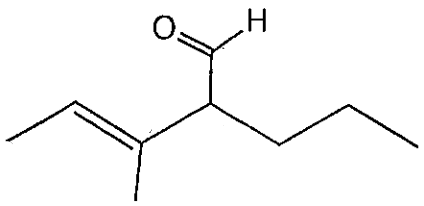
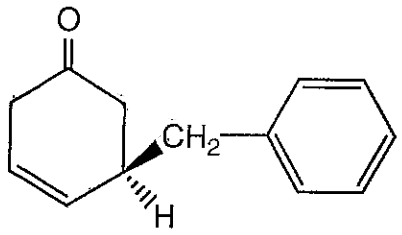
Exam 2, Sp 2018

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

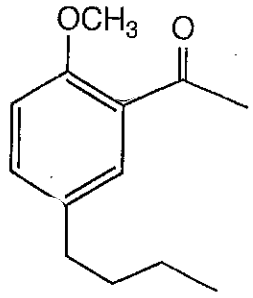
1.



2.

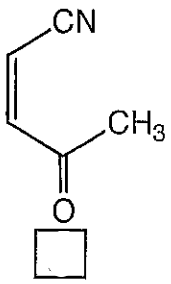


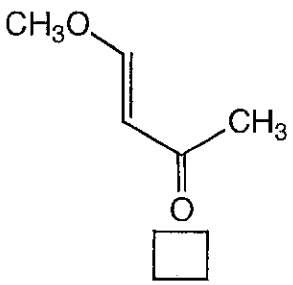
3.

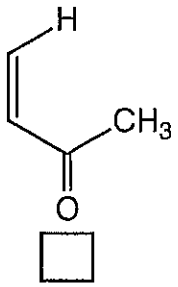


B. Facts: Total points = 20

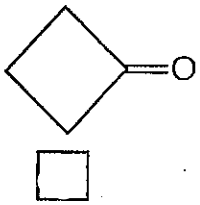
1. Place the compounds in order of increasing reactivity in a Diels-Alder reaction. (1=least reactive, 3=most) (3 pts.)

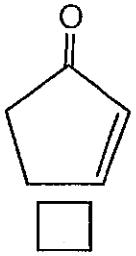


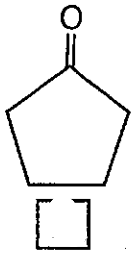




2. Place the compounds in order of increasing frequency (cm^{-1}) of the C=O stretch. (1=lowest frequency, 3=highest) (3 pts)

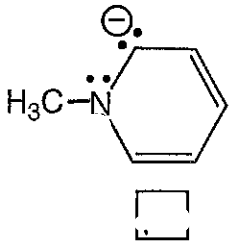


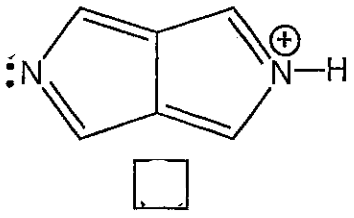


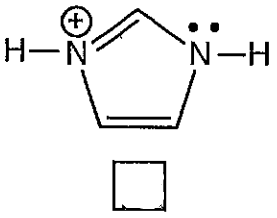


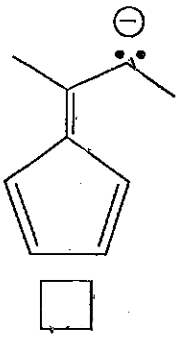
3. With <u>brief</u> statements about transition states, intermediates, and activation energies, explain why a methoxy substituent increases the rate of electrophilic aromatic substitution. (4 pts.)

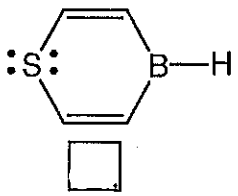
4. Label the molecules below as aromatic (**AR**), antiaromatic (**AA**), or nonaromatic (**NA**). (10) pts)





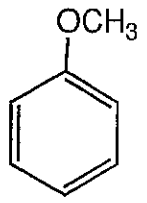


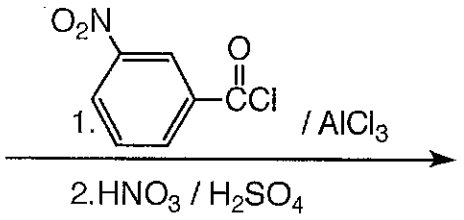


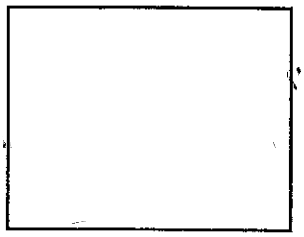


C. Reactions: Total = 36 points, 6 points each
Please provide the major product in the answer box. Indicate **stereochemistry** if applicable. **Full credit is awarded only when the product of each step in a multi-step reaction is shown below the reaction.**

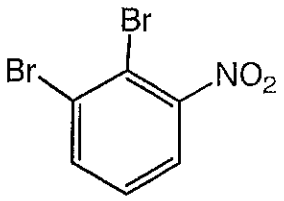
1.



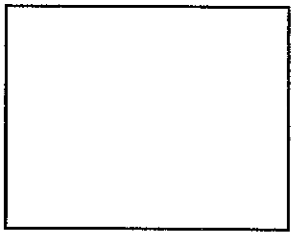




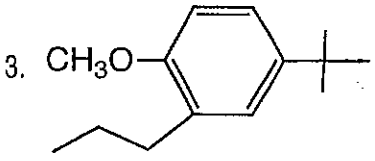
2.



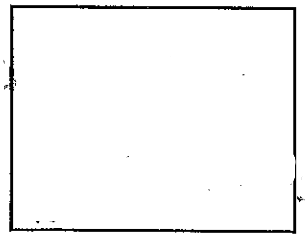
1. $CH_3O^-Na^+$ / 100 °C
2. Li / NH_3 / CH_3OH



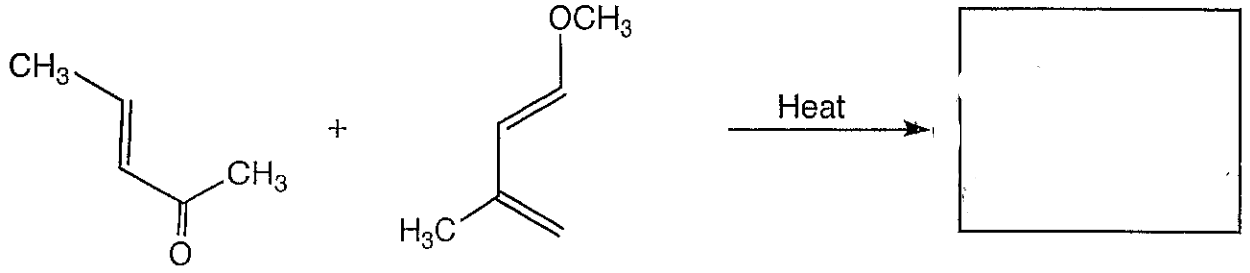
3.



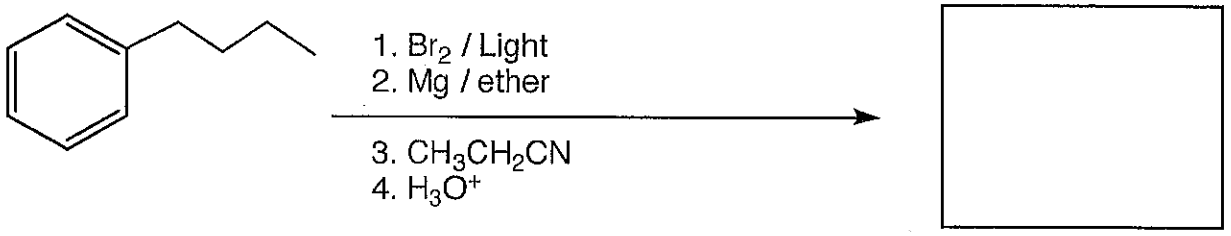
1. $Na_2Cr_2O_7$ / H_2SO_4 / heat
2. $CH_3CH_2CH_2Li$ (2 eq), then H_3O^+
3. NaCN / H^+



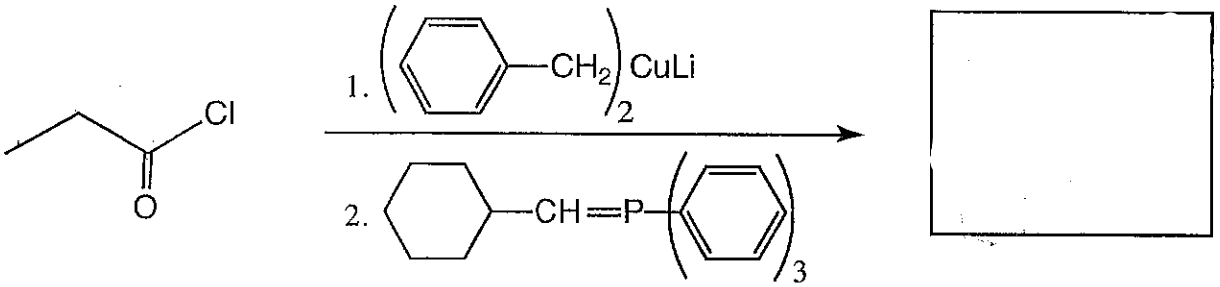
4.


CH3
CH3
O
+
OCH3
H3C
Heat

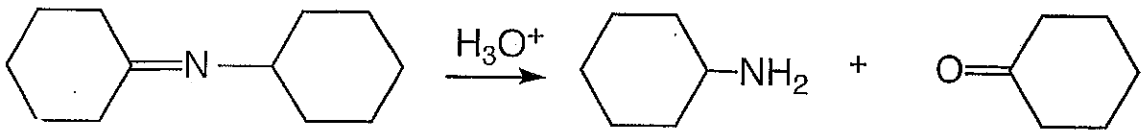
5.


1. Br2 / Light
2. Mg / ether
3. CH3CH2CN
4. H3O+

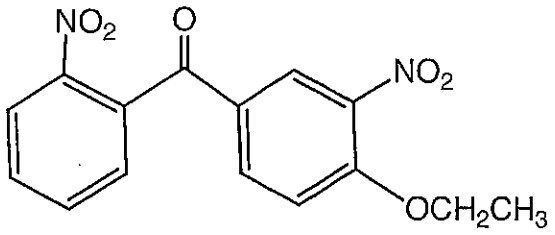
6.


Cl
O
1.
CH2
2
CuLi
2.
CH=P
3

D. Mechanism: (11 points)
Provide a clear mechanism to explain the formation of the product shown. Use curved arrows to indicate "electron flow". Remember to show only one step at a time. **Show all intermediates and all formal charges**. If more than one resonance contributor may be drawn, be sure to draw the most stable one. Please do not show transition states.



E. Synthesis: 11 Points
Synthesize the molecule below using any of the following reagents: **benzene, ethanol**, any inorganic reagents, any oxidizing or reducing agents, and any peroxyacids.



F. Spectroscopy: 10 Points

A compound with the formula $C_{11}H_{14}O_2$ exhibits the IR and ^1H NMR spectra shown below. Please identify this compound and draw the structure in the box provided below.