Hour Exam #2
Chemistry 345
Professor Gellman
26 March 2010

Last Name __Answer__

First Name __Key__
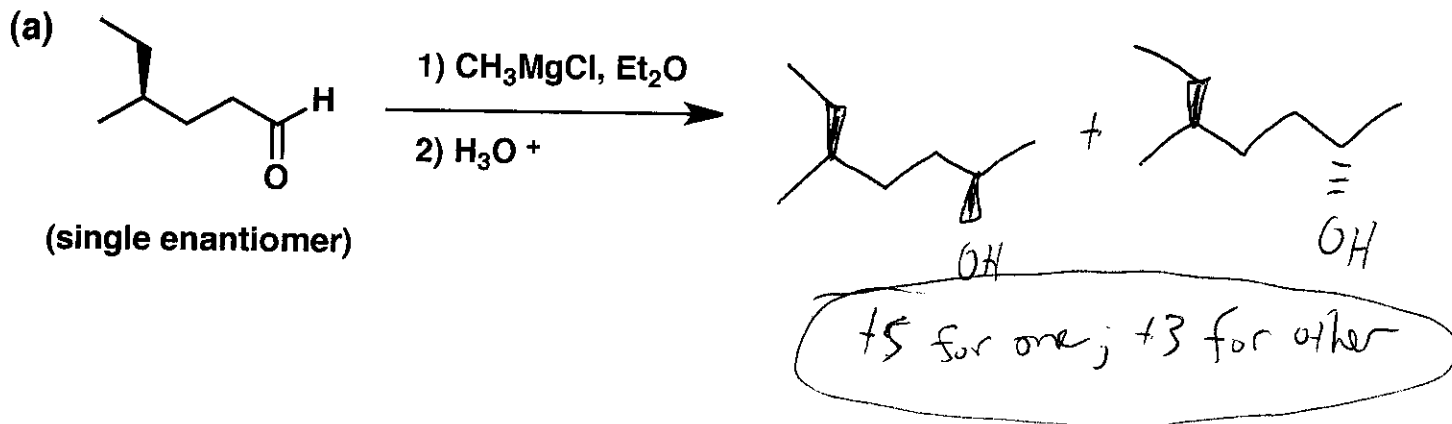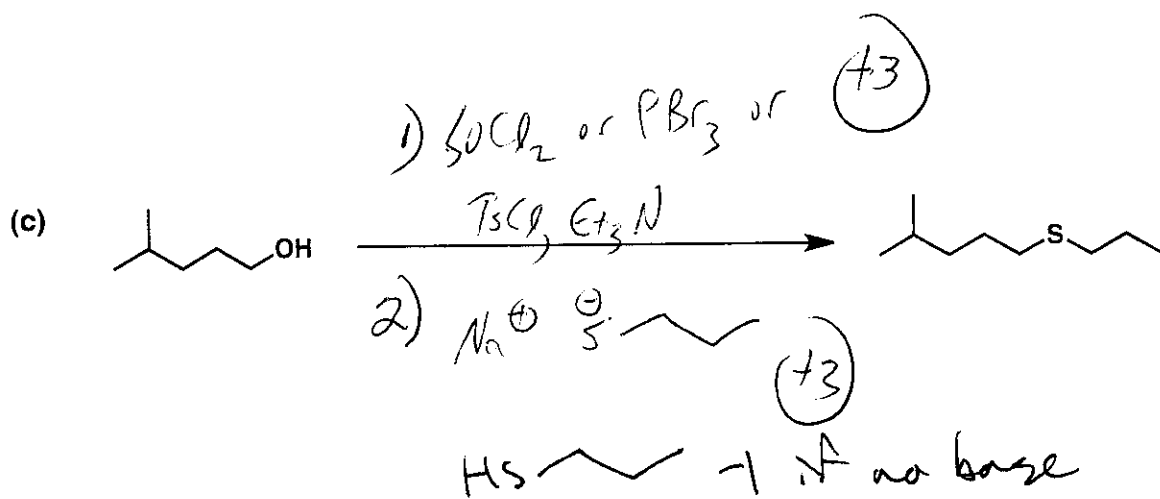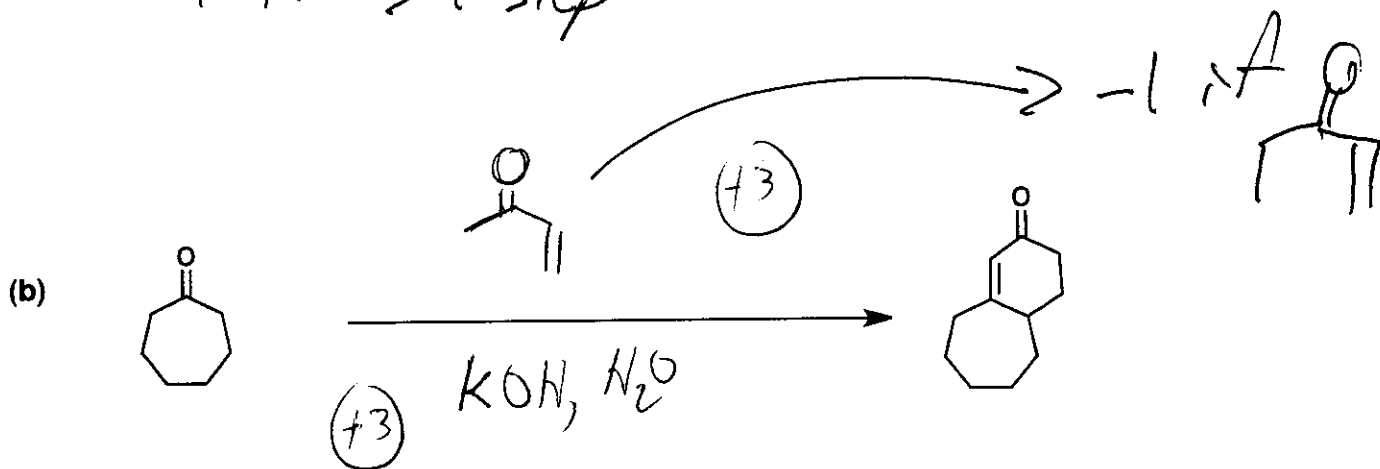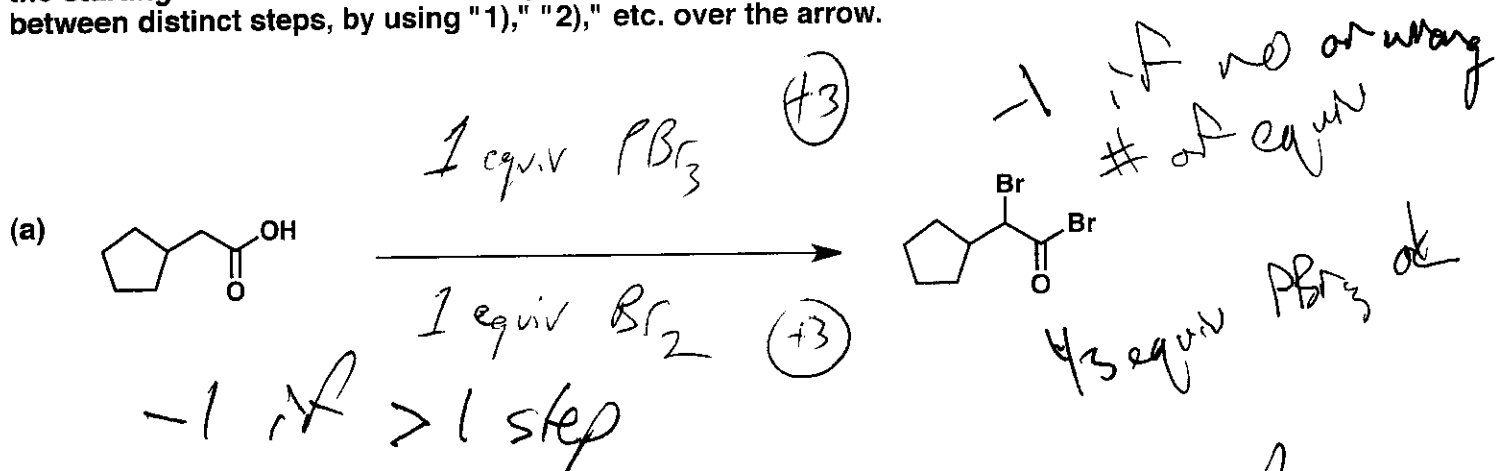
[Use scratch paper at back of exam to work out answers; final answers must be recorded at the proper place on the exam itself for credit.]

1. **(20 points)** Show the major product or products expected from each reaction.

(a)

1) CH_3MgCl, Et_2O

2) H_3O^+

(single enantiomer)

$+5$ for one; $+3$ for other

(b)

1) KF, H_2O

2) NaH

$+6$

(c)

MnO_2

$+6$
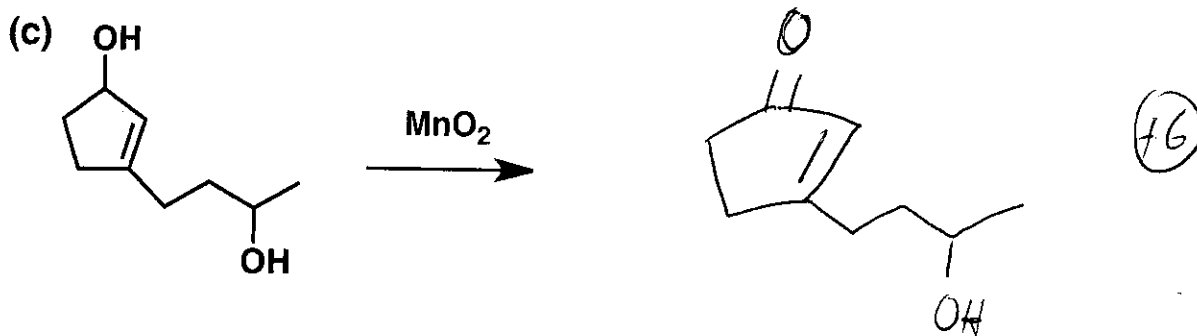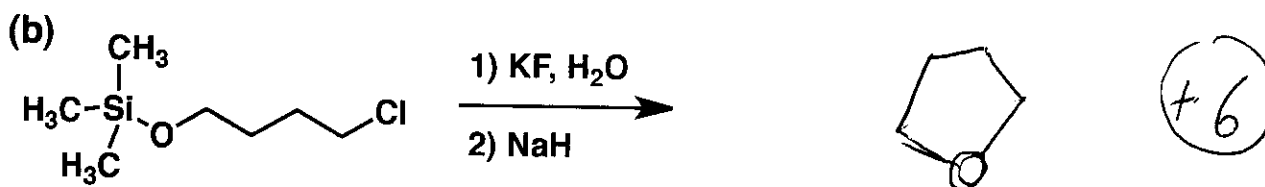
2. (18 points) Show the reagents and other organic molecules required to convert the starting material to the indicated product. Be sure to differentiate clearly between distinct steps, by using "1)," "2)," etc. over the arrow.
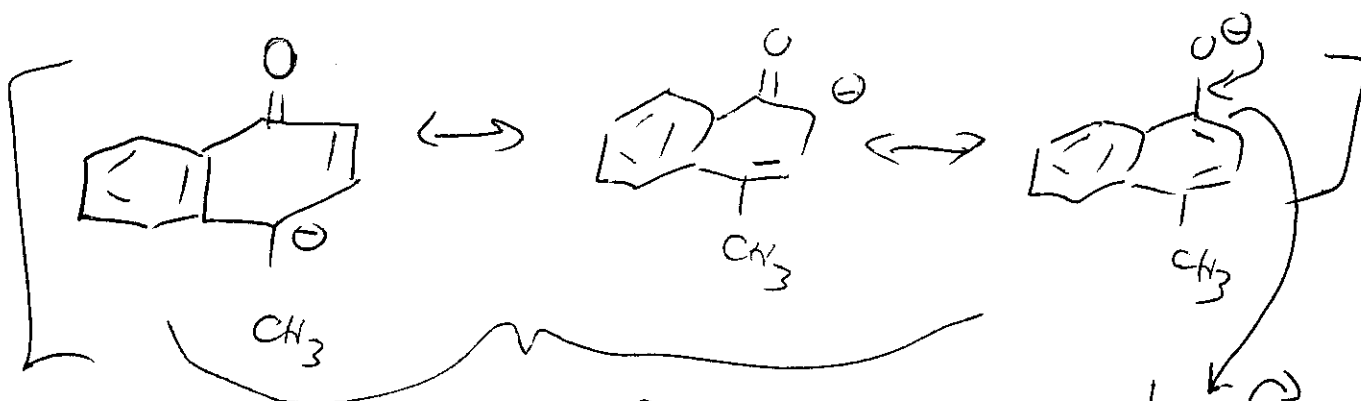
(a)

1 equiv PBr₃   (+3)

1 equiv Br₂   (+3)

-1 if > 1 step

-1 if no or wrong # of equiv

4/3 equiv PBr₃ ok

(b)

(+3)

KOH, H₂O   (+3)

-1 if [ketone structure]

(c)

1) SOCl₂ or PBr₃ or   (+3)

TsCl, Et₃N

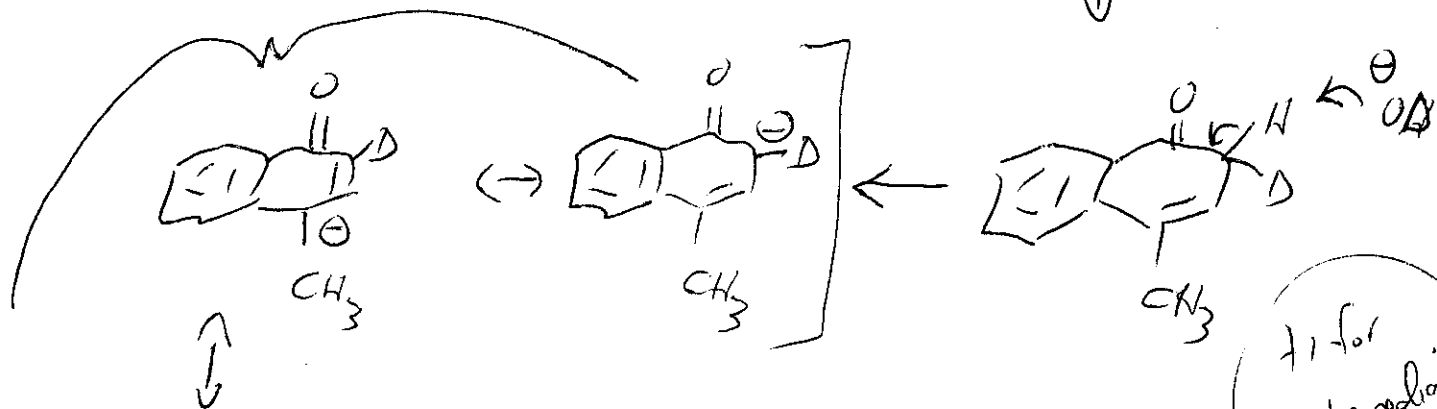2) Na⊕ ⊖S⌒⌒   (+3)

HS⌒⌒ -1 if no base

HS⌒⌒ if just thiol +2

3. (20 points) Draw a complete mechanism (curved arrows) for each of the reactions shown below; be sure to show all important resonance forms.
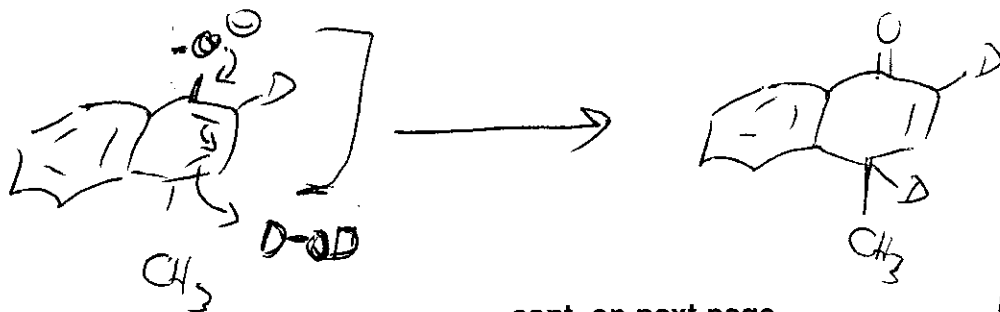
(a)
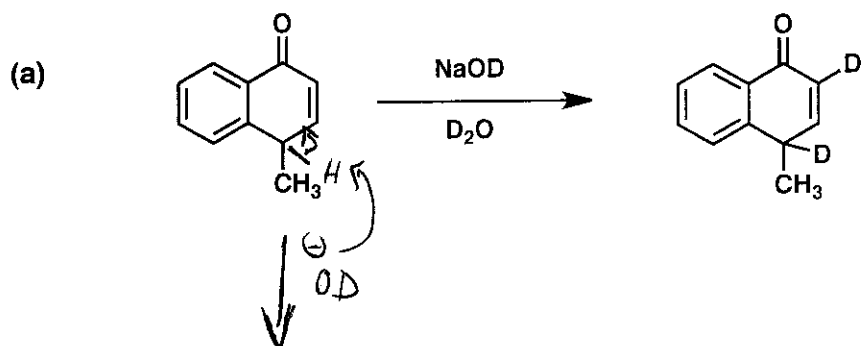
+1 for each set
of mechanistic
arrows [+4 total]
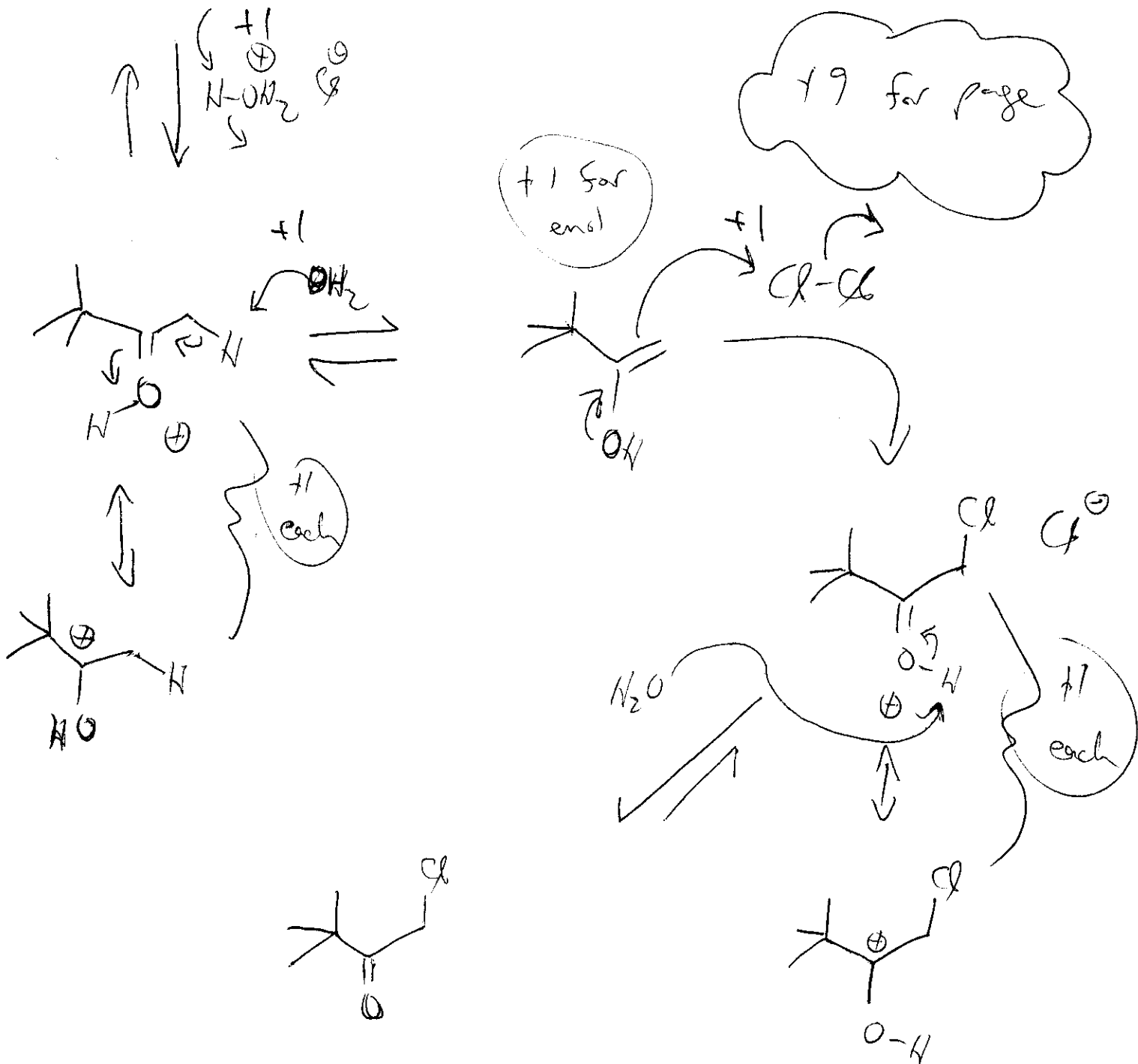
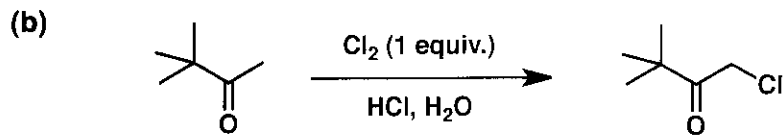+1 for each res. structure [+6 total]
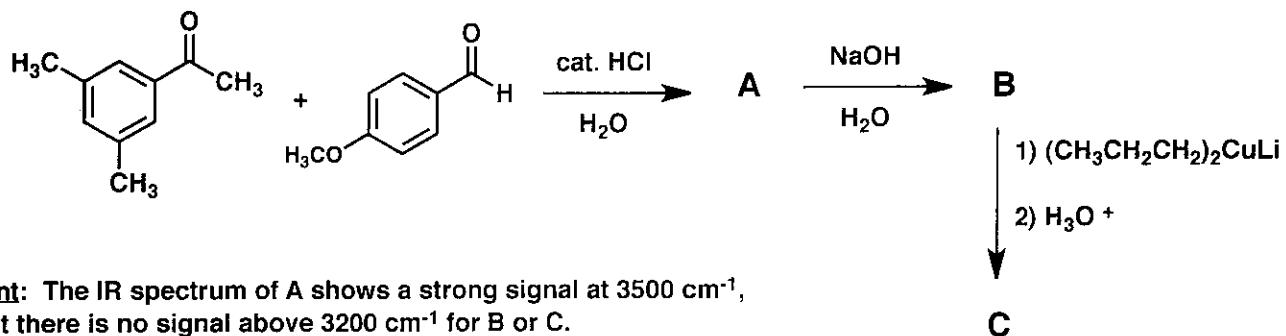
+1 for
intermediate

D−OH

D−OD

+ 11 total
points

3. (cont.)

(b)

Cl$_2$ (1 equiv.)

HCl, H$_2$O

+1 for each set of mechanistic arrows [~4 total]

+9 for page

+1 for enol

+1 each

+1 each

Cl–Cl

H$_2$O

O–H

4. (18 points) Show the structure of A, B and C in the appropriate boxes. The structures you propose should be consistent with the spectroscopic data provided.
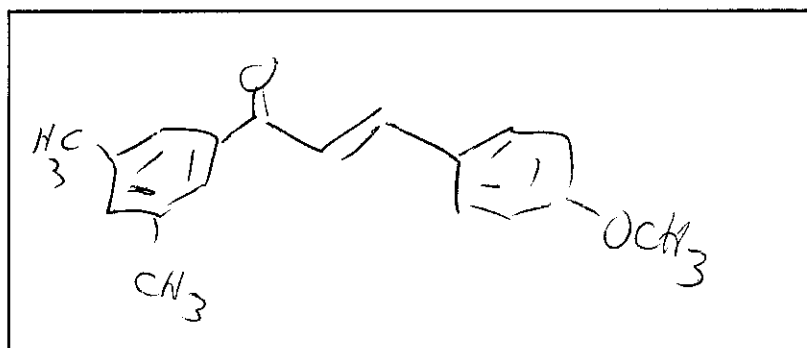
H_3C — (structure: 3,5-dimethylacetophenone) — CH_3
CH_3
+
(structure: 4-methoxybenzaldehyde) — H, H_3CO

$\xrightarrow[\text{H}_2\text{O}]{\text{cat. HCl}}$ **A** $\xrightarrow[\text{H}_2\text{O}]{\text{NaOH}}$ **B**

$\downarrow$ 1) $(CH_3CH_2CH_2)_2CuLi$

2) H_3O^+

C

<u>Hint</u>: The IR spectrum of A shows a strong signal at 3500 cm^{-1}, but there is no signal above 3200 cm^{-1} for B or C.

A =
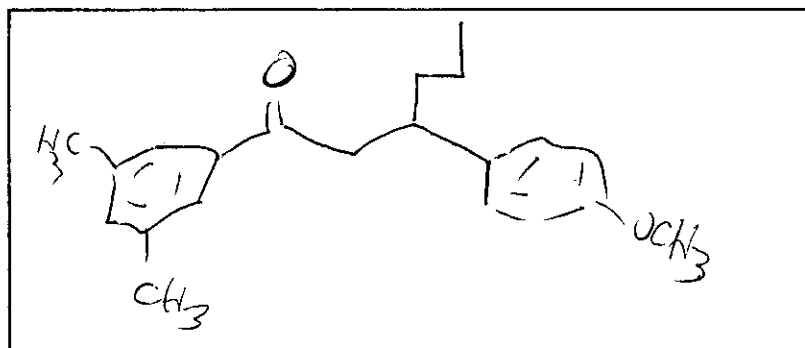

B =

C =
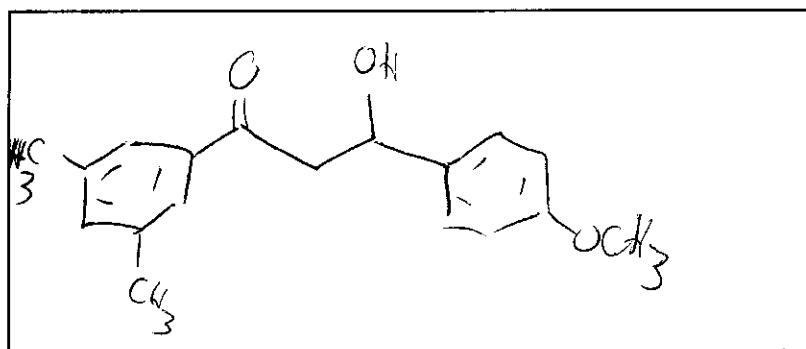
5. (24 points) Devise a synthetic beginning with the "starting materials" to generate the "target", using any necessary reagents.

Starting Materials   **Target**

(+6)

$R\overset{O}{\underset{}{C}}OOH$

(+6)

1) LiAlH₄

2) H₃O⁺

(+6)

PBr₃

(SOCl₂ ok)

1) Mg°, Et₂O

2)

3) H₃O⁺ (+6)