text{Br}_2$

Lewis Structure	Description of Bonding	Sketch of the Molecular Geometry

6. $\text{C}_2\text{H}_2\text{F}_2$

Lewis Structure	Description of Bonding	Sketch of the Molecular Geometry

7. $\text{CH}_3\text{CO}_2\text{H}$

Lewis Structure	Description of Bonding	Sketch of the Molecular Geometry

8. HCN

Lewis Structure	Description of Bonding	Sketch of the Molecular Geometry

9. HCO_2^-

Lewis Structure	Description of Bonding	Sketch of the Molecular Geometry

10. PCl_5

Lewis Structure	Description of Bonding	Sketch of the Molecular Geometry

11. IBr_3

Lewis Structure	Description of Bonding	Sketch of the Molecular Geometry

12. SF₆

Lewis Structure	Description of Bonding	Sketch of the Molecular Geometry

13. IF₅

Lewis Structure	Description of Bonding	Sketch of the Molecular Geometry

14. XeF₄

Lewis Structure	Description of Bonding	Sketch of the Molecular Geometry