1. Give the product(s) for the following reactions. Show stereochemistry in 3-D when appropriate and all stereoisomers.

   \[
   \begin{align*}
   \text{苯乙烯} & \xrightarrow{Cl_2, CH_2Cl_2} \\
   \text{1-溴-2-溴} & \xrightarrow{H_2, Pd/C} \\
   \text{五元环} & \xrightarrow{\text{OH}, H_2SO_4} \\
   \text{氯代环己烷} & \xrightarrow{\text{CH}_3\text{OH}}
   \end{align*}
   \]

2. Show how you would accomplish the following synthesis. More than one step is required. Show intermediate isolated products along the way.

   \[
   \begin{align*}
   \text{1-氯} & \xrightarrow{\text{Br}} \\
   \text{1-碘}
   \end{align*}
   \]
3. Give the mechanism of the following reaction showing electron-pushing arrows and all intermediates.

4.(a) Write the mechanism of the following reaction.

(b) Is the rate of the reaction faster, slower or the same when done with CH₃CH₂OH as solvent? Why?
5. (a) Which would you expect to react faster in a E2 reaction with NaOH, trans-4-tert-butyl-1-bromocyclohexane or cis-4-tert-butyl-1-bromocyclohexane? Why?

(b) Draw the mechanism and product(s) for the faster of the two reactions.

(c) Write an expression for the rate law of the reaction. Use "k" for the rate constant.

6. (a) Draw a mechanism for the reaction shown below. Be sure to account for the formation of both stereoisomers.

(b) Is the reaction unimolecular or bimolecular?

(c) Write an expression for the rate law of the reaction. Use "k" for the rate constant.