Chem 30C, Spring 2005

Final Exam

Prof. Ohyun Kwon, UCLA

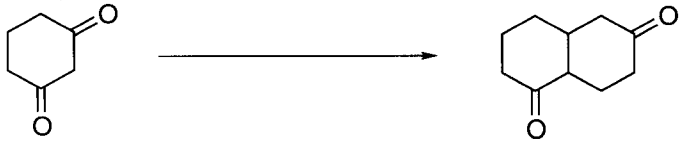
Answer Keys

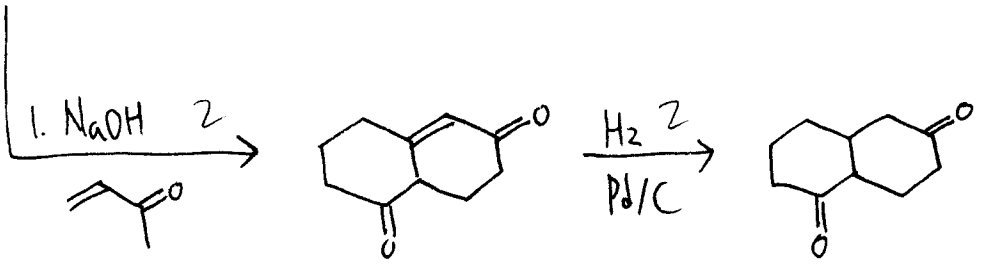
Your Name (Please Print)

Question	Your points
1 (26 points)	26
2 (16 points)	16
3 (20 points)	20
4 (28 points)	28
5 (18 points)	18
6 (21 points)	21
7 (20 points)	20
8 (18 points)	18
9 (12 points)	12
10 (20 points)	20
11 (16 points)	16
12 (21 points)	21
13 (24 points)	24
Total (260 points)	260

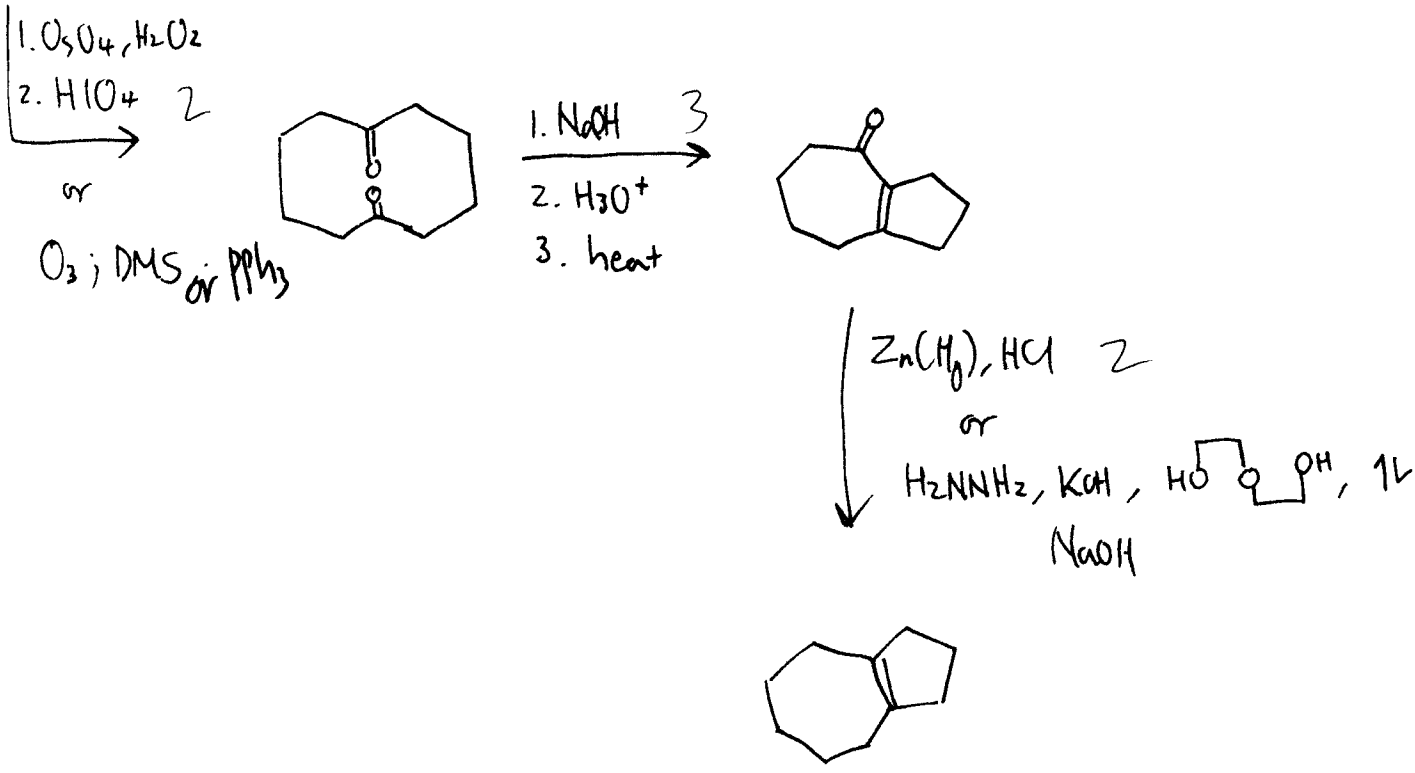
1. (25 points) Show how to synthesize the following products form the given starting materials.

(a) (6 point)



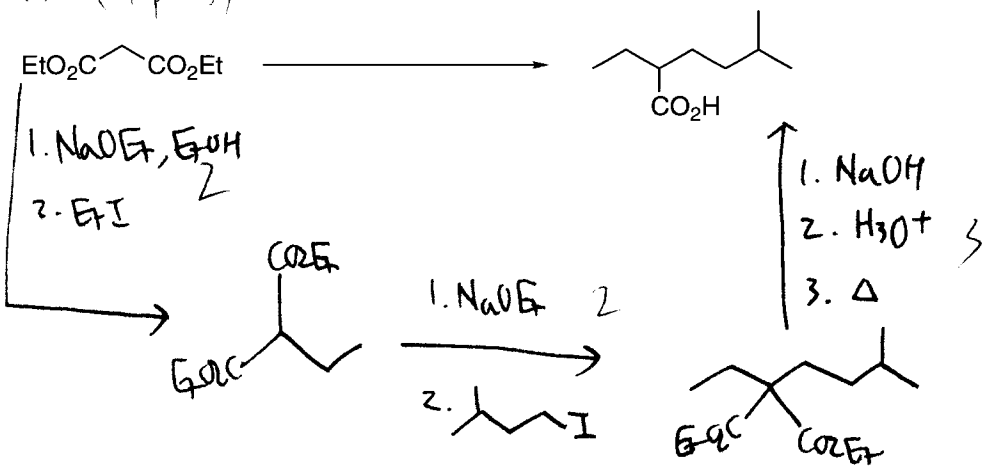


(b) (7 points)

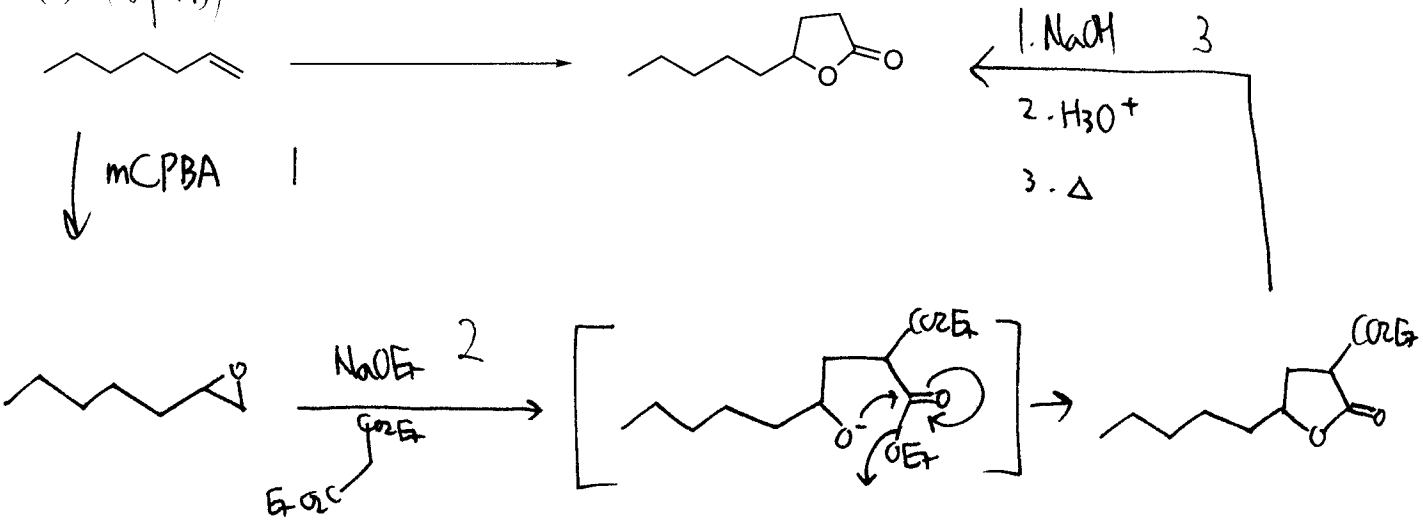


1. Continued.

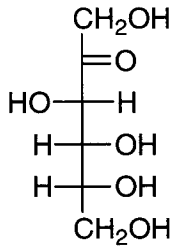
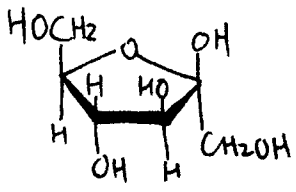
(c) (17 points)



(d) (16 points)

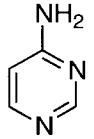
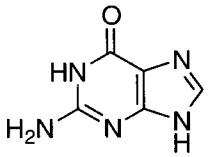
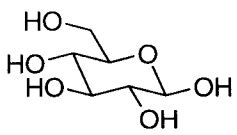


2. (a) (6 points) Write a Haworth projection of β-D-fructose.

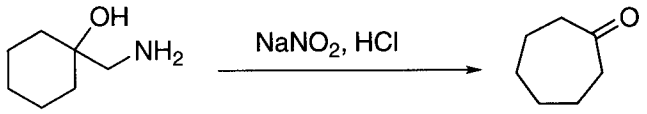
	
D-Fructose	β-D-fructose

(b) (10 points) Name the following molecules.

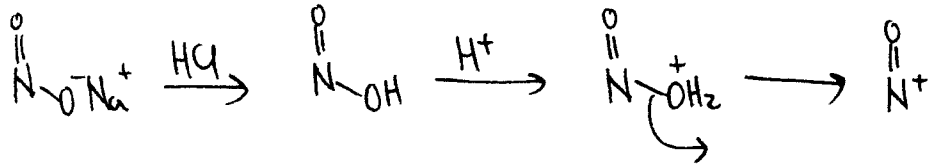
2 pts each

	4-aminopyrimidine
	oxacyclopentane (tetrahydrofuran)
	5-nitrocytosine
	guanine
	β-D-glucose

3. (20 points) Shown below is the Tiffeneau-Demjanov reaction that converts cyclic beta-aminoalcohol to a ring expanded ketone. Show the reaction mechanism.

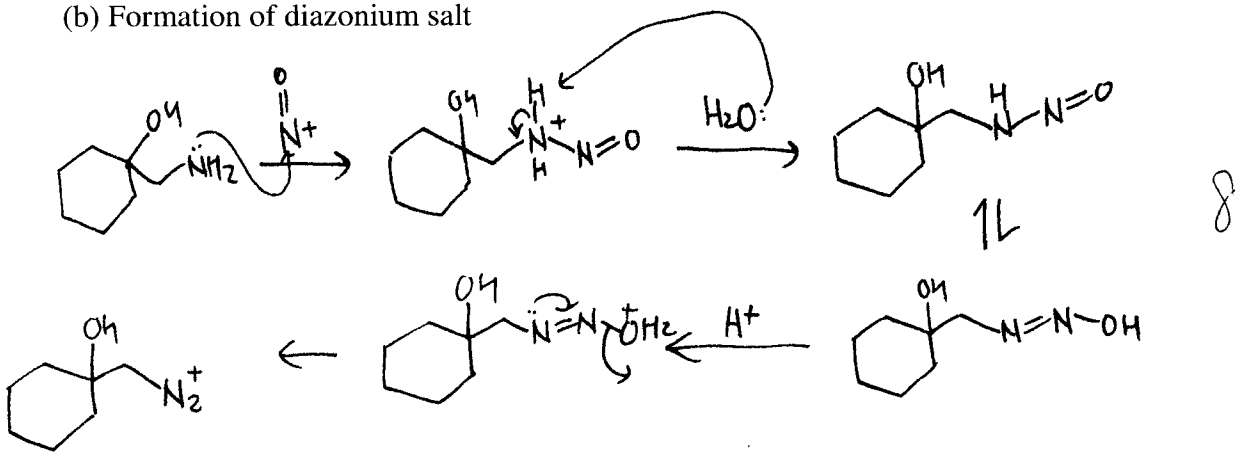


(a) Formation of nitrosyl cation



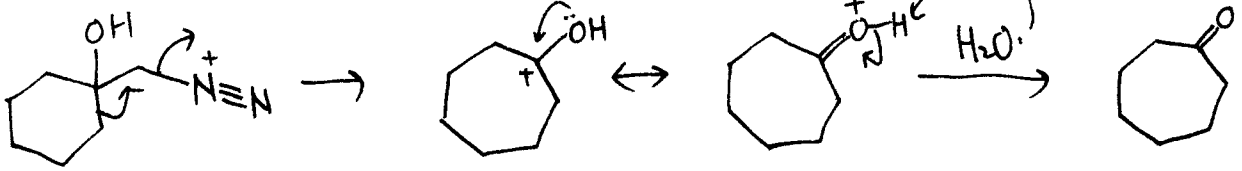
6

(b) Formation of diazonium salt



8

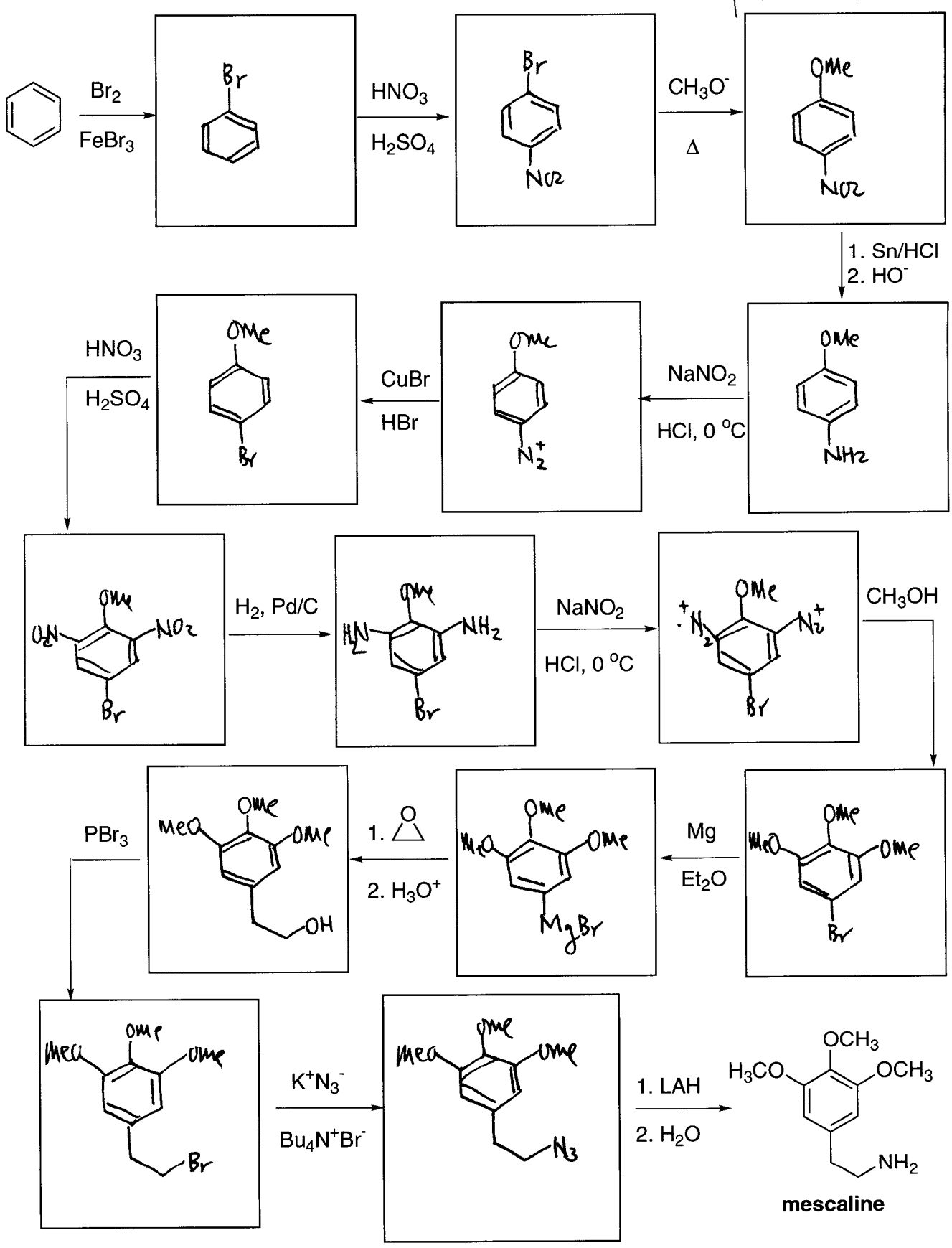
(c) The rest



6

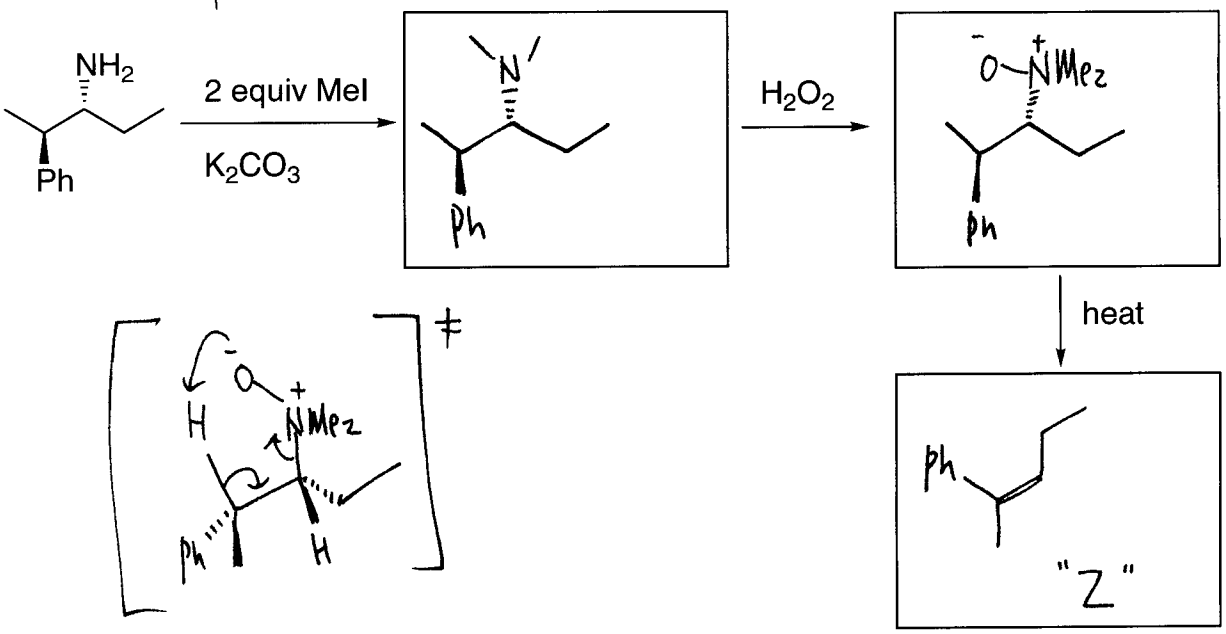
4. (28 points) The scheme below shows how mescaline could be synthesized from benzene. Draw the products from each chemical operation. Hint: work backwards.

2 pts each

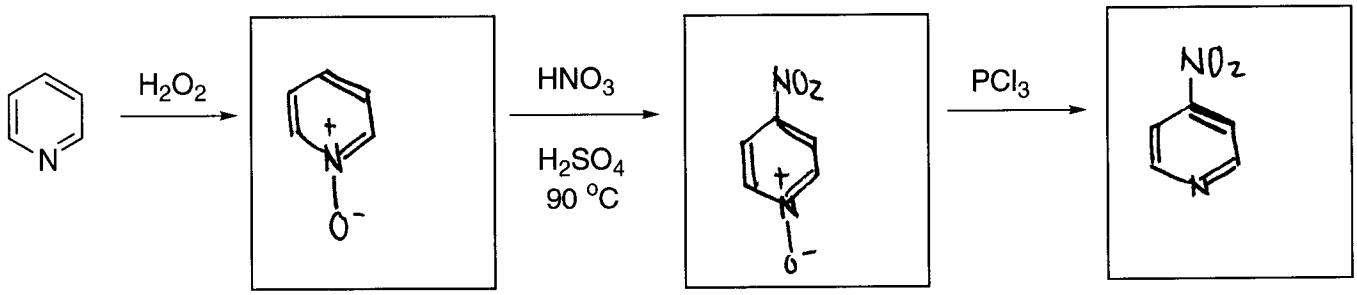


5. (18 points) Provide structural formulas for the products of each reaction step.

(a) 3 pts each



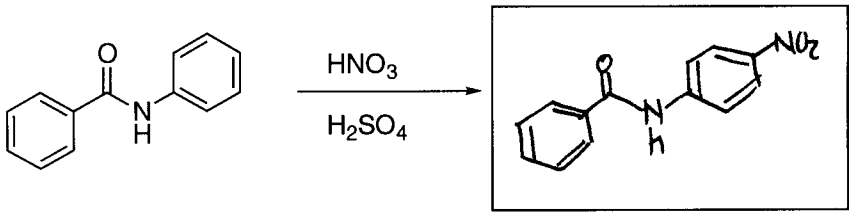
(b)



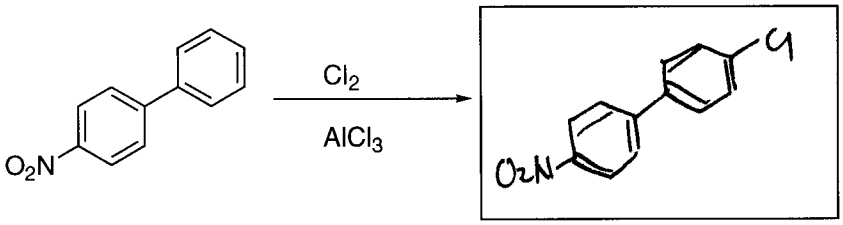
6. (21 points) Predict products for each electrophilic aromatic substitution.

3 pts each

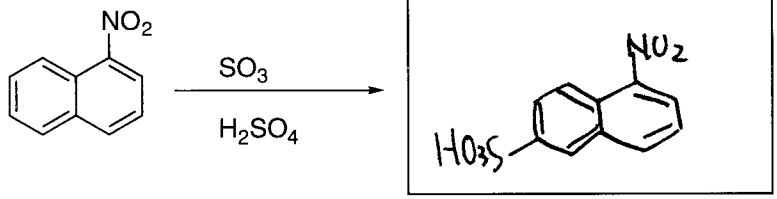
(a)



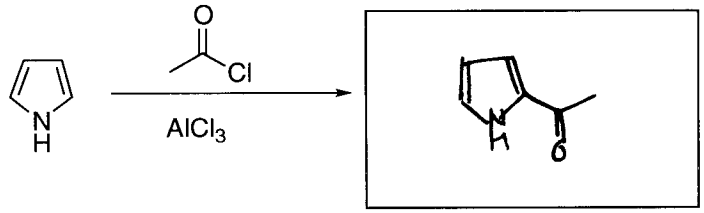
(b)



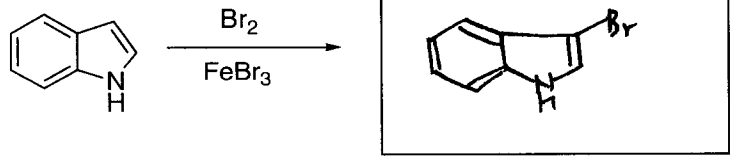
(c)



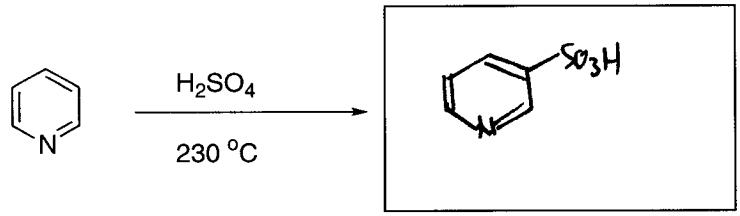
(d)



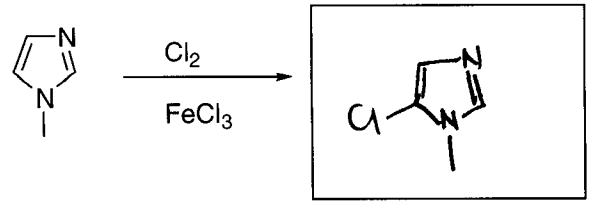
(e)



(f)

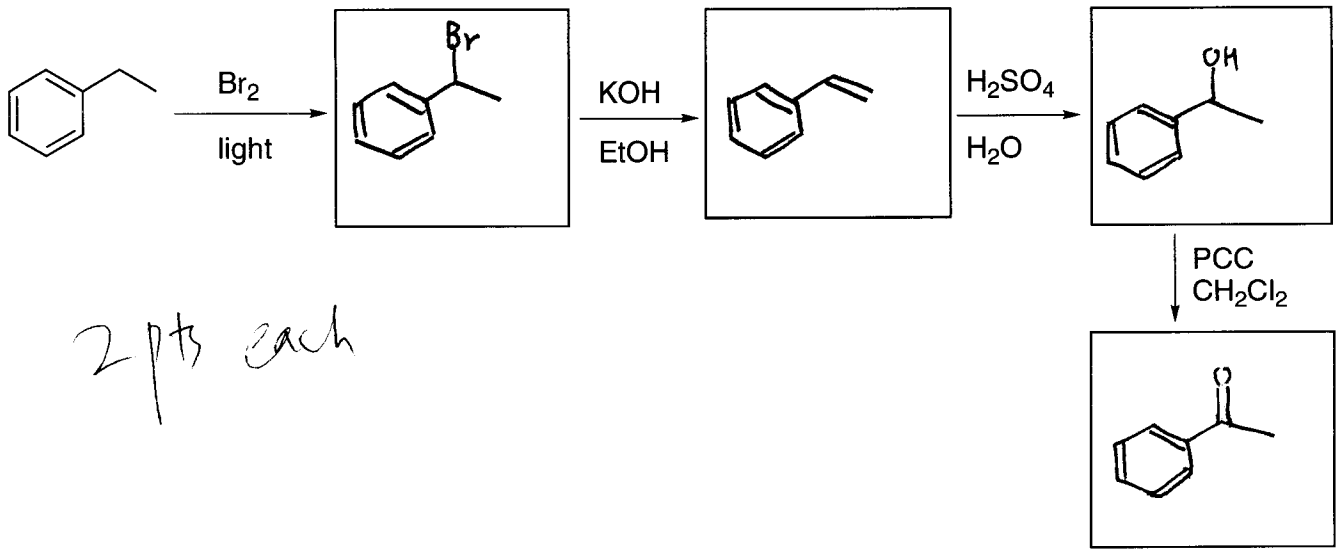


(g)



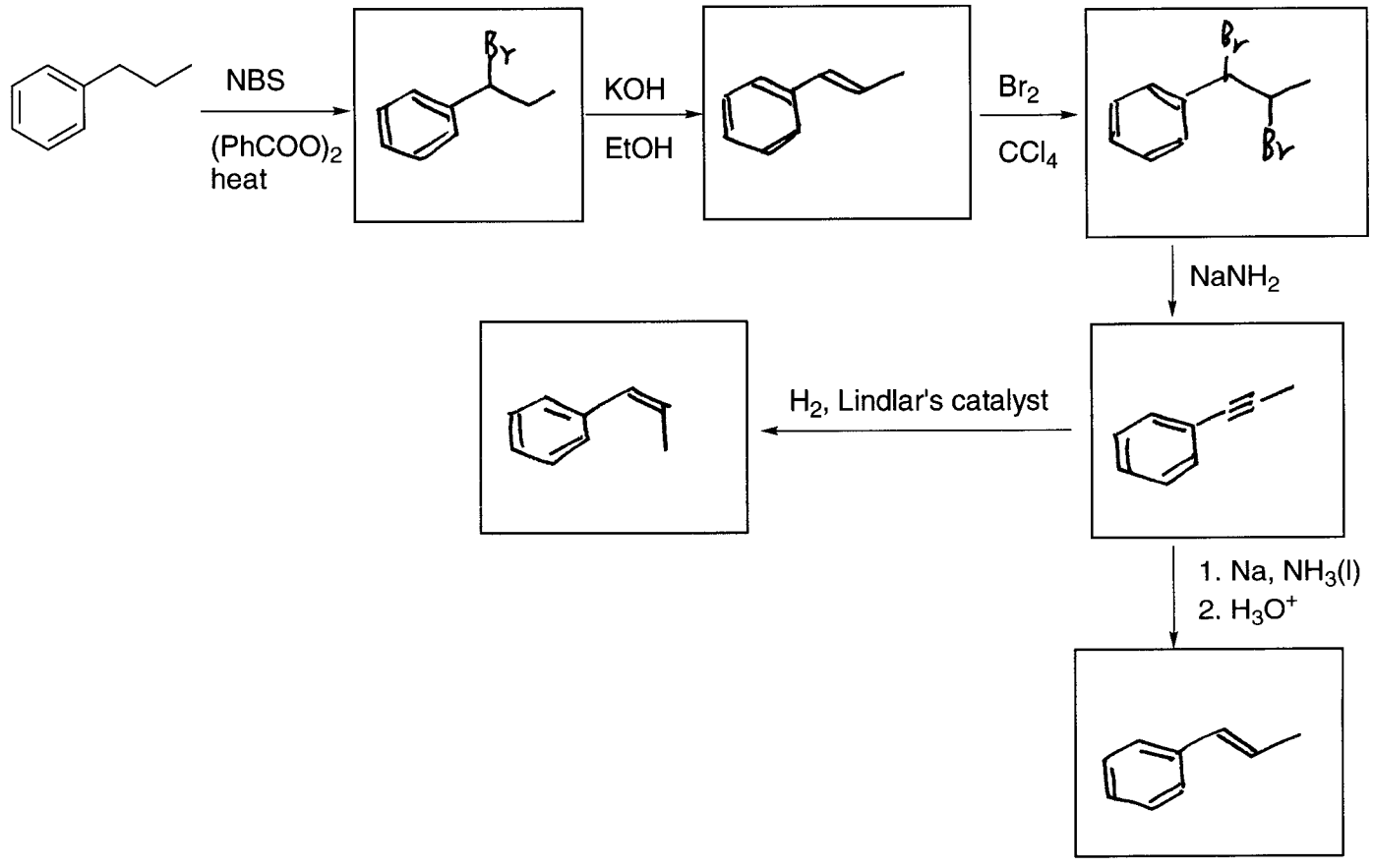
7. (20 points) Predict the structures of the expected products.

(a)

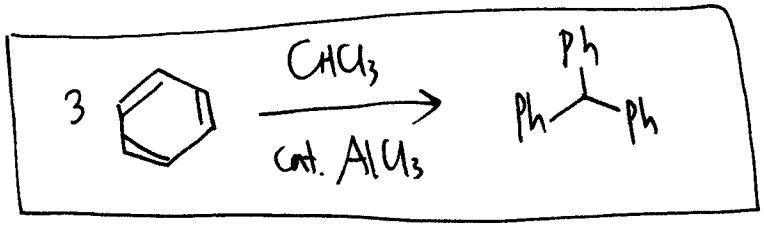


2 pts each

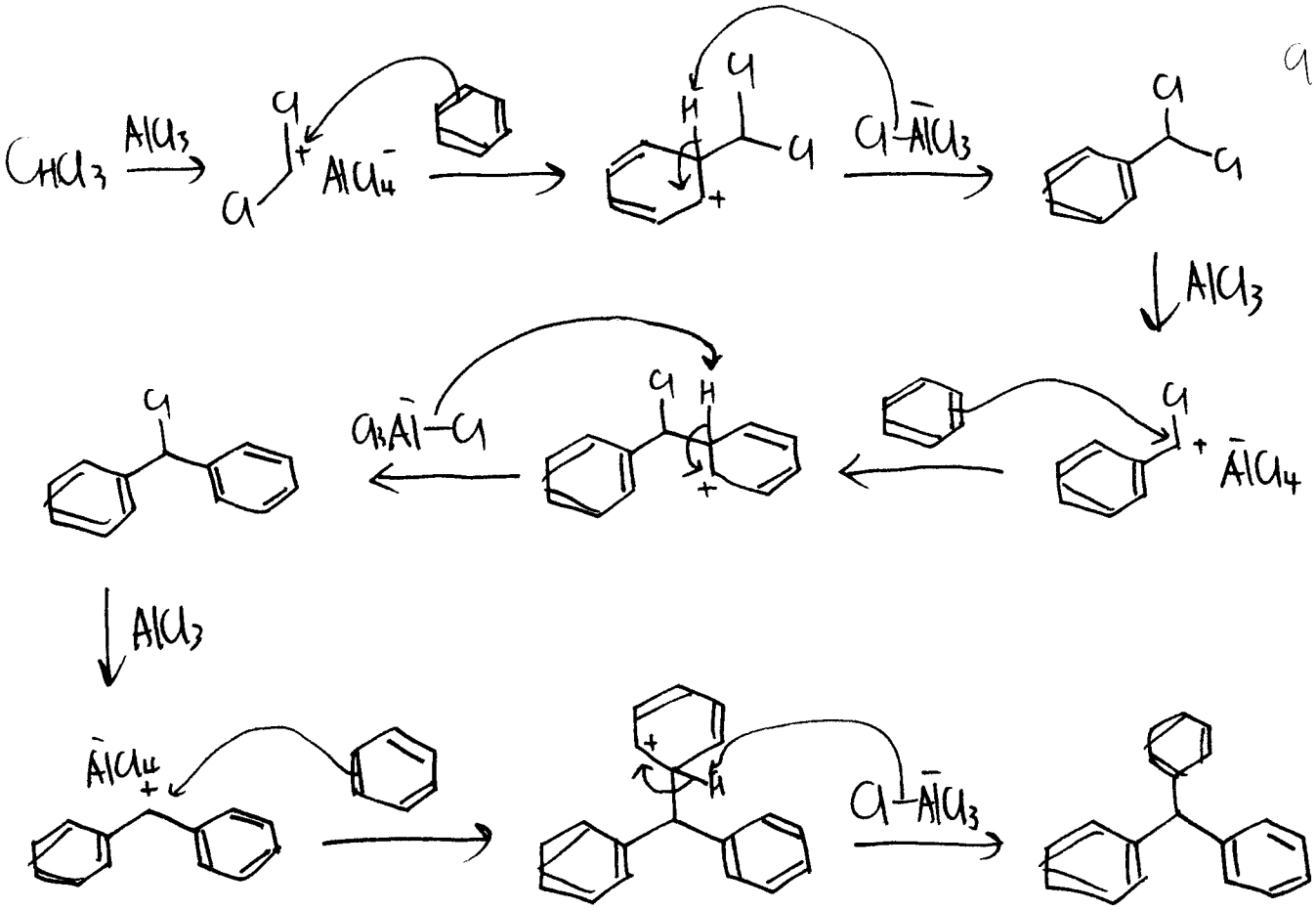
(b)



8. (18 points) Propose a synthesis of triphenylmethane from benzene, as the only source of aromatic rings, and any other necessary reagents. Propose a mechanism for the reaction.

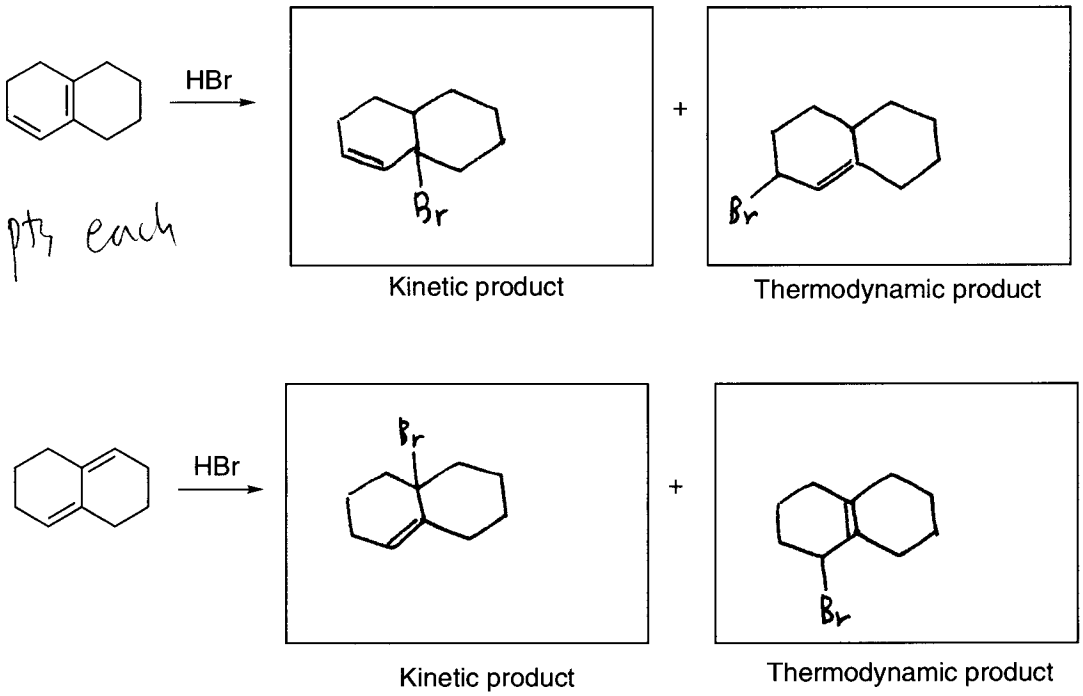


9 pts



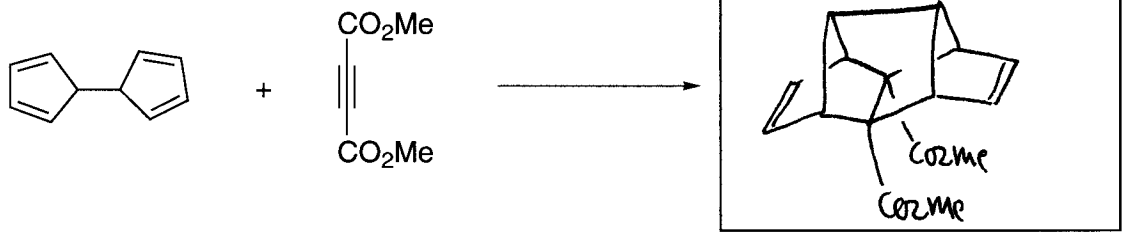
9 pts

9. (12 points) Predict the structures of the expected kinetic and thermodynamic products from addition of one mole of HBr to the following dienes.

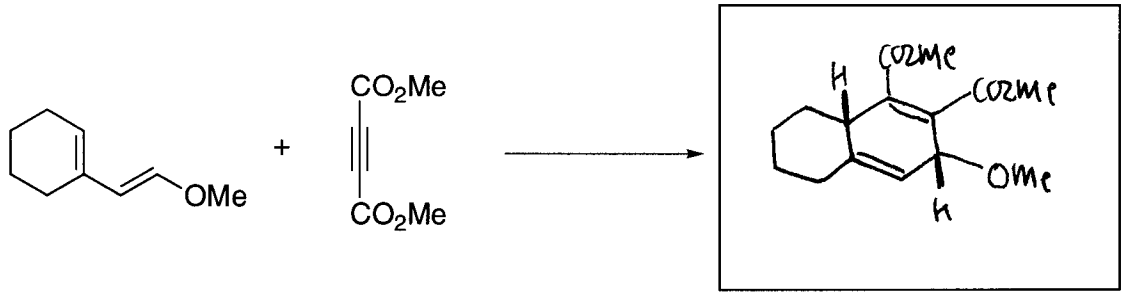


10. (20 points) Predict the structures of the products of the Diels-Alder reactions shown below. Specify the relative stereochemistry of the chiral centers in the products if there is more than one chiral center.

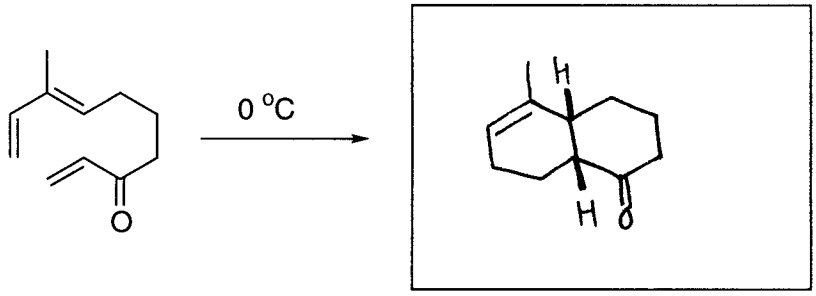
(a) 5 pts each



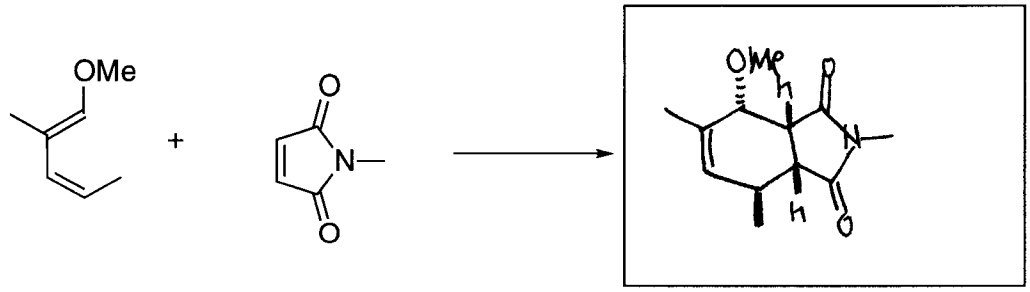
(b)



(c)

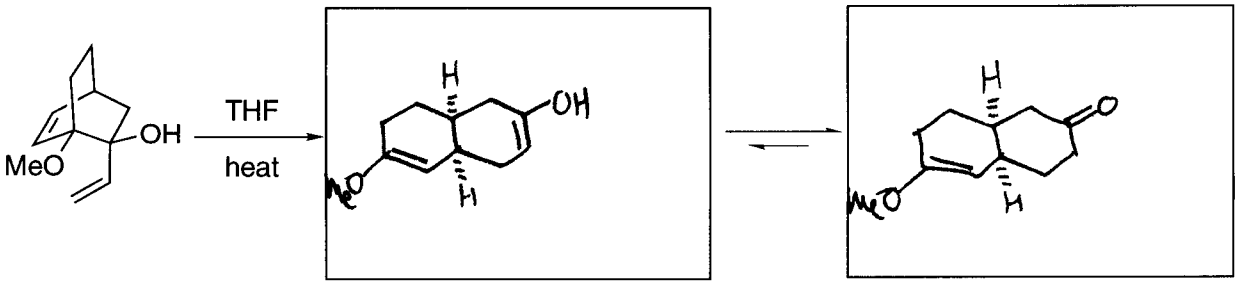


(d)

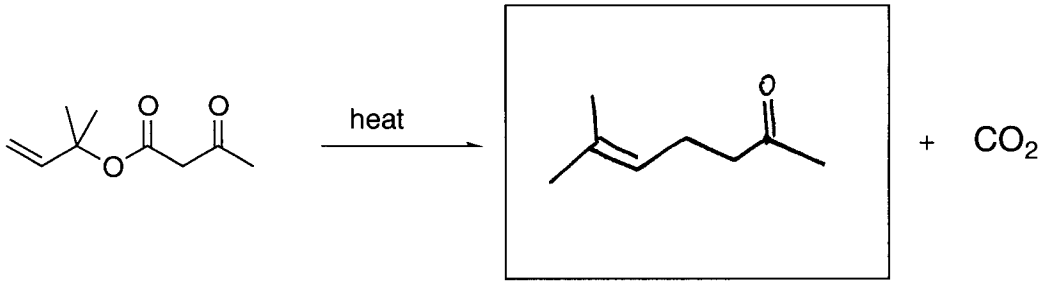


11. (16 points) Show the products of Cope or Claisen rearrangements shown below. Specify the relative stereochemistry of the chiral centers in the products if there is more than one chiral center.

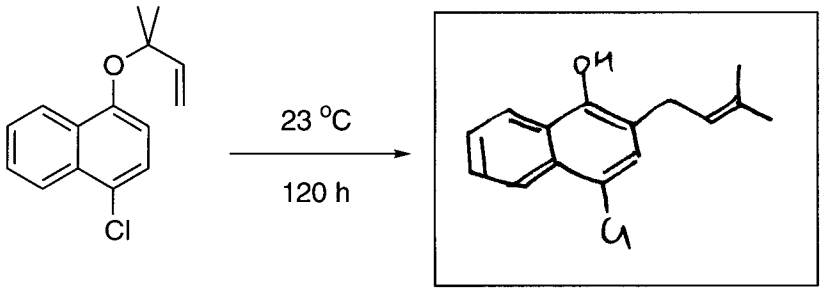
(a) 4 pts each



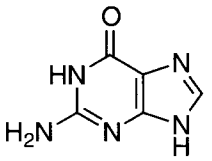
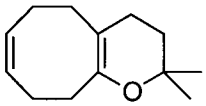
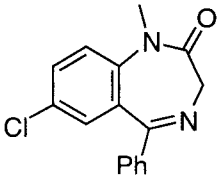
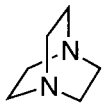
(b)



(c)



12. (a) (12 points) Which of the compounds below are expected to be UV/Vis active and which are not? Briefly explain why.

				
Yes or No	yes 2	no 2	yes 2	no 2 pts
Why	contains highly conjugated π system (chromophore) 1	no conjugated π system 1	contains extended, highly conjugated π system 1	no double bond 1 pt

(b) (5 points) What is Beer–Lambert law and what is the use of it?

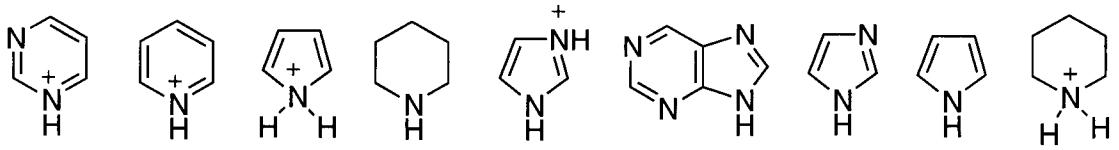
→ The relationship between absorbance (A), concentration (c), and length of the sample cell (l): $A = \varepsilon c l$ where ε is the extinction coefficient (molar absorptivity). 3 pts

→ Measurement of absorbance allows to determine the concentration of a sample. 2 pts

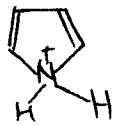
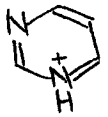
(c) (4 points) What are HOMO and LUMO?

HOMO	highest occupied molecular orbital 2 pts
LUMO	lowest unoccupied molecular orbital 2 pts

13. (24 points) List the following compounds in order of decreasing acidity.



1 5.16 -3.8 36 6.8 8.9 14.9 17 11.2

Most acidic	
↓	
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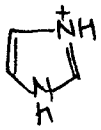
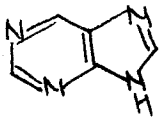
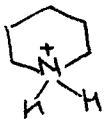
↓	
↓	
↓	
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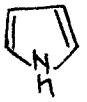
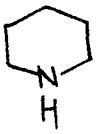
↓	
Least acidic	

3 pts for each correct (relative) order