"Perhaps one of you gentlemen would mind telling me just what it is outside the window that you find so attractive..?"
1. Give the major organic product/products for following reactions. Be mindful of specifics such as rearrangements. Indicate major and minor products where appropriate. If one or more chiral centers are present in your product, then explicitly show all stereoisomers produced using wedges and dashes when appropriate (6 pts. each).

a. (1R, 2S)-2-methylcyclohexyl iodide

b. 1) \( \text{Cl}_2, \text{H}_2\text{O} \)
   2) \( \text{KOH, DMSO} \)

(c) \( \text{Cl} \)

(d) 1) \( \text{TsCl, py} \)
   2) \( \text{NaI, acetone} \)

(e) \( \text{H}_2\text{SO}_4 \)

1) \( \text{CH}_3\text{CH}_2\text{OH} \)
2) \( \text{CH}_3\text{CH}_2\text{I} \)

\( \Delta \)
2. Synthesize the following two molecules using the reagents provided and any inorganic reagents or necessary solvents (15 points each).

a) from propyne, NaSCH$_2$CH$_3$ and cyclopentanol

Any reasonable synthesis accepted—see me with questions

b) from

Any reasonable synthesis accepted—see me with questions
3. Circle the answer which best describes the following statements:

a) This compound will undergo solvolysis in aqueous ethanol most rapidly.

b) This compound will give a rearranged product when treated with HBr.

c) This compound will undergo an S_N2 reaction.

d) These conditions will yield an alkene when reacted with cyclohexyl bromide.

KOEt, EtOH   TsCl, py, heat   H_2SO_4, EtOH

e) This compound will undergo an E2 reaction most rapidly.
4. Do 4 OF THE FOLLOWING 5! For the following compounds, Indicate the relationship between the pair (identical compounds, enantiomers, diastereomers, structural isomers, or completely different compound), and assign R or S to any chiral carbon. (4 pts each)

a)

\[
\begin{align*}
\text{Cl} & \quad \text{CH(CH}_3\text{)}_2 \\
\text{ClCH}_2\text{CH}_2 & \quad \text{I} & \quad \text{and} & \quad \text{CH}_2\text{CH}_2\text{Cl} \\
\text{ClCH}_2\text{CH}_2 & \quad \text{I} & \quad \text{R} \quad \text{R}
\end{align*}
\]

same compound

b)

\[
\begin{align*}
\text{I} & \quad \text{I} \\
\text{Cl} & \quad \text{H}_3\text{C} \\
\text{H}_3\text{C} & \quad \text{Br} \\
\text{H} & \quad \text{H}
\end{align*}
\quad \text{and} \quad \begin{align*}
\text{I} & \quad \text{Cl} \\
\text{I} & \quad \text{Br} \\
\text{CH}_3 & \quad \text{H}
\end{align*}
\]

R \quad S

enantiomers

c)

\[
\begin{align*}
\text{CH}_3 & \quad \text{H} \\
\text{HO} & \quad \text{H} \\
\text{CH}_3 & \quad \text{H}
\end{align*}
\quad \text{and} \quad \begin{align*}
\text{HO} & \quad \text{H} \\
\text{H}_3\text{C} & \quad \text{H} \\
\text{HO} & \quad \text{H}
\end{align*}
\]

E, R \quad E, S

enantiomers

d)

\[
\begin{align*}
\text{HO} & \quad \text{H}_2\text{C} \\
\text{CH}_2\text{OH} & \quad \text{OH} \\
\text{CH}_3 & \quad \text{C} \\
\text{OH} & \quad \text{H}_3\text{C}
\end{align*}
\quad \text{and} \quad \begin{align*}
\text{HO} & \quad \text{H}_2\text{C} \\
\text{CH}_2\text{OH} & \quad \text{OH} \\
\text{CH}_2\text{OH} & \quad \text{H}_2\text{C}
\end{align*}
\]

constitutional isomers
(9) 5. Fill in the following synthetic roadmaps. Keep in mind things like stereochemistry where appropriate (3 pts for each compound). There will be NO partial credit!

A = \text{draw only the isomer that is carried through}

C = \text{(draw only the isomer that is carried through)}
If a tree falls in the woods and there is no one there to hear it, does it make a sound? Yes or No – there is only one correct answer. Feel free to justify your answer.

YES!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!