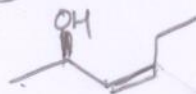


1. Provide structures for the following compounds (don't forget stereochemistry!).

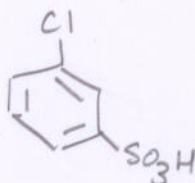
(20 points)

a. (2R,4Z)-hex-3-en-2-ol

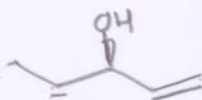


should have been 3Z, but
can still assign in
structural

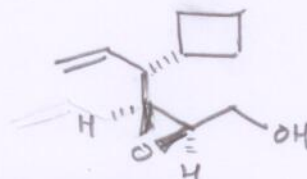
b. 3-chlorobenzenesulfonic acid



c. (3S,4R)-4-mercaptopent-1-en-3-ol

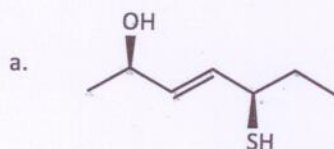


d. (2S,3S,4R)-4-cyclobutyl-2,3-epoxyshex-5-en-1-ol

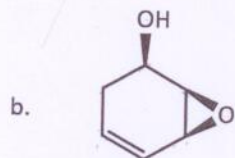


2. Provide IUPAC names for the following structures (don't forget stereochemistry!).

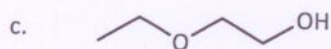
(15 points)



(2R,3E,5R) -
5-mercaptohept-3-en-2-ol
or
5-sulfanylhept-3-en-2-ol

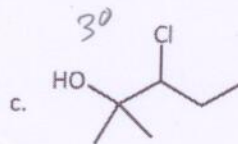
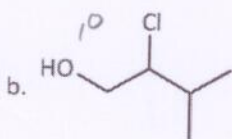
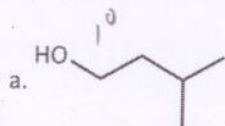


(1R,5S,6R) -
5,6-epoxycyclohex-3-enol



2-ethoxyethanol

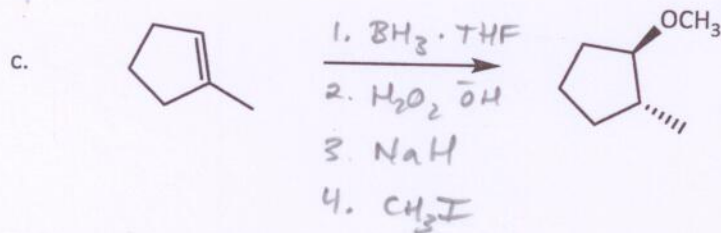
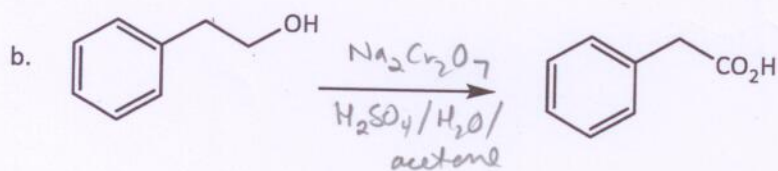
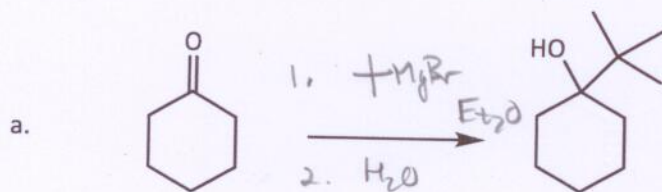
3. For the series of alcohols below, indicate which one has the *highest* pK_a value and which has the *lowest*. Explain the reasoning for your choices. (20 points)



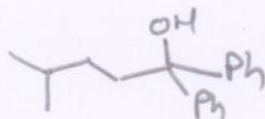
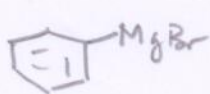
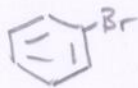
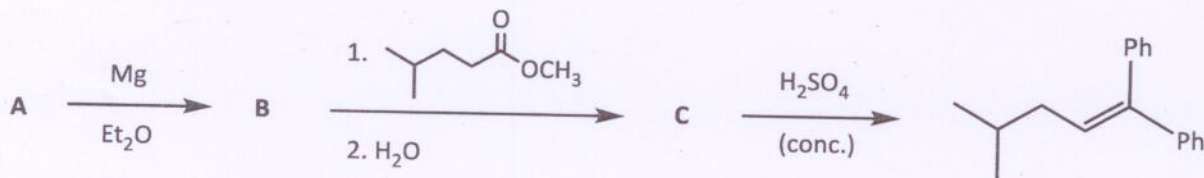
highest
ordinary
 1° alcohol

lowest middle
both have inductive stabilization of conjugate base - 1° alcohol has better solvation, so more acidic

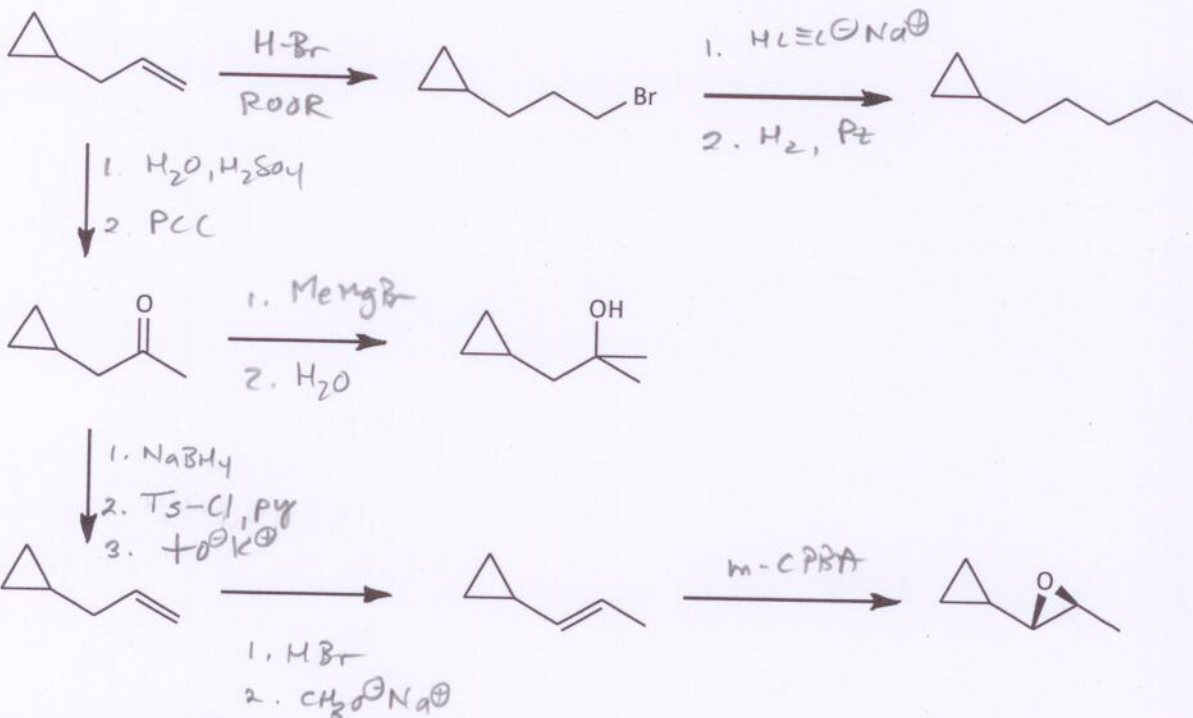
4. Show the reagents and conditions to accomplish the following (more than one step may be necessary). (15 points)



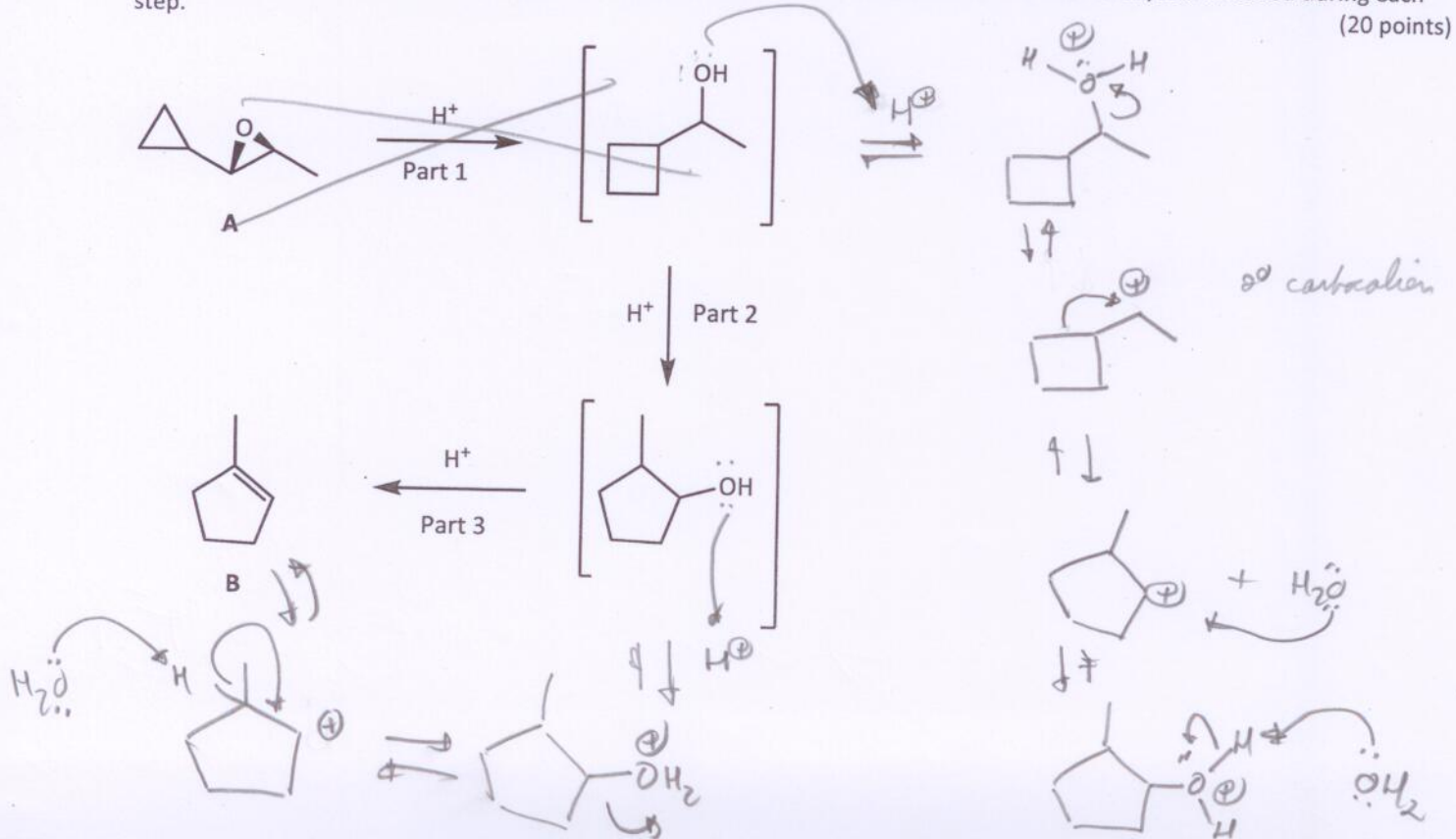
5. Show the structure of A, B and C in the following synthesis. (15 points)



6. For the following series of reactions, fill in the reagents necessary to accomplish each transformation (some of them require more than one step – be sure to use numbers (1., 2., etc) to show separate steps when necessary. You do not need to show any intermediates. (70 points)



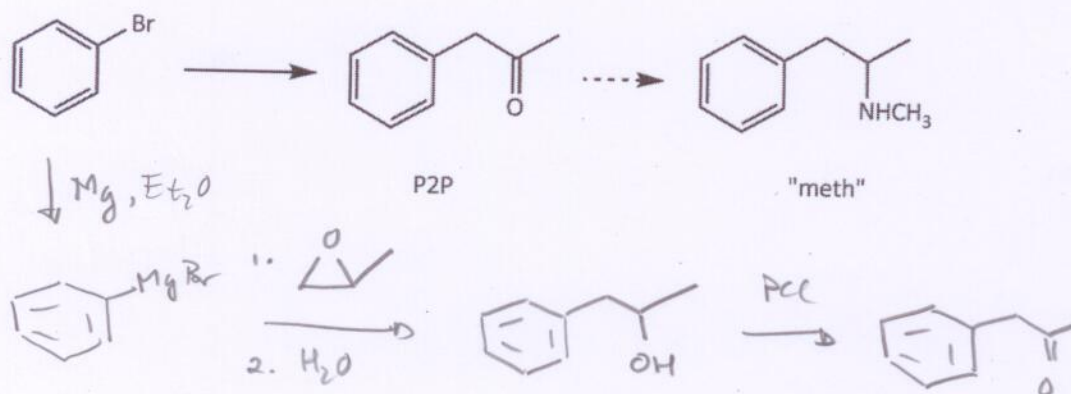
7. Provide the mechanism for the acid-catalyzed rearrangement of A to B. The entire process involves essentially three parts and the indicated intermediates are formed along the way. Be sure to show how the acid-catalyst is involved during each step. (20 points)



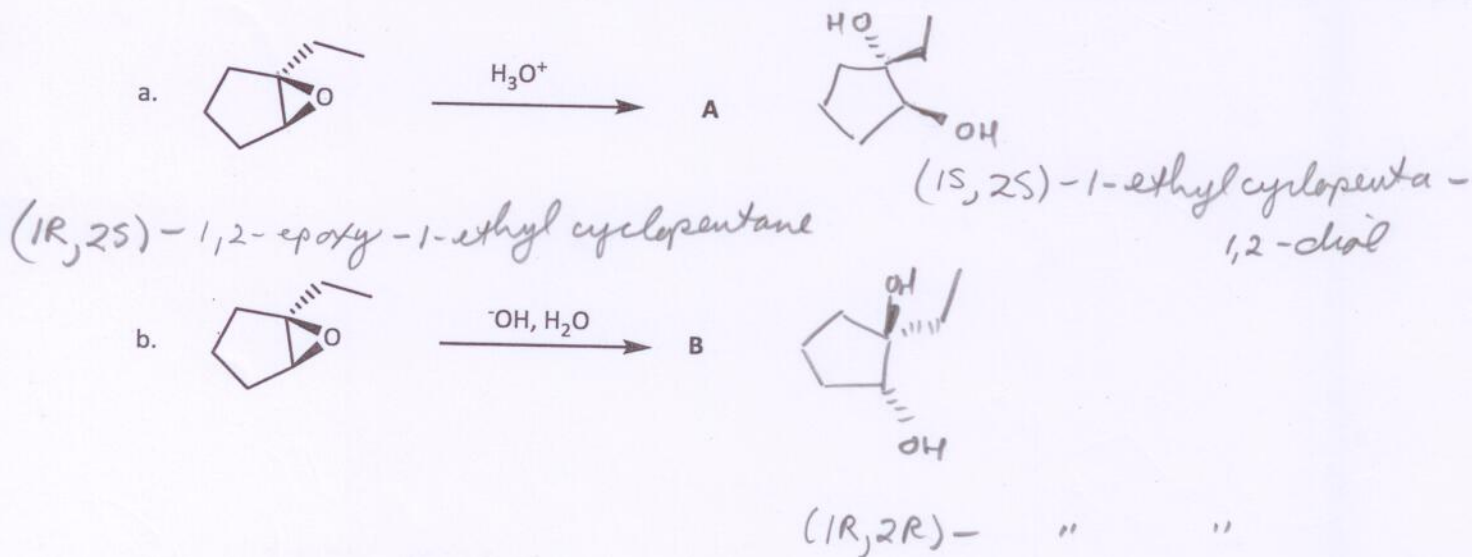
8. Explain why ether solvents, such as Et_2O and THF, are used for preparing and using Grignard reagents (R-MgBr), instead of solvents like methanol, ethanol (5 points)

Ethers act as Lewis bases and stabilize the formation of the organometallic reagent. Alcohol solvents are too acidic to be used in the presence of the strongly basic Grignard reagent.

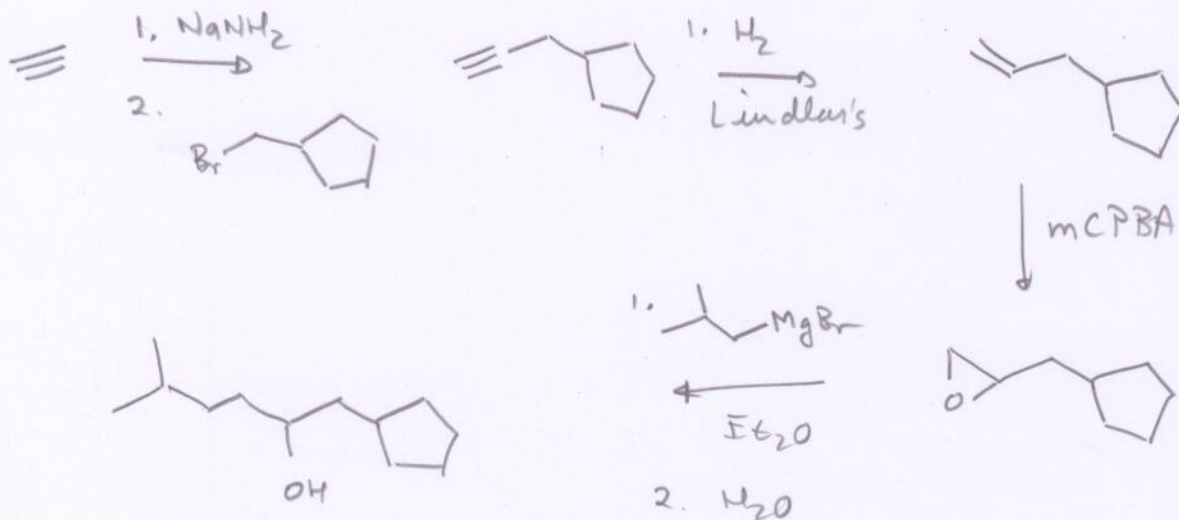
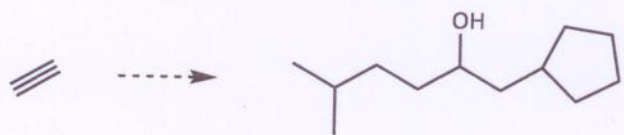
9. The ketone shown below, P2P, is an infamous starting material for the street drug methylamphetamine ("meth"). Show how to convert bromobenzene into this ketone using any reagents that you want, but the synthesis must include an epoxide at some point. Show all intermediates. (Don't try to synthesize "meth" - that's illegal!) (20 points)



10. Given the exact stereoisomer of the compound shown below, show the products **A** and **B** from each reaction (they are not exactly the same). (20 points)
Extra Credit: Provide IUPAC names for the starting compound and the products (including stereochemistry) (15 EC points)

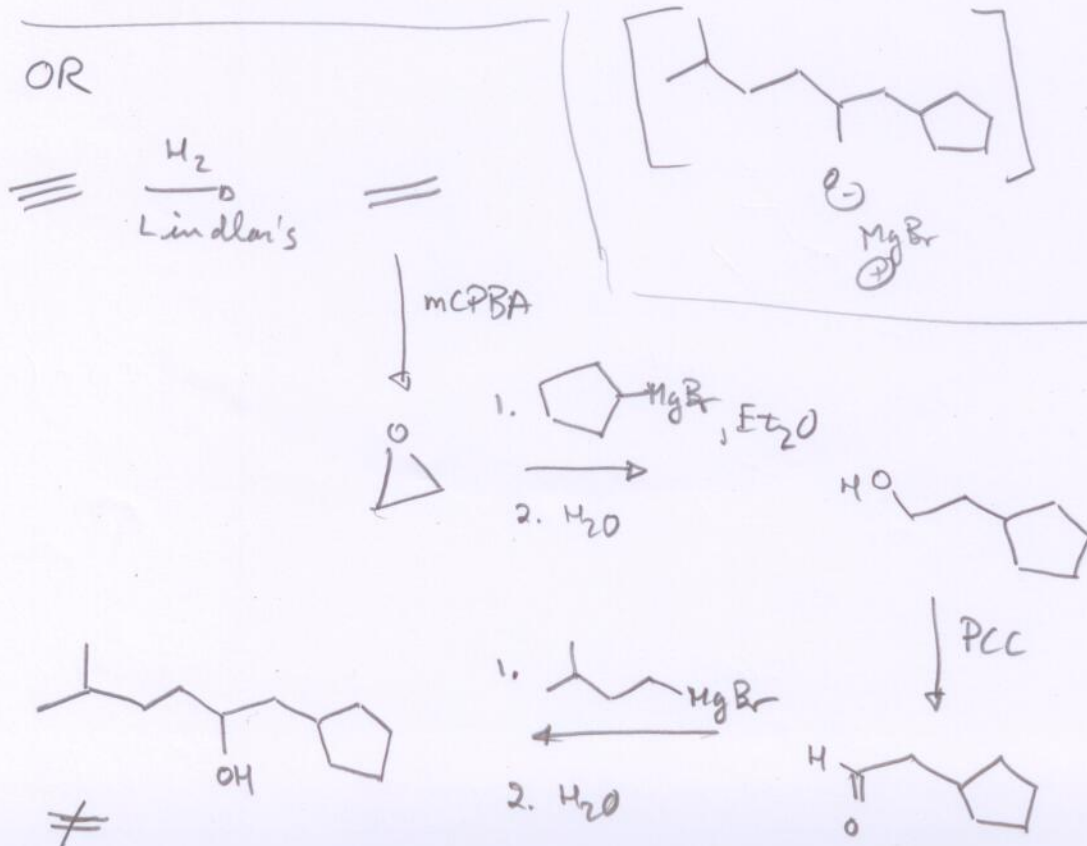


11. Starting from acetylene, show a synthesis of the following product. You can choose any reagents and other intermediates that you like, but the synthesis *must* start with acetylene. (50 points)



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OR



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