Hour Exam #2
Chemistry 345
Professor Gellman
1 April 2011

Last Name Answer

First Name Key

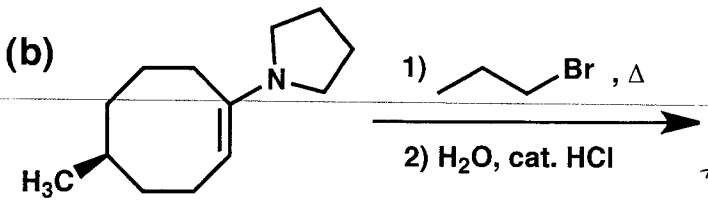
[Use scratch paper at back of exam to work out answers; final answers must be recorded at the proper place on the exam itself for credit.]

1. (26 points) Show the major product or products expected from each reaction.

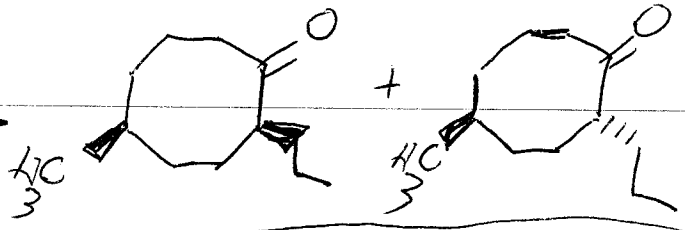
(a)

+6

(b)

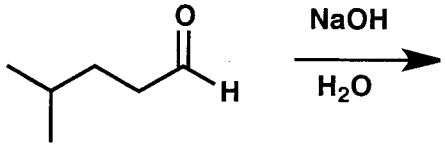


(The starting material is a single pure enantiomer.)

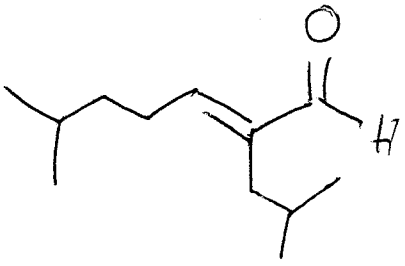


+6 for one; +8 for both
+2 for alkyl group correct
+3 if stereochem
for no stereochem

(c)



(A single product is formed. The IR spectrum of this product has a strong signal at 1685 cm^{-1}. In contrast, the starting material has a strong signal at 1725 cm^{-1}.)

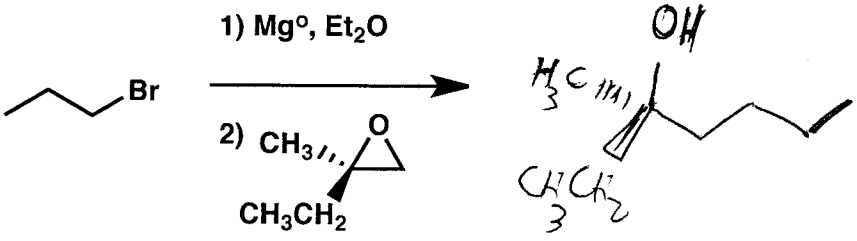


+6

(either alkene isomer ok)

+4 for Aldol product

(d)



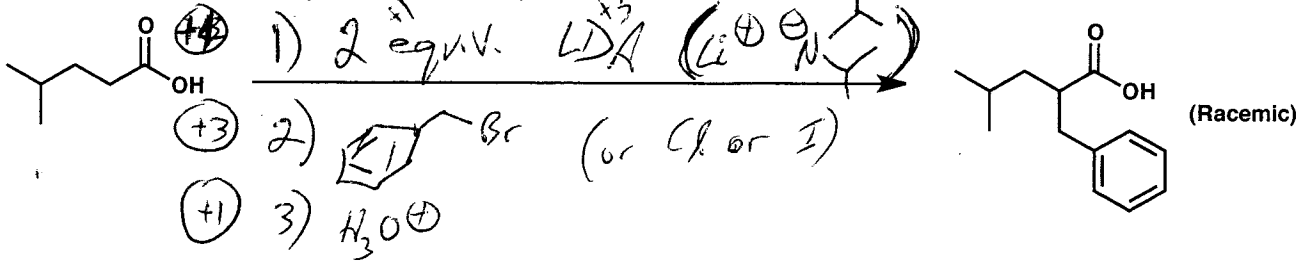
+6

(No stereochem required)

Name _____

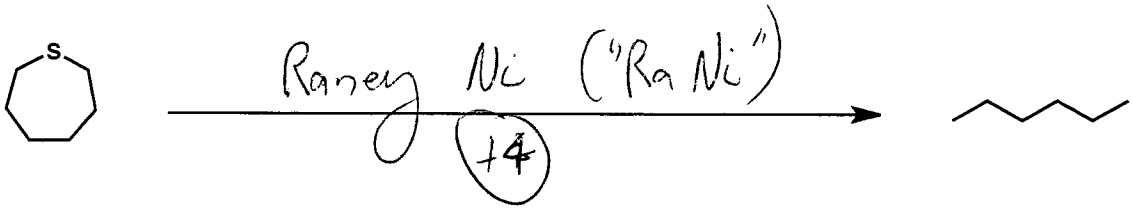
2. (29 points) Show the reagents and other organic molecules required to convert the starting material to the indicated product. Be sure to differentiate clearly between distinct steps, by using "1)," "2)," etc. over the arrow.

(a)

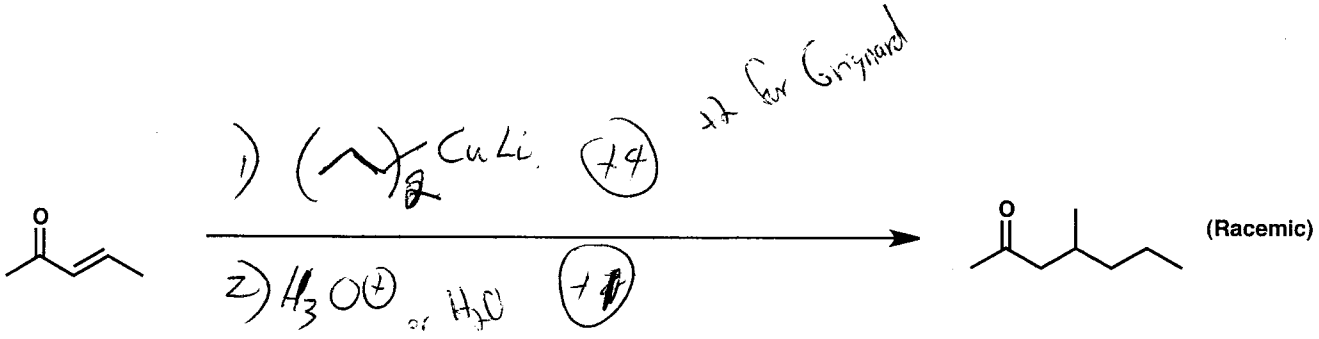


(b)

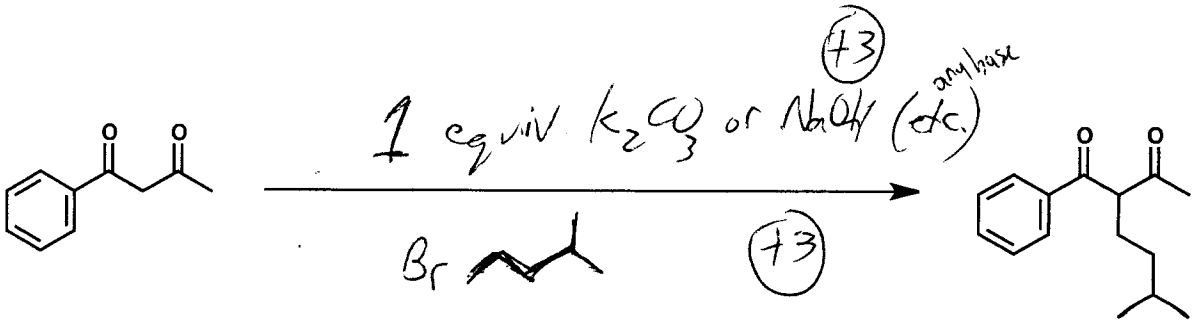
(c)



(d)

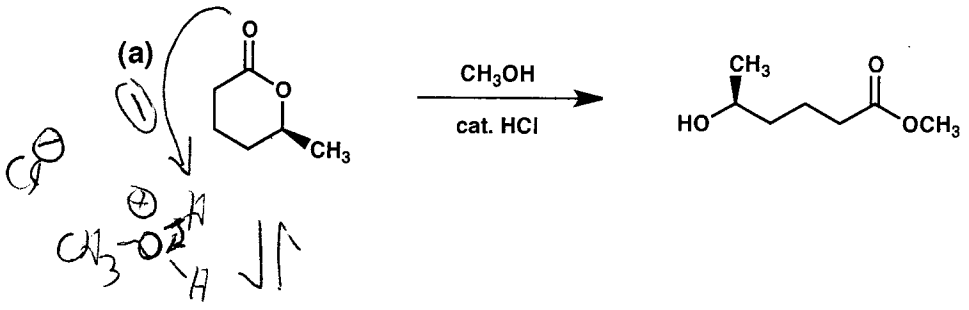


(e)



Name _____

3. (25 points) Draw a complete mechanism (curved arrows) for each of the reactions shown below; be sure to show all important resonance forms.



+1 for each ⊕O–H res. structure (+2 total)

+1 for each intermediate (+3 total)

+1 for each ⊕O–H res. structure (+2 total)

+1 for each set of curved arrows (+6 total)

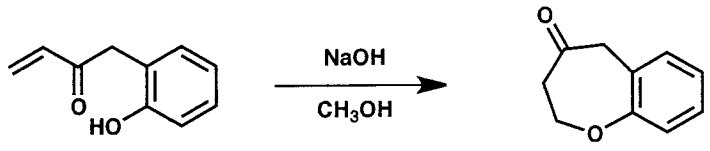
-- cont. on next page --

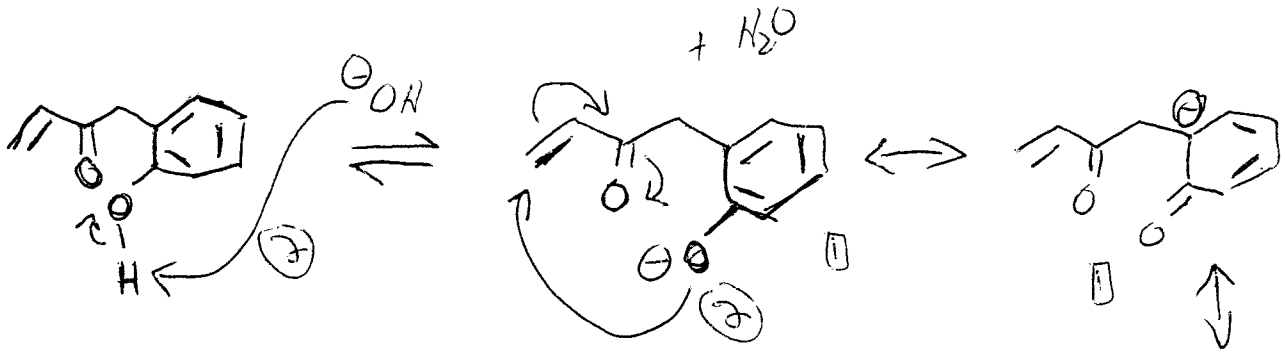
+13 grand total

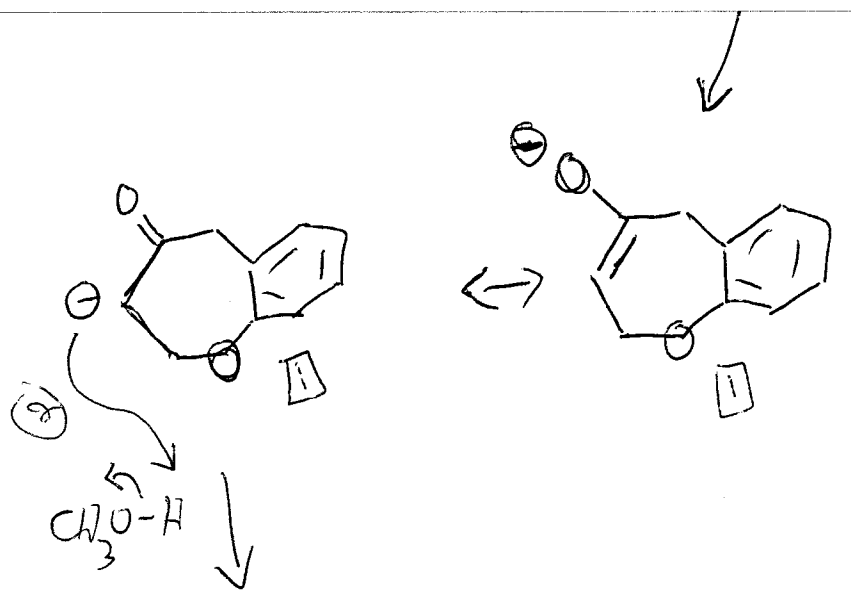
Name _____

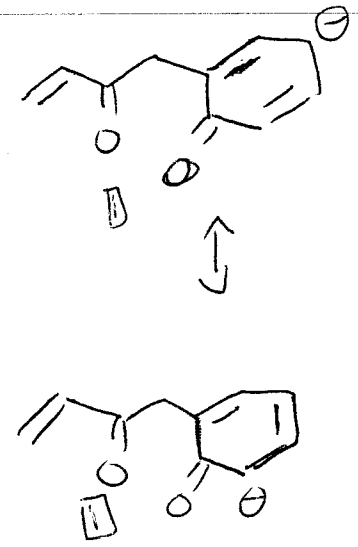
3. (cont.)

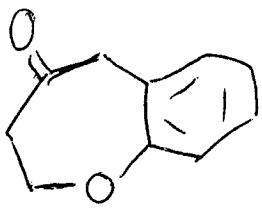
(b)











(+ $CH_3O^{\ominus}$)

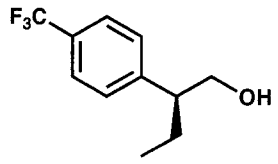
+1 for each intermediate res structure (+6 total)

+2 for each set of curved arrows (+6 total)

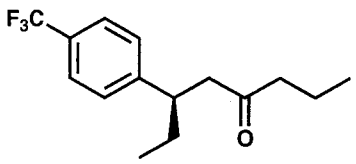
+1/2 Grand total

Name _____

4. (20 points) Devise a synthetic route beginning with the "starting material" (enantiomerically pure) to generate the "target", using any necessary compounds/reagents.



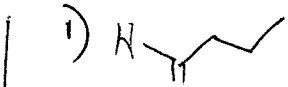
Starting Material



Target

(+5) PBr_3 (or $SOCl_2$)

(+5) Mg^0, Et_2O (or Li^0)

(+5) 1)  2) $H_3O^{\oplus}$

(+5) $KMnO_4$, $K_2Cr_2O_7$, H_2SO_4 (or other Cr(VI))

Alternate:

$R\text{-}Br$ (+5) $\xrightarrow{Mg^0}$ $RMgBr$ (+5) $\xrightarrow[2)\,H_3O^{\oplus}]{1)\,CO_2}$ $R\text{-}CO_2H$ (+5) $\xrightarrow[2)\,H_3O^{\oplus}]{1)\,2\ equiv\ Li}$