Chapter 5 Additional Problems

1. Give the structure of the principal organic product(s) produced from 3-ethyl-2-pentene under each of the following reaction conditions.

   a. H₂, Pd/C
   b. H₂O, Br₂
   c. Cl₂ in CCl₄ at 0 °C
   d. (i) aq. Hg(OAc)₂, (ii) NaBH₄
   e. HBr
   f. Br₂, dilute solution in CH₃OH

2. What product do you expect to obtain from the following reaction? Propose a mechanism to rationalize your prediction.

   ![Reaction](attachment:image)
3. Treatment of a trialkylborane with many molar equivalents of dimethylsulfoxonium methyline, followed by alkaline hydrogen peroxide gives long-chain alcohols. This reaction is called the polyhomologation reaction. Explain how this reaction occurs, suggesting mechanisms that illustrate the key steps.

\[
\begin{align*}
&1. \quad \overset{O}{(CH_3)_2S-CH_2} \\
&\quad \oplus \quad \ominus \\
&\quad R_3B \quad (3n \text{ equivalents}) \quad \rightarrow \\
&\quad 3 \quad R(CH_2)_nOH \\
&2. \quad \text{NaOH, H}_2\text{O}_2, \text{H}_2\text{O}
\end{align*}
\]

4. The following cyclization has been observed in the oxymercuration-demercuration of this unsaturated alcohol.

\[
\begin{align*}
&1. \quad \text{Hg(OAc)}_2 \\
&\quad \rightarrow \\
&\quad \text{OH} \\
&2. \quad \text{NaBH}_4
\end{align*}
\]

**a.** Propose a mechanism for this reaction.

**b.** Reaction with bromine in dichloromethane of the same unsaturated alcohol shown above yields a product that has only one bromine in it. Draw its structure and propose a mechanism that supports your prediction.
5. Which of the following compounds cannot be made as the major product by hydroboration of an alkene followed by oxidation and hydrolysis with $\text{H}_2\text{O}_2$ and $\text{OH}^-$?

a. 

b. 

c. 

d. 

6. Give the structure of the alkene that would yield each of the following product mixtures upon ozonolysis followed by reductive workup.

a. 

b. 

and 

7. In the cleavage reaction of a vicinal diol by $\text{IO}_4^-$, a cyclic intermediate is generated:

Which compound, A or B, would you expect to be cleaved faster by periodate ion? Explain.
8. What is the major product that you would expect to isolate from the reaction of 2-methylpropene with the reagent CH$_3$S-Cl, which undergoes electrophilic addition to alkene double bonds?