1. Propose a synthesis of the molecule shown beginning with an alcohol containing 8 carbons using the reagents that you have learned. Remember to show all reactants and any products which would be isolated after each reaction. In a synthesis mechanisms are not required.

2. Radical species with a carbon bearing the unpaired electron follow the same stability trend as carbocations ($3^\circ > 2^\circ > 1^\circ$). Explain this trend in terms of orbital interactions. Your answer should include drawings of orbitals. Show hyperconjugative resonance.

3. a) Benzyl radicals show enhanced stability, much like benzyl carbocations. Draw resonance structures for the benzyl radical shown below to account for this stability.

b) Based on your answer in part a, predict the product of the reaction shown below.
4. Draw the mechanism for the reaction shown below. Show all intermediates and electron-pushing arrows. This is a radical reaction. **Hint: the Br - Br bond is a relatively weak bond in homolytic cleavage.**

\[
\text{Br}_2 \quad \text{heat or light} \quad \text{Br}_2 \quad \text{heat or light} \\
\text{Br} \quad \text{Br} \quad 2 \text{Br} \quad \uparrow \\
\text{Br}_2 \quad \text{Br} \quad \text{Br} \\
\text{HBr} \\
+ \quad \text{HBr}
\]

5. a) Name the following. If a stereocenter exists, place a * next to it. If possible, draw the enantiomer.

- not a stereocenter

\[
\text{cis-3,5-dimethyl} \quad \text{pentene} \\
\text{2,3-dimethyl} \quad \text{1-butene} \\
(\text{S}) - 5\text{-bromo-3-ethyl-3-heptene} \\
(3S, 5R) - 3,5\text{-dimethyl} \quad \text{cyclopentene}
\]

b) If the first compound in part a has a specific rotation of 20.7 degrees mL/gdm, then what is the specific rotation of the enantiomer?

\[
[\alpha] = -20.7 \text{ degrees mL/gdm}
\]