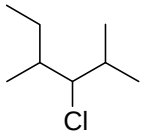
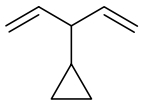
Chem52 Homework Set 1

This homework set is similar to a Chem 51 final exam. Please provide answers in the spaces provided or, preferably, on attached sheets. Point values are listed only to give you the relative importance of each problem. All problems from the Ch. 16 material have been deleted, so the 3 hr. exam was originally a little longer.

1. (6 points) Provide IUPAC accepted names for the following compounds.





2. (6 points) Provide a structure for the following compounds.

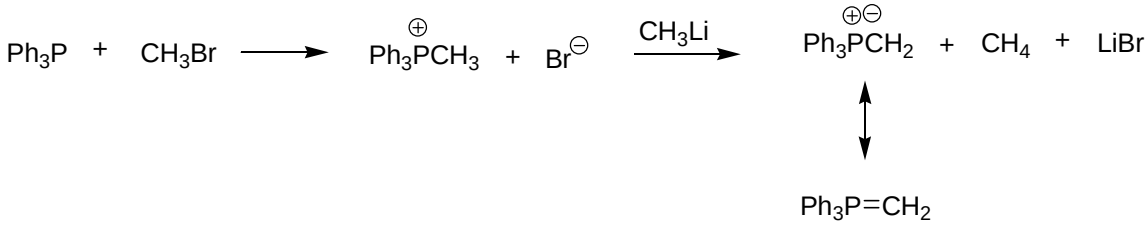
p-ethylphenol sec-butyl bromide

3. (8 points, 2 each) Provide an example of a molecule containing the indicated functional group. Do not include more than one functional group in each compound you draw.

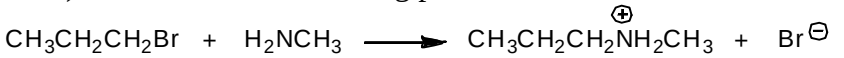
a) ester b) carboxylic acid c) amine d) alkyl halide

4. (6 points) Draw the lowest energy chair conformation of cis-1-t-butyl-2-fluorocyclohexane. Clearly show the H's on C1 and C2 and label both substituents as either axial or equatorial.

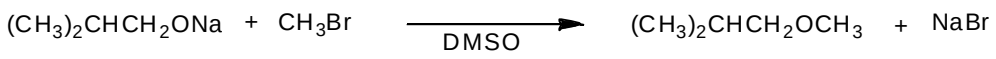
5. (6 points) Provide the missing electron-pushing arrows for the following reaction sequence. Some steps should be redrawn to clearly show lone pairs or bonds that are involved in the reactions.

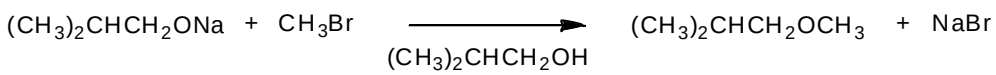


6. (9 points) For each of the following pairs of reactions, circle the reaction that proceeds faster.

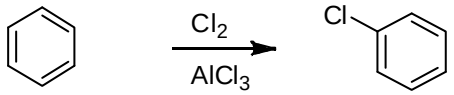
a. 

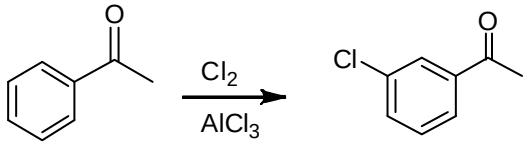


b. 

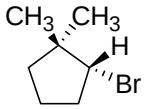


c.

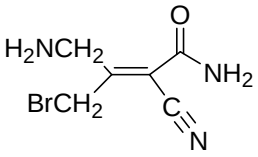




7. (5 points) Determine the absolute configuration of all stereocenters in the following compound. Show your reasoning.



8. (5 points) Classify the following alkene as E or Z. Show your reasoning.

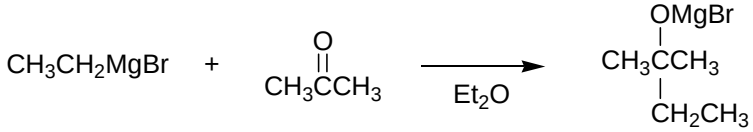


9. (10 points, 2 each) Circle the aromatic structures.

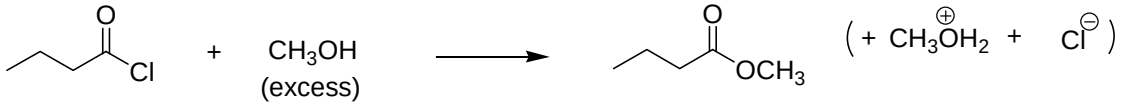


10. (6 points, 3 each) Classify each of the following reactions as either addition, elimination, substitution, or rearrangement reactions.

a)



b)



11. (4 points, 2 each) Calculate the oxidation state of the indicated carbons. (A one page handout on calculating oxidation states is available on Blackboard. See the Review folder.)

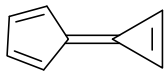


12. (6 points, 3 each) Classify each of the following reactions as oxidation, reduction, or neither. You do NOT need to provide the reagents necessary to complete the reactions.

a) $CH_3CH{=}CH_2 \longrightarrow CH_3\overset{\overset{OH}{|}}{C}HCH_3$

b) $CH_3CH{=}CH_2 \longrightarrow CH_3\overset{\overset{Br}{|}}{C}HCH_2Br$

13. (6 points) Calicene has an unusually large dipole moment for a hydrocarbon. Explain why.



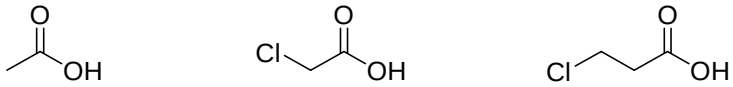
calicene

14. (6 points, 3 each) For each set, circle the compound that is most basic.

a) $CH_3CH_2\overset{\oplus}{O}H_2$ CH_3CH_2OH CH_3CH_2ONa

b) 

15. (6 points, 3 each) For each set, circle the compound that is most acidic.

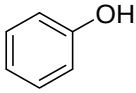
a) 

b) CH_3SH CH_3NH_2 CH_3OH

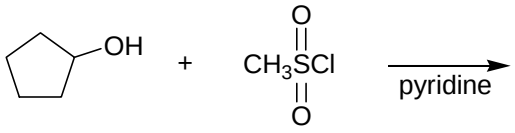
16. (15 points, 5 each) For each of the following Bronsted-Lowry acid/base reactions
    a. provide products that would form if the reaction proceeds as written
    b. label the acid and base on each side of the reaction
    c. draw an arrow indicating which way the equilibrium actually lies

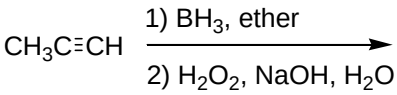
$HC{\equiv}CNa + CH_2{=}CH_2 \rightleftharpoons$

$CH_3CH_2Li + CH_3CH_2NH_2 \rightleftharpoons$

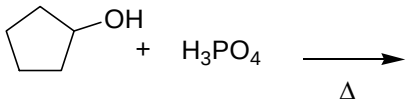
 $+ CH_3ONa \rightleftharpoons$

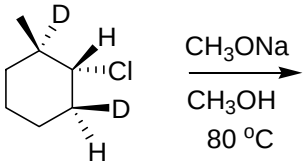
17. (42 points, 3 each) Provide the major organic products for the following reactions. Be sure to indicate stereochemistry when necessary. (4 problems from Ch.16 were deleted.)

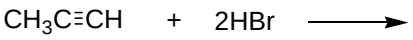


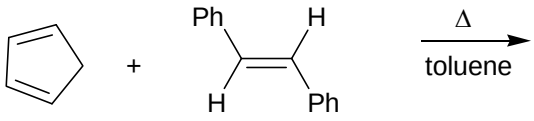


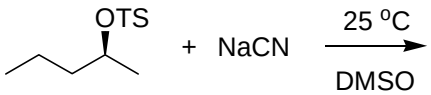


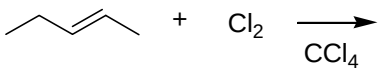




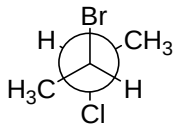


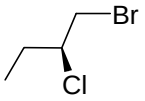


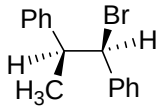


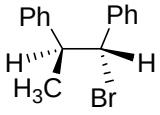


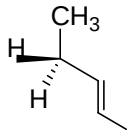
18. (12 points, 4 each) Determine if each of the following pairs of compounds represent enantiomers, diastereomers, constitutional isomers, or two molecules of the same compound.

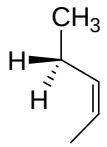




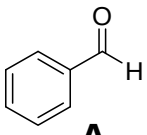




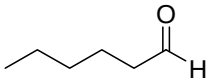




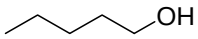
19. (10 points) Match each of the given IR spectra to one the following compounds. Label <u>at least one</u> peak in each IR spectrum that allows you to conclusively match spectrum to compound.



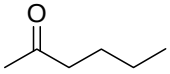
A



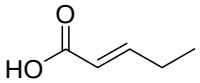
B



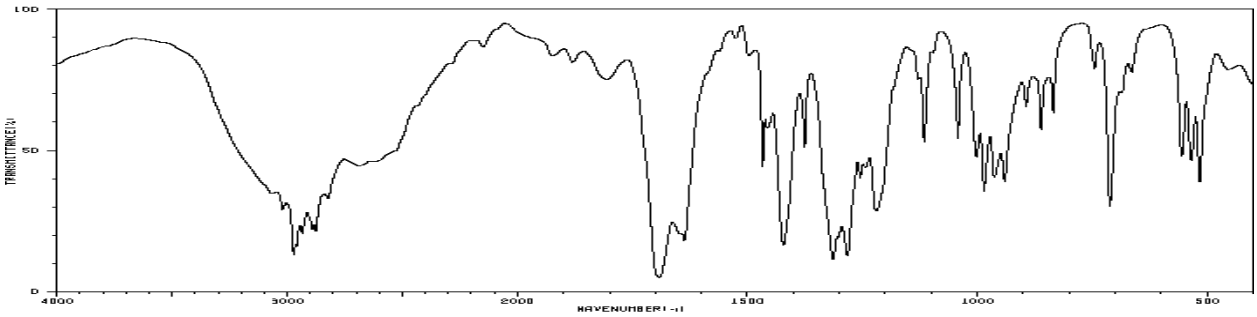
C

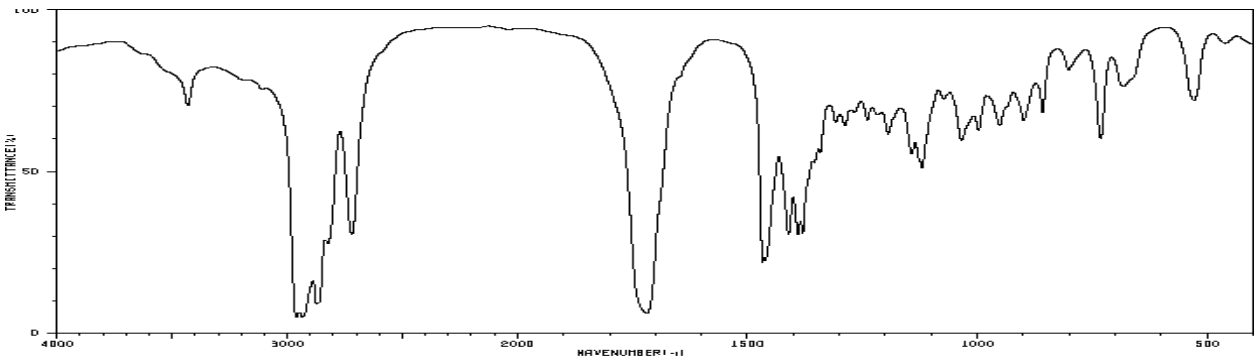


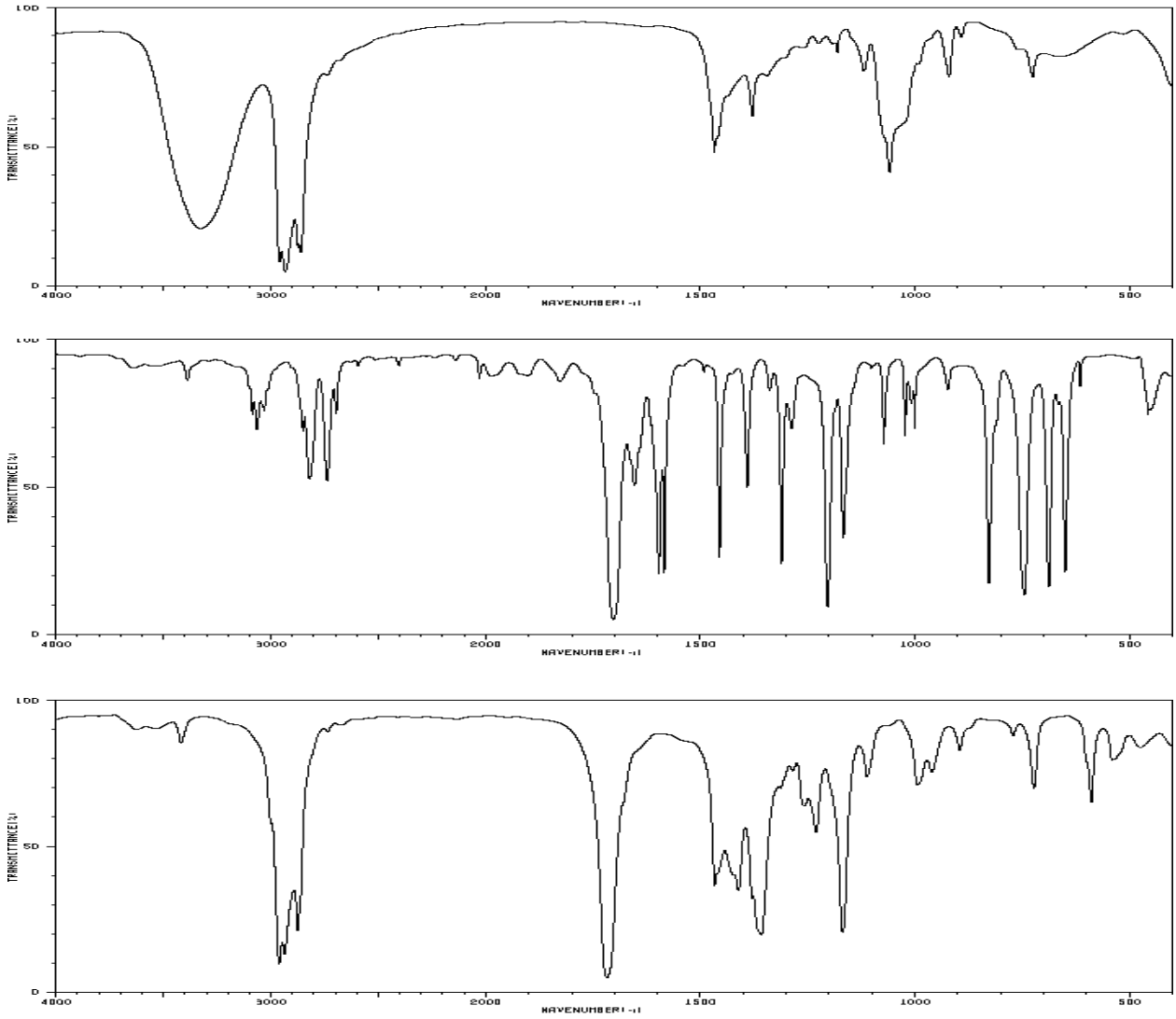
D



E

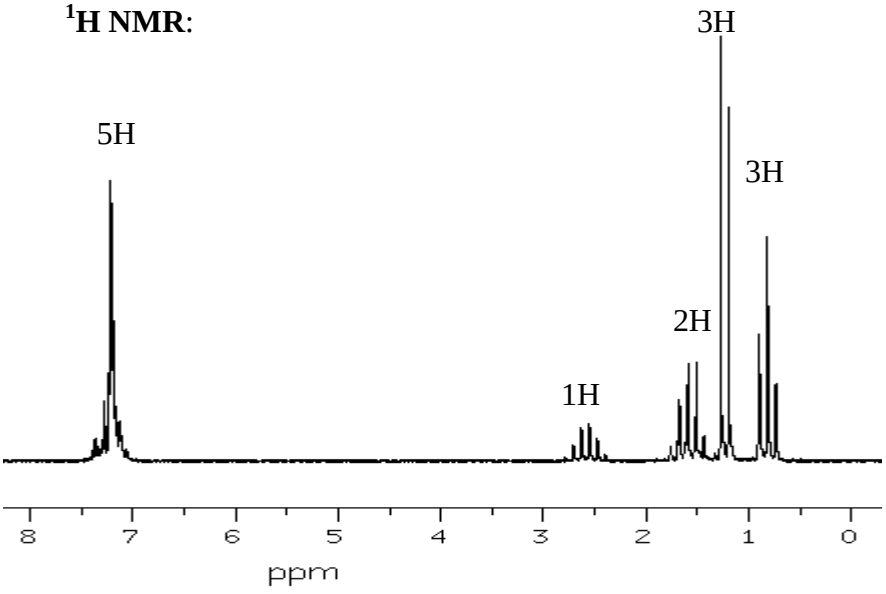






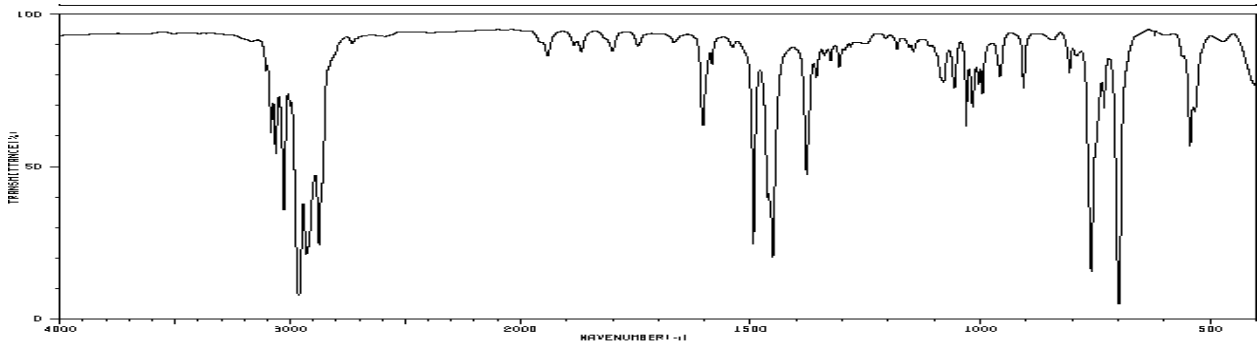
20. (10 points) Determine the structure of the following $C_{10}H_{14}$ compound. Partial credit will be awarded if you solve pieces of the final structure and <u>show your reasoning</u>. Place your final answer in the box. **^{13}C NMR** (δ, ppm): 148, 128, 127, 126, 42, 31, 22, 12

^{1}H NMR:

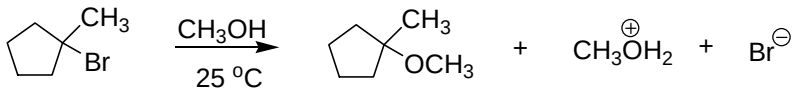


(IR on next page.)

IR:



21. (16 points) Provide a complete electron-pushing mechanism and the corresponding energy diagram for the following reaction. Label and draw starting materials, transition state(s), intermediate(s), products, and axes on the diagram. Show the structure(s) of any transition state(s).



(Ch. 16 mechanism and synthetic problems deleted.)

22. (10 points) Provide a synthesis for each of the following compounds. You may use organic reagents containing <u>three carbons or less</u> and any inorganic reagents you need.

