1. Under the proper conditions, the dehydration of 2,3-dimethylbutanol results in a mixture of the two products shown below.

(a) Draw a mechanism for the formation of each product.

(b) If the reaction is allowed to reach equilibrium, which product would you expect to be the major product? Why?

2. Propose syntheses for the transformations shown below. More than one step is required. Provide reagents for each step and draw any products isolated between steps.
3. Show how you would synthesize the following ether by (a) Williamson Ether Synthesis b) Alkoxymercuration-Demercuration and (c) Alkene Addition.

4. Draw the mechanism of the following reaction showing all intermediates and electron-pushing arrows. Write out $\text{K}_2\text{Cr}_2\text{O}_7$ and $\text{H}_2\text{SO}_4$ as Lewis structures.
5. The O in epoxides can be a good leaving group even as an alkoxide since the three-membered ring is strained and is easily cleaved. Give the product(s) and mechanism of the following reactions in 3-D

(a) \[ \text{CH}_3\text{CH}_3\text{CH}_3\text{CH}_3 \xrightarrow{\text{NaOH, } \text{H}_2\text{O}} \]

(b) \[ \text{CH}_3\text{CH}_3\text{CH}_3\text{CH}_3 \xrightarrow{\text{NaOH, } \text{H}_2\text{O}} \]

6. Show how you would synthesize the following two regioisomers from the appropriate alkene.

\[ \text{Br-CH}_2\text{OH} \quad \text{and} \quad \text{HO-CH}_2\text{Br} \]