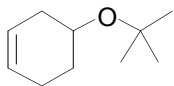


Sample Exam #1A

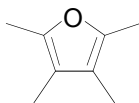
A. Nomenclature (3 points each; 12 total points)

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

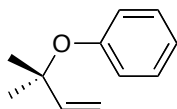
1.



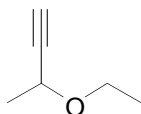
2.



3.

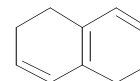
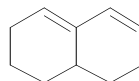
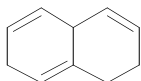
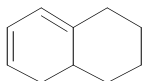


4.

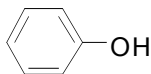


B. Facts (1 point for each answer; 13 total points)

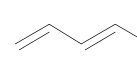
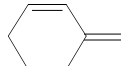
1. Rank the following dienes from shortest (1) to longest (4) λ_{max} value.



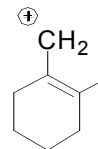
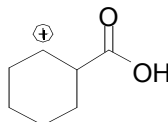
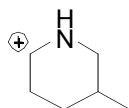
2. Estimate the $\text{p}K_{\text{a}}$ of the following molecules.



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



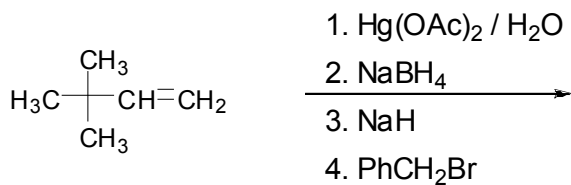
4. Rank the following cations from least stable (1) to most stable (3).



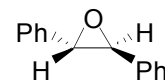
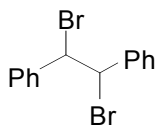
C. Reactions (7 points each; 28 total points)

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.

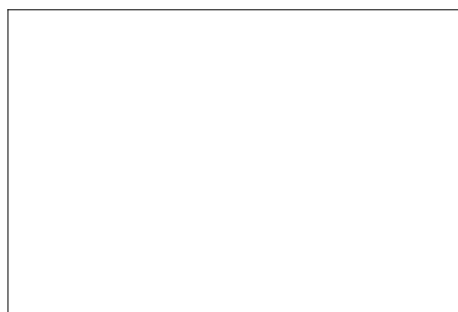
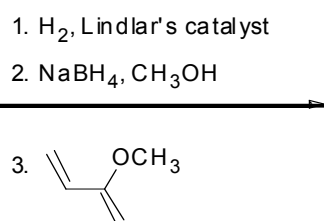
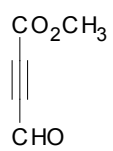


Reactions (continued)

3.

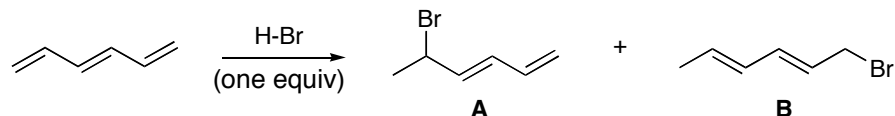


4.



D. Mechanism: (17 points)

Treatment of 1,3,5-hexatriene with HBr gives the two products shown. Draw a mechanism for the formation of product **A**; separately, draw a mechanism for the formation of product **B**. Use curved arrows to indicate "electron flow". **Show all intermediates and all formal charges.**



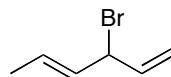
Mechanism A:

Mechanism B:

2. Which is the major product at $-80\text{ }^{\circ}\text{C}$? Rationalize your answer.

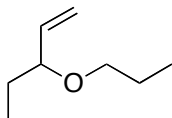
3. Which is the major product at $40\text{ }^{\circ}\text{C}$? Rationalize your answer.

4. Explain why the following compound does not form at $40\text{ }^{\circ}\text{C}$:



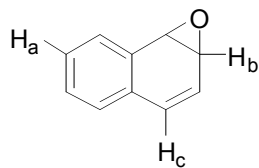
E. Synthesis: (15 Points)

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.



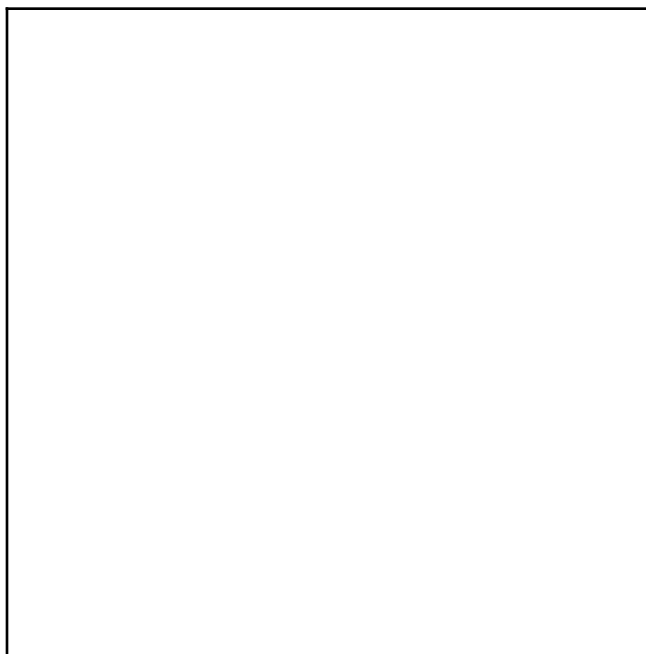
F. Spectroscopy: (15 total points)

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

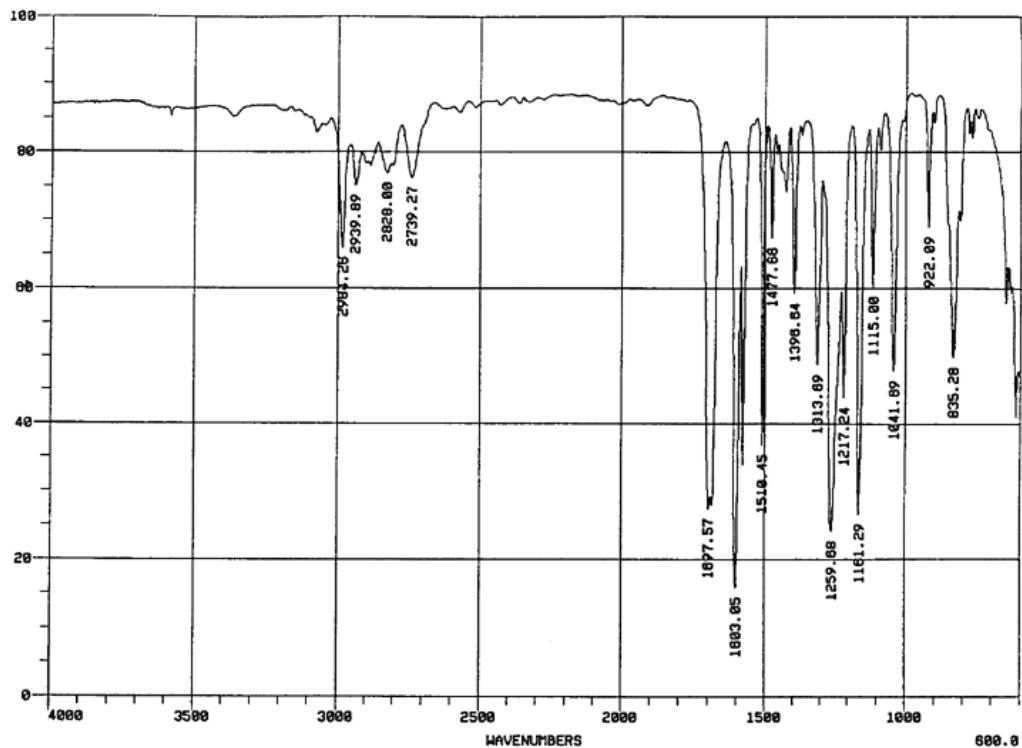


	<u>δ</u>	<u>SP</u>
H_a	_____	_____
H_b	_____	_____
H_c	_____	_____

2. A compound with the formula $\text{C}_9\text{H}_{10}\text{O}_2$ 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)

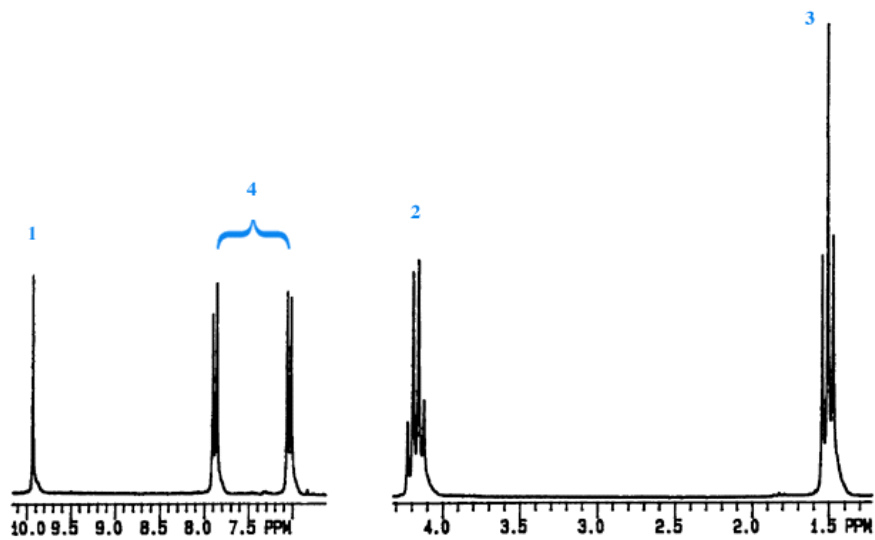


IR



$C_9H_{10}O_2$

1H NMR



^{13}C NMR

