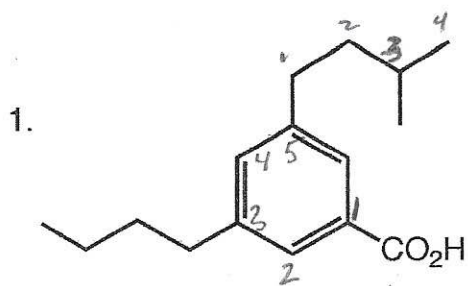


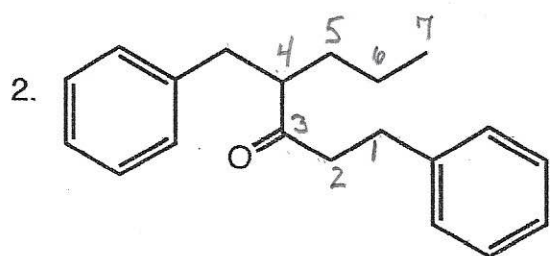
# Exam 2 S25

## A. Nomenclature: (12 points)

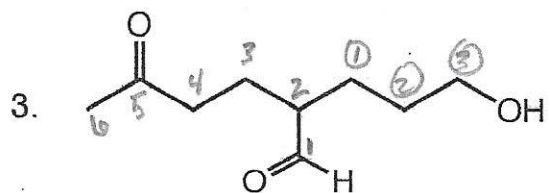
Give an acceptable name for each of the following compounds. Be sure to indicate the stereochemistry where appropriate.



3-butyl-5-(3-methylbutyl)benzoic acid



4-benzyl-1-phenyl-3-heptanone

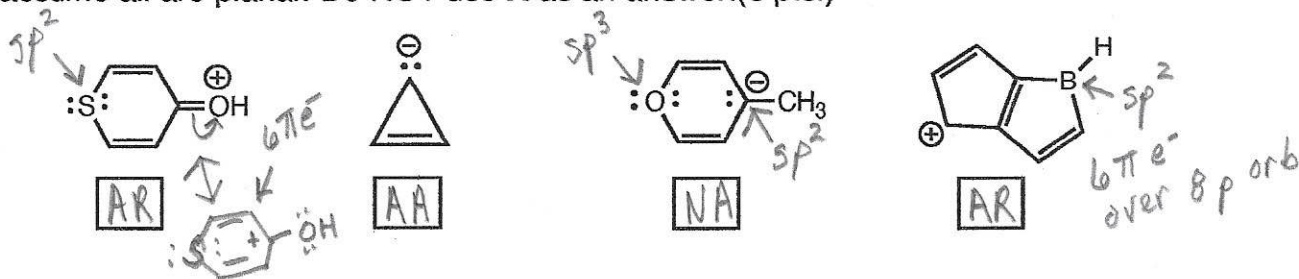


2-(3-hydroxypropyl)-5-oxohexanal

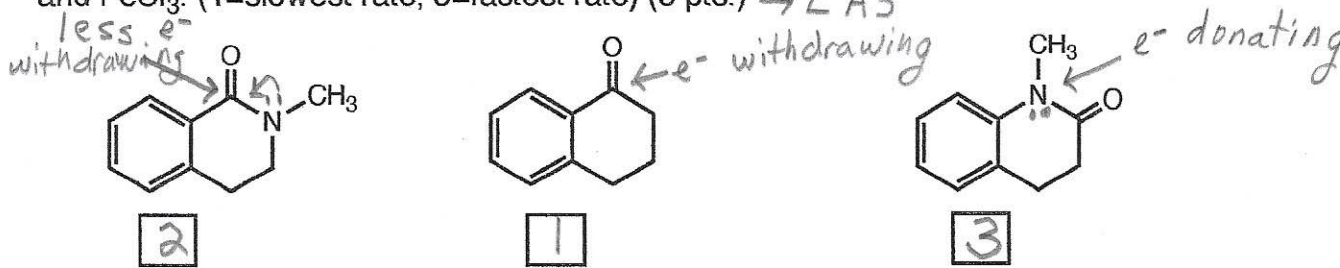


**B. Facts: 20 points**

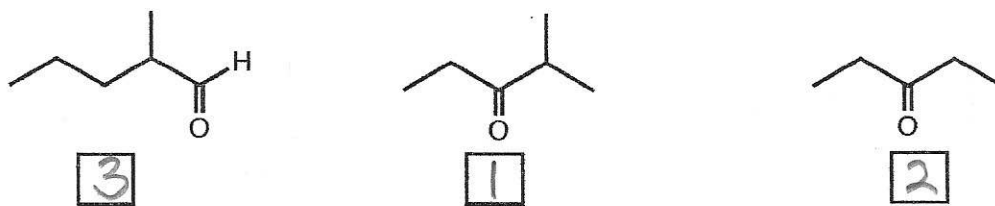
1. Label the molecules below as aromatic (AR), antiaromatic (AA), or nonaromatic (NA). Please assume all are planar. Do NOT use A as an answer! (8 pts.)



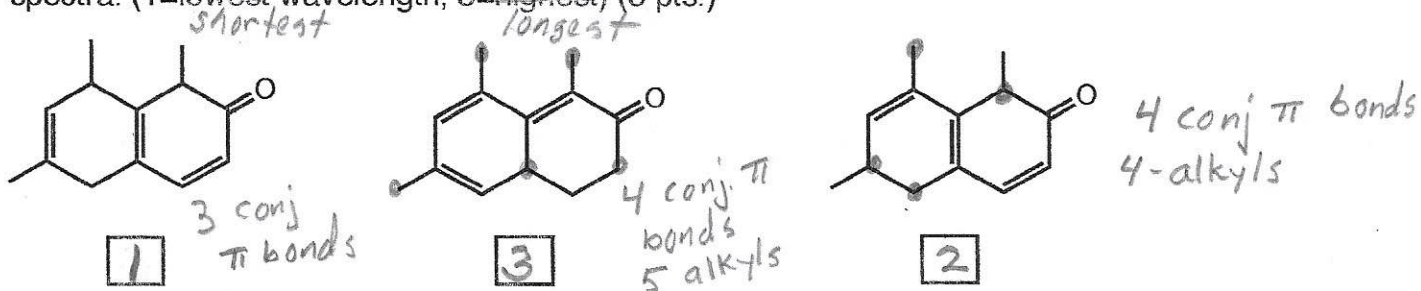
2. Rank the following substituted benzene compounds in order of increasing reaction rate with  $\text{Cl}_2$  and  $\text{FeCl}_3$ . (1=slowest rate, 3=fastest rate) (3 pts.)  $\rightarrow$  EAS



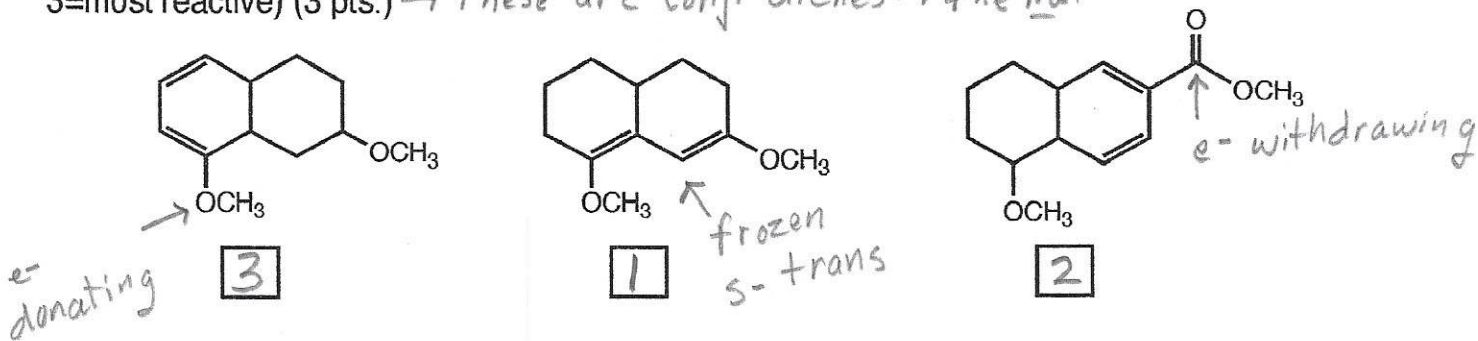
3. Rank the compounds in order of increasing reactivity in a nucleophilic addition reaction. (1= least reactive, 3=most reactive) (3 pts.)



4. Place the following compounds in order of increasing wavelength of the  $\pi$  to  $\pi^*$  transition in their UV spectra. (1=lowest wavelength, 3=highest) (3 pts.)

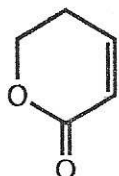
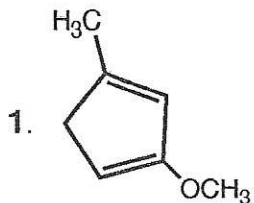


5. Rank the compounds in order of increasing reactivity in a Diels-Alder reaction. (1= least reactive, 3=most reactive) (3 pts.)  $\rightarrow$  These are conj. dienes  $\rightarrow$  the Nu.

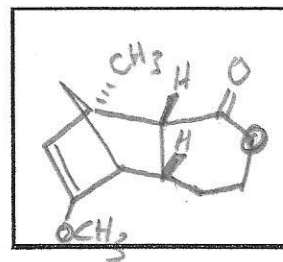


**C. Reactions:** Total = 36 points, 6 points each

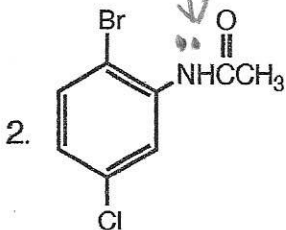
Please provide the reagents or the major product in the answer box. Indicate **stereochemistry** if applicable. **Full credit is awarded only when the product of each step in a multi-step reaction is shown below the reaction.**



Heat  $\rightarrow$



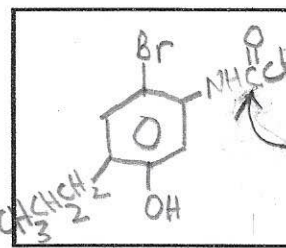
2pts  $\rightarrow$  correct rings  
2pts  $\rightarrow$  stereo  
2pts  $\rightarrow$  regio



1.  $\text{CH}_3\text{CH}_2\text{COCl}$ ,  $\text{AlCl}_3$

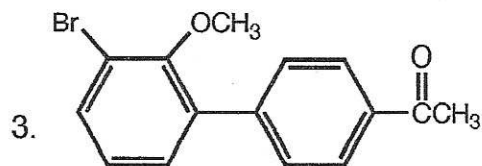
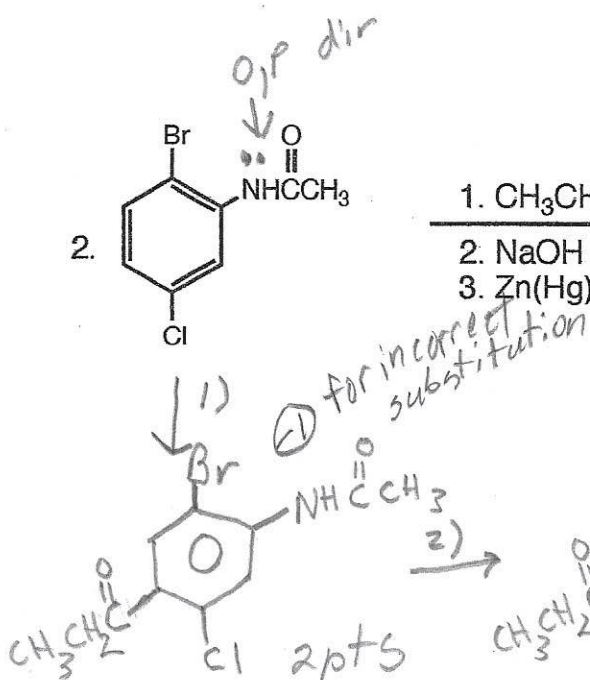
2.  $\text{NaOH}$  (2eq),  $100^\circ\text{C}$ , then  $\text{H}_3\text{O}^+$

3.  $\text{Zn(Hg)}$  /  $\text{HCl}$



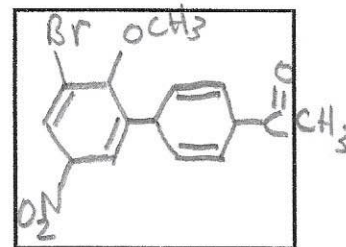
-1 if also reduced

2pts



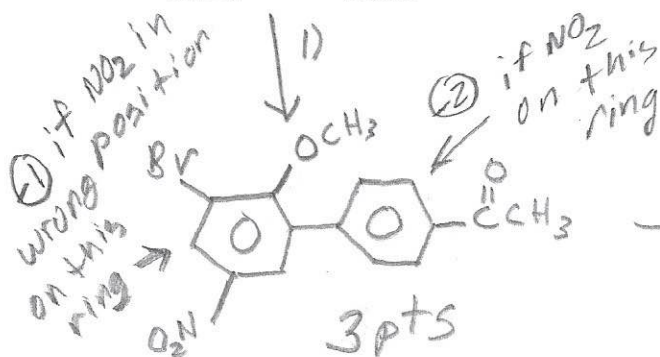
1.  $\text{HNO}_3$  /  $\text{H}_2\text{SO}_4$

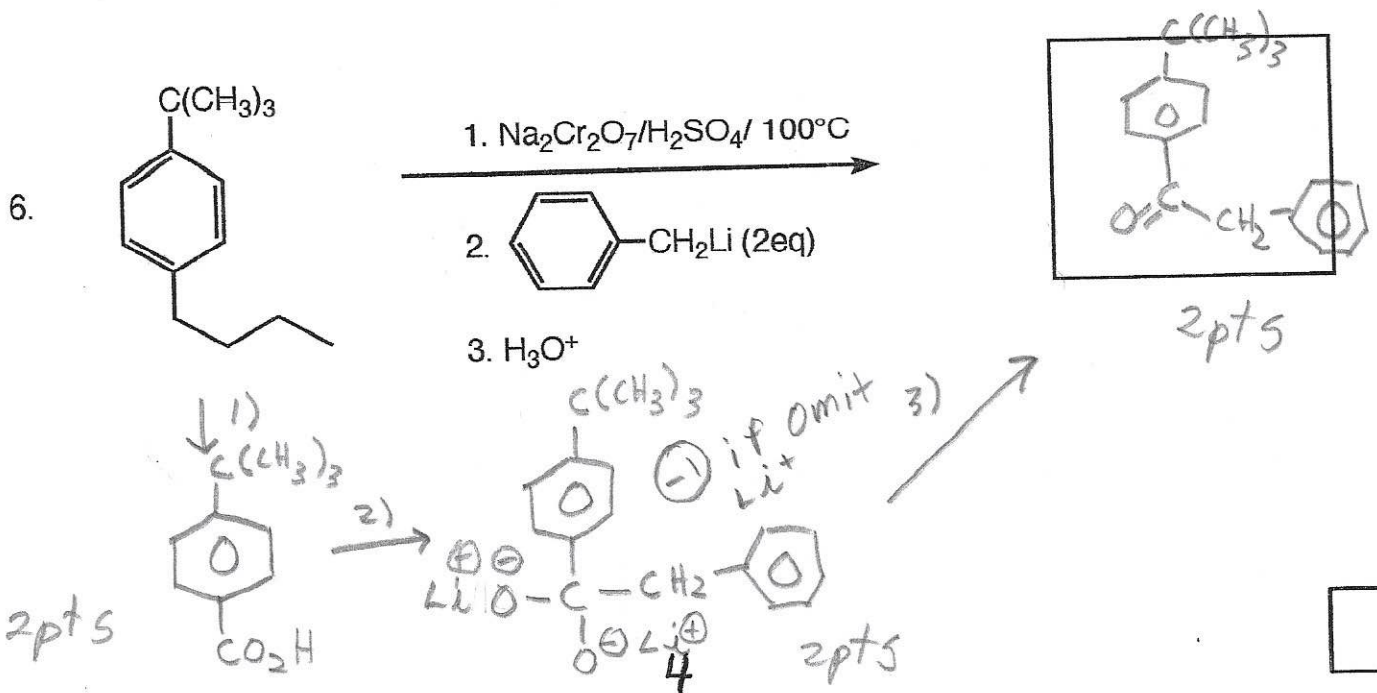
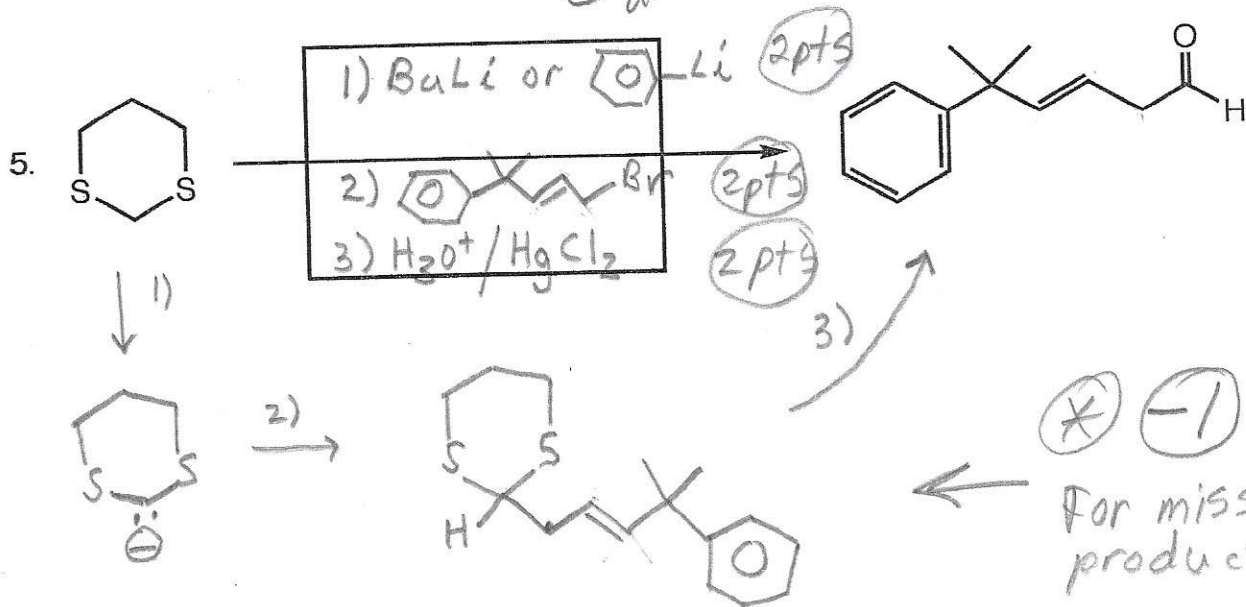
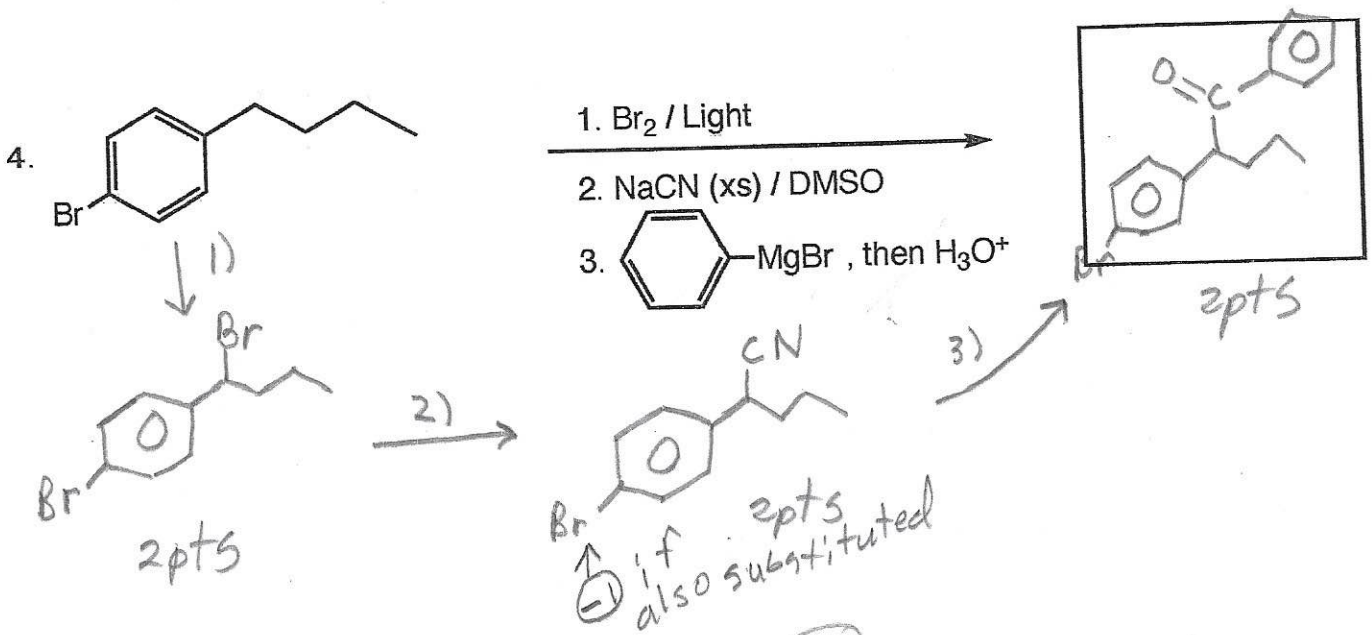
2.  $\text{Na}$  /  $\text{NH}_3$  /  $\text{CH}_3\text{OH}$  (xs)



3pts

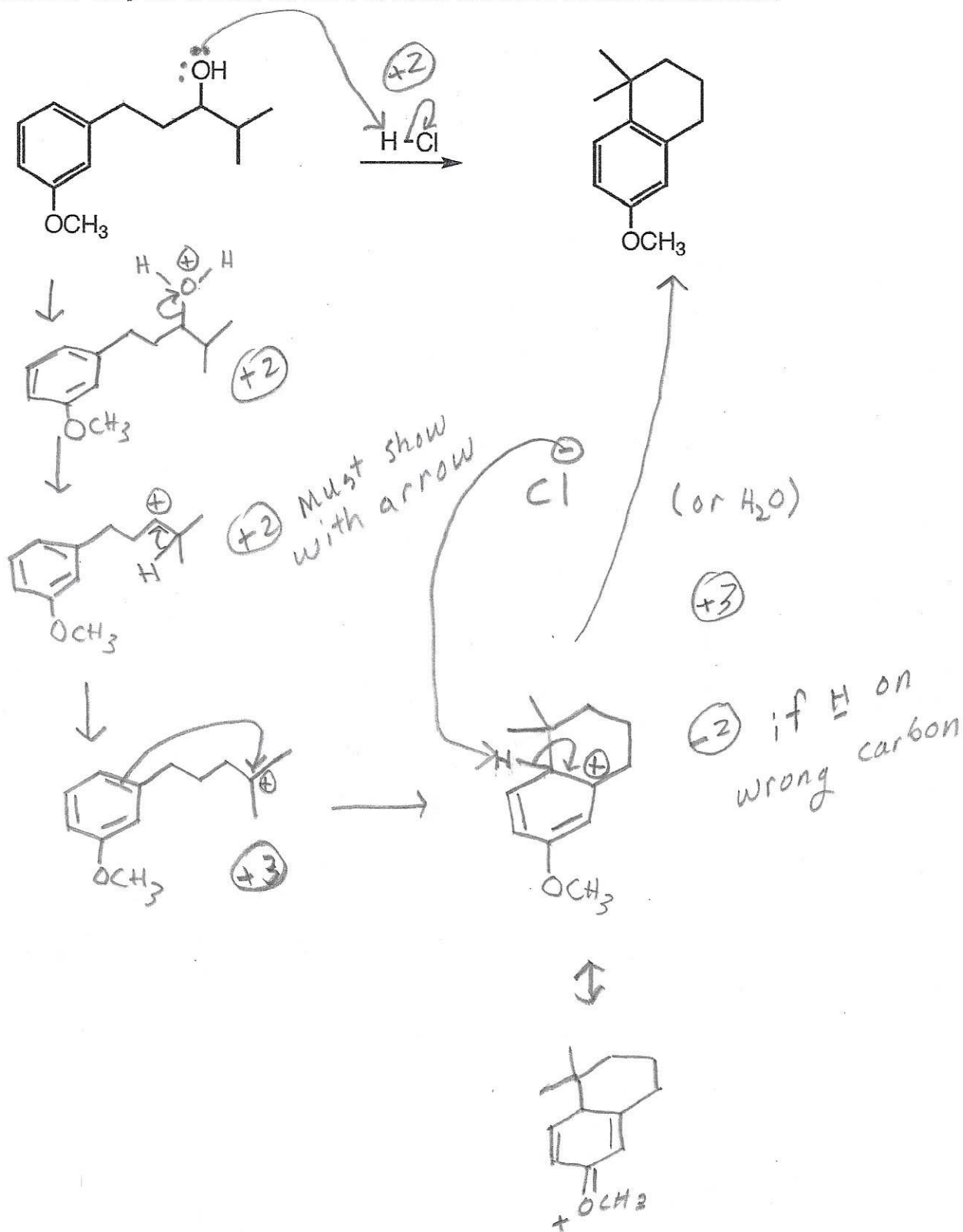
-1 per ring for incorrect position





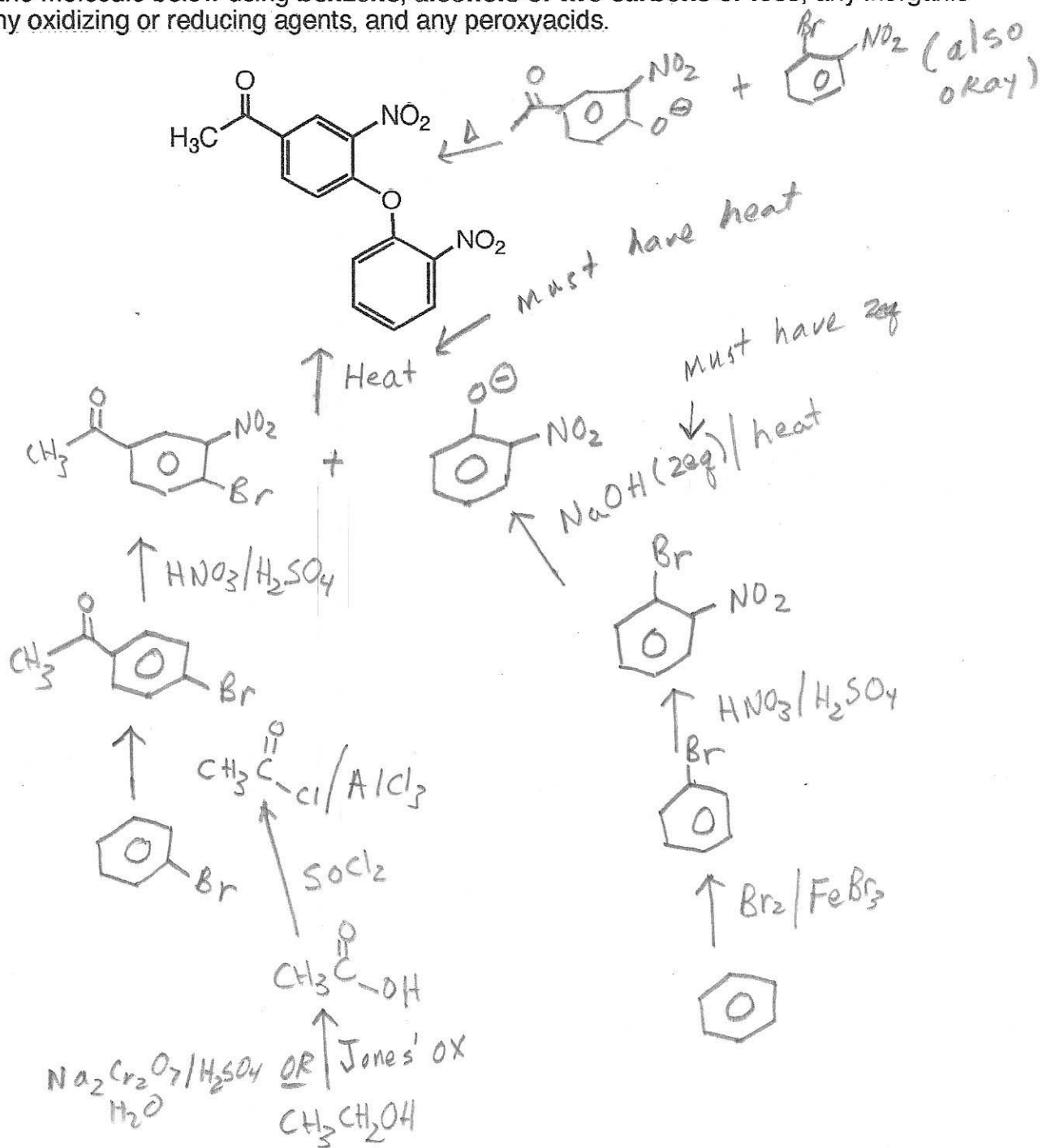
**D. Mechanism: (12 points)**

Provide a clear mechanism to explain the formation of the product. Use curved arrows to indicate "electron flow". Show all intermediates and all formal charges. When more than one resonance contributor may be drawn, be sure to draw the most stable contributor.



**E. Synthesis: 10 Points**

Synthesize the molecule below using benzene, alcohols of two carbons or less, any inorganic reagents, any oxidizing or reducing agents, and any peroxyacids.

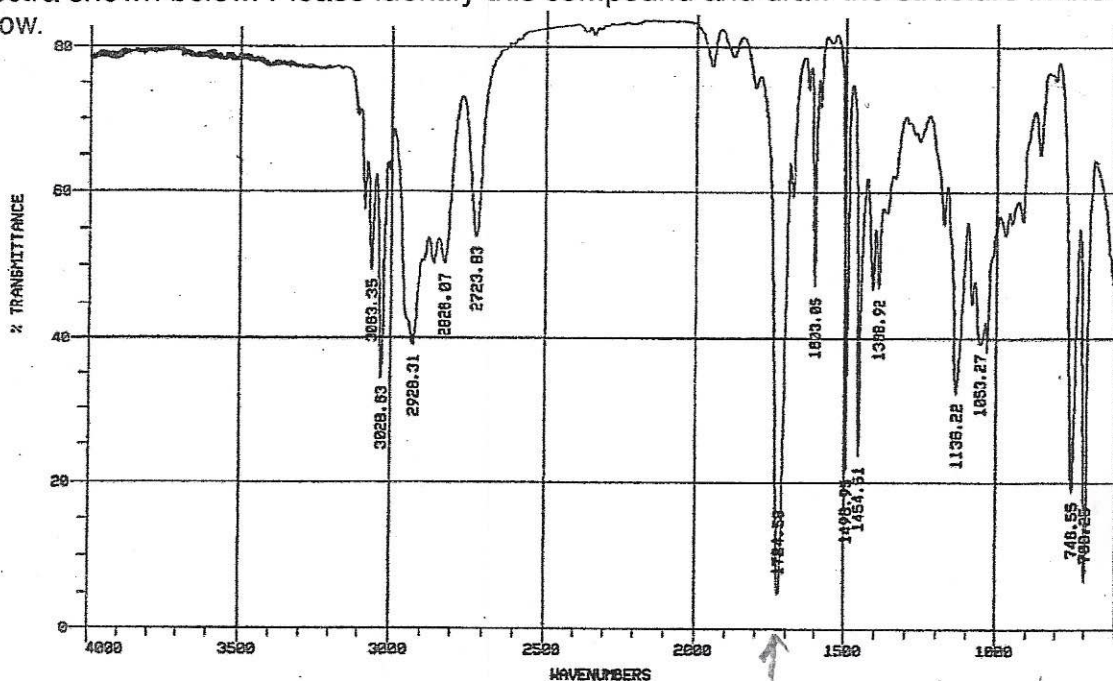


- NO F-C with  $\text{NO}_2$  already on the ring (-2)
- NO Grignard rxn. with  $\text{NO}_2$  present (-2)



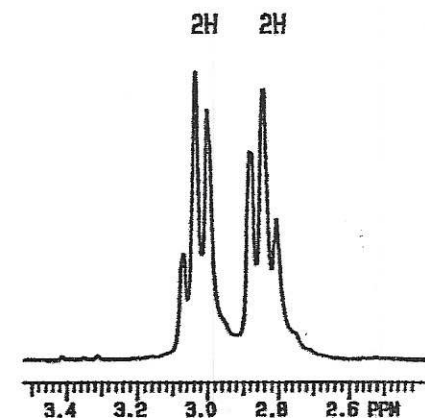
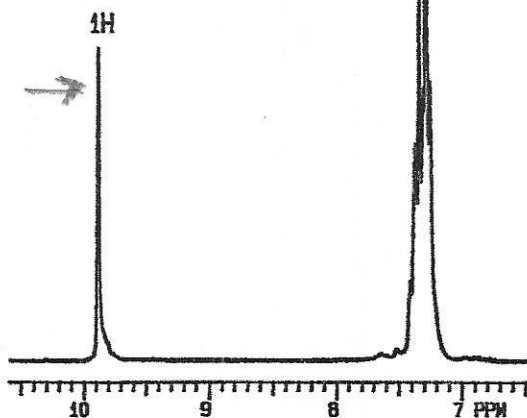
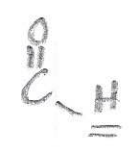
### F. Spectroscopy: 10 Points

A compound with the formula  $C_9H_{10}O$  exhibits the IR,  $^1H$  NMR and proton decoupled  $^{13}C$  NMR spectra shown below. Please identify this compound and draw the structure in the box provided below.



↑ 1724 → not conjugated

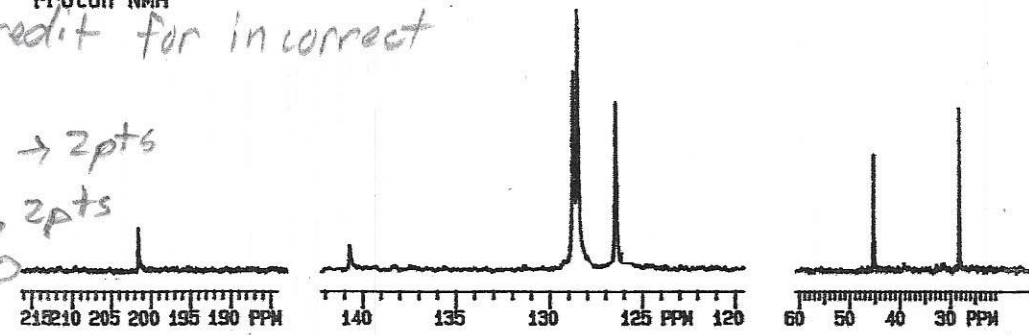
MONO → 5H substitution



Proton NMR

partial credit for incorrect answers!

- mono ring → 2pts
- aldehyde → 2pts
- other C=O only, 1pt
- CH<sub>2</sub>adj to only 2H → 2pts each



Carbon 13 NMR

