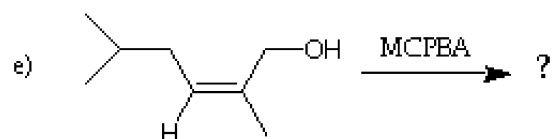
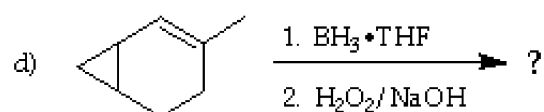
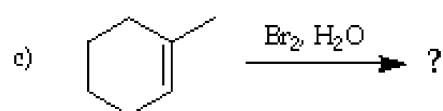
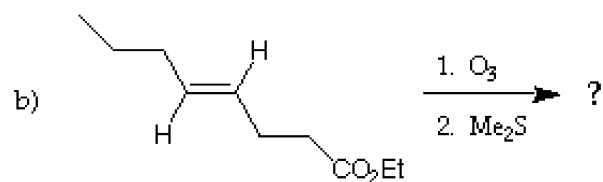
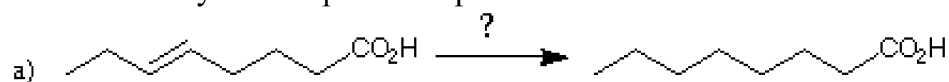
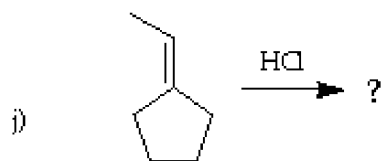
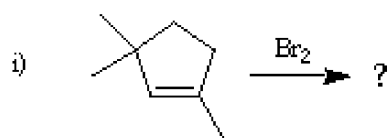
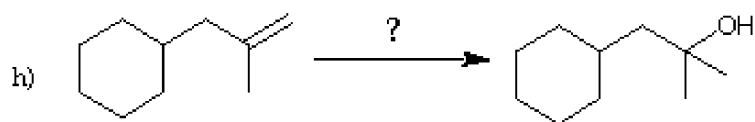
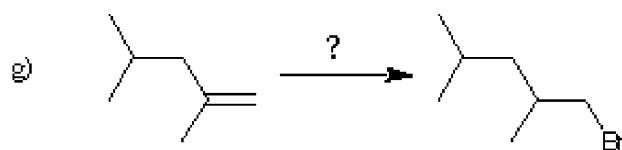
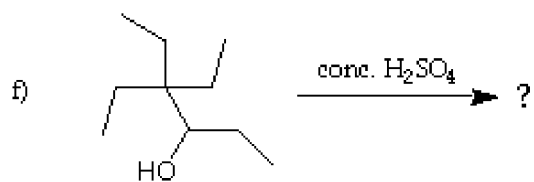
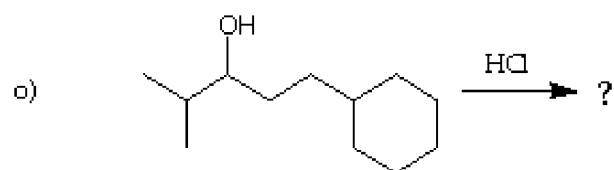
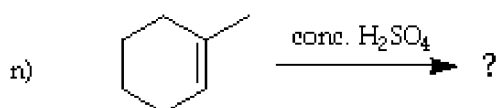
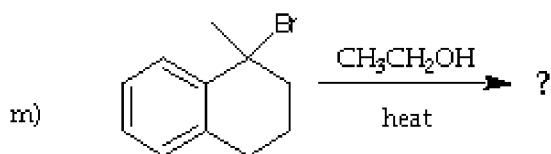
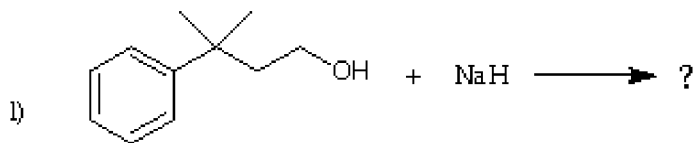
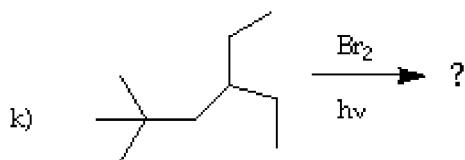


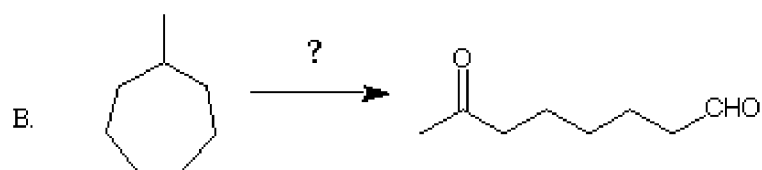
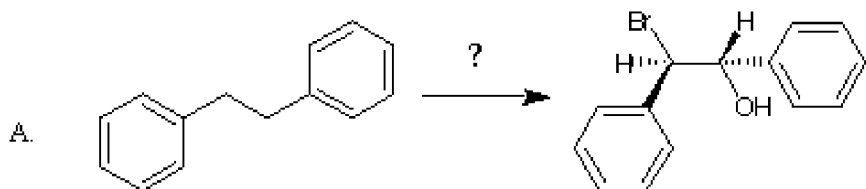
1. (30 points) Provide the missing reagents or products for the following reactions. If more than one product will result, show both the major and minor products and indicate which is the major. Carefully show the stereochemistry of each product if pertinent.



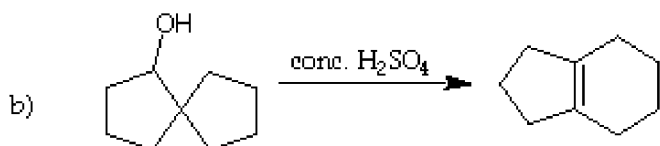
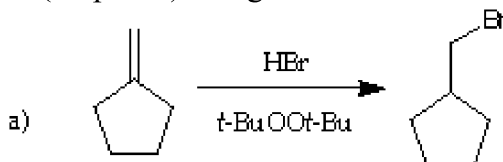




2. (20 points) Propose a synthesis of the target compounds starting with the substrate provided and any other chemical reagents. Several steps are required in each case. You do not have to show mechanisms for each of the individual steps, but do show the products formed (including any stereochemistry) from each of the reactions you use.



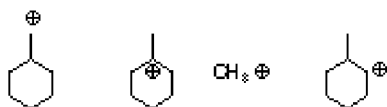
3. (20 points) Using the arrow formalism, draw a detailed, stepwise mechanism for the following reactions.



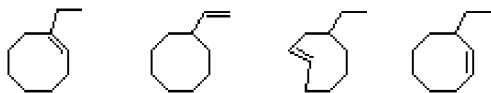
4. (30 points)

A. Rank the following (1-4, 1 = greatest or most) according to the indicated criteria.

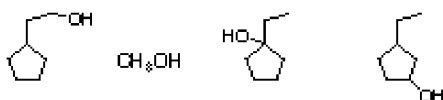
i. stability



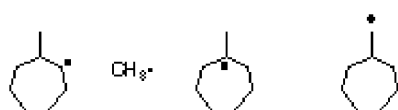
ii. stability



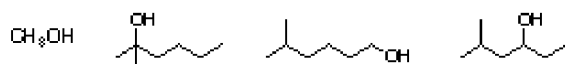
iii. Re activity under $\text{S}_\text{N}1$ Conditions



iv. Stability



v. Reactivity under $\text{S}_\text{N}2$ Conditions



B. The benzylic cation shown below is actually more stable than a tertiary carbocation even though it is formally a primary carbocation. *Very briefly* explain why this might be the case, and provide structures to bolster your reasoning.

