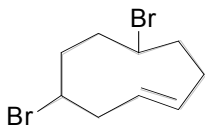


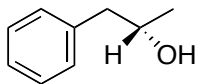
A. Nomenclature (3 points each; 12 total points)

Please provide an acceptable name for each of the following compounds, noting stereochemistry where appropriate.

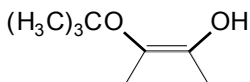
1.



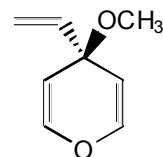
2.



3.

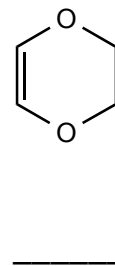
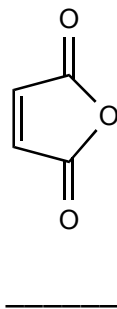
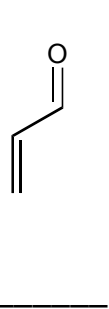


4.

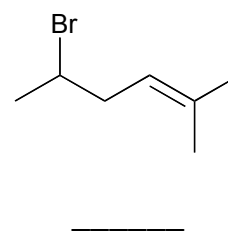
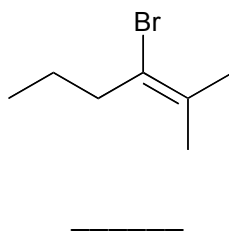
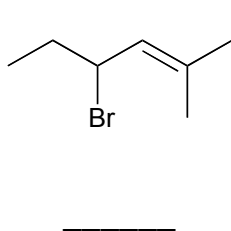


B. Facts (1 point for each answer; 12 total points)

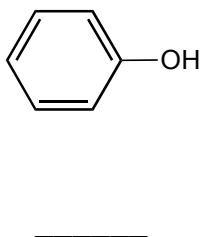
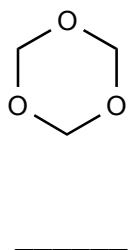
1. Rank the following dienophiles from slowest (1) to fastest (3) in Diels-Alder reactivity.



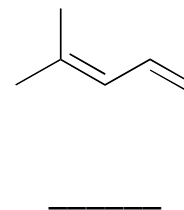
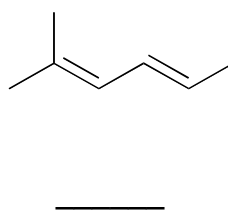
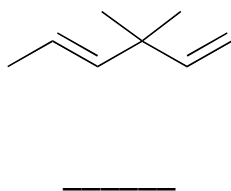
2. Rank the following electrophiles from slowest (1) to fastest (3) in S_N1 reactivity.



3. Rank the pK_a of the following molecules from lowest (1) to highest (3).



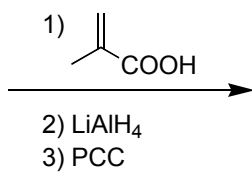
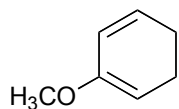
4. Rank the following dienes from least stable (1) to most stable (3).



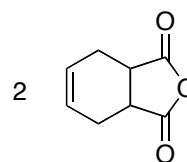
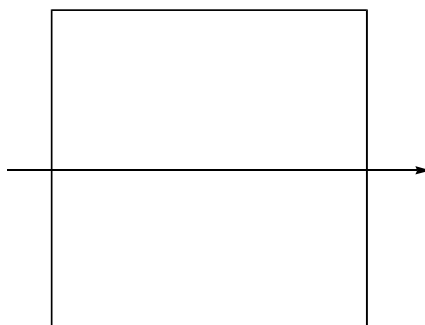
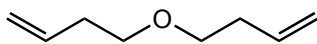
C. Reactions (7 points each; 28 total points)

Please provide the **major** product, or **necessary reagents**, or **starting material** in the **box** provided below. Be sure your drawing indicates stereochemistry if applicable.

1.

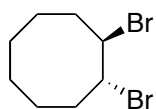


2.



Reactions (continued)

3.



1. NaI / acetone

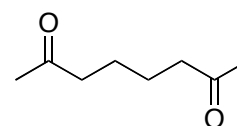
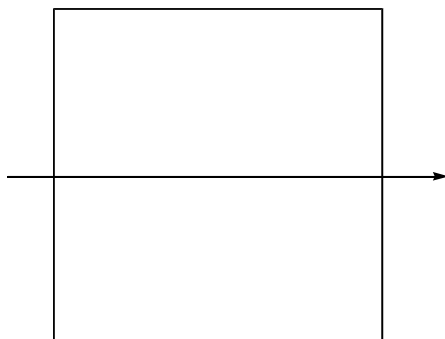
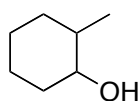
2. H_3O^+

3. TsCl / pyridine

4. LiAlH_4

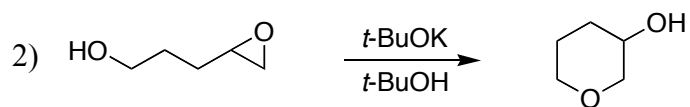
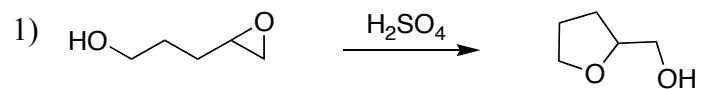


4.



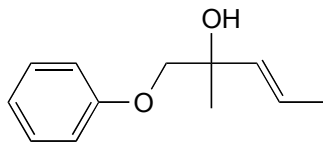
D. Mechanism: (16 points)

Provide a reasonable mechanism for each of the following reactions. Use curved arrows to indicate "electron flow". **Show all intermediates and all formal charges.** If there is more than one resonance structure, you must show the "best" (i.e., lowest energy) structure.



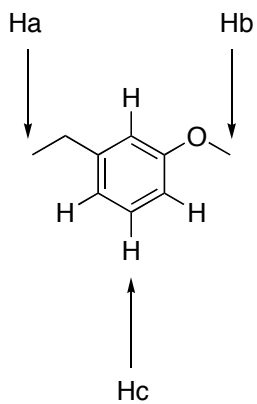
E. Synthesis: (17 Points)

Noting stereochemistry, synthesize the molecule below using any of the following reagents: alkanes, alkenes, or alkynes having **no more than two carbon atoms**, any inorganic reagents, any oxidizing or reducing agents, any peroxyacids, benzene, and phenol.



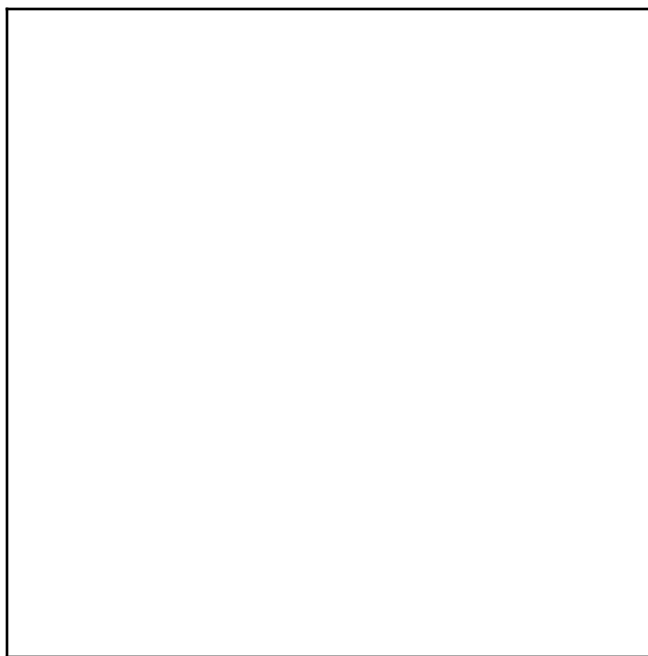
F. Spectroscopy: (15 total points)

1. Estimate the chemical shift (δ) and splitting pattern (**SP** or multiplicity) for each of the indicated protons. (6 points)



	<u> δ </u>	<u> SP </u>
Ha	_____	_____
Hb	_____	_____
Hc	_____	_____

2. A compound with the formula $\text{C}_9\text{H}_{10}\text{O}$ exhibits the IR, ^1H NMR, and proton-decoupled ^{13}C NMR spectra shown on the following page. Please identify this compound and draw the structure **in the box** provided below. (9 points)

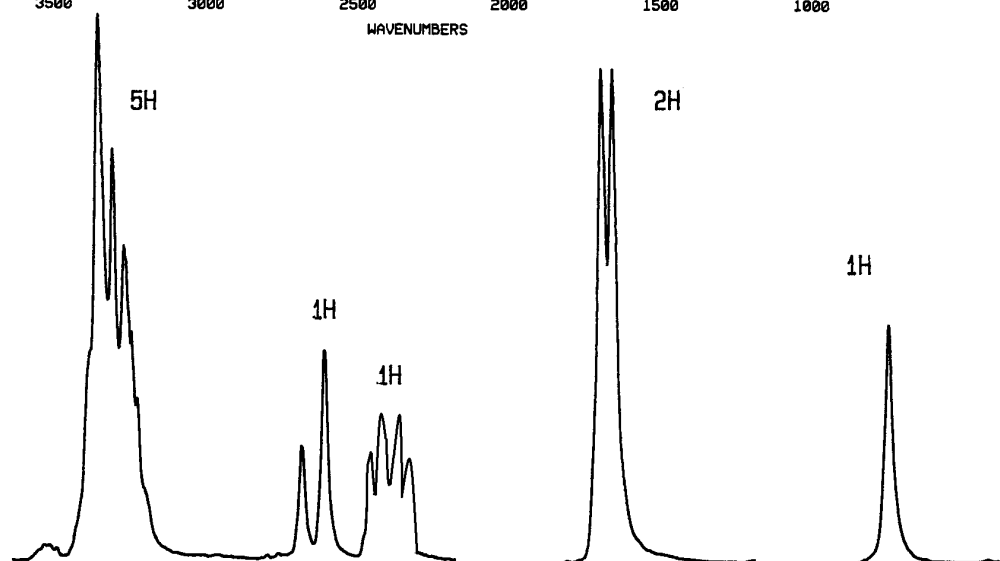
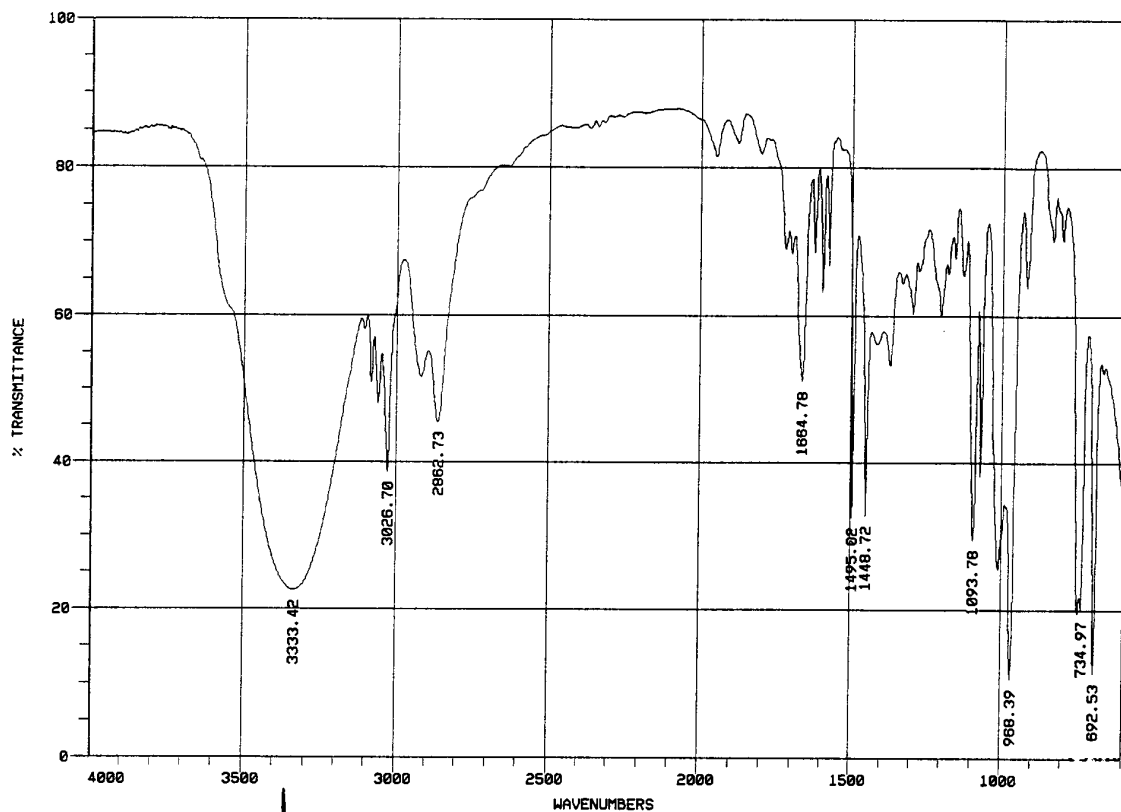


MF C₉H₁₀O

MW 134

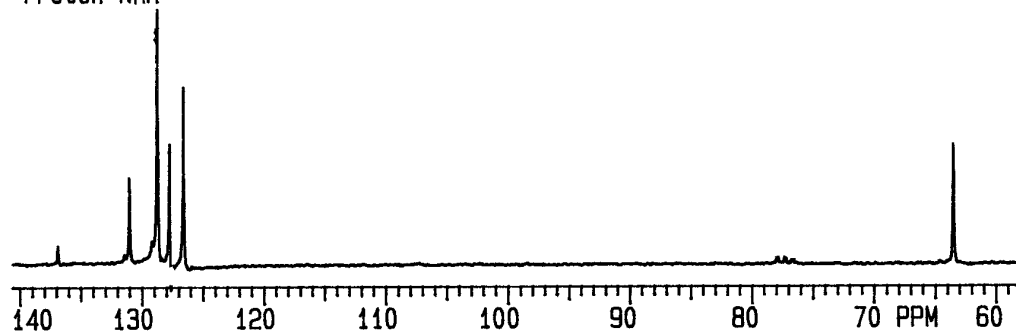
%C 80.6

%H 7.5



7.6 7.4 7.2 7.0 6.8 6.6 6.4 PPM 2
4.4 4.2 PPM 4.0
2.0 1.8 1.6 1.4 PPM

Proton NMR



Carbon 13 NMR