Key

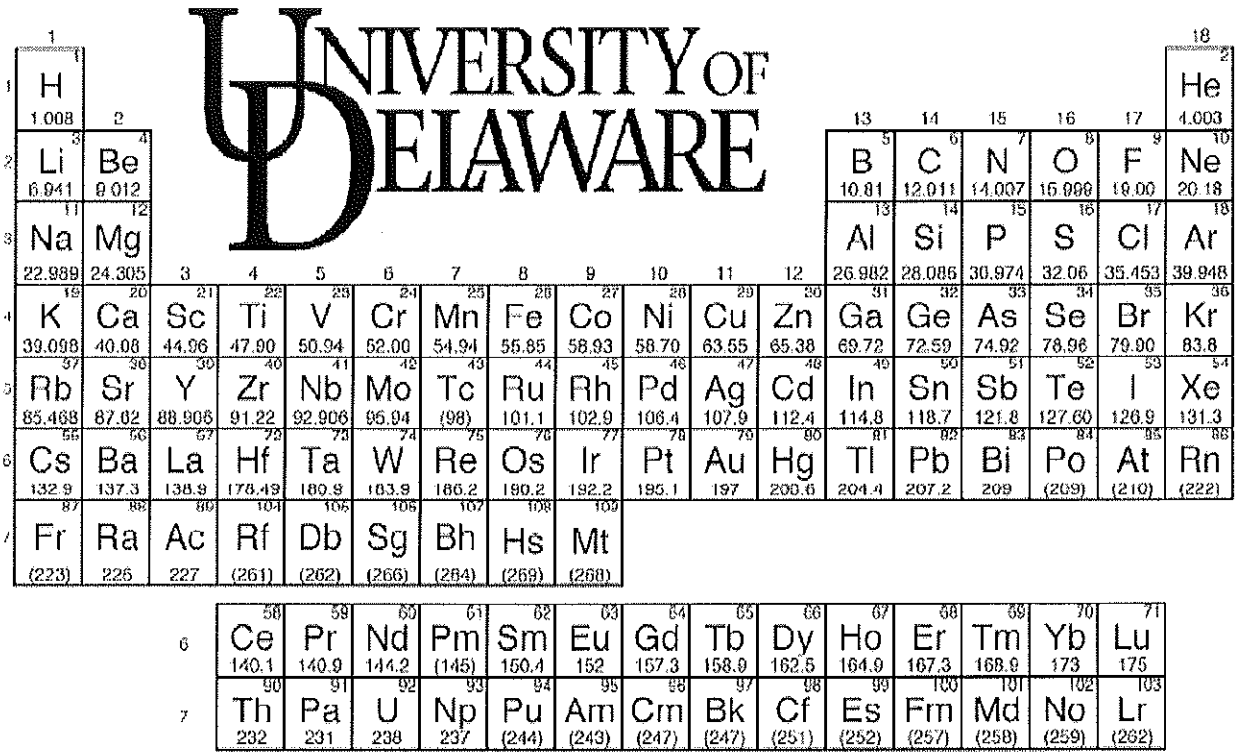
Name:_____ F

(Print your name clearly!)

Sametz: CHEM 322 2010

Organic Chemistry Exam 3

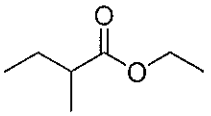
All answers should be written CLEARLY in the space provided. (If it's not clear, it's wrong).



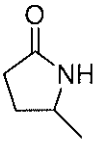
You may raise your hand to ask a question if you are unsure what a question is asking of you.

Part 1 Short Answer

1. (6 points) Name the following compounds:

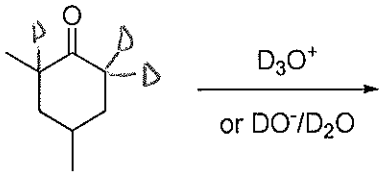


ethyl 2-methylbutanoate

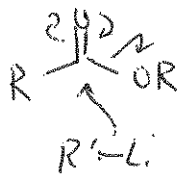


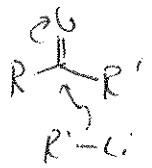
3-aza-3-methylcyclopentanone

2. (4 points) Give the product of the following reaction, i.e. explicitly show which hydrogen(s) is/are exchanged for deuterium.

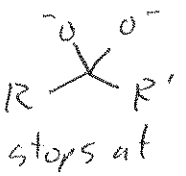


3. (10 points) Explain why an alkyllithium reagent adds two alkyl groups to an ester, but only one alkyl group to a carboxylic acid.

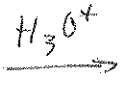


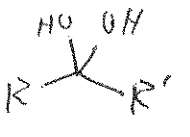


- ketone more reactive than ester
- ketone formed in presence of $R'-Li$
∴ 2X



stops at 1 add'n



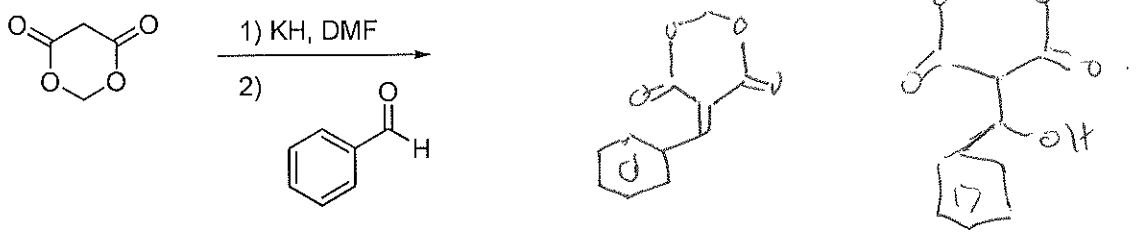


ketone never sees $R'-Li$.

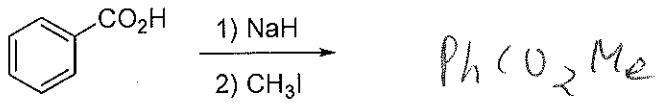
Part 2: Reactions and Synthesis

4. (30 points) Give the major organic product(s) for 10 of the following 11 reactions. **CLEARLY INDICATE THE QUESTION THAT YOU <u>DON'T</u> WANT GRADED! Otherwise, the first 10 questions that show work will be graded.**

a)

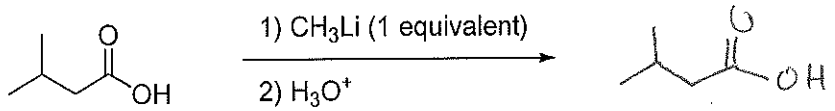


b)



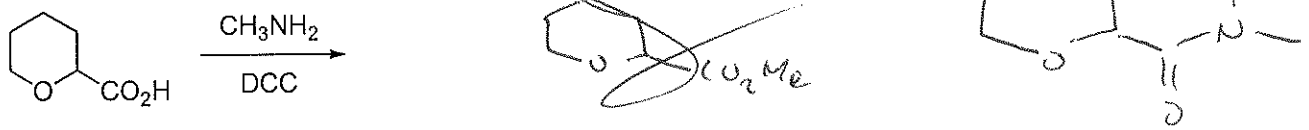
PhCO2Me

c)

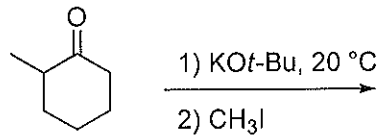


(no net rxn)

d)



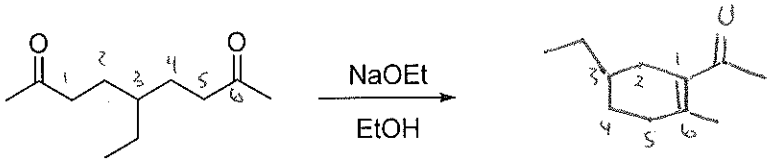
e)



TD

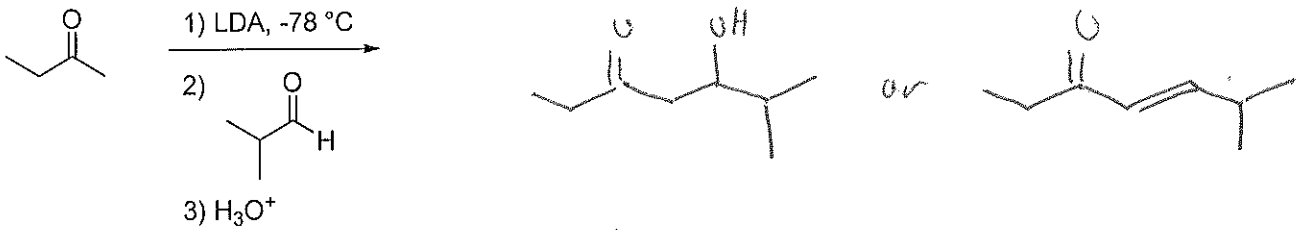
kinetic result: (2)

f)



aldol prod. also OK

g)

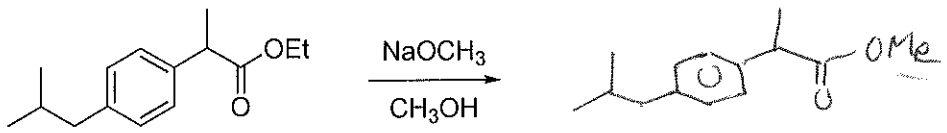


(TD result: (2))

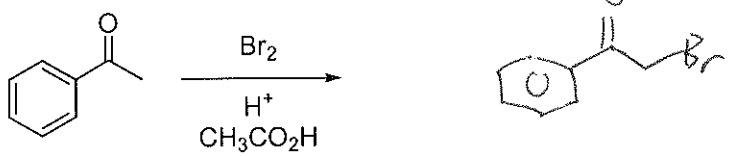
h)

(E1 OK too)

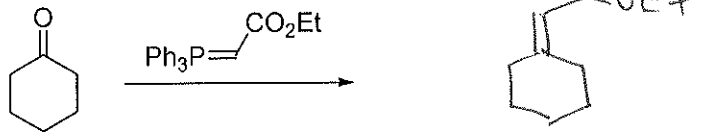
i)



j)

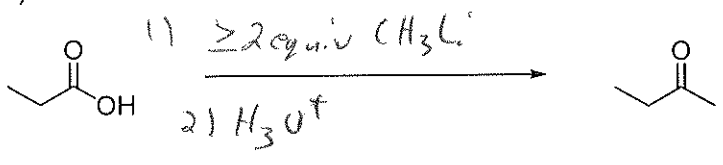


k)

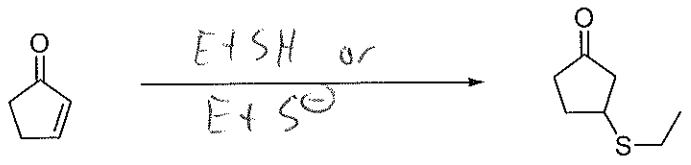


5. (30 points) Give reagents for the following transformations:

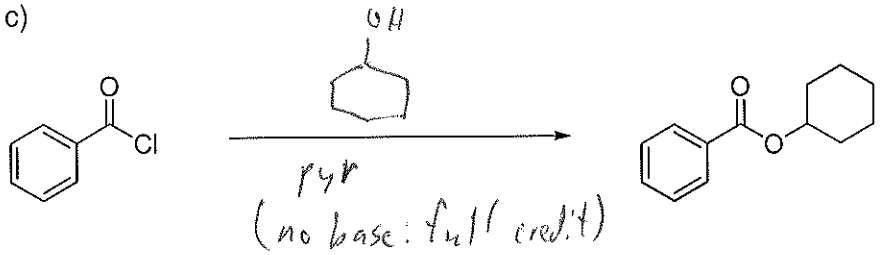
a)



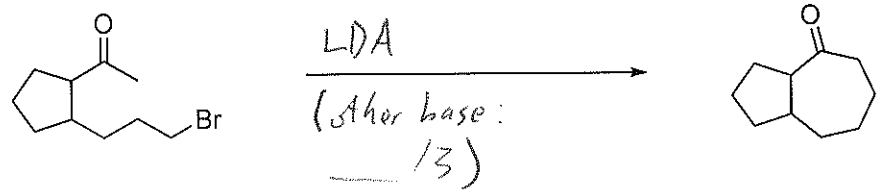
b)



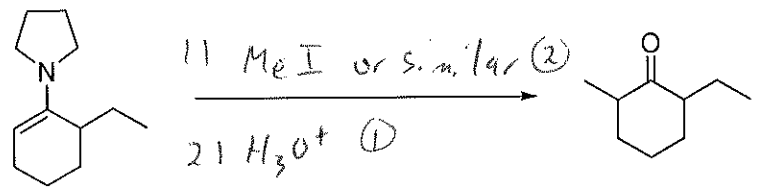
c)



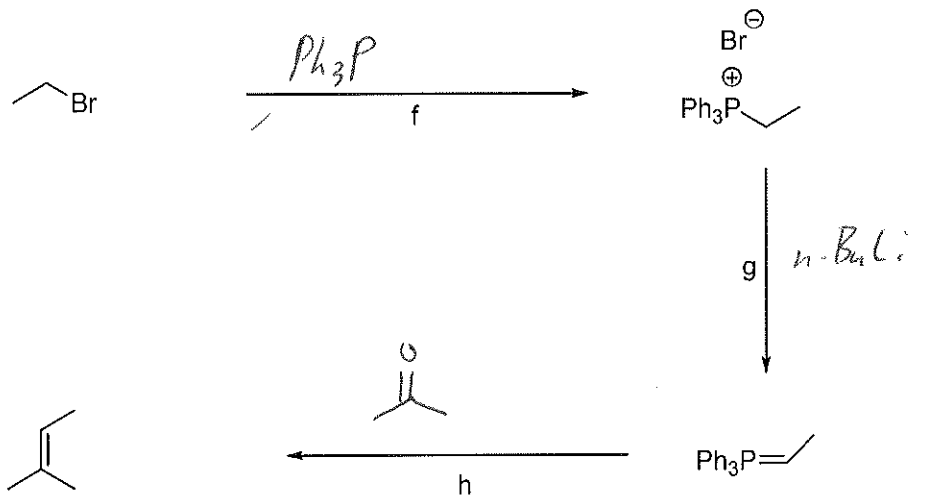
d)



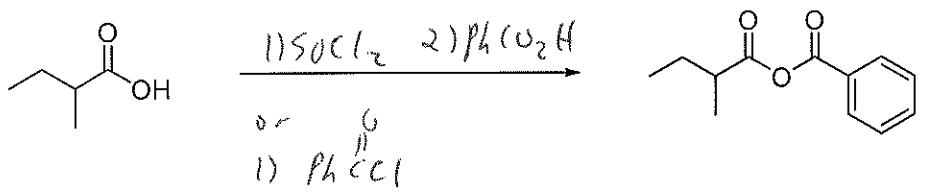
e)



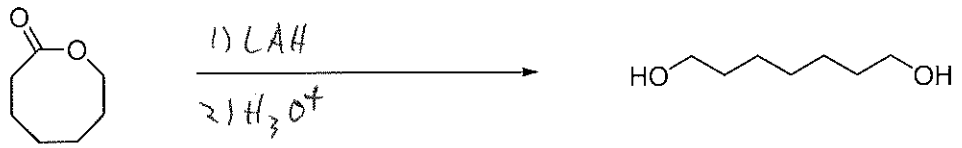
f-h)


Br
Ph3P
f
Br
Ph3P
g
n-BuLi
Ph3P=
h

i)

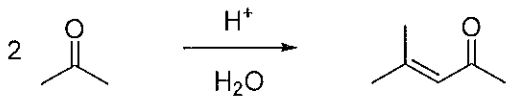

OH
1) SOCl2 2) PhCO2H
or
1) PhCCl
O
O
O

j)

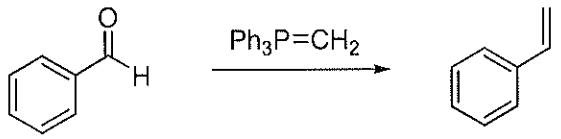

O
O
1) LAH
2) H3O+
HO
OH

6. (10 points) Give mechanisms for ONE of the following two transformations. **CLEARLY INDICATE THE QUESTION THAT YOU WANT GRADED! Otherwise, the first question that shows work will be graded.**

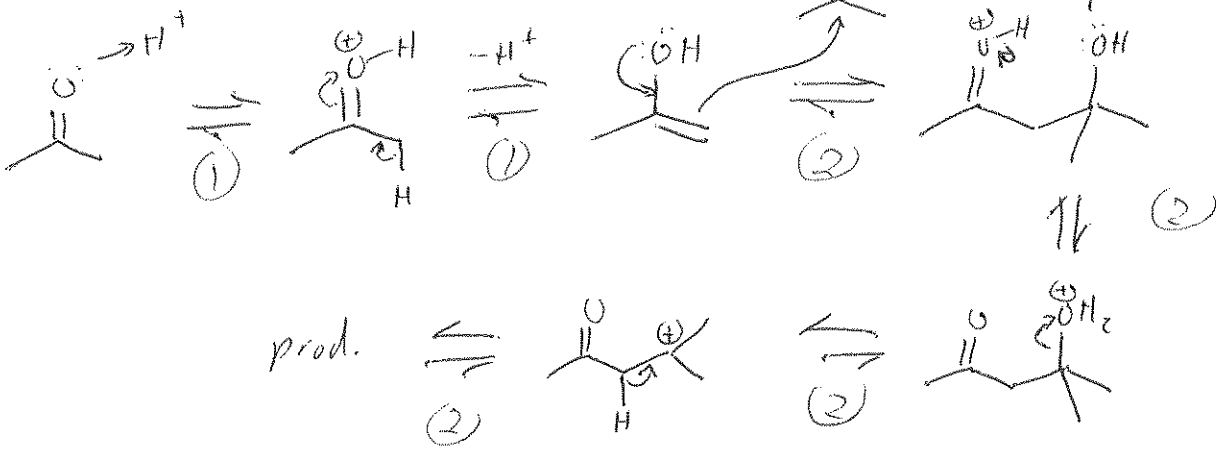
a)



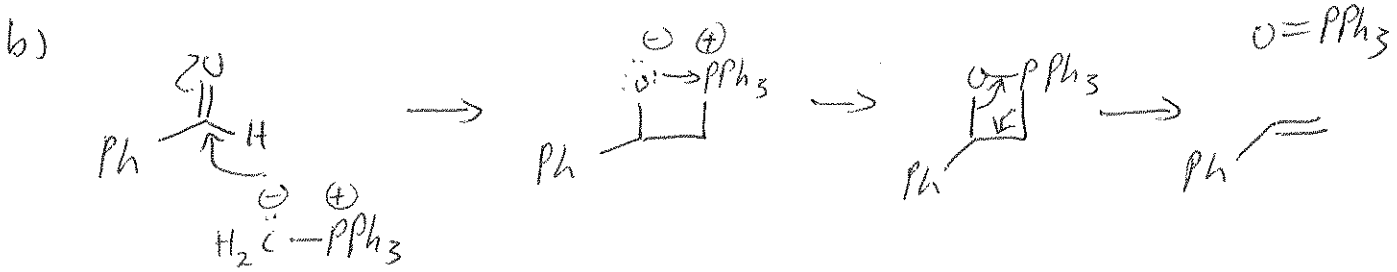
b)



a)



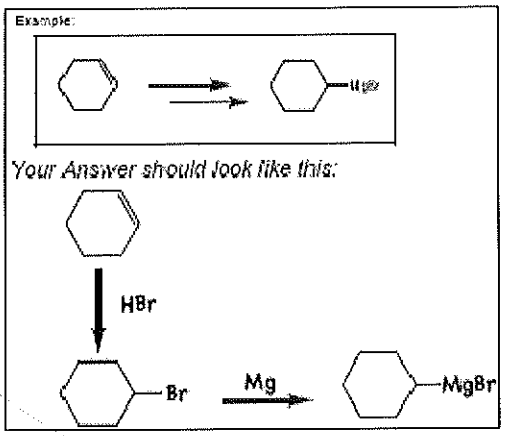
b)



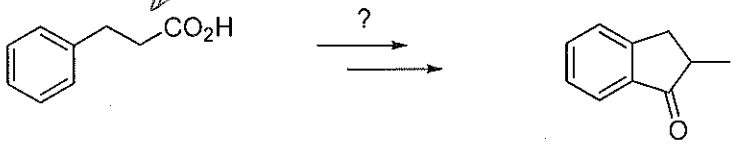
~ 3% per step
1 for all formal charges ✓

Part III Multistep Synthesis (9 points)

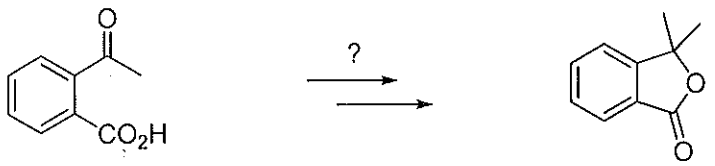
7. (10 points) Choose one of the two following synthesis problems. Show how you can synthesize the product on the right from the indicated starting material on the left. You can show a retrosynthesis for partial credit, but full credit requires writing out a sequence of forward reactions (see box at right for an example).



a)



b)



Could alkylate 1st. i) LDA 2 equiv 2) MeI

a) $SOCl_2$ → $AlCl_3$ → 1) $Br_2^{\ominus}$ 2) MeI prod.

or similar, e.g. enamine alkylation

b) 1) CH_3MgBr or CH_3Li 2) H_3O^+ → [OH, OR] → H^+ or some bases (e.g. NaH; NOT ^-OR or ^-OH) → prod.

or similar

CO_2R ↑ esterify

CO_2H

eg: Fischer esterin, CH_2N_2, S_N2 etc.

exactly 2 equiv MeLi; protection could be skipped

if no protection, but rest OK, 5/10

$CH_3Li \times 2$

might be possible

could also:

1) acetal 2) saponify 3) $SOCl_2$ 4) CH_3MgBr 5) H_3O^+ 6) iodoform 7) lactonization