1. Name the following compounds

A:

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

\[
\text{CHCH}_3
\]

\[
\text{OH}
\]

\[
\text{C(CH}_3\text{)}_3
\]

B

\[
\text{OHC}\quad\text{CHO}
\]

\[
\text{Cl}
\]

(you should know this kind of notation but if you are uncertain ask)

2. Which of the following will have the highest boiling point and which the lowest? Indicate next to each compound the kind of intermolecular forces present:

\[
\text{CH}_3\text{CH}_2\text{NH(CH}_3\text{)}
\]

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

\[
\text{(CH}_3\text{)}_2\text{N}
\]

\[
\text{(CH}_3\text{)}_3\text{CH}
\]
1. For the following reaction what is the acid and what is the base?

\[ \text{NH}_3 + \text{BF}_3 \rightarrow \text{H}_3\text{NBF}_3 \]

2. What are the formal charges in the product in the question above?

3. Draw the unique isomers of C\textsubscript{2}H\textsubscript{5}N.

4. Circle the molecules which are completely planar.

5. What are the names of the two compounds given above.
1. Draw three electron dot diagrams for the positive ion \([\text{HO-CH-NH}_2]^+\) 

Show formal charges.

2. Name the following compound

\[\text{CHO}\]

Remember that the terminal of each line segment is understood to be a carbon atom with the appropriate number of hydrogens unless otherwise specified.

3. Which of the following is the strongest acid? Which the strongest base?

\[
\begin{array}{cccc}
\text{SH}_2 & \text{OH}_2 & \text{NH}_3 & \text{NH}_2^- \text{ anion} \\
\text{strongest acid} & \text{strongest base} \\
\end{array}
\]
1. Draw a stable electron dot structure for CH$_3$NO$_2$. Show all valence electrons and formal charges.

2. Make a careful three dimensional drawing, using wedges and dotted bonds, to show the structure of CH$_2$=C=CH$_2$.

3. Name the following.

Select a compound from the following list for 4 and 5.

4. Which has the highest boiling point?

5. Which would be least soluble in water?
1. Circle and name each of the functional groups in the following molecule.

\[ \text{CH}_3 - \text{CH} = \text{CH} - \text{CO}_2\text{H} \]

2. Name the molecule above

3. Which of the following is the strongest acid and which is the weakest?

\[ \text{CH}_3^+ \quad \text{NH}_4^+ \quad \text{H}_3\text{O}^+ \]

4. Give an acceptable electron dot structure for \( \text{H}_2\text{CNN} \) showing formal charges.

5. There are several isomers having the formula \( \text{C}_3\text{H}_8\text{O} \).
   Give the structure of an isomer which would have a high solubility in water.

   Give an isomer having low water solubility.
1. Draw four isomers of molecules having the formula $C_3H_6O$.

2. Draw two different electron dot diagrams for molecule HNNN. Show formal charges.

3. Which of the following is the strongest base? Which is the strongest acid?

   $CH_4$  $NH_3$  $H_2O$  $HF$

4. Name the following compound

   ![Chemical Structure]

5. For the formula $C_4H_{10}O$ draw the structure which you would expect to have the lowest boiling point.
1. Circle the compounds below which are associated liquids.

\[ \text{CH}_3\text{CO}_2\text{H} \quad \text{CH}_3\text{OCH}_3 \quad \text{C}_2\text{H}_5\text{CCH}_3 \quad (\text{CH}_3)_3\text{CCH}_2\text{CH}_2\text{OH} \]

2. Write the IUPAC name of each compound above under the structure.

3. Draw two resonance structures for the CNO\(^-\) anion. Show formal charges.

4. In each pair below circle the stronger base.

I\(^-\) vs F\(^-\) \quad \text{NH}_3 \quad \text{vs} \quad \text{CH}_3\text{OH}

CH\(_3\)\(^-\) vs OH\(^-\) \quad \text{OH}\(^-\) vs \quad \text{SH}\(^-\)
1. Draw isomers of molecules having the formula C₃H₆O.

2. Which of the following would be the strongest base?

   CH₄   NH₃   H₂O   HF

3. Which of the following will have the lowest boiling point?

   Which highest?

   CH₃CH₂CO₂H   CH₃CH₂CH₂CH₂CH₃   (CH₃)₄C   CH₃CH₂COCH₃

4. Give an electron dot diagram for the anion OCN-
1. Which of the following is the strongest base and which the weakest?

\[ \text{CH}_3^- \quad \text{NH}_2^- \quad \text{OH}^- \quad \text{F}^- \]

strongest  weakest

2. Draw a stable electron dot structure for the cation \( \text{CH}_2\text{NH}_2^+ \)

3. Name the following compound \( \text{CF}_3\text{CH}_2\text{C} = \text{CCH}_2\text{CHCH}_2\text{CH}_3 \)

4. Draw the structure of the compound having the formula \( \text{C}_5\text{H}_{12}\text{O} \) which would have the lowest boiling point.
1. Draw at least four isomers of the compound $C_4H_9N$.

2. Draw three different electron dot structures for the nitrate ion, $\text{NO}_3^-$ ion. Show formal charge.

3. Consider the following compounds

$\text{CH}_3\text{CH}_3$ $\text{CH}_3\text{NH}_2$ $\text{CH}_3\text{OH}$ $\text{CH}_3\text{F}$

Which is the strongest acid?

Which is the strongest base?

4. In each pair circle the compound which will the higher boiling point?

$(\text{CH}_3)_2\text{NH}$ vs $(\text{CH}_3)_3\text{N}$

$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ vs $(\text{CH}_2)_4\text{C}$

$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CO}_2\text{H}$ vs $\text{HO}_2\text{CCH}_2\text{CO}_2\text{H}$
1. X has the formula \( \text{C}_5\text{H}_{10}\text{O}_2 \). X reacts with metallic potassium to liberate hydrogen gas. X is not acidic. Write an acceptable structure for X.

2. Name the following compound:

![Chemical structure]

3. Here are some bond dissociation energies. H-H 104 kcal/mol; F-F 38 kcal/mol; H-F 136 kcal/mol. Calculate the \( \Delta H \) for

\[
\text{H}_2 + \text{F}_2 \rightarrow 2\text{HF}
\]
1. For the molecule having the formula \( \text{CH}_2=\text{C}=\text{C}=(\equiv)\text{CH} \) identify the hybridization of each carbon and make an accurate drawing showing the three-dimensional structure of the molecule.

2. For the anion shown below draw three reasonable electron dot structures showing formal charges. Which is the most stable and why?

\[
\text{[NC-CH-CHO]}^{-}
\]

3. Draw as many isomers as you can for molecules having the formula \( \text{C}_3\text{H}_5\text{F} \). Name the structures.

4. Rank the following for the size of molecular dipole moments,

\( \text{CF}_4 \quad \text{CH}_3\text{F} \quad \text{CF}_3\text{H} \)
1. For each equilibrium indicate whether the right side (products) or left side (reactants) is favored. Write the letter R or L.

   a - \( \text{NH}_3 + \text{OH}^- \rightleftharpoons \text{NH}_2^- + \text{H}_2\text{O} \)

   b - \( \text{CH}_3\text{F} + \text{NH}_3 \rightleftharpoons \text{CH}_2\text{F}^- + \text{NH}_4^+ \)

2. Name the following compound

   ![Chemical structure](image)

3. Draw at least three electron dot structures for the following. Which is the most stable?

   ![Chemical structure](image)
1. For each of the following equilibria should the equilibrium constant be greater or less than 1.

\[ \text{NH}_2^- + \text{CH}_3^+ \rightleftharpoons \text{CH}_3\text{NH}_2 \]

\[ \text{CH}_5^+ + \text{H}_2\text{O} \rightleftharpoons \text{CH}_4 + \text{H}_3\text{O}^+ \]

2. For compounds having the formula C_6H_{10} draw a structure having
   no pi bonds   ***   one pi bond      ****        two pi bonds

3. a) For the halogenation of ethane with UV light to yield chloroethane and HCl what is the mechanism? Draw the transition state very carefully of each step.

b) Some butane is formed during the course of the reaction above. Give a mechanism to explain the formation of the butane.