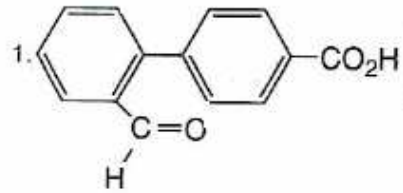
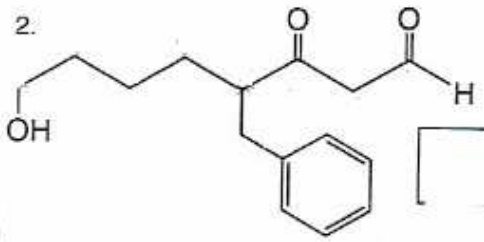
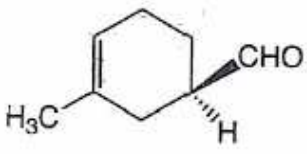
A. Nomenclature: (12 points)
Give an acceptable IUPAC name for each of the following compounds. Be sure to indicate the **stereochemistry** where appropriate.

1. 

2. 

3. 

B. Facts: 17 points

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

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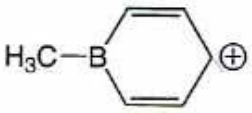

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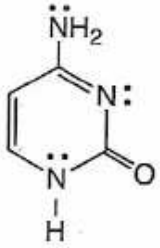

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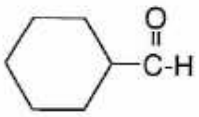
2. Rank the following compounds in order of increasing reactivity with a nucleophile. (1=least reactive, 3=most reactive) (3 pts.)



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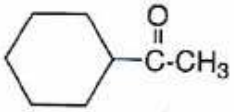

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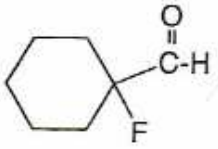

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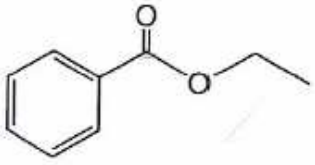
3. Rank the following substituted benzene compounds in order of increasing reactivity in an electrophilic aromatic substitution reaction with Br_2 / $FeBr_3$. (1=least reactive, 3=most reactive) (3 pts.)



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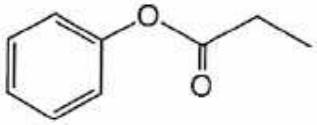

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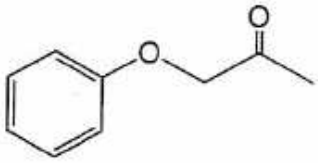

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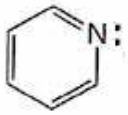
4. Place the compounds below in increasin order of basicity. (1 = least basic, 3 = most basic) (3 pts.)



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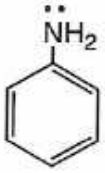

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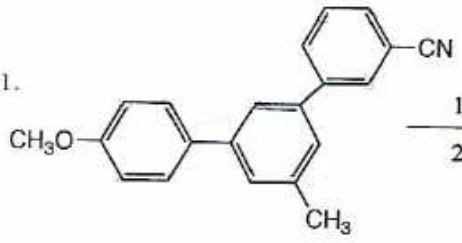
C. Reactions: Total = 36 points, 6 points each
Please provide the major product in the answer box. Indicate **stereochemistry** if applicable. Partial credit is awarded only when intermediate products in a multi-step reaction are shown below the reaction.

1.



1. $CH_3\overset{O}{\overset{\|}{C}}-Cl$ / $AlCl_3$
2. CH_3CH_2MgBr (2 eq.) then H_3O^+

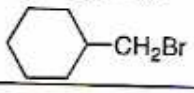
2.

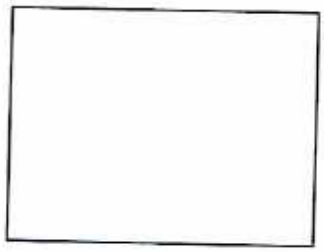
1. $Na_2Cr_2O_7$ / H_2SO_4 / heat
2. CH_3CH_2Li (2 eq.), then H_3O^+
3. HNO_3 / H_2SO_4

3.

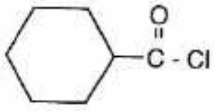
1. $CH_3O^-Na^+$ / CH_3OH/ Heat
2. Na / NH_3 / CH_3OH

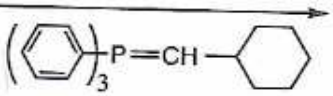
4.

1. $CH_3(CH_2)_2CH_2Li$
2. 
3. $H_3O^+ / HgCl_2$
4. $NaCN / H^+$ or HCN / CN^-



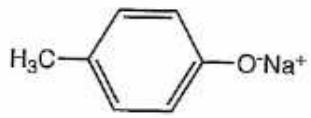
5.



1. $LiAlH(OtBu)_3$
2. 

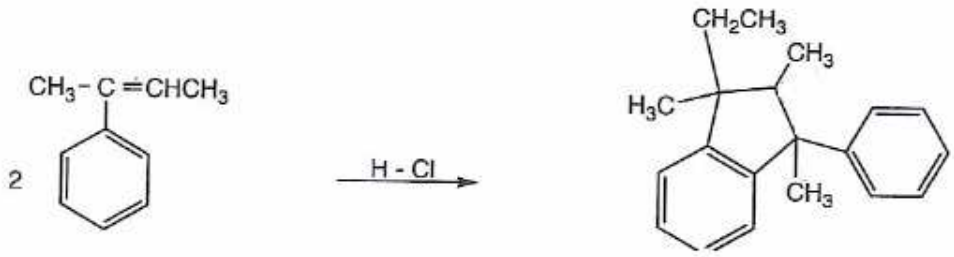
Note: $LiAlH(OtBu)_3$ = lithium aluminium tri t - butoxyhydride

6.

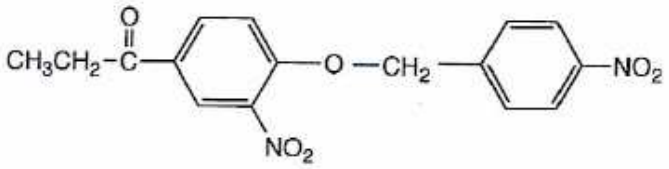


1. CO_2 then H^+
2. $SOCl_2$
3. $(CH_3CH_2)_2CuLi$
4. $CH_3CH_2NH_2 / H^+$

D. Mechanism: (12 points)
Provide a clear mechanism to explain the formation of the product. Use curved arrows to indicate "electron flow". Remember to show only one step at a time. **Show all intermediates and all formal charges. When more than one resonance contributor may be drawn, be sure to draw the most stable contributor.**

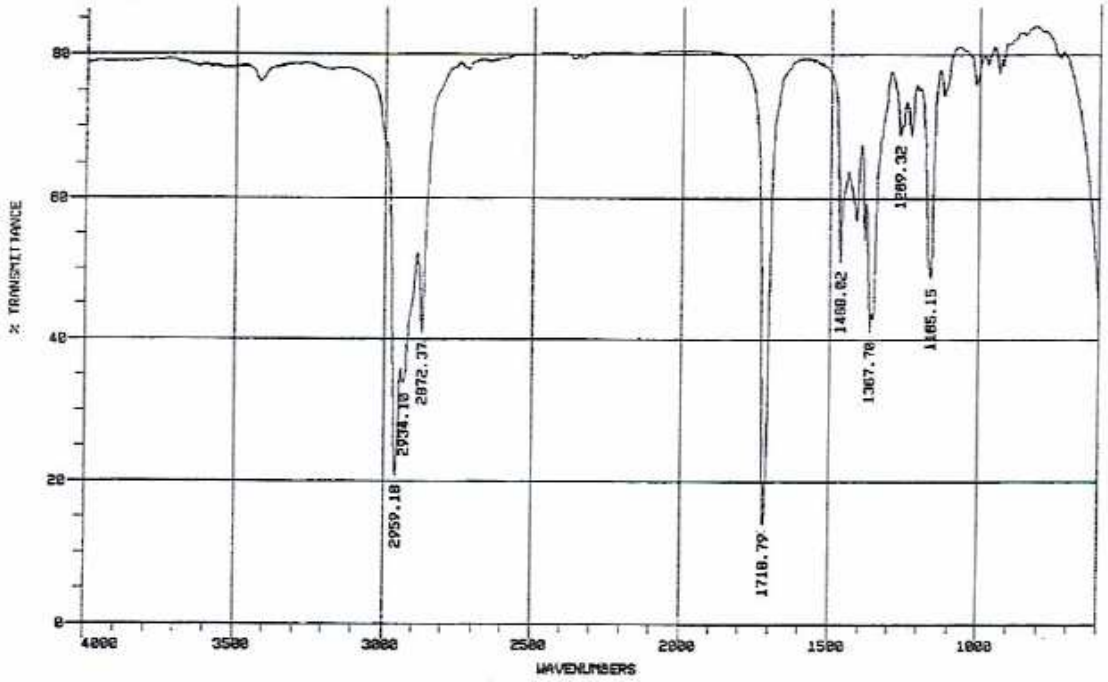


E. Synthesis: 12 Points
Synthesize the molecule below using any of the following reagents: **benzene**, any **alkanes, alkenes, or alcohols of three carbons or less**, any inorganic reagents, any oxidizing or reducing agents, and any peroxyacids.



F. Spectroscopy: 11 Points

A compound with the formula $C_7H_{14}O$ exhibits the IR, ^1H NMR and proton decoupled ^{13}C NMR spectrashown below. Please identify this compound and draw the structure in the box provided below. Note:The peak at 1.4 - 1.65 ppm represents two overlapped signals.)



answer