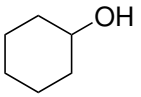
Name:_____

1. (5 points each, 50 total) NOTE: This question is distributed over two pages.
Draw the structure of the major organic product of the each of the following reactions in the box provided.
Specify stereochemistry where appropriate.

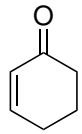
A.



CrO_3, H_2SO_4

Acetone

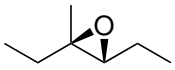
B.



1. $LiMe_2Cu$

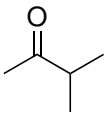
2. H_3O^+

C.



H^+, CH_3OH

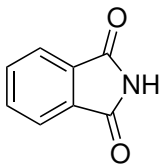
D.



$CH_3PPh_3^+$ Br^-, BuLi

THF

E.



1. n-BuLi
2. $BrCH_2CH_2CH(CH_3)_2$

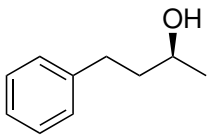
3. NH_2NH_2

Name:_____

1. (continued)

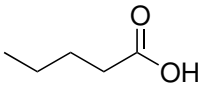
Draw the structure of the major organic product of the each of the following reactions in the box provided. Specify stereochemistry where appropriate.

F.



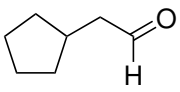
1. $TsCl, Et_3N$
2. $NaCN$
3. $LiAlH_4$
4. H_3O^+

G.



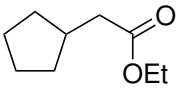
1. $SOCl_2$
2. 2 eq. $HN(Me)CH_2CH_3$

H.



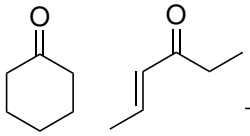
$NaOEt, EtOH$

I.



$NaOEt, EtOH$

J.

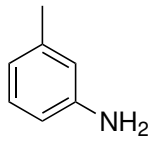


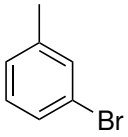
$NaOEt, EtOH$

Name:_____

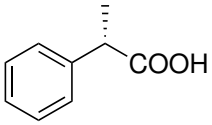
2. (5 points each; 30 total)
Specify how to accomplish each of the following transformations in the box provided. These might require more than one step.

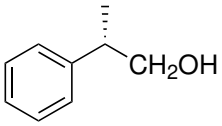
A



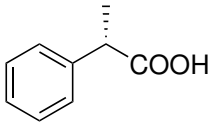


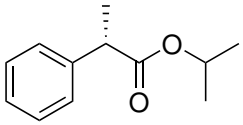
B



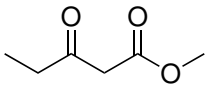


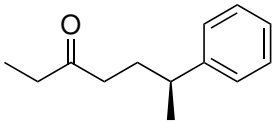
C



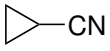


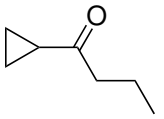
D



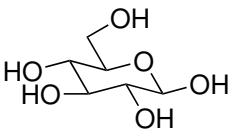


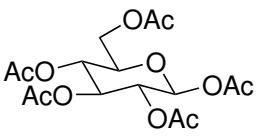
E





F



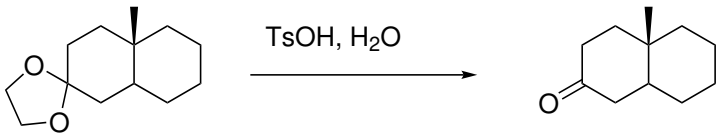


(Ac = acetyl, $CH_3C(=O)$-)

Name:_____

3. (10 points each; 20 total)
Write reasonable mutistep mechanisms for the transformations below, using the curved arrow formalism to show electron flow. Write important resonance contributors where approrpriate.

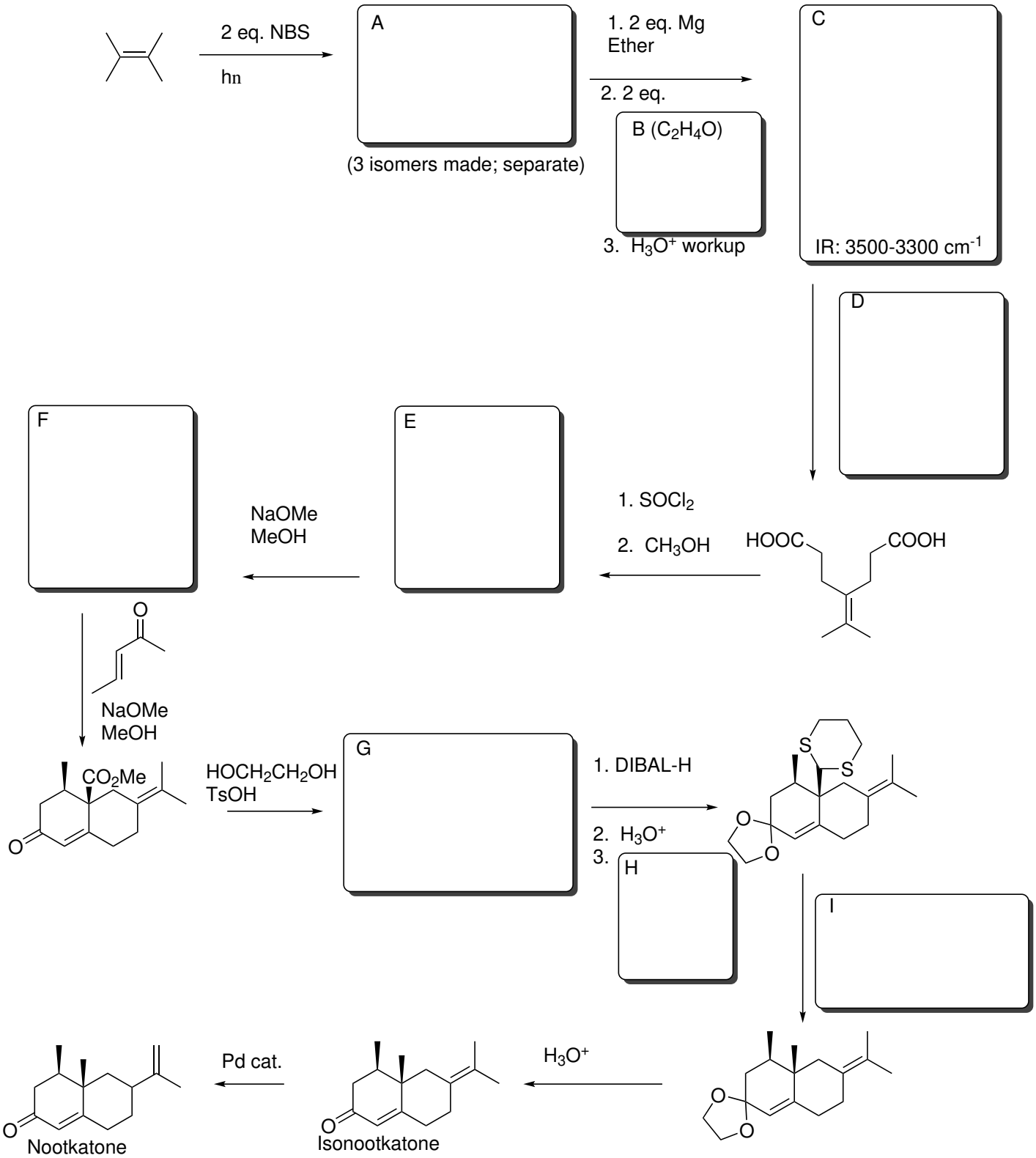
A.



B.

Name:_____

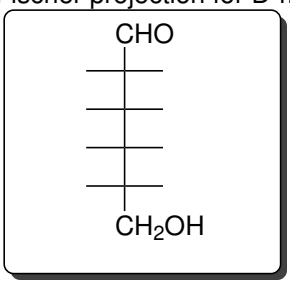
4. (5 points each; 45 total)
The following multistep process creates nootkatone, a natural product found in cedars and in grapefruit that is of interest as a low-toxicity insect repellent. Fill in the missing structures and reagents.



Name:_____

5. (6 points each; 30 points total)
Mannose is the 2-epimer of glucose. It is isolated in high yield from palm nut kernels.

A. Draw the Fischer projection for D-mannose.



B. Draw the conformational perspective drawing and Haworth projection for b-D-mannopyranose.

C. Reduction of mannose ($NaBH_4$) followed by acid-catalyzed reaction with acetone gives a compound with molecular formula $C_{12}H_{22}O_6$, that exhibits 6 lines in the ^{13}C NMR. Draw it.

D. Reaction of the product from (C) with acidic $NaIO_4$ followed by acid catalyzed hydrolysis gives glyceraldehyde ($C_3H_6O_3$). Explain whether the product is D, L, or a racemic mixture, and why.

Name:_____

6. (25 total) From the spectra and other information provided, propose a structure consistent with the data. Provide explanations of the data for partial credit.

Molecular formula: $C_6H_{12}O_3$.

IR: 1710 cm^{-1}.

^1H NMR:
2.1 ppm s, 3H
2.6 d, 2H
3.2 s, 6H
4.7 t, 1H

The compound gives a positive iodoform test (treatment with I_2/KOH gives a yellow precipitate) and a negative Tollens test (treatment with $Ag(NH_3)_2^+OH^-$). However, after treatment with water containing a drop of H_2SO_4, the Tollens test turns positive by depositing a silver mirror.