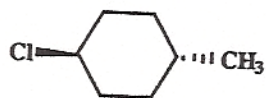
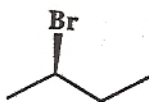


1. Provide names or structures for the following. 2 points each. Specify stereochemistry when appropriate!



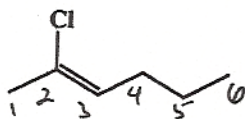
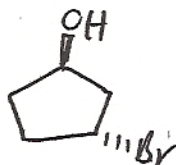
trans-1-chloro-4-methylcyclohexane

Most
representative
in terms
of length

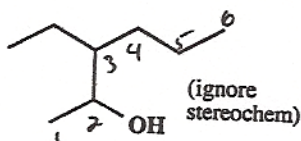


R-2-bromobutane

trans-3-bromocyclopentanol

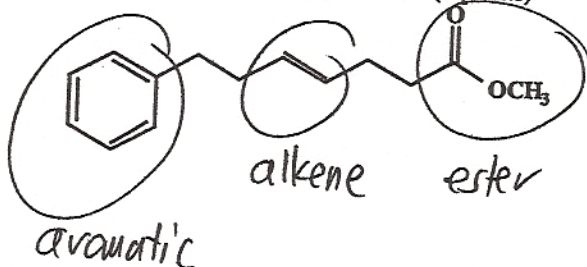


Z-2-chloro-2-hexene

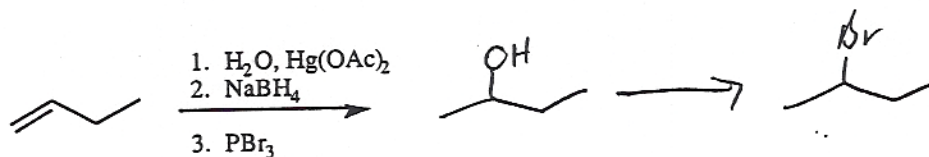
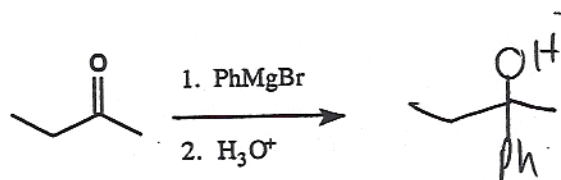
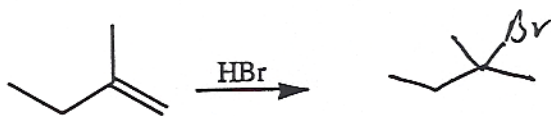
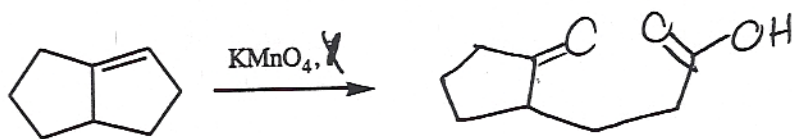
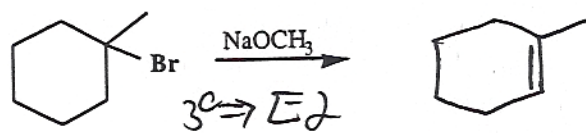
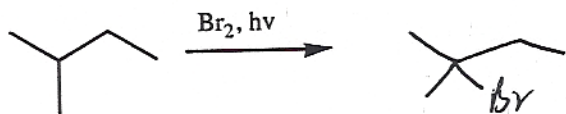
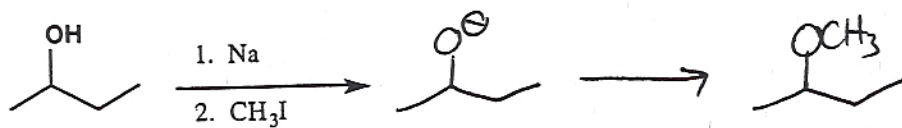


3-ethyl-2-hexanol

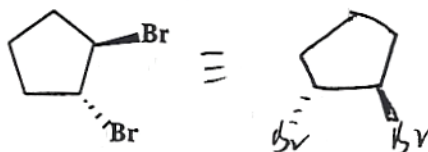
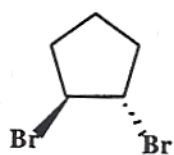
2. Identify the functional groups in the following molecule. (4 points)



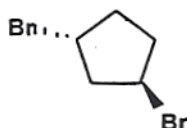
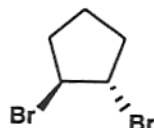
3. Predict the major products for the following reactions. Pay careful attention when orientation is a factor. Draw just one major product in each case. (3 points each)



4. Classify the pairs of molecules as totally different, identical, structural isomers, diastereomers, or enantiomers. (2 points each)

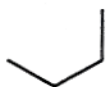
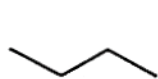


enantiomers



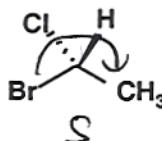
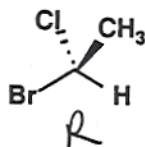
structural isomers

1,2 vs. 1,3



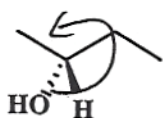
Same

(interconvert by rotation)

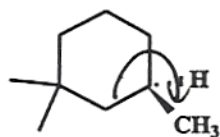


enantiomers

5. Classify each chiral carbon as R or S. (2 points each)

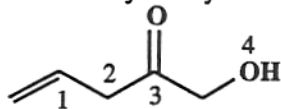


R



R

6. Classify the hybridization and bond angles (109, 120, or 180) at the labelled atoms. (5 points)



C-1 sp^2
120

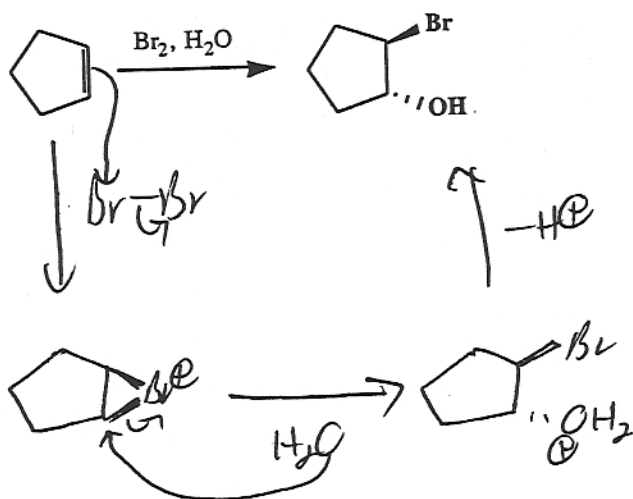
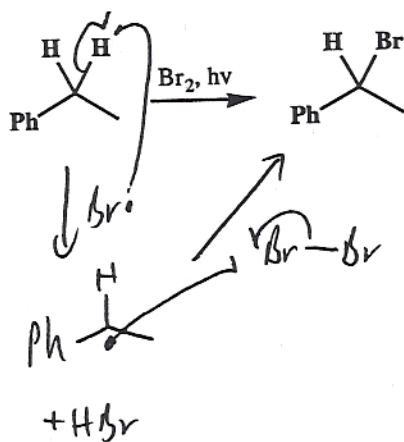
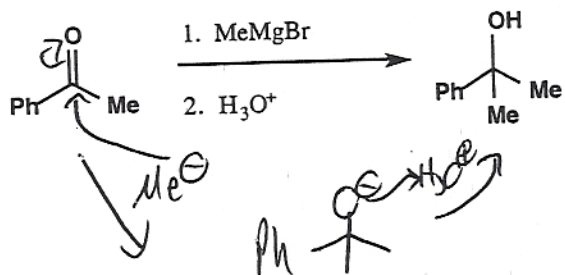
C-2 sp^3
109

C-3 sp^2
120

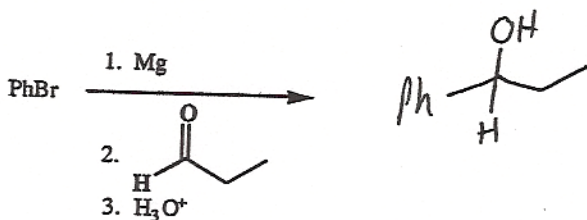
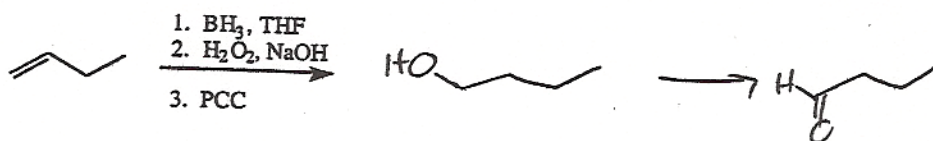
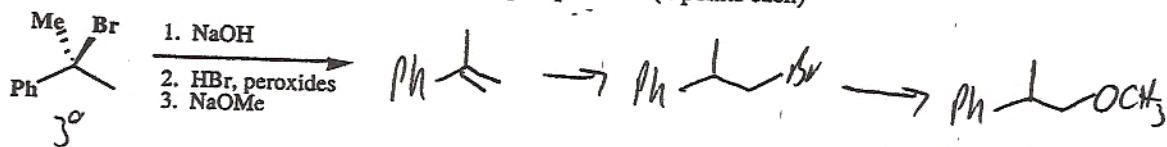
O-4 sp^2
120

Oops. O-4 should be sp^3 , 109.

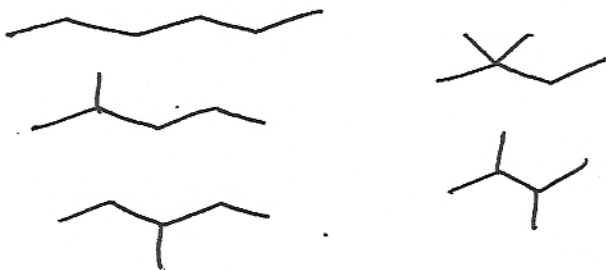
7. Draw the mechanisms for the following reactions. For any radical reactions, draw propagation steps only. 5 points each.



8. Draw the products of the following multi-step sequences. (4 points each)

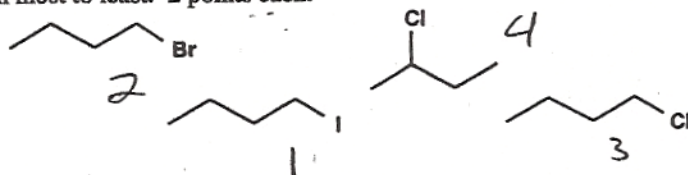


9. Draw as many structural isomers as you can for C_6H_{14} . Circle any that are chiral. (Note: be careful! You will lose points for any repeats!) (6 points) $\rightarrow \text{EU} = 0$



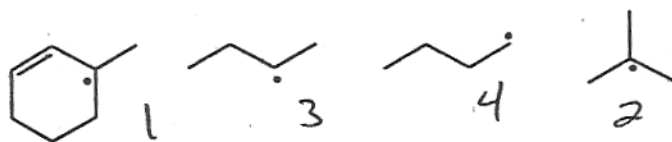
10. Rank the Following, from most to least. 2 points each.

a. Reactivity toward S_N2

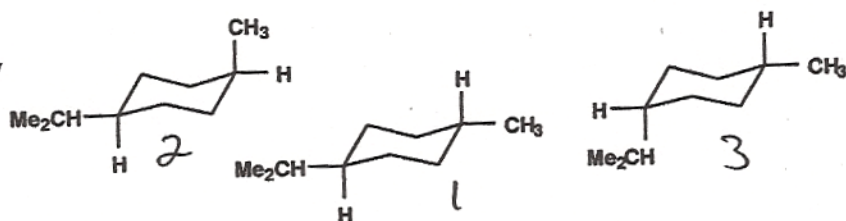


① Leaving Group
② 10720

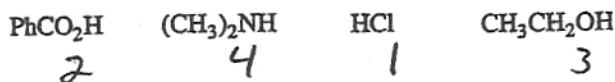
b. Stability



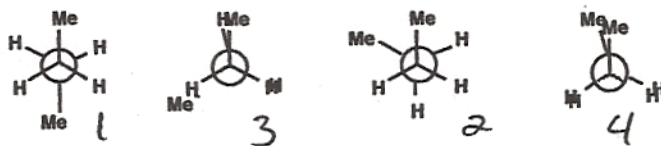
c. Stability



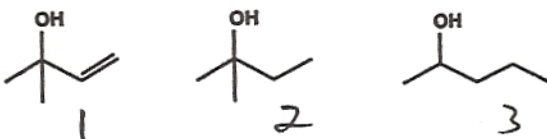
d. Acidity



e. Stability

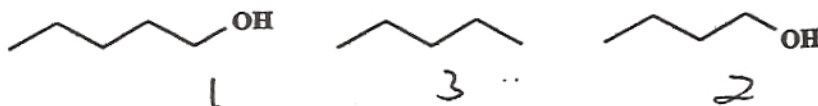


f. Reactivity toward H_2SO_4 catalyzed dehydration

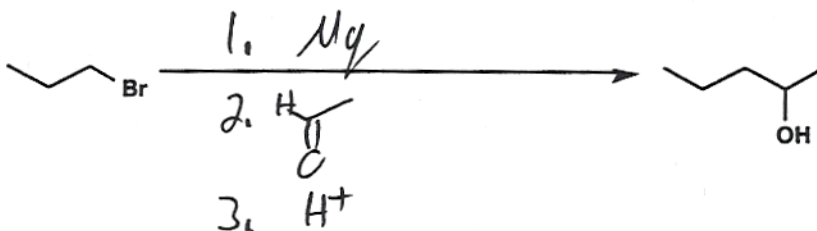
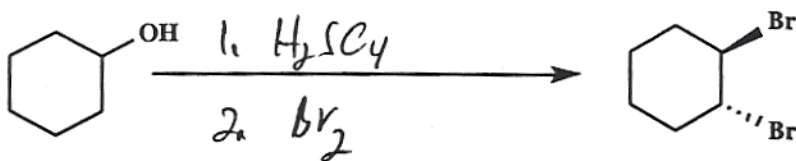
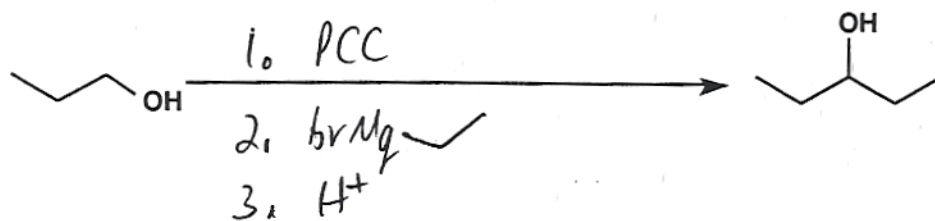


Cation stability

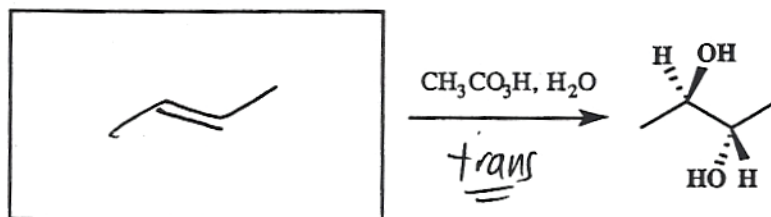
g. Boiling Point



11. Provide reagents for the following transformations. You may use anything you like. Each can be done within ≤ 3 steps. (4 points each)

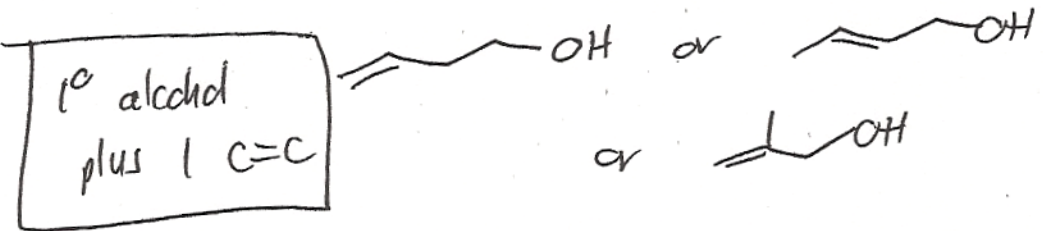


12. Provide the appropriate reactant for the following transformation. (3 points)



13. Suggest a structure for X, given the following info: (5 points)

Formula: C_4H_8O $EU=1$
 It Reacts With: chromic acid 1° or 2° alcohol
 H_2/Pt $C=C$
 Br_2 $C=C$
 It doesn't React With: Lucas reagent ($HCl/ZnCl_2$) 1°
 $NaBH_4$ not $C=O$



14. Design syntheses of the following molecule. Permissible starting materials include alkenes or alcohols of ≤ 5 carbons, and anything else you might want. (6 points)

