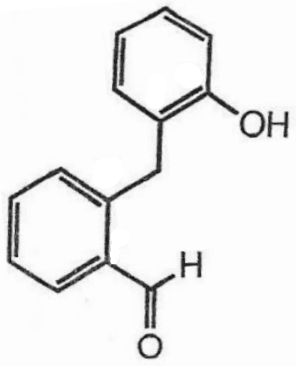
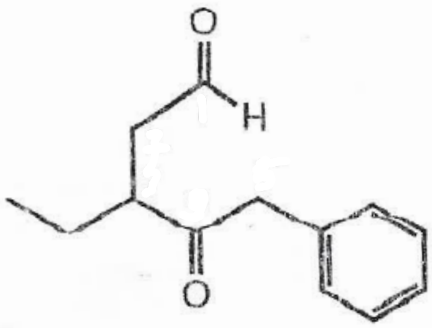
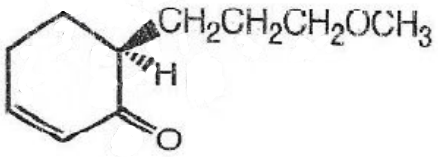
Exam 2, Sp 23

A. Nomenclature: (12 points)
Give an acceptable name for each of the following compounds. Be sure to indicate the **stereochemistry** where appropriate.

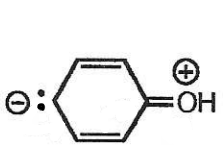
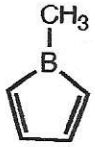
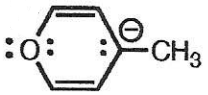
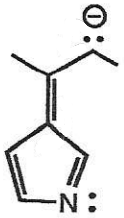
1. 

2. 

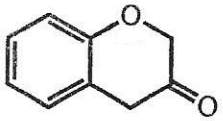
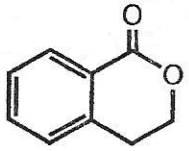
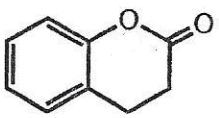
3. 

B. Facts: 20 points

1. Label the molecules below as aromatic(**AR**), antiaromatic(**AA**), or nonaromatic(**NA**). Please assume all are planar. (8 pts.)

2. Rank the following substituted benzene compounds in order of increasing rate in the reaction with CH_3Cl and $AlCl_3$. (1=slowest rate, 3=fastest rate) (3 pts.)

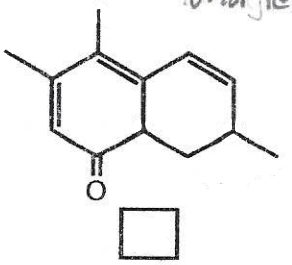
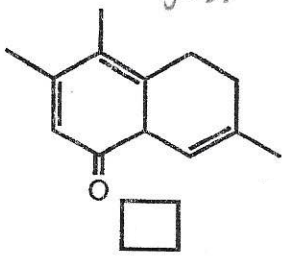
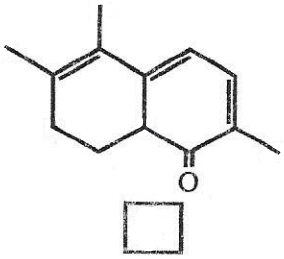




3. Rank the compounds in order of increasing reactivity in a nucleophilic addition reaction. (1= least reactive, 3=most reactive) (3 pts.)

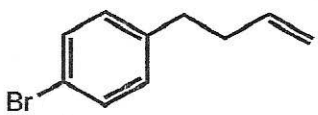
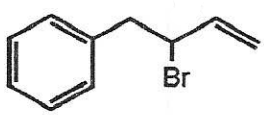
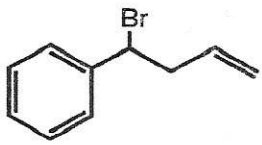


4. Place the following compounds in order of increasing wavelength of the π to π^* transition in their UV spectra. (1=~~lowest~~ wavelength, 3=~~highest~~) (3 pts.)

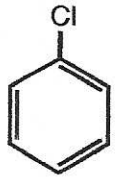
shortest longest

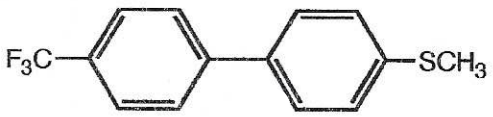
5.Rank the following compounds in order of increasing rate in a reaction with sodium iodide in acetone. (1=slowest rate, 3=fastest rate) (3 pts.)

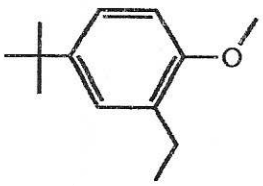
C. Reactions: Total = 36 points, 6 points each
Please provide the the major product in the answer box. Indicate **stereochemistry** if applicable. **Full credit is awarded only when the product of each step in a multi-step reaction is shown below the reaction.**

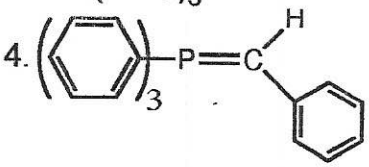
1. 

$\xrightarrow[\text{2. } Br_2 / FeBr_3]{\text{1. } CH_3CH_2\overset{O}{\overset{\|}{C}}\text{-Cl}\text{ , } AlCl_3}$
3. $CH_3O^-Na^+$ (2eq) /100°C

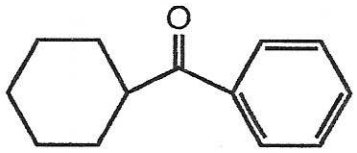
2. 

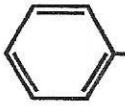
$\xrightarrow[\text{2. Na / } NH_3 / CH_3OH]{\text{1. } HNO_3 / H_2SO_4}$

3. 

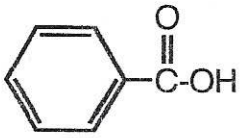
$\xrightarrow[\text{2. } SOCl_2]{\text{1. } KMnO_4/OH^- / 100°C, \text{ then } H_3O^+}$
3. $LiAl(OtBu)_3$
4. 

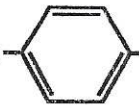
4.



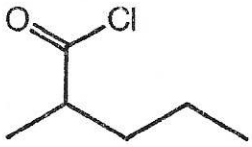
1. Zn(Hg) / HCl
2. Br_2 / Light
3. NaCN / DMSO
4.  , then H_3O^+

5.



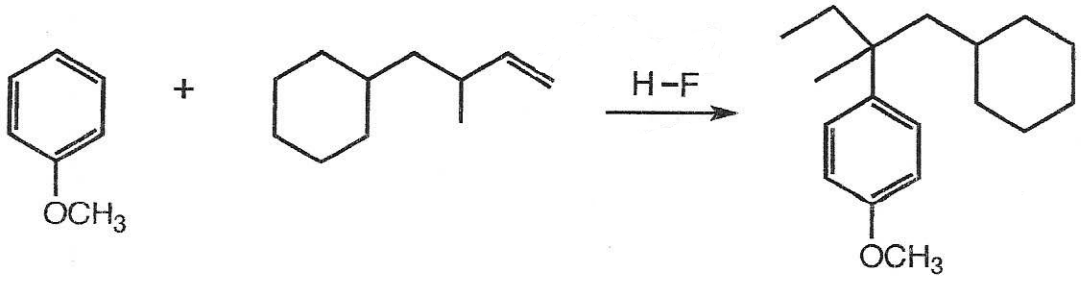
1. CH_3O-  -Li (2eq)
2. H_3O^+
3. fuming H_2SO_4

6.

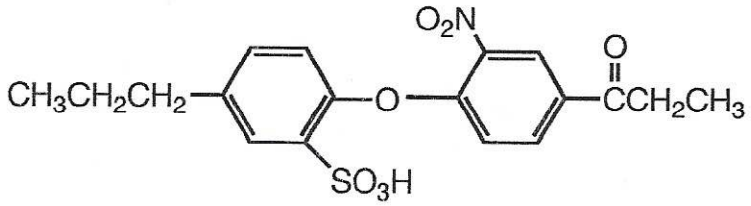


1. $(CH_3CH_2)_2CuLi$
2. $HC{\equiv}C^-Na^+$, then H_3O^+
3. Sia_2BH
4. H_2O_2 / OH^-

D. Mechanism: (11 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: 11 Points
Synthesize the molecule below using **benzene**, **alcohols of three carbons or less**, any inorganic reagents, and any oxidizing or reducing agents.



F. Spectroscopy: 10 Points

A compound with the formula $C_7H_{14}O$ 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.