REVIEW CHAPTER 1 AND NAMING OF COMPOUNDS

Concepts and skills
- Electronic structure of atoms
- Lewis model of bonding: Lewis structures, formal Charges, resonance
- Quantum Mechanics, valence bond and molecular orbital theory approach to covalent bonding (hybrization of s and p orbitals understand σ bonds C-H, C-C, N-H, O-H and σ, π bonds (double, triple bonds CC, C=O)
- Bond angles and shapes of molecules, VSEPR (Know how to calculate the shape of a molecule and angles between the atoms)
- Functional groups
- Naming of compounds: SUPPLEMENT!

Very important
- How to draw Lewis structures from condensed structural formulas
- How to draw curved arrows and push electrons in creating contributing structures (and in reactions)

Exercises

1. Following are several Lewis structures showing all valence electrons. Assign formal charges in each structure as appropriate:

   a) \[
   \begin{array}{c}
   H \\
   \text{C} \\
   \text{O} \\
   \text{C} \\
   \text{H} \\
   \end{array}
   \]
   b) \[
   \begin{array}{c}
   H \\
   \text{N} \\
   \text{C} \\
   \text{C} \\
   \text{H} \\
   \end{array}
   \]

2. Use VSEPR to predict bond angles about each highlighted atom. Draw lone pairs of electrons.

   a) \[
   \begin{array}{c}
   H \\
   \text{C} \\
   \text{O} \\
   \text{C} \\
   \text{H} \\
   \end{array}
   \]
   b) \[
   \begin{array}{c}
   H \\
   \text{C} \\
   \text{C} \\
   \text{Cl} \\
   \end{array}
   \]

   c) \[
   \begin{array}{c}
   H \\
   \text{C} \\
   \text{C} \\
   \text{H} \\
   \end{array}
   \]
   d) \[
   \begin{array}{c}
   H \\
   \text{C} \\
   \text{O} \\
   \text{H} \\
   \end{array}
   \]

   e) \[
   \begin{array}{c}
   H \\
   \text{O} \\
   \text{N} \\
   \text{O} \\
   \end{array}
   \]
   f) \[
   \begin{array}{c}
   H \\
   \text{C} \\
   \text{N} \\
   \text{H} \\
   \end{array}
   \]
3. Draw condensed structural formulas for all compounds with molecular formula C₄H₈O.
   a) A carbonyl group (there are two aldehydes and one ketone)
   b) A carbon-carbon double bond and a hydroxyl group (there are 8)

4. Draw the contributing structure indicated by the curved arrow(s). Assign formal charges as appropriate. Label pairs of contributing structures that are equivalent. For those sets in which structures are not equivalent, label the more important contributing structure.

   a) \[ \text{H} \overset{\cdots}{-} \overset{\text{O}}{\text{C}} \overset{\text{O}^{-}}{\text{O}} \]
   b) \[ \text{H} \overset{\cdots}{-} \overset{\text{O}}{\text{C}} \overset{\text{O}^{-}}{\text{O}} \]

   c) \[ \text{H}_3\text{C} \overset{\cdots}{-} \overset{\text{O}}{\text{C}} \overset{\text{O}^{-}}{\text{O}} \]
   d) \[ \text{O} \overset{\cdots}{-} \overset{\text{C} \equiv \text{C}}{\text{O}} \]

   e) \[ \text{H} \overset{\cdots}{-} \overset{\text{N}}{\text{C}} \overset{\text{O}^{-}}{\text{O}} \]
   f) \[ \text{H} \overset{\cdots}{-} \overset{\text{N}}{\text{C}} \overset{\text{O}^{-}}{\text{O}} \]

5. Draw structures for each of the following compounds. If a name is not consistent with IUPAC rules, suggest a better name. If a name is incorrect give the correct name
   a) N-Methyl-2-buten-1-amine
   b) 4-nitrophenylbenzenecarboxylate

6. Circle the formulae below which represent unstable organic compounds. For each unstable structure briefly explain why it is unstable.

   (a) \[ \text{H}_2\text{C} \equiv \text{N} \overset{\cdots}{-} \text{CH} \]
   (b) \[ \text{CH}_3^+ \]
   (c) \[ \text{H}_2\text{C} \overset{\cdots}{-} \text{C} \overset{\text{H}}{\text{C}} \overset{\text{H}}{\text{C}} \overset{\text{H}}{\text{C}} \overset{\text{H}}{\text{C}} \]
7. For each of the following compounds supply the IUPAC substitutive name and, where possible, another name.

\[
\text{CH}_3\text{CH}_2\text{CHCH}_3
\]

a) \(\text{H}_3\text{CH}_2\text{CH}_2\text{C}==\text{CH}_2\text{OH}\)  

b) \(\text{CH}_3\text{C}==\text{CCH}_2\text{CH}_2\text{C}==\text{CHCH}_2\text{CH}_3\)

8. In the formula shown below draw a circle around the group of atoms which have to be coplanar due to hybridization of the atoms

![Diagram](image)

9. Draw a Lewis structure for the azide ion, \(\text{N}_3^-\) (the order of atom attachment is N-N-N and they do not form a ring). How does the resonance model account for the fact that lengths of N-N bonds in this ion are identical?