

Name: \_\_\_\_\_

EXPERIMENTAL PROCEDURE AND DATASHEET

I. Valence Electrons and Electron Dot Symbols for the Elements

Give the electron dot symbol for each of the following elements and specify how many valence electrons each contains.

Hydrogen (H)

Helium (He)

Lithium (Li)

Beryllium (Be)

Boron (B)

Carbon (C)

Nitrogen (N)

Oxygen (O)

Fluorine (F)

Neon (Ne)

Sodium (Na)

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## Building Molecules

### II. Single Bonds

Draw Lewis dot structures and (if possible) indicate the molecular shape of the following molecules. (Table I will help you with this). After you have completed these, construct the following molecules using the Prentice-Hall Organic Model Kit.

Key to colors in the Organic Molecular Model Kit from Prentice Hall

Atom	Color	Atom	Color	Atom	Color
carbon	black	fluorine or iodine	purple	hydrogen	white
chlorine	green	oxygen	red	sulfur	blue
nitrogen	blue	bromine	orange		

Use the short, gray connectors for single bonds. Use the long, gray connectors to construct double and triple bonds. Use the short, white connectors for lone pairs.

#### A. Compounds of hydrogen

1. Methane (CH<sub>4</sub>)
2. Water (H<sub>2</sub>O)
3. Ammonia (NH<sub>3</sub>)
4. Hydrogen sulfide (H<sub>2</sub>S)
5. Hydrogen fluoride (HF)

#### B. Compounds of carbon:

1. Tetrachloromethane (Carbon tetrachloride, CCl<sub>4</sub>)
2. Fluorotrichloromethane (CFCl<sub>3</sub>)
3. Dichlorodifluoromethane (CF<sub>2</sub>Cl<sub>2</sub>)

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4. HCFC-22 ( $\text{CHF}_2\text{Cl}$ )

5. HFC-134a ( $\text{CF}_3\text{CH}_2\text{F}$ )

6. Propane ( $\text{C}_3\text{H}_8$ )

### III. Double Bonds

Draw Lewis dot structures and (if possible) indicate the molecular shape of the following molecules (Table I will help you with this.). After you have completed these, construct the molecule.

A. Carbon Dioxide ( $\text{CO}_2$ )

B. Oxygen ( $\text{O}_2$ )

C. Teflon ( $\text{C}_2\text{F}_4$ )

D. Formaldehyde ( $\text{CH}_2\text{O}$ )

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### IV. Triple Bonds

Draw Lewis dot structures and (if possible) indicate the molecular shape of the following molecules (Table I will help you with this). After you have completed these, construct the molecule.

A. Nitrogen ( $N_2$ )

B. Hydrogen cyanide (HCN)

C. Carbon Monoxide (CO)\*

D. Acetylene ( $C_2H_2$ )

\*For this model ONLY, use BLUE to represent oxygen.

### V. Violation of the Octet Rule and Resonance

Draw Lewis dot structures and (if possible) indicate the molecular shape of the following molecules (Table I will help you with this). After you have completed these, construct the molecule.

A. Hydrogen ( $H_2$ )

B. Ozone ( $O_3$ )

C. Nitrogen oxide (NO)

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D. Nitrogen dioxide ( $\text{NO}_2$ )

E. Sulfur dioxide ( $\text{SO}_2$ )

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## Building Molecules

### REVIEW QUESTIONS

1. When an atom is bonded, how many electrons should it have in its valence shell? What elements prove to be exceptions to this general rule? Why?
2. How do nonbonding pairs of electrons influence the shape of the molecule?
3. How does a double or triple bond affect the shape of a molecule?
4. Draw Lewis dot structures for the following atoms:
  - a. carbon
  - b. magnesium
  - c. sulfur
5. Draw the Lewis structure for a nitrogen containing molecule. Try  $\text{NO}_2$ . What problem arises? Can resonance solve it?
6. Explore the concept of resonance by making the following molecules and anions obey the octet rule
  - a. sulfur dioxide ( $\text{SO}_2$ )
  - b. sulfur trioxide ( $\text{SO}_3$ )
  - c. carbonate ( $\text{CO}_3^{2-}$ )
  - d. nitrate ( $\text{NO}_3^-$ )