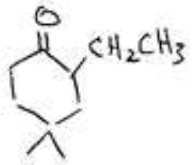
name:

Chemistry 3371-100
Organic Chemistry / Dr. Barney Ellison
Thursday: Feb. 12th **@ 7:00pm → 9:00** / 1st Exam / Hellems 201

Name: Key (please print)

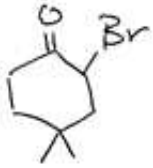
1. (12 pts) What is the product of the reaction of 4,4-dimethylcyclohexanone with:

a) (i) LDA in THF followed by (ii) CH_3CH_2Br

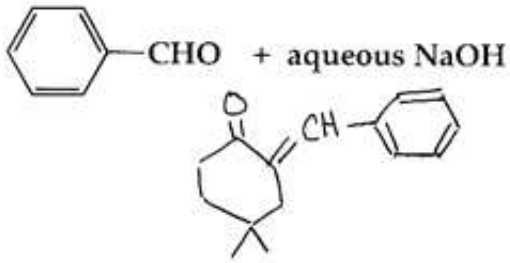


High 100
Low 10
Mean 55.7

b) Br_2 in acetic acid solvent

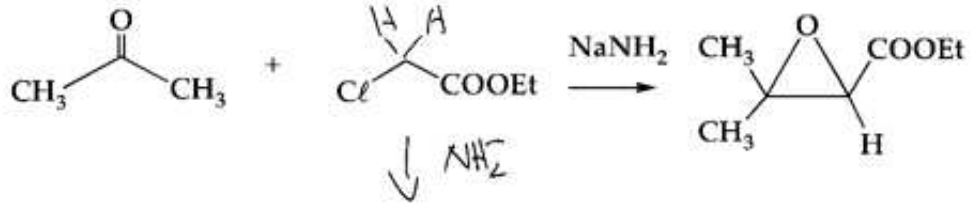


c)

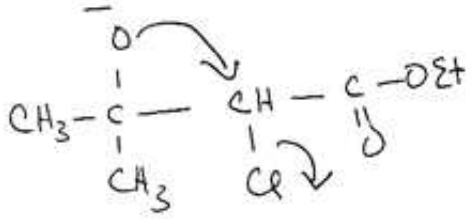


d) NaOD in D_2O @ 25°

2. (10 pts) When a mixture of an aldehde or ketone and an α-halo ester is treated with a strong base, an α, β epoxy ester is obtained. Propose a mechanism for the following:

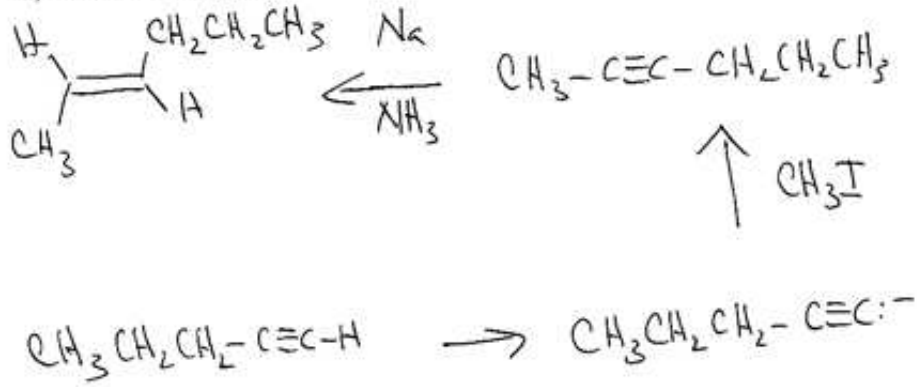


↓ NH_2^-

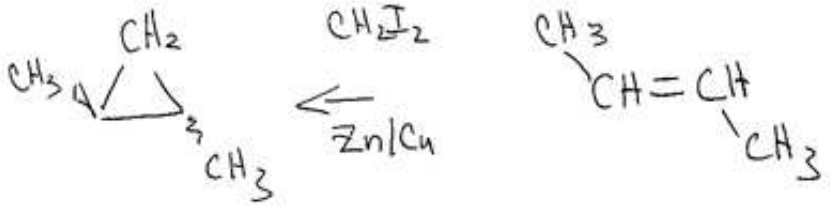


3. (18 pts) Plan a synthesis for each of the following compounds from monofunctional starting materials containing 5 or fewer C atoms.

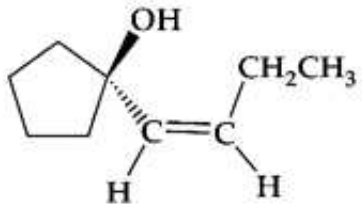
a) *trans*-2-hexene



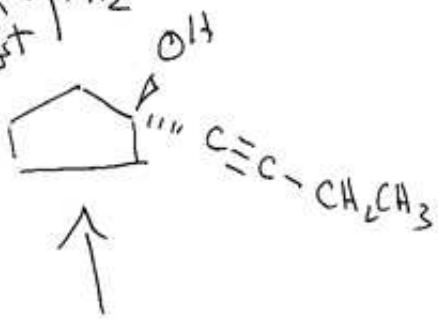
b) *trans*-1,2-dimethylcyclopropane

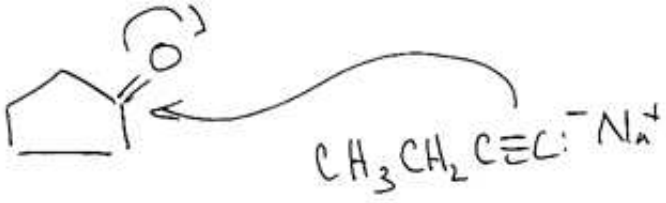


c)



Lindlar catalyst ↑ H_2



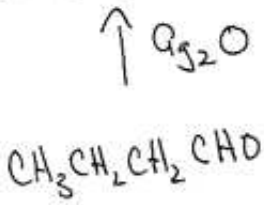


↑ $NaNH_2$

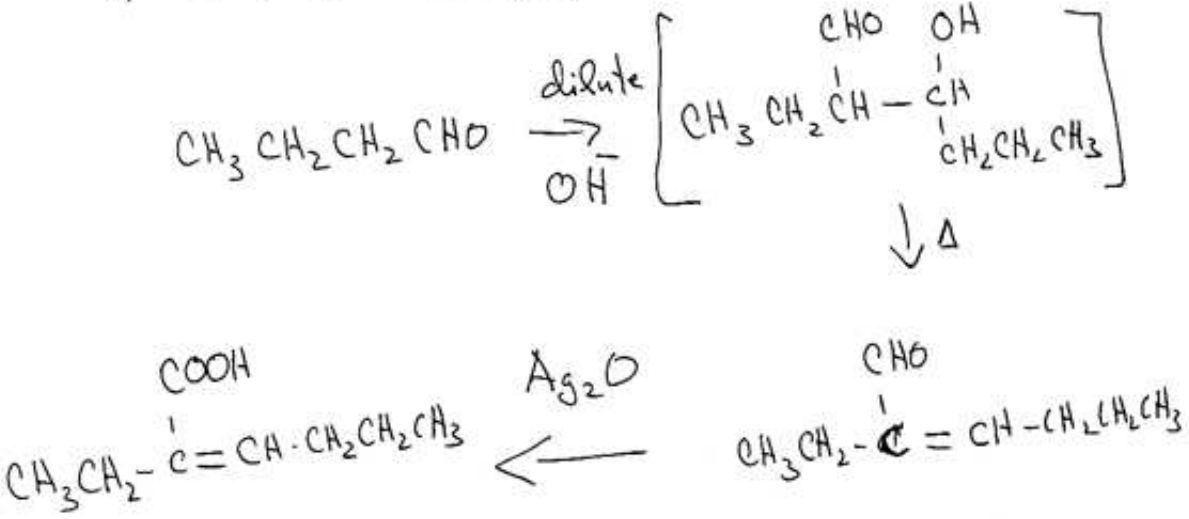
$CH_3CH_2C{\equiv}C{-}H$

4. (20 pts) Show how butanal can be converted into each of the following compounds:

a) $CH_3CH_2CH_2COOH$



b) $CH_3CH_2CH_2CH{=}C(COOH)\text{-}CH_2CH_3$



c) $CH_3CH_2CH_2\underset{\displaystyle HO}{\underset{|}{C}}HCOOH$

↑ H_3O^+

$CH_3CH_2CH_2\underset{\displaystyle OH}{\underset{|}{C}}H-CN$

↑ Na^+CN^-

$CH_3CH_2CH_2CHO$

d) $CH_3CH_2CH_2CH_2COOH$

↑ CO_2

$CH_3CH_2CH_2CH_2MgCl$

↑ Mg

$CH_3CH_2CH_2CH_2Cl$

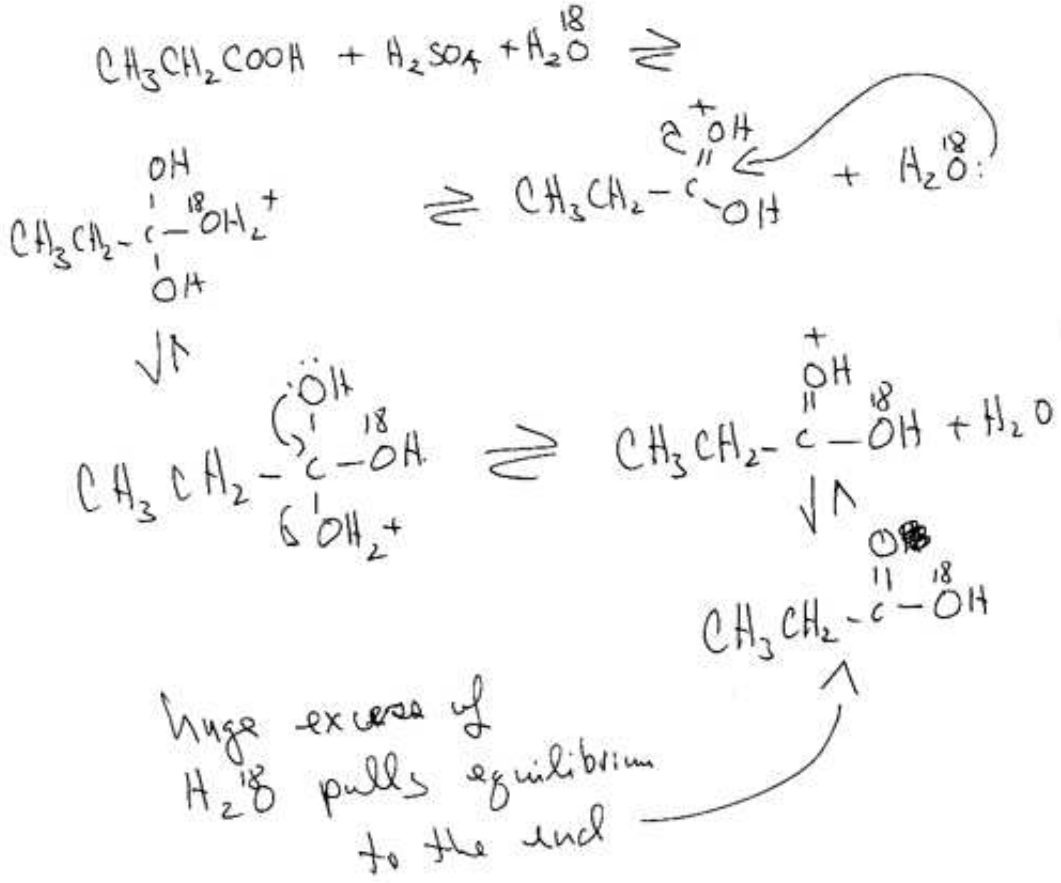
↑ $SOCl_2$

$CH_3CH_2CH_2CH_2OH$

↑ $LiAlH_4$

$CH_3CH_2CH_2CHO$

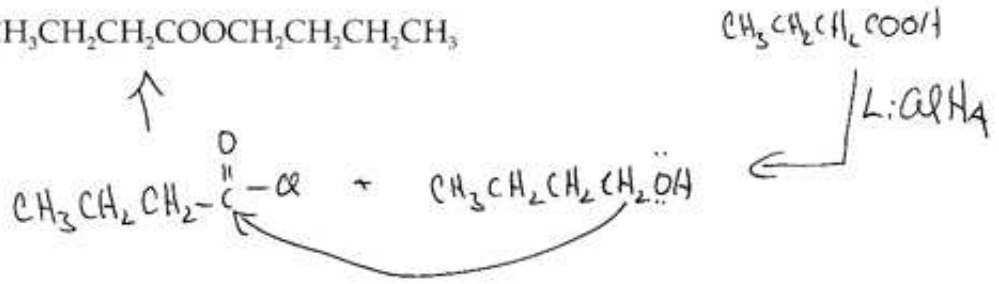
5. (10 pts) When propanoic acid is refluxed in some H_2SO_4 in $H_2{}^{18}O$, ^{18}O gradually appears in the COOH group. Write a mechanism.



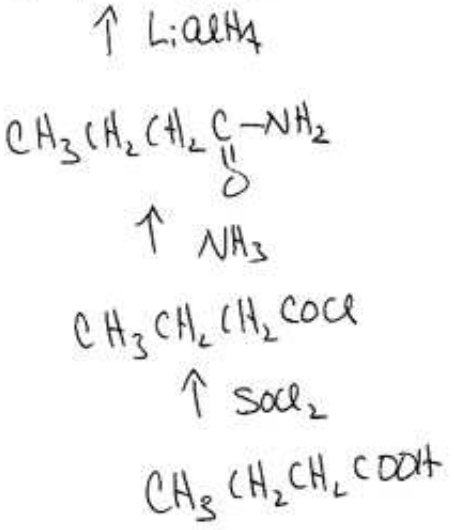
6. (15 pts) Show how butanoic acid can be converted into each of the following compounds.

a) $CH_3CH_2CH_2COCl$ ← $CH_3CH_2CH_2COOH$ ($SOCl_2$)

b) $CH_3CH_2CH_2COOCH_2CH_2CH_2CH_3$



c) $CH_3CH_2CH_2CH_2NH_2$



7. (15 pts) Ortho esters are compounds that have 3 alkoxy groups attached to the same carbon, for example, ethyl orthoacetate, $CH_3C(OCH_2CH_3)_3$. When ethyl orthoacetate is treated with dilute H_3O^+, ethyl acetate is obtained. Write a mechanism.

$$CH_3C(OCH_2CH_3)_3 + H_3O^+ \rightarrow CH_3COOCH_2CH_3 + 2\,CH_3CH_2OH$$