Instructions: Read the directions to each type of question carefully.

1. Indicate the HYBRIDIZATION and IDEAL BOND ANGLES for the following atoms in the boxes provided.

2. Classify each of the following as either an electrophile or nucleophile:

   a.  
   b.  
   c.  
   d.  
   e.  
   f.  
   g.  

Value = 10 points
Due on Wednesday, October 7.
3. Draw the expected product(s) or label as "NR" if no reaction would be expected to occur for the following:

\[
\begin{align*}
\text{Cl}^- + \text{Cl}^- &\rightarrow \text{NR} \\
\text{Cl}^- + \text{H}^+ &\rightarrow \text{NR} \\
\text{H}_3\text{C} = \text{C} = \text{C} - \text{H} &\rightarrow \text{NR} \\
\text{H}_3\text{C} = \text{C} = \text{C} - \text{H} &\rightarrow \text{NR} \\
\text{CH}_3\text{OH} &\rightarrow \text{NR}
\end{align*}
\]

4. For i. and ii., identify the electrophile and nucleophile in each of the following reaction steps. Then draw curved arrows to illustrate the bond-making and bond-breaking process. In iii. also identify the electrophile and nucleophile and then draw what the final product (not the carbocation intermediate) of the reaction will be.

\[
\begin{align*}
i. \text{CH}_3\text{-CH}_2\text{C} = \text{C} - \text{CH}_2 &+ \text{:Cl}^- \rightarrow \text{CH}_3\text{-CH}_2\text{C} = \text{C} - \text{CH}_2 \\
\text{H}^+ &\rightarrow \text{NR}
\end{align*}
\]

\[
\begin{align*}
\text{CH}_3\text{-C} = \text{C} - \text{CH} &+ \text{H} - \text{Br} \rightarrow \text{CH}_3\text{-C} = \text{C} - \text{CH}_2 + \text{Br}^- \\
\text{H}^+ &\rightarrow \text{NR}
\end{align*}
\]

\[
\begin{align*}
\text{CH}_3\text{-CH}_2\text{-C} = \text{C} - \text{CH}_2 &+ \text{H} - \text{Cl} \rightarrow \text{NR}
\end{align*}
\]
5. Draw the complete mechanism using curved arrows to show the flow of electrons for the acid catalyzed reaction of (Z)-3-methyl-2-pentene with methanol.

\[
\begin{align*}
\text{H}_3\text{C} & \quad \text{CH}_2\text{CH}_3 \\
\text{H} & \quad \text{CH}_3
\end{align*}
\] + \[\text{CH}_3\text{OH}\] \[\text{H}_2\text{SO}_4\]