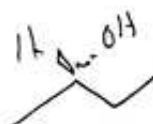
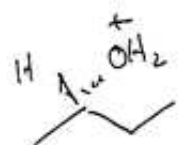
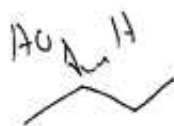
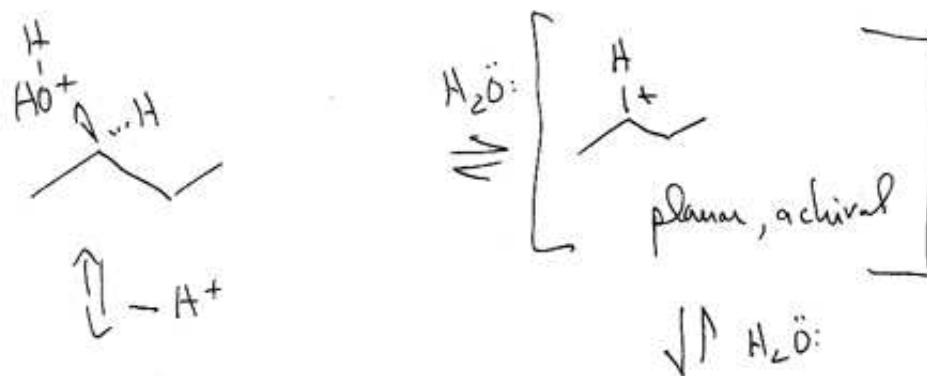


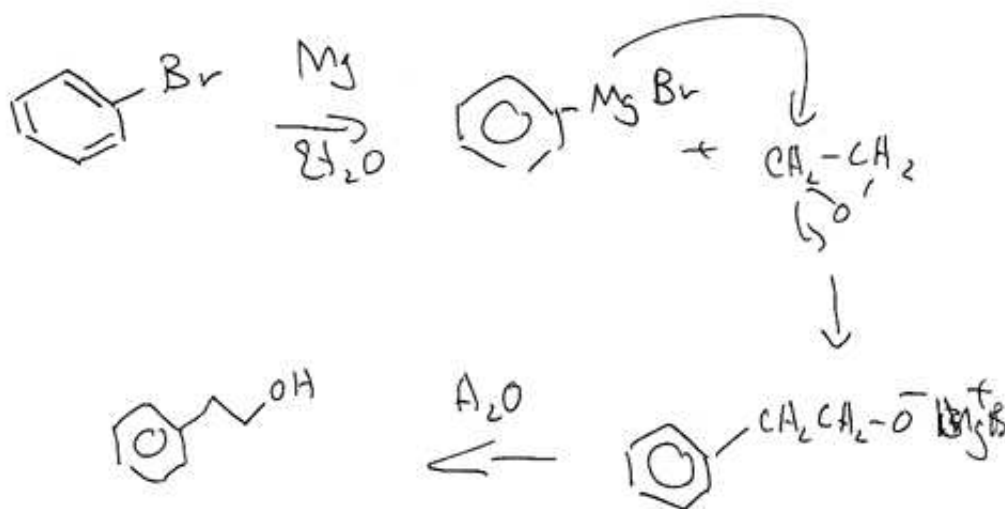
Name: Key (please print)

1. (10 pts) When allowed to stand in dilute aqueous acid, (R)-2-butanol slowly loses its optical activity. Write a mechanism that can account for this racemization.

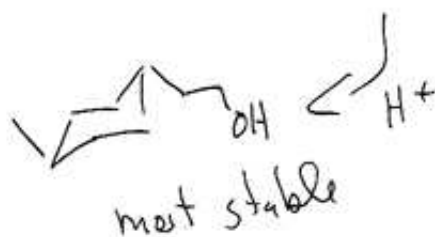
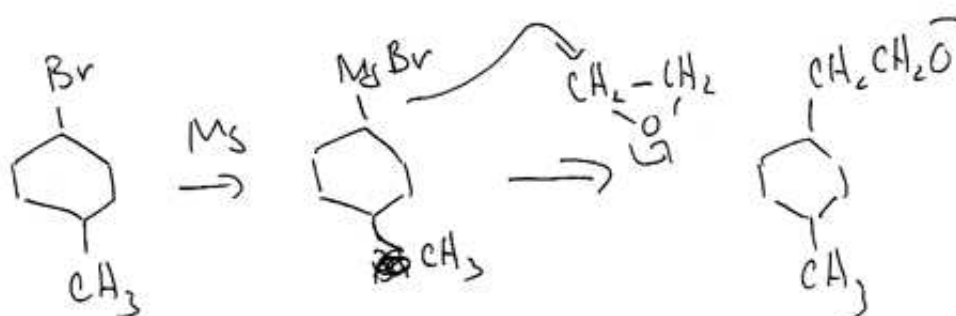


2. (12 pts) Identify the organic halide that, after conversion to a Grignard reagent and treatment with ethylene oxide, would produce each of the following alcohols.

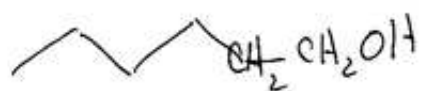
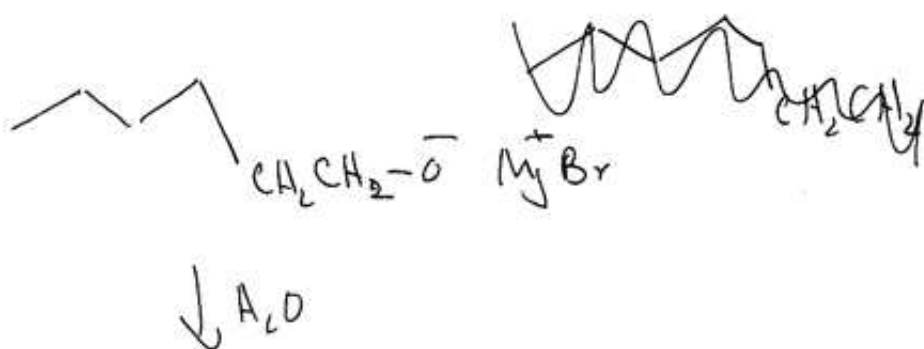
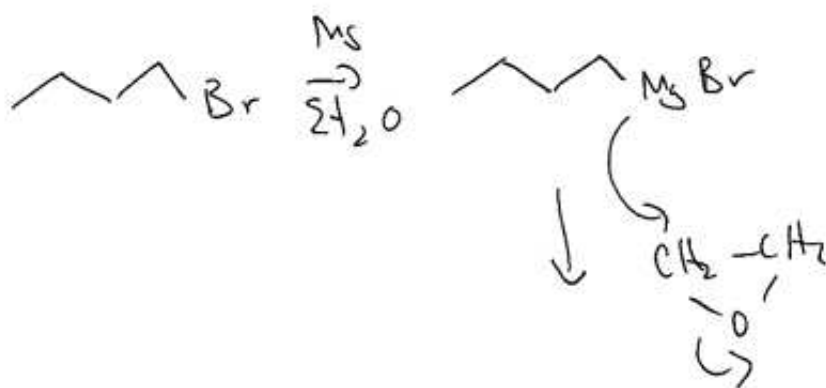
a) $C_6H_5-CH_2CH_2OH$



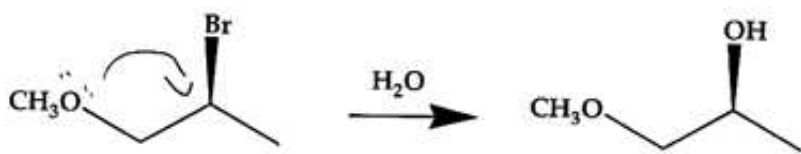
b)



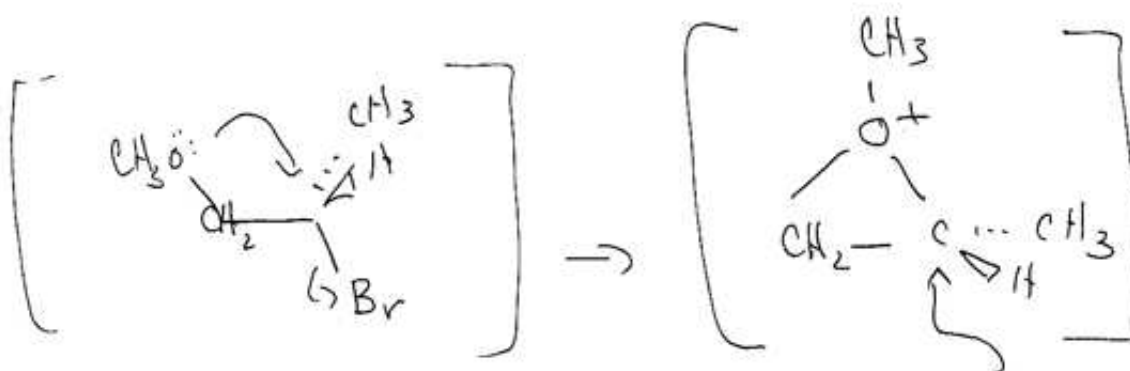
c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$



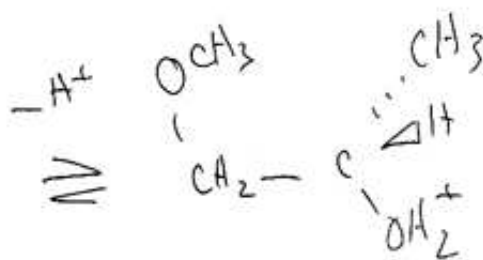
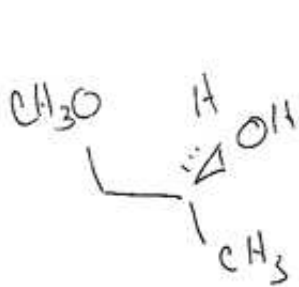
3. (8 pts) S_N1 reactions proceed through planar carbocations, and only under special circumstances does a reaction give a nonracemic product. For example, although the reaction rate depends only on the concentration of the reactant, the isolated product when (S)-2-bromo-*n*-propylmethylether is hydrolyzed is (S)-2-hydroxy-*n*-propylmethylether. Suggest a mechanism.



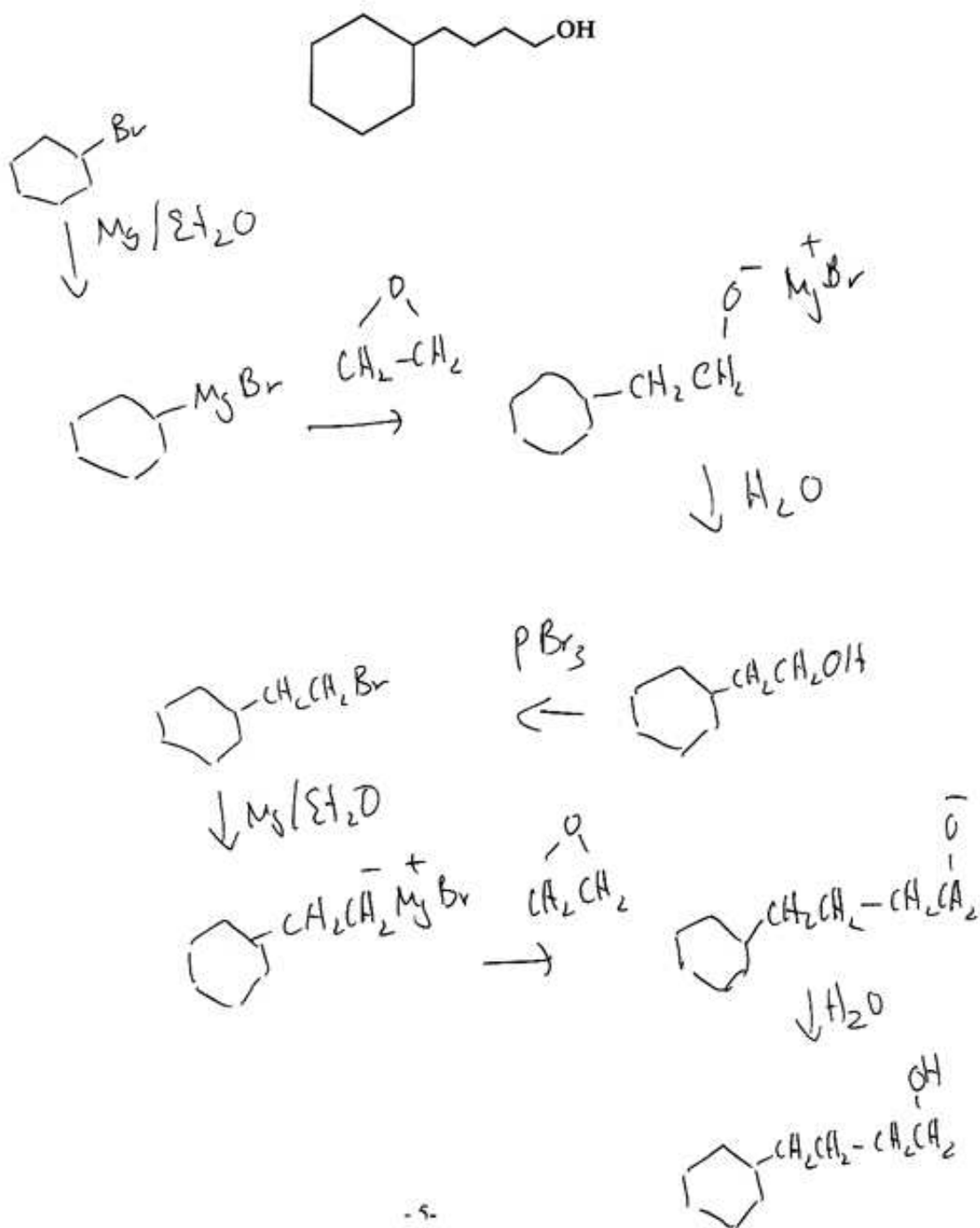
↓ slow



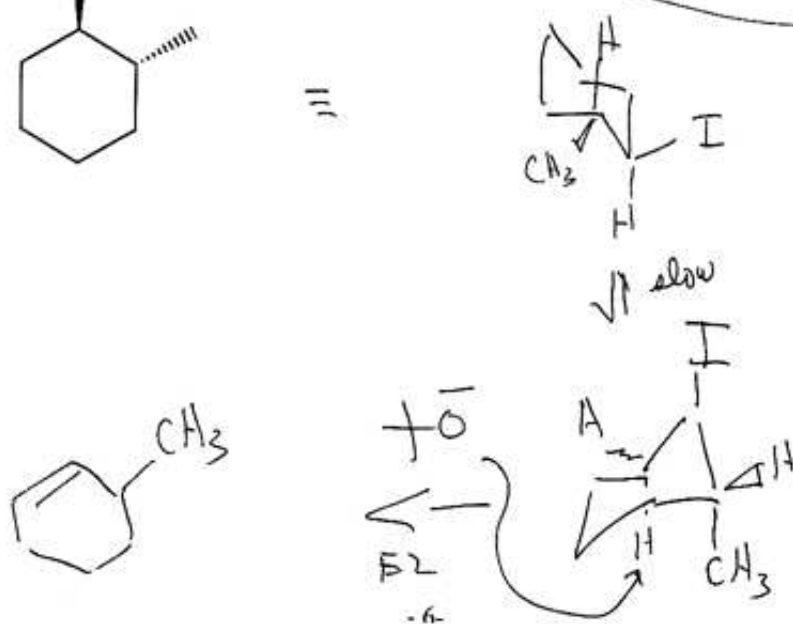
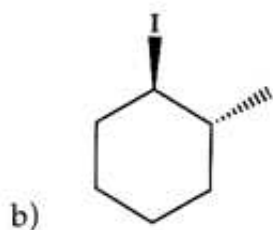
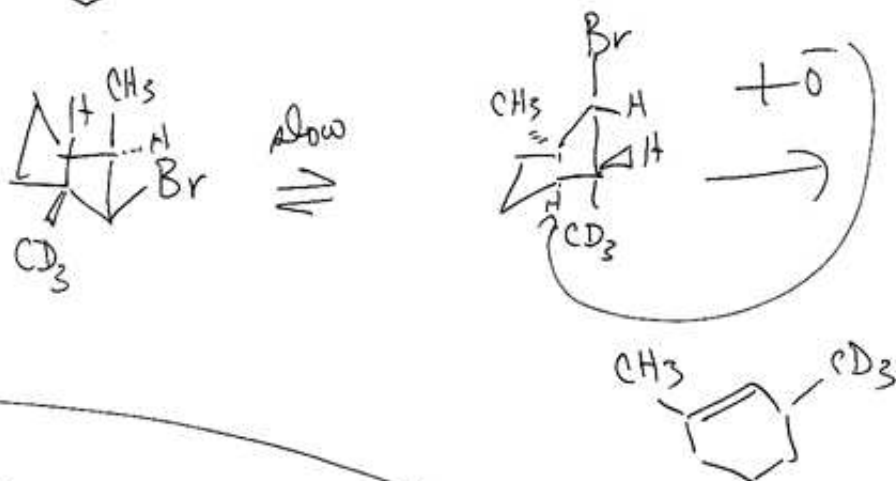
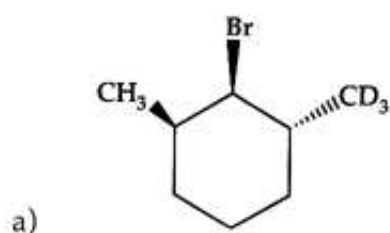
↓ $H_2O:$



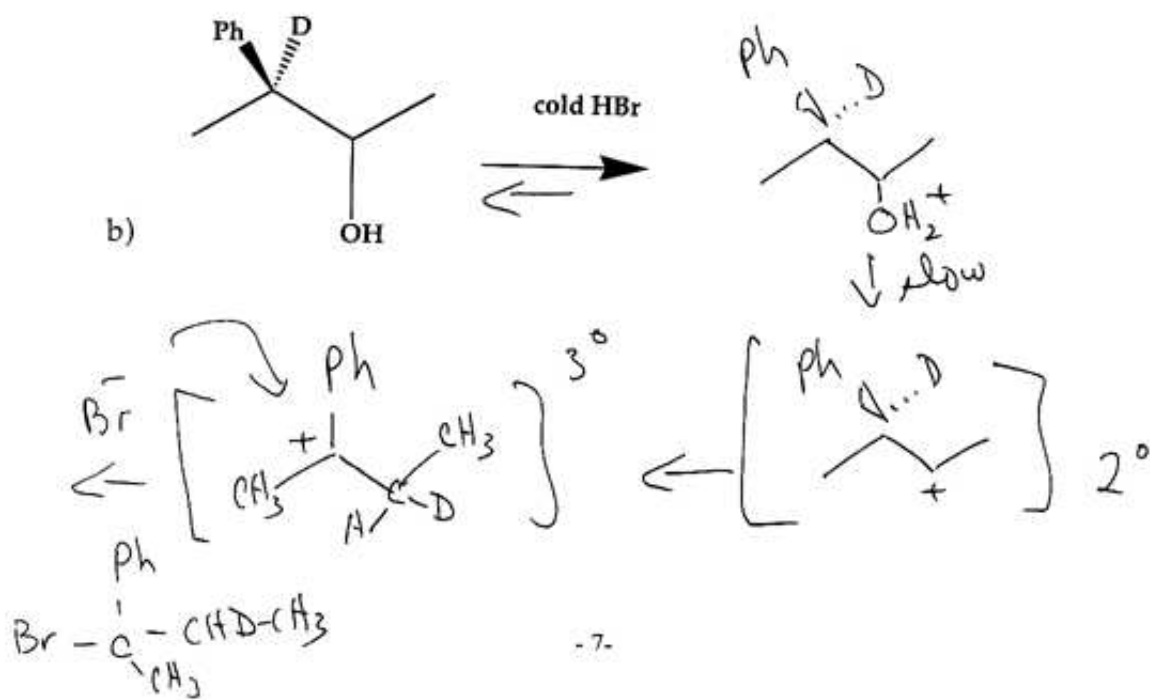
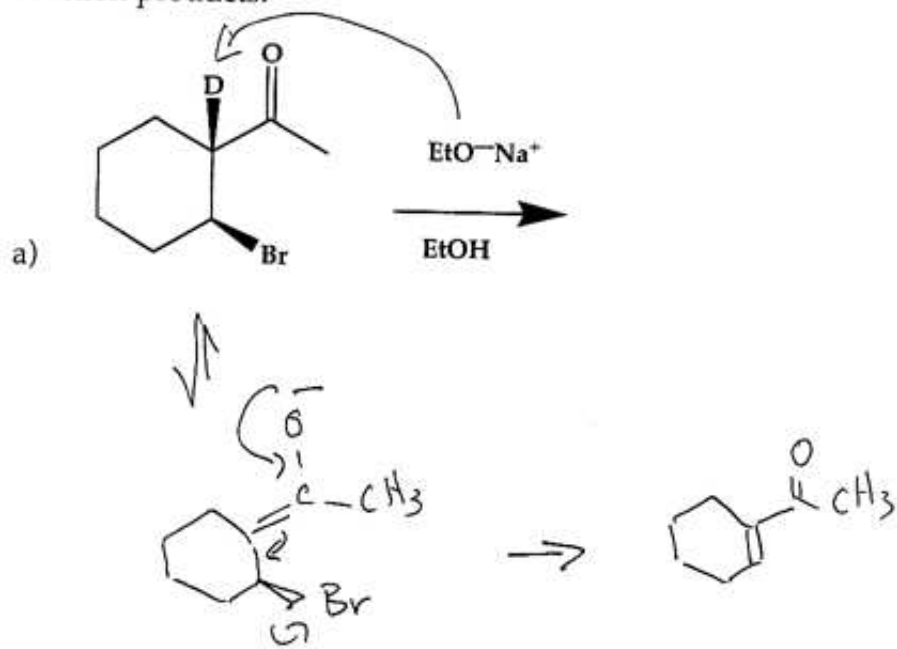
4. (10pts) How can the following alcohol be prepared from bromocyclohexane and ethylene oxide as the only sources of carbon atoms?



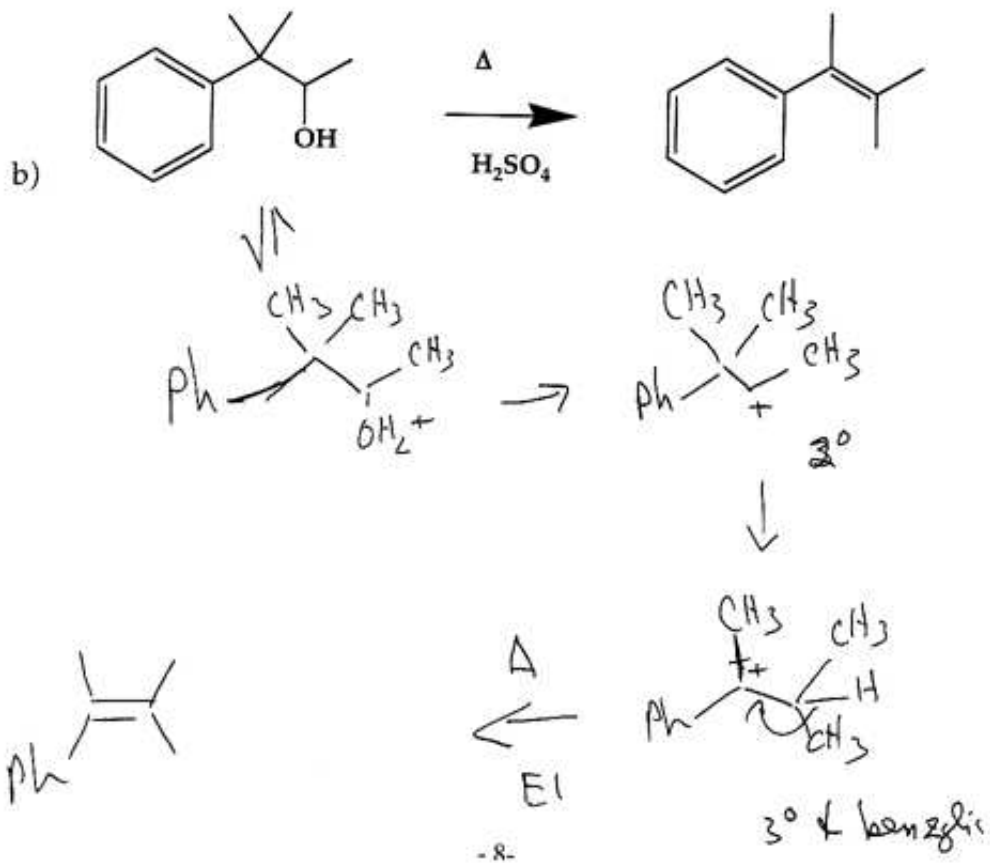
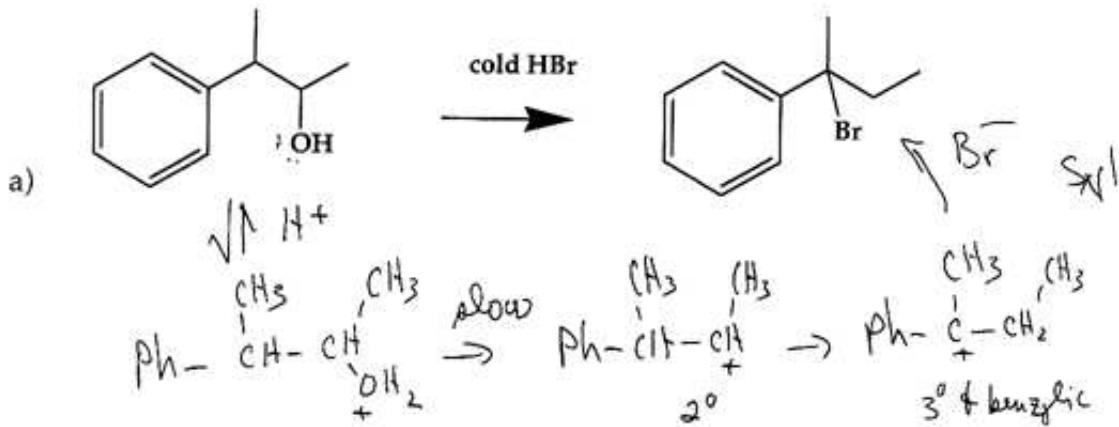
5. (10 pts) Assume that treatment of the following cyclohexyl halides with $(\text{CH}_3)_3\text{CO}^- \text{K}^+$ effects an E2 reaction. Predict the structure of the reaction product.



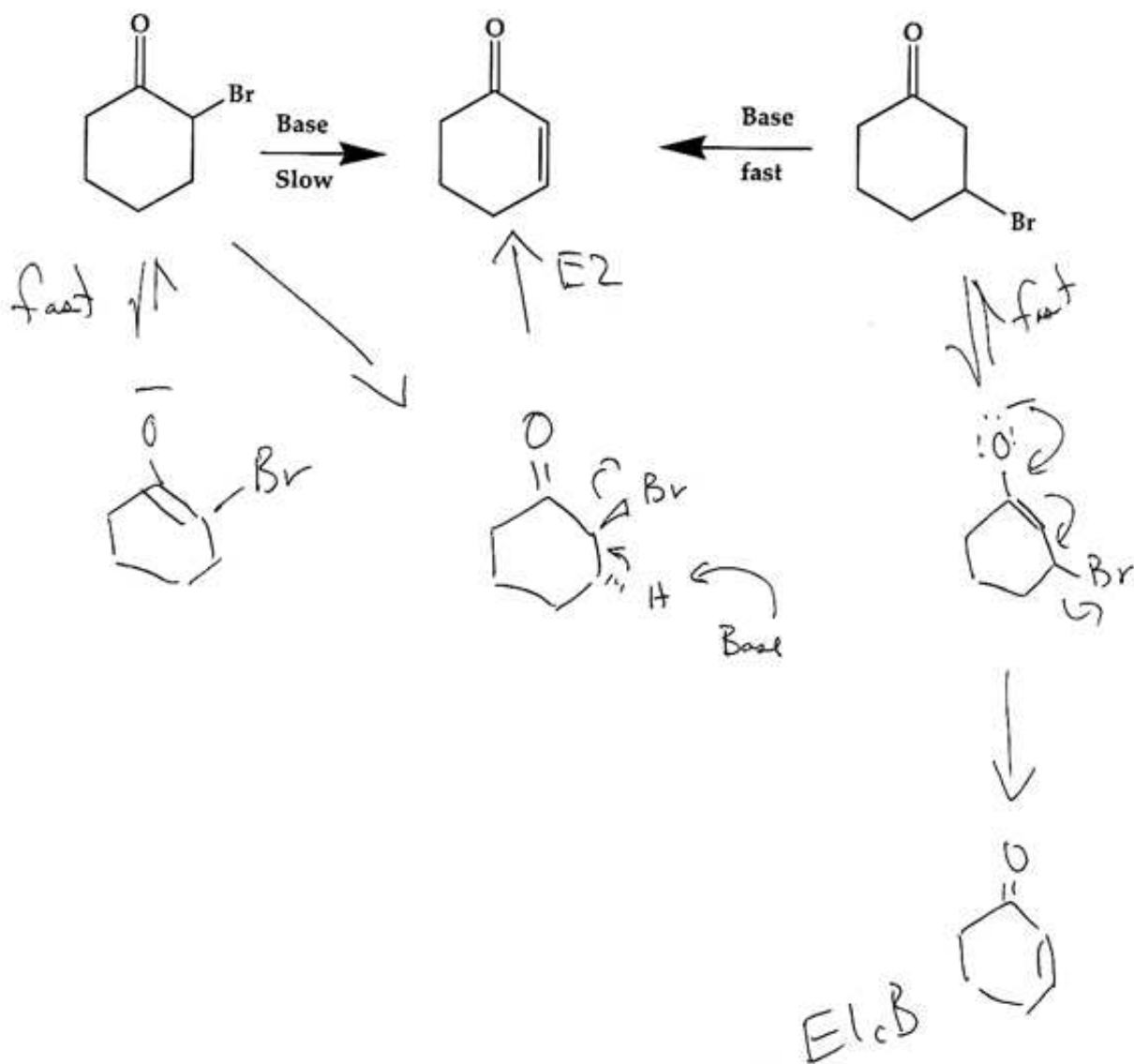
6. (10 pts) If the starting material is labeled with deuterium, predict the reaction products.



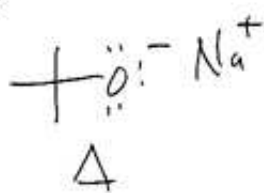
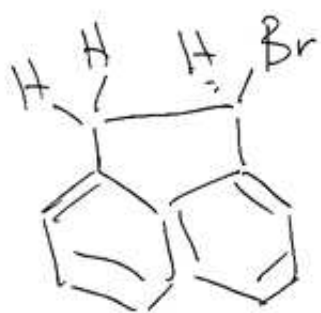
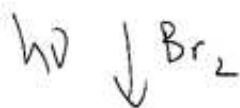
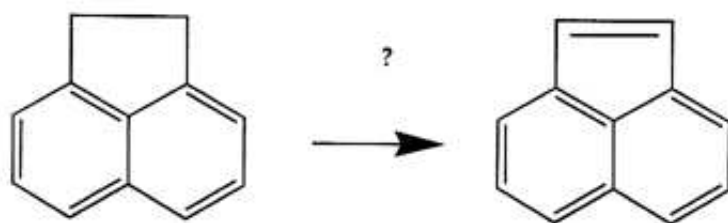
7. (10 pts) In the following reactions, a rearranged skeleton is observed in the principal products. Write a mechanism.



8. (10 pts) Treatment of both α and β -bromoketones with base results in loss of HBr to form α, β -unsaturated ketones. However, the former react much more slowly and require much stronger bases. Account for these differences.



9. (10 pts) How might you convert this compound to an alkene?



10. (10 pts) Under sufficiently mild conditions, diols such as those shown here undergo selective monodehydration to form alkenols. Suggest a mechanism.

