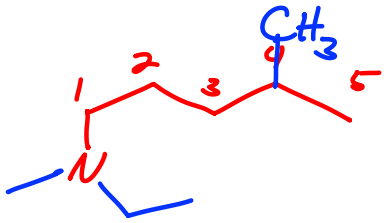
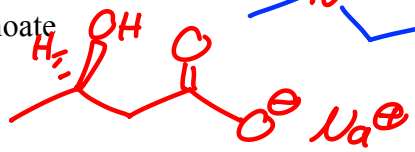
JASPERSE CHEM 360 TEST 4 VERSION 3
Ch 19-21 Amines, Carboxylic Acids, Carboxylic Acid Derivatives

1. Nomenclature. Provide Either the Name or the Structure for the Following Chemicals. (10 points)

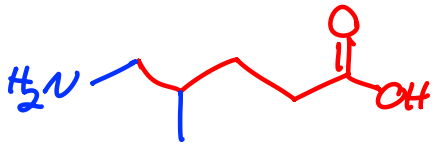
a. N-ethyl-N-methyl-4-methylpentan-1-amine



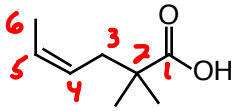
b. sodium (R)-3-hydroxybutanoate



c. 5-amino-4-methylpentanoic acid

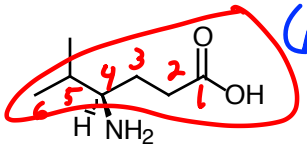


d.



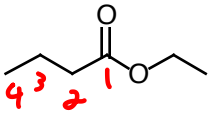
(Z)-2,2-dimethyl hex-4-enoic acid

e.



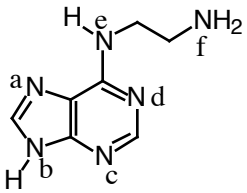
(R)-4-amino-5-methyl hexanoic acid

f.



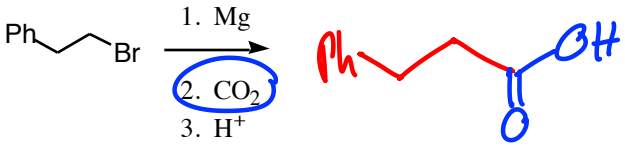
ethyl pentanoate

2. For each nitrogen a-f, identify the hybridization of the nitrogen atom, and identify the hybridization of the nitrogen lone pair. [Adenine is an important player in information transfer (DNA, RNA, genetics, etc.) and energy storage/release (ATP/ADP).]

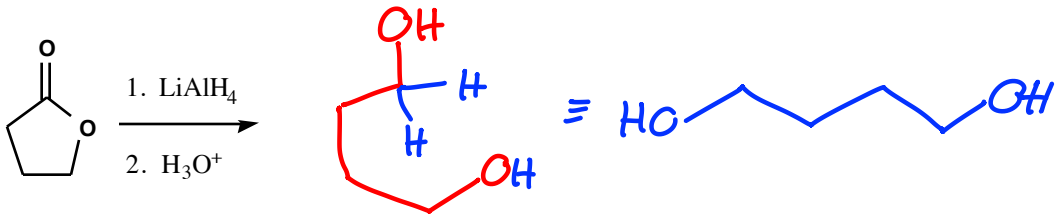


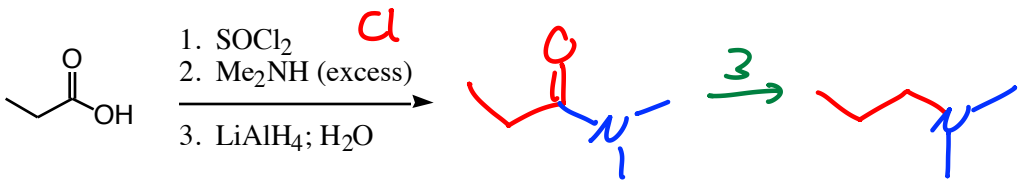
Nitrogen Atom	Hybridization of the Nitrogen Atom	Hybridization of the Nitrogen Lone Pair
a	sp^2	sp^2
b	sp^2	p
c	sp^2	sp^2
d	sp^2	sp^2
e	sp^2	p
f	sp^3	sp^3

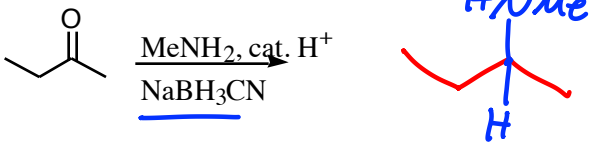
3. Synthesis Reactions. Draw the feature product of the following reactions (need not show any byproducts). (15 points)

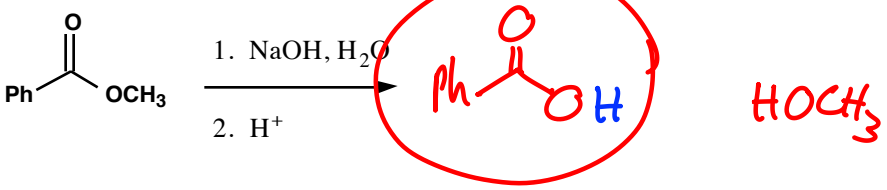
a. 

b. 

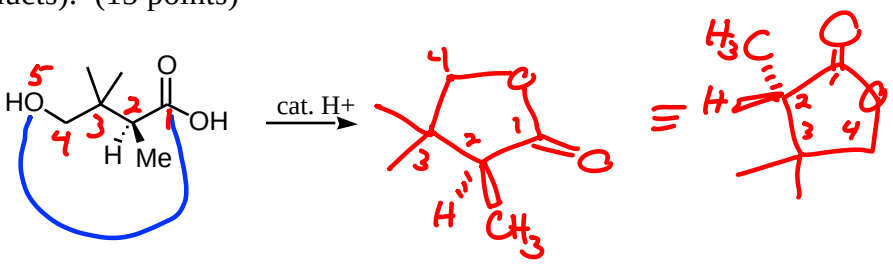
c. 

d. 

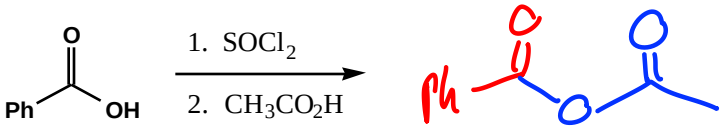
e. 

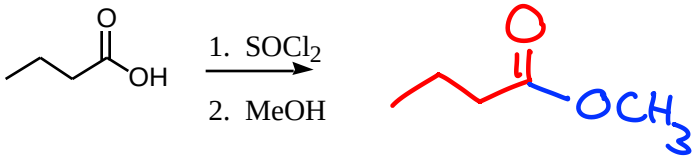
f. 

4. Synthesis Reactions. Draw the feature product of the following reactions (need not show any byproducts). (15 points)

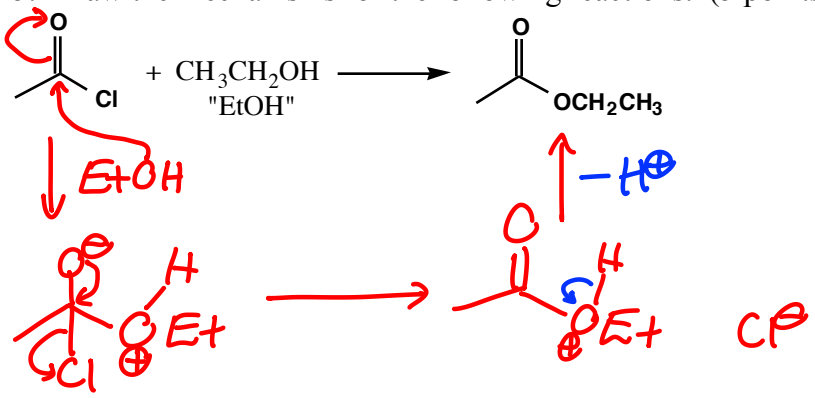
a. 

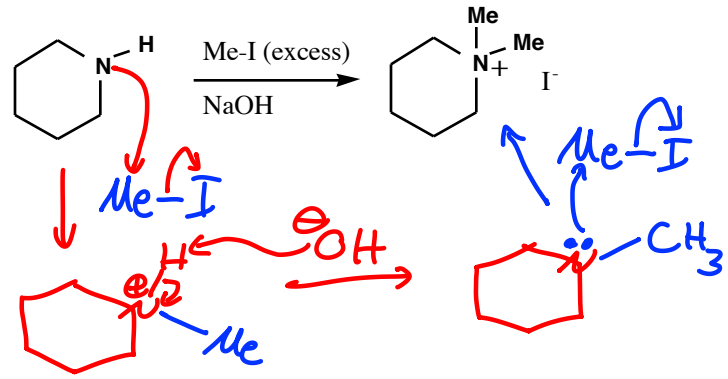
b. 

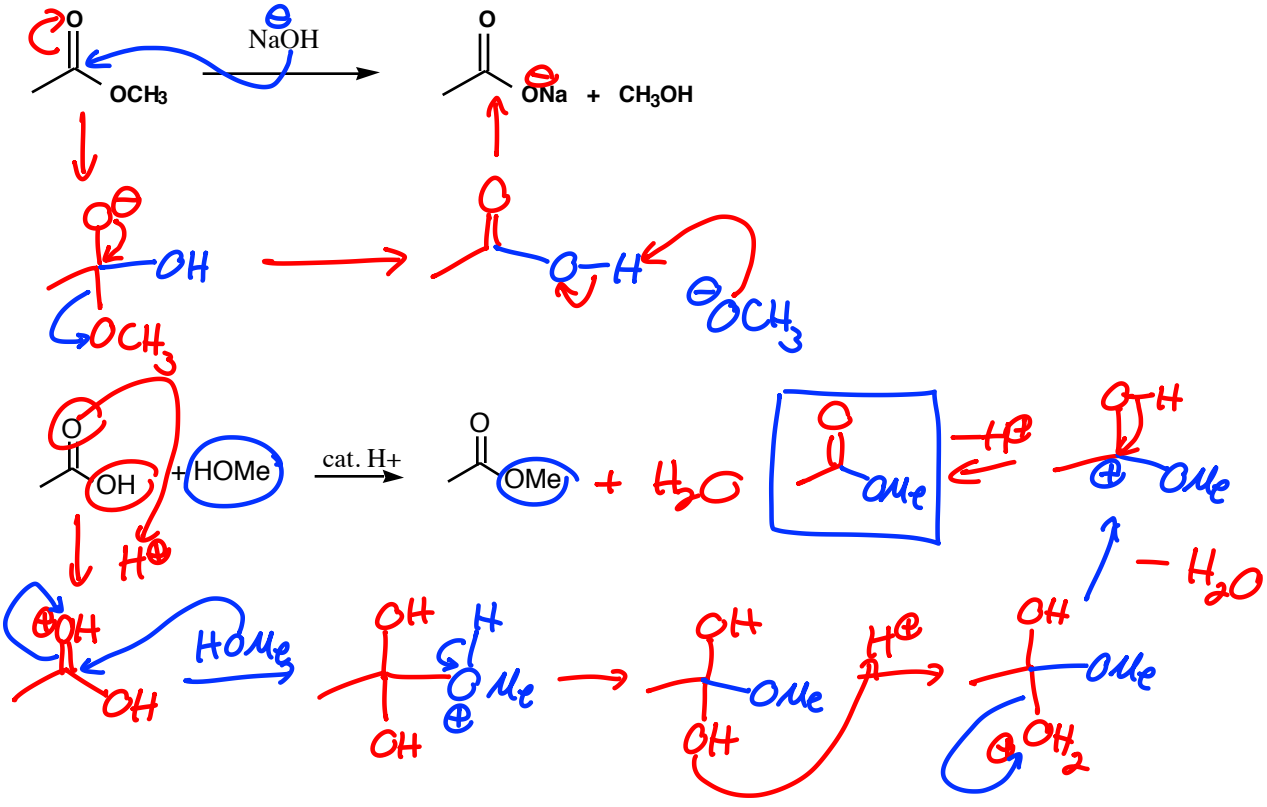
c. 

d. 

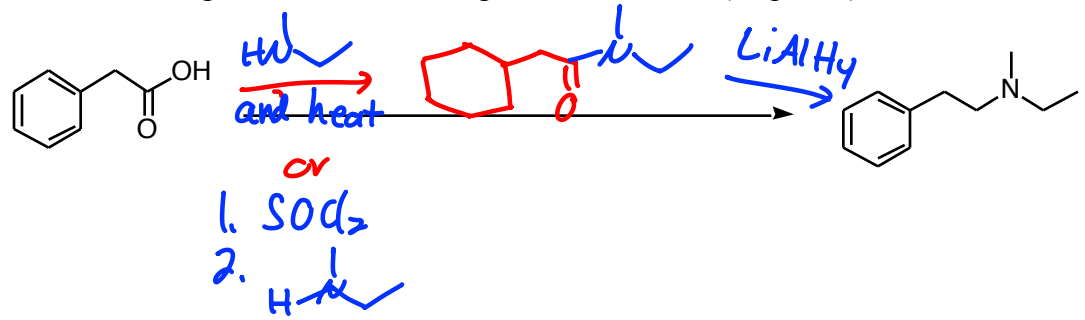
5. Draw the mechanisms for the following reactions. (5 points)

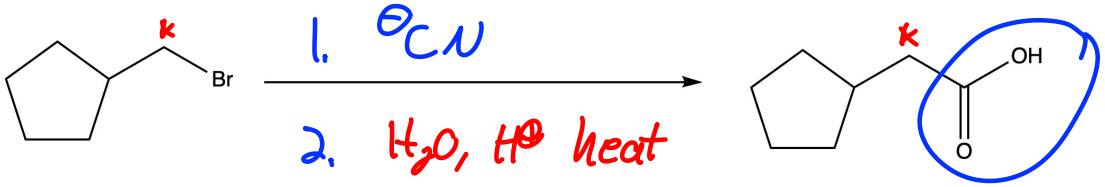


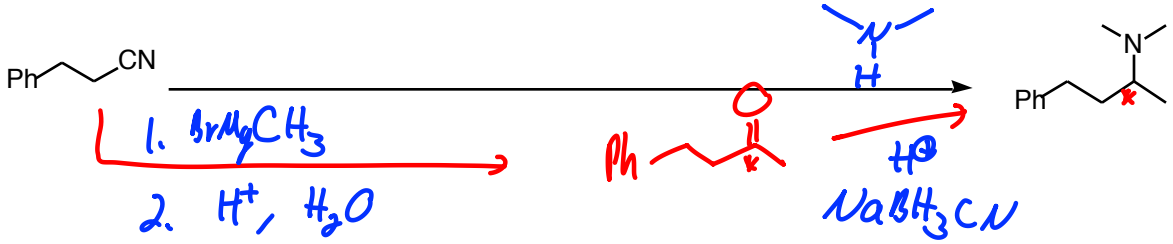


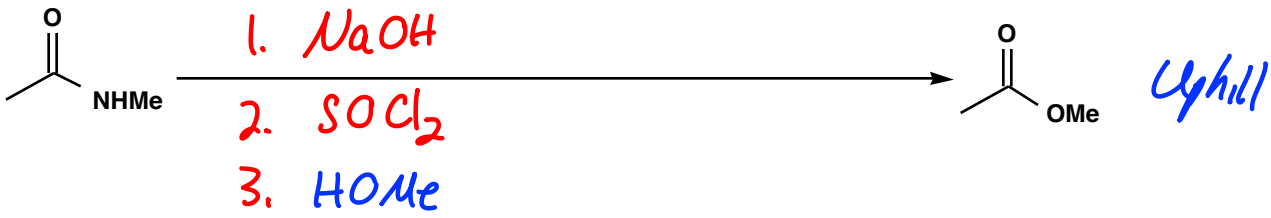


6. Provide Reagents for the following Transformations (15 points)







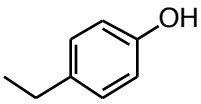


7. Which, when dissolved in diethyl ether, will: (5 points each)

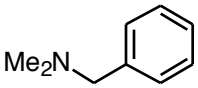
a) Extract into NaOH/H_2O? A, D — NaOH ionizes RCO2H and phenols

b) Extract into HCl/H_2O? B — HCl ionizes amines

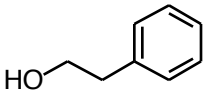
c) Extract into water? None — Neutral water does not ionize them



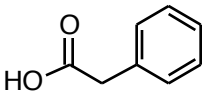
A



B



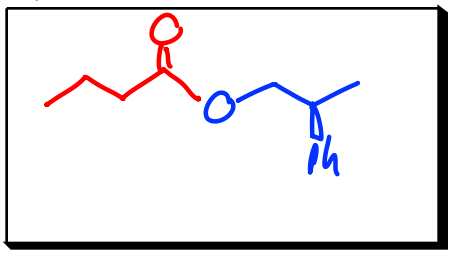
C

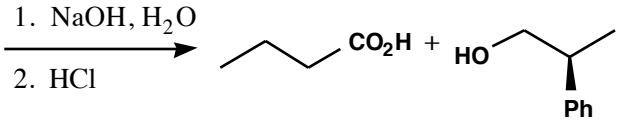


D

8. Hydrolysis Reactions. Draw the starting materials for the following hydrolysis reactions. (6 points)

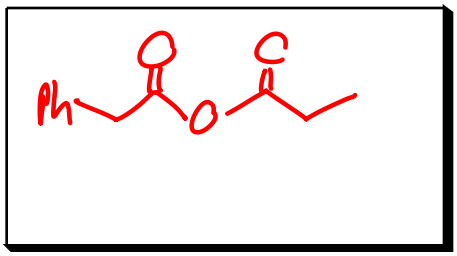
a.

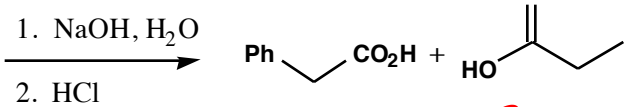




alcohol & ester at start

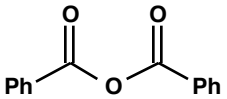
b.



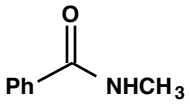


acid & anhydride

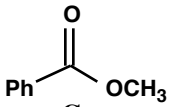
9. Rank the following according to their reactivity toward NaOH/H_2O hydrolysis.



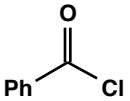
A A



B N

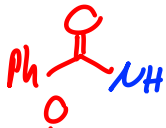


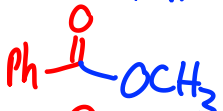
C E

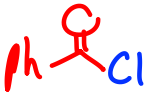


D Cl

Given the structures **A-D** above, which of the following reactions will proceed spontaneously? (2 points)

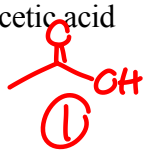
(A) **A** + H_2NCH_3 → **B** — N —  — Yes — Downhill

A + $HOCH_3$ → **C** — E —  — Yes — Downhill

A + HCl → **D** — Cl —  — No — Uphill

10. Rank the acidity of the following, 1 being most acidic, 3 being least (3 points each)

a. acetic acid vs. water vs. $NH_4^+Cl^-$



1 3 2

b. CH_3OH vs. CH_3NH_2 vs. F_2CHOH

2 3 1

w

$F_2CHO^\ominus$

stabilizes oxyanion

c. p-methoxybenzoic acid vs. benzoic acid vs. acetone

donor

2 1 3

disadvantageous for conjugate anion

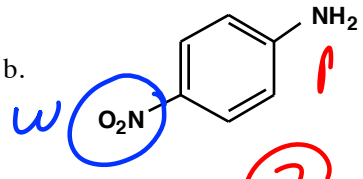
11. Rank the basicity of the following, 1 being most basic, 3 being least (3 points each)

a. CH_3OH vs. $PhNH_2$ vs. CH_3NH_2

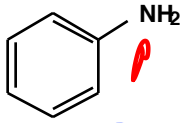
3 2 1

sp^3

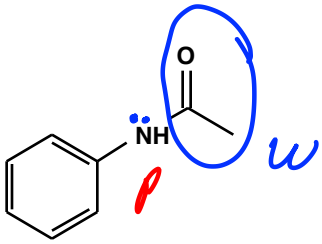
b.



vs.



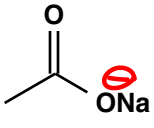
vs.



w

2 1 3

c.



2

$(CH_3CH_2)_3N$

1 sp^3

H_2O

3