1								

1 ⓪ ⓪ ⓪ ⓪ ⓪ ⓪ ⓪ ⓪
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② ② ② ② ② ② ② ②
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CEM 352 –Quiz 1

Spring 2025

NAME	

Score		

⓪ ⓪ ⓪
① ① ①
② ② ②
③ ③ ③
④ ④ ④
⑤ ⑤ ⑤
⑥ ⑥ ⑥
⑦ ⑦ ⑦
⑧ ⑧ ⑧
⑨ ⑨ ⑨

READ THIS!

Bubble in your PID in the space above. Write your answer for each question in the space provided.

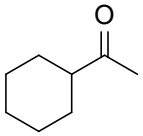
LEAVE THIS COVER SHEET ATTACHED TO THE Quiz!

1. **_____/15**
2. **_____/16**
3. **_____/12**
4. **_____/11**

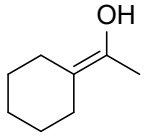
TOTAL:_____/ 50

1) Complete the acid catalyzed (H_3O^+) mechanism for the enol/keto tautomerization.
Place the appropriate small molecules in the smaller boxes drawn as <u>Lewis (line) structures e.g. (:X–Y⁺–Z:)</u> that show bonds, lone electron pairs, and formal charges on the correct atoms. (11 pts)

CURVED ARROWS MUST BE INCLUDED THAT SHOW THE MOVEMENT OF ELECTRONS (4 pts)



A



B

Acid cat.
(arrows 2 pts)

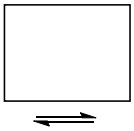
1 pt

A cation (2 pts)

+

conj base (1 pt)

arrows 2 pts
neutral base



(1 pt)

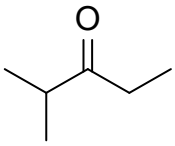
cpd B
+

conj acid of neutral base (1 pt)

What is the other enol?

1 pt

Show the products of the following reactions

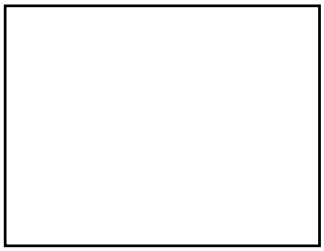


A

Cl_2,
CH_3CO_2H, H_2O

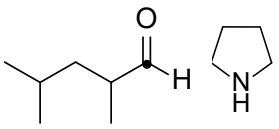
2 are products derived from A (2 pts)

Cl_2, NaOH
H_2O



one product, 2 pts

2) Complete the synthesis scheme.



NOTE the dot (•)

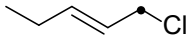
H_3O^+ (cat)

$-H_2O$

A cation
Include dot (•)

Include dot (•)

$C_{11}H_{21}N$ (neutral)
This cpd is isolated, then reacted with the reagent below



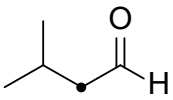
Include dots (•)

A cation

H_3O^+ (XS)

Show the dotted (•) atoms

3) Complete the synthesis scheme.



Cpd A

NOTE the dotted carbon

NaOH
H_2O, 4 °C

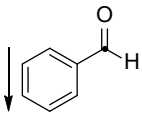
Include dot (•)

Initial enolate

Cpd A

Include dots (•)

(neutral) $C_{10}H_{20}O$



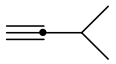
NaOH
H_2O, heat

Heat, 100 °C

Show the dotted (•) atoms

Show the dotted (•) atoms

4) Complete the synthesis scheme. (Baeyer-Villiger)



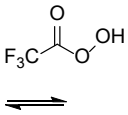
Cpd A

NOTE the dotted carbon

$HgSO_4$
H_2SO_4
H_2O

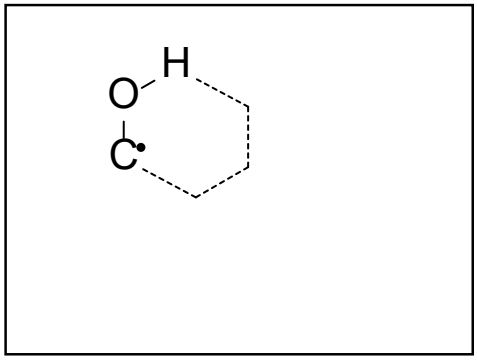
Include dot (•)

Most abundant at equil



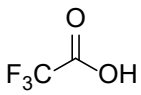
Include dot (•)

(A cation) – an activated intermediate



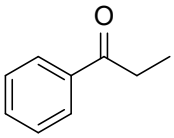
Partial scaffold for the 6-atom intermediate is provided: dotted C shown. Fill in the remaining bonds/atoms along with curved mechanism arrows to show access to the final products

+



HINT: look at this product to figure out how to complete prior box

5) Show the products.

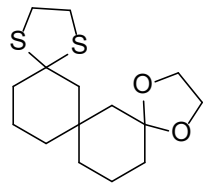


$H_2N\text{-}NH_2$

(Hydrazine)
KOH

What are the 2 neutral byproducts of this reaction?

6) Complete the synthesis scheme.



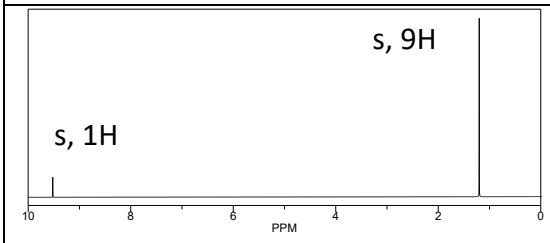
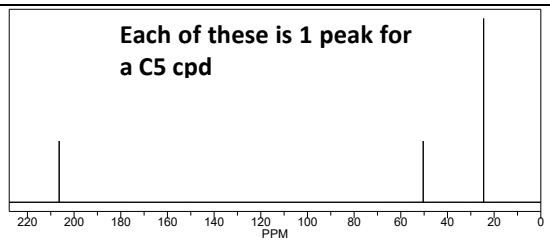
$HgCl_2$ ⇌ $CaCO_3$ H_2O

D_2O/D_3O^+ ⇌ (XS)

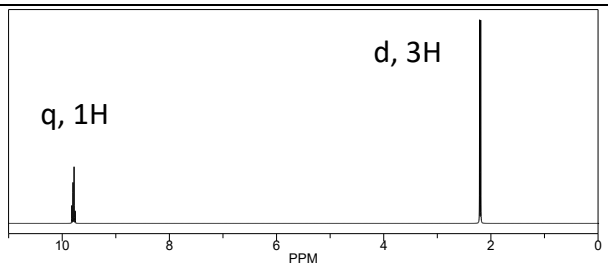
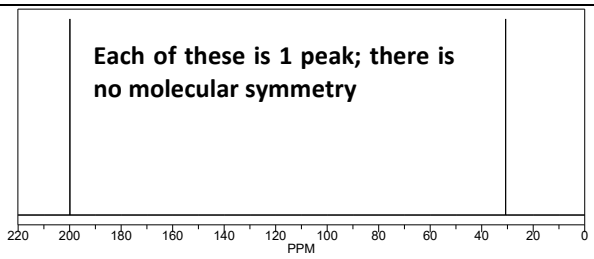
D_2O/D_3O^+

7) Two different aldehydes are mixed in NaOH/H2O and heated at 100 C for 12 h.
The NMR spectra for Aldehyde 1 and Aldehyde 2 are shown.

Aldehyde 1

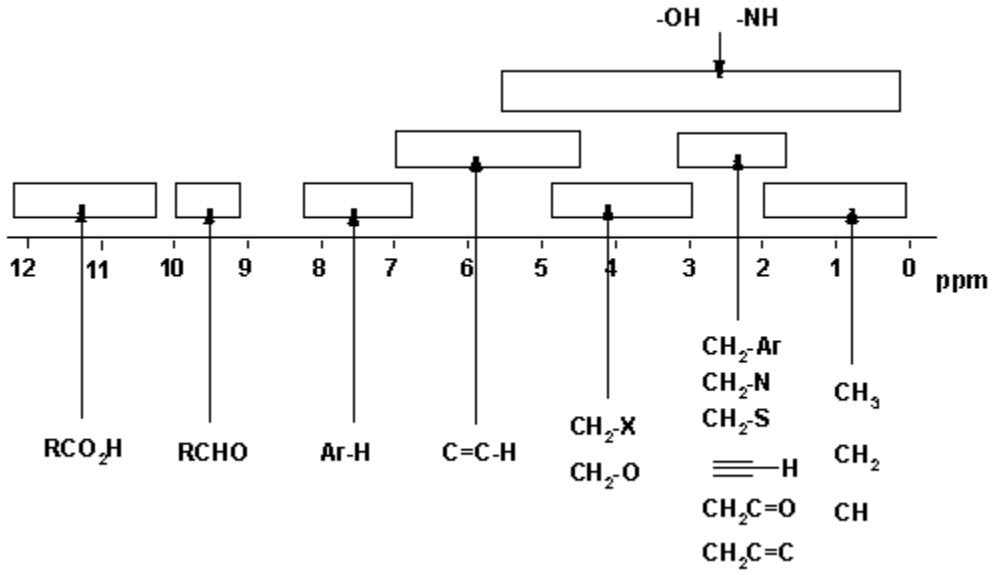
1H NMR	13C NMR
	

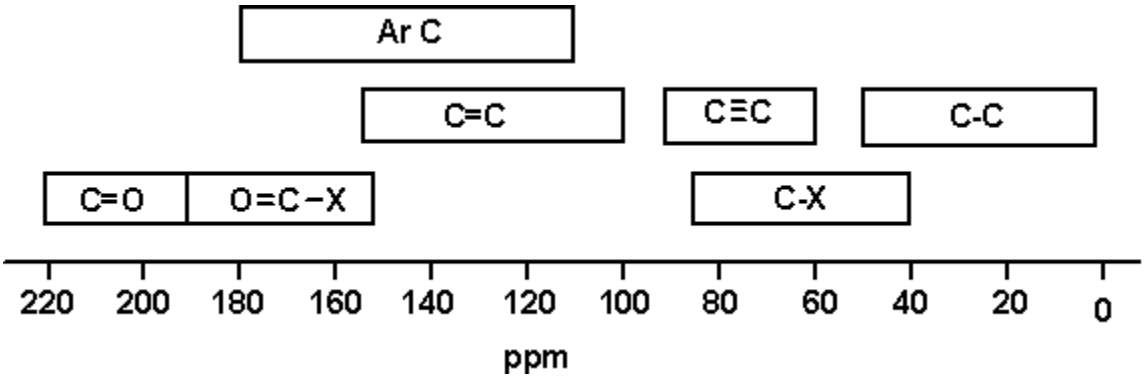
Aldehyde 2

1H NMR	13C NMR
	

The final aldol condensation product isolated after heating has a molecular formula of C7H12O
Derived the structures

Aldehyde 1 **Aldehyde 2** **Aldol Condensation Product after △**


-OH
-NH
12
11
10
9
8
7
6
5
4
3
2
1
0
ppm
RCO2H
RCHO
Ar-H
C=C-H
CH2-X
CH2-O
CH2-Ar
CH2-N
CH2-S
H
CH2C=O
CH2C=C
CH3
CH2
CH


Ar C
C=C
C≡C
C-C
C=O
O=C-X
C-X
220
200
180
160
140
120
100
80
60
40
20
0
ppm