1. Nomenclature & Acid-Base Chemistry – suffixes for acyl derivatives on the cover page

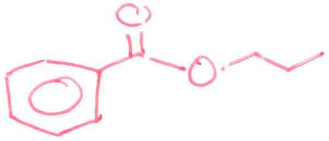
(a) (*9 points*) **Draw structures** corresponding to **any three** of the following names. **Skip one by drawing a large "X" over it**, otherwise **(i)** - **(iii)** will be graded.

3pts each

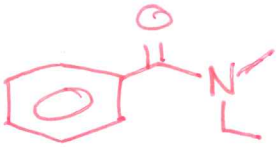
(i) 2,4-Dimethylpentanenitrile

(ii) Acetyl chloride (ethanoyl chloride)

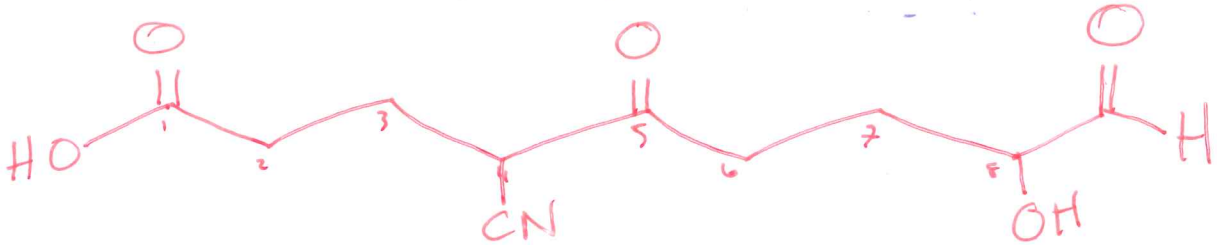
(iii) Propyl benzoate



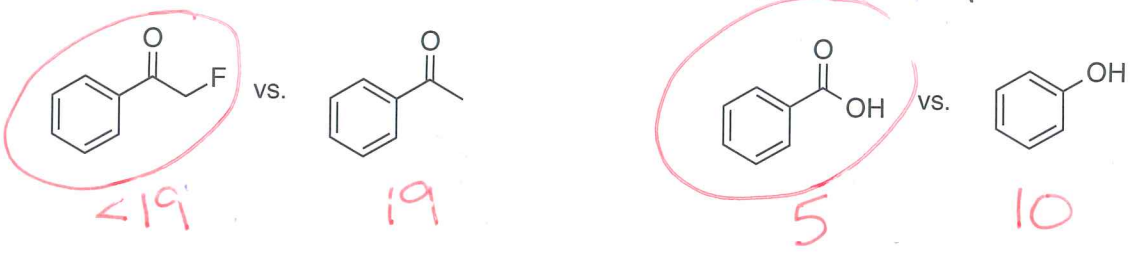
(iv) *N*-ethyl-*N*-methyl-benzamide



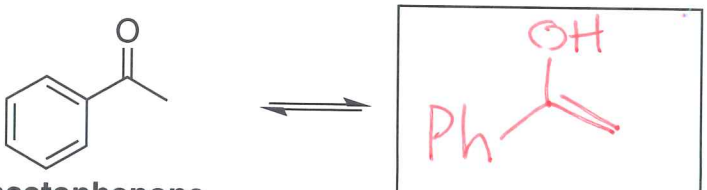
(b) (*10 points*) Draw the structure of **4-cyano-8-hydroxy-5,9-dioxo-nonanoic acid**.



(c) (*6 points*) Circle the more acidic compound in each pair. Approximate pKa.



(d) (*5 points*) Draw the enol tautomer of acetophenone.



acetophenone (keto form) ⇌ **enol form**

Last Name, First Initial _____

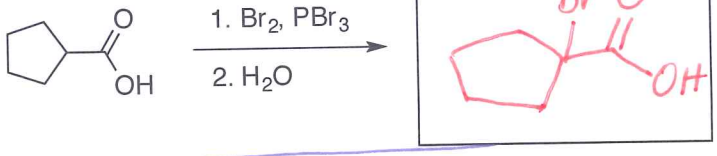
32 → 2 possible extra points

2. (*30 points*) **Single Step Reactions** – Fill in the box with the reactant, reagent(s), or product.

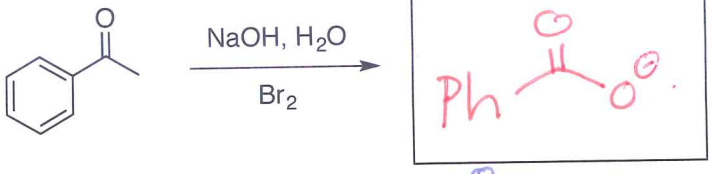
Any FOUR, X out one

8 pts each

(a)

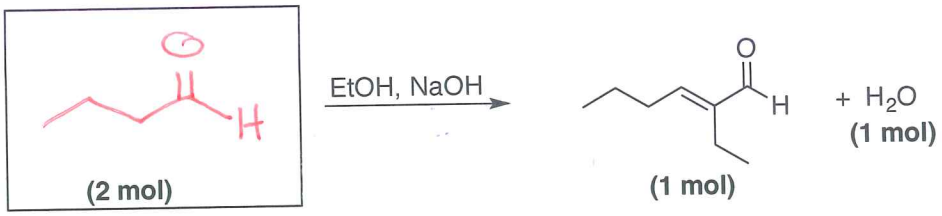


(b)

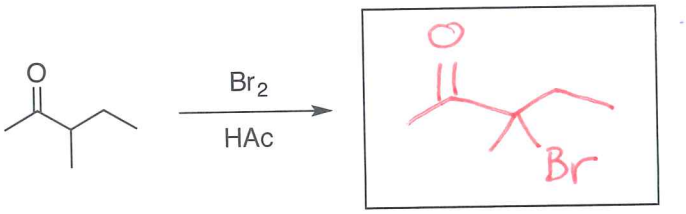


Ph OH OK

(c)

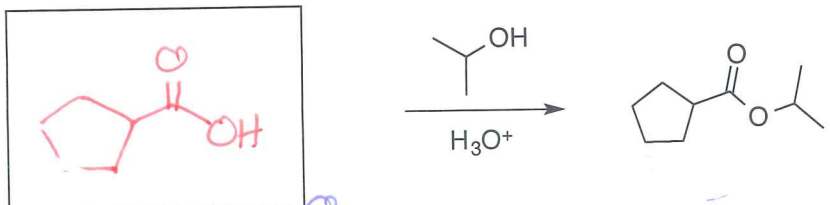


(d)

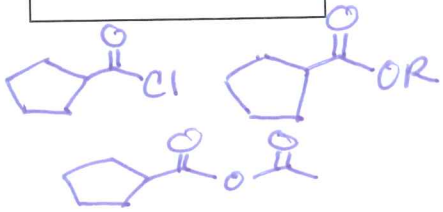


major (more stable) product

(e)



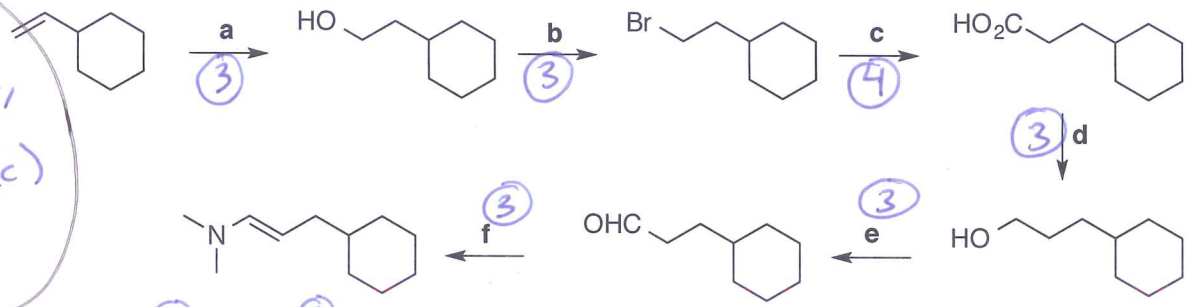
all OK



3. Reaction Puzzles – Complete both puzzles.

Puzzle 1 (*19 points*) Fill in the missing reagents for reactions **(a)** through **(f)** on the lines below.

3pts each, except 4pts (c)



(a) 1. BH_3 (1) 2. H_2O_2, $^{\ominus}OH$ (1)

(b) PBr_3 (3) HBr → lpt

$NaBH_4 \rightarrow \varnothing$

(c) 1. Mg (1) 2. CO_2 (2) 3. $H_3O^{\oplus}$ (1)

(d) 1. $LiAlH_4$ (2) 2. $H_3O^{\oplus}$ (1) H_2O OK

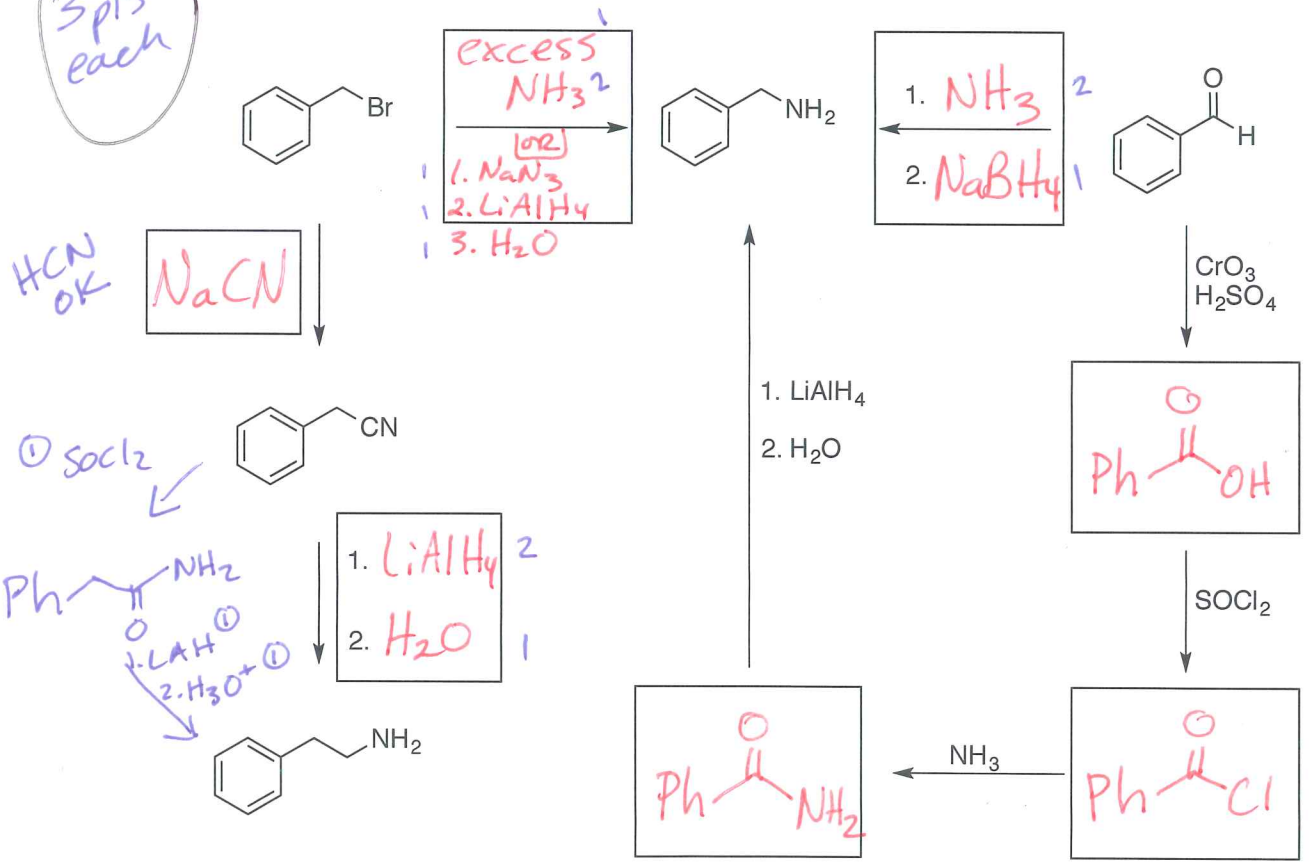
LAH OK!

(e) DMP (3)

(f) $HN(CH_3)_2$ (2), $H_3O^{\oplus}$ (1)

Puzzle 2 (*21 points*) Fill in the missing reagents and products in the boxes provided.

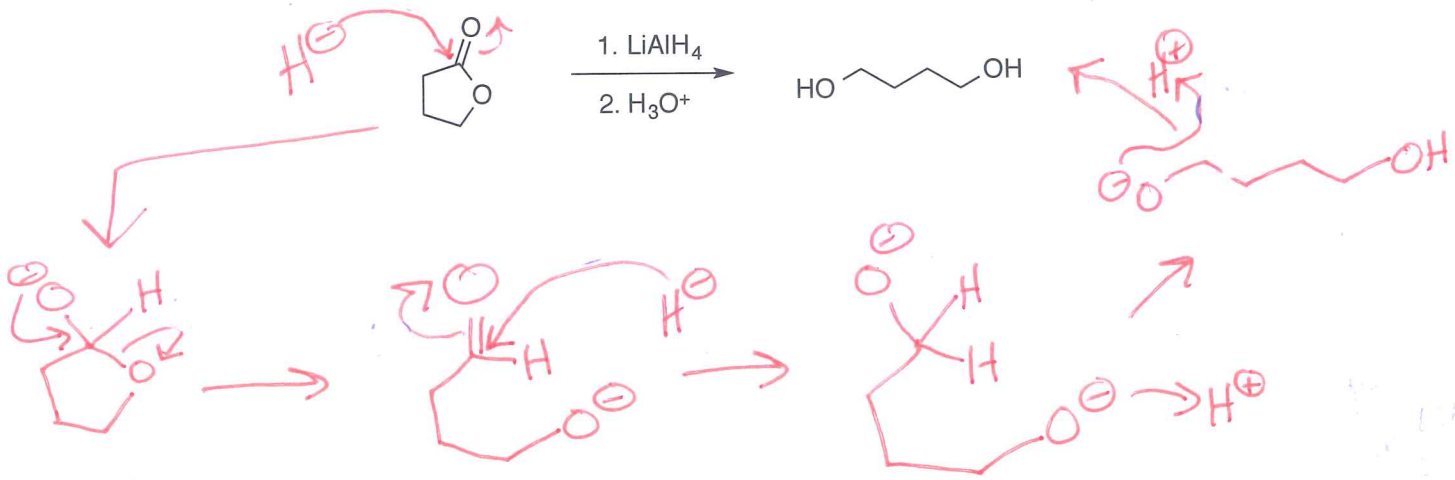
3pts each



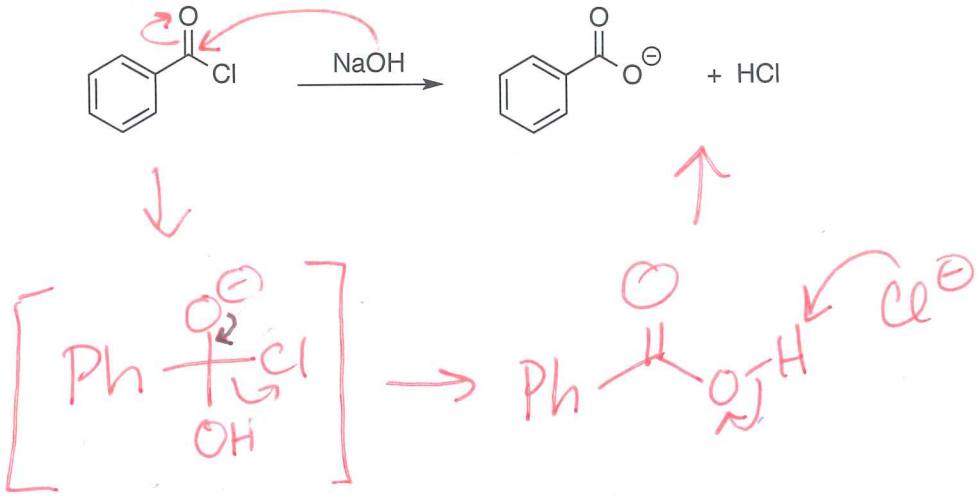
4. Basic Mechanisms – Draw the arrow-pushing mechanism for **the reactions** below, including all arrows for acid-base reactions and proton transfers. Include all intermediates with proper charges circled for each step.

-1 per missing charge

(a) (*20 points*) Draw the mechanism for the reduction of the lactone (cyclic ester) with lithium aluminum hydride, followed by quenching with acid.

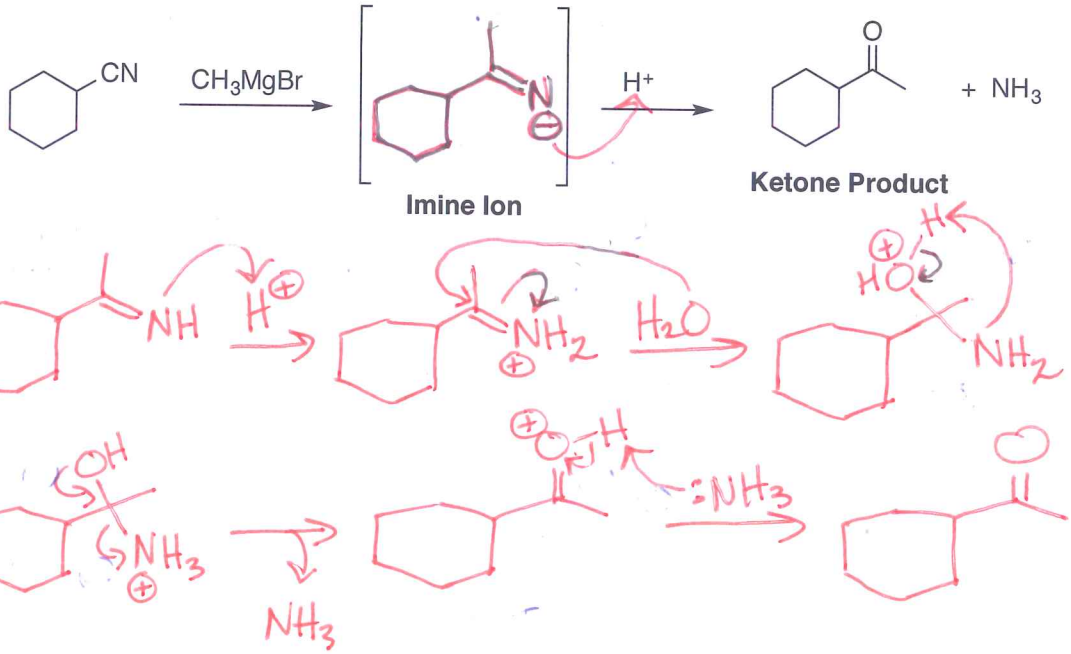


(b) (*10 points*) Draw the mechanism for the base-catalyzed hydrolysis of the following acid chloride.

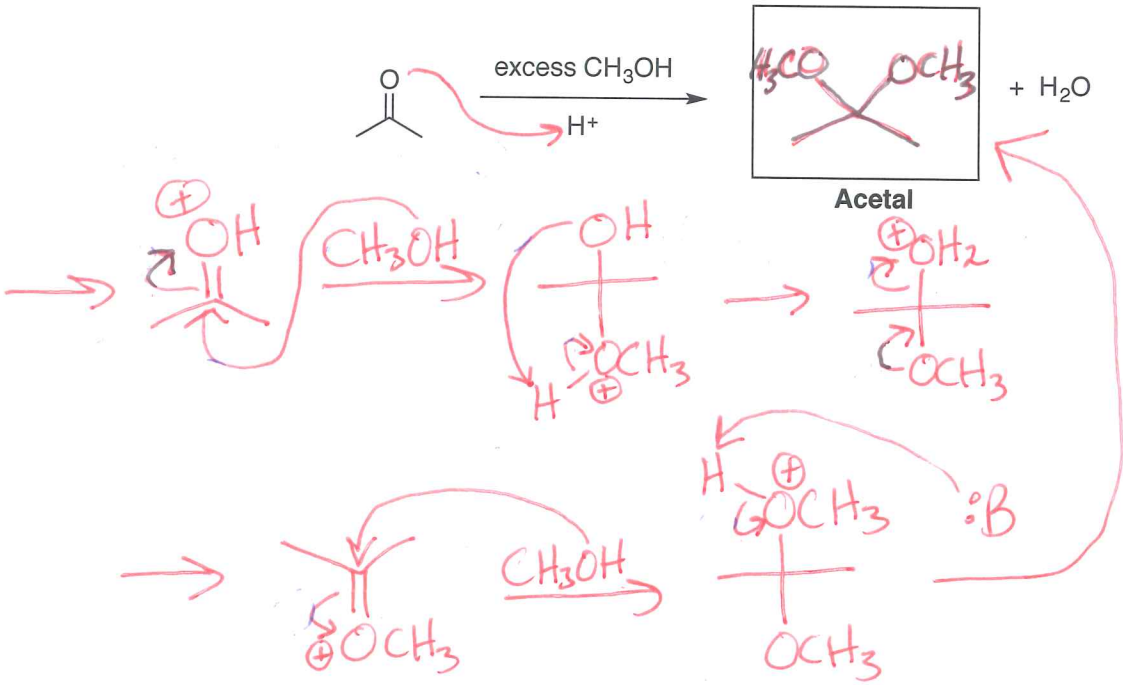


5. Acidic Mechanisms - Draw the arrow-pushing mechanism for **the reactions** below, including all arrows for acid-base reactions and proton transfers. Include all intermediates with proper charges circled for each step.

20 pts **(a)** The reaction of nitriles with Grignard reagents yields a ketone product. This reaction goes through an imine ion intermediate, which is then hydrolyzed under acidic conditions. **Draw the structure of the Imine Ion** in the brackets then **draw the mechanism from the imine ion to the ketone product** in the space below. No mechanism necessary for the Grignard addition step.



20 pts **(b) Draw the acetal product** of the reaction of acetone with excess methanol under acidic conditions in the box provided. **Draw the mechanism** for the reaction in the space below.

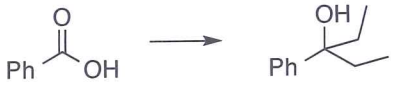


30

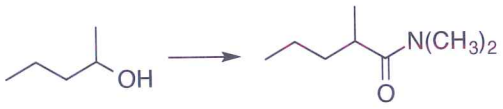
6. (~~50~~ *points*) **Multi-Step Synthesis** - Carry out <u>any two</u> of the syntheses below using the starting material provided and any other reagents or carbon sources needed. Draw the product after each synthetic step. No mechanisms.

15 pts each

CHOOSE ANY TWO

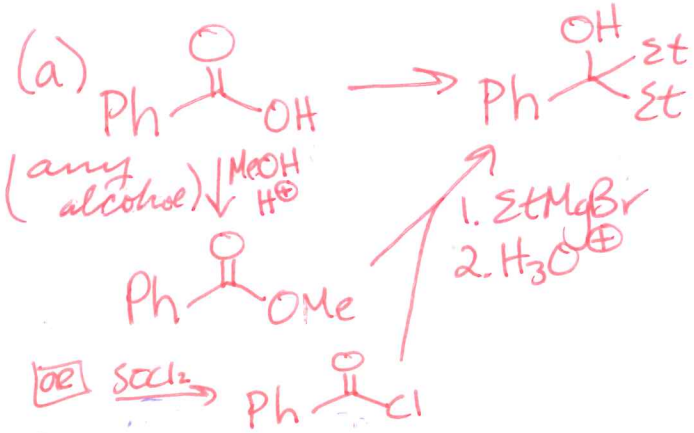
(a) 

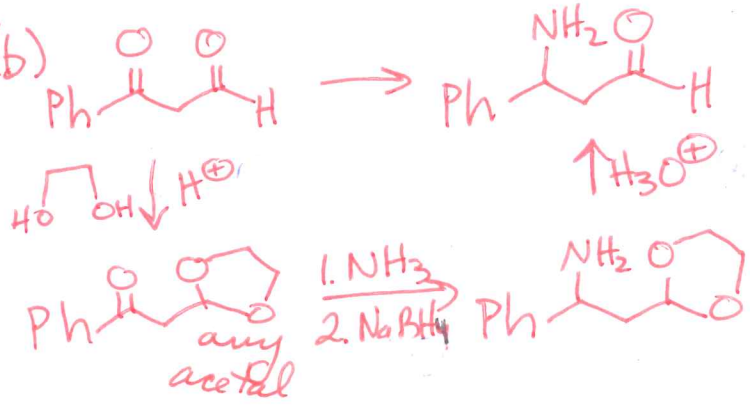
(b) 

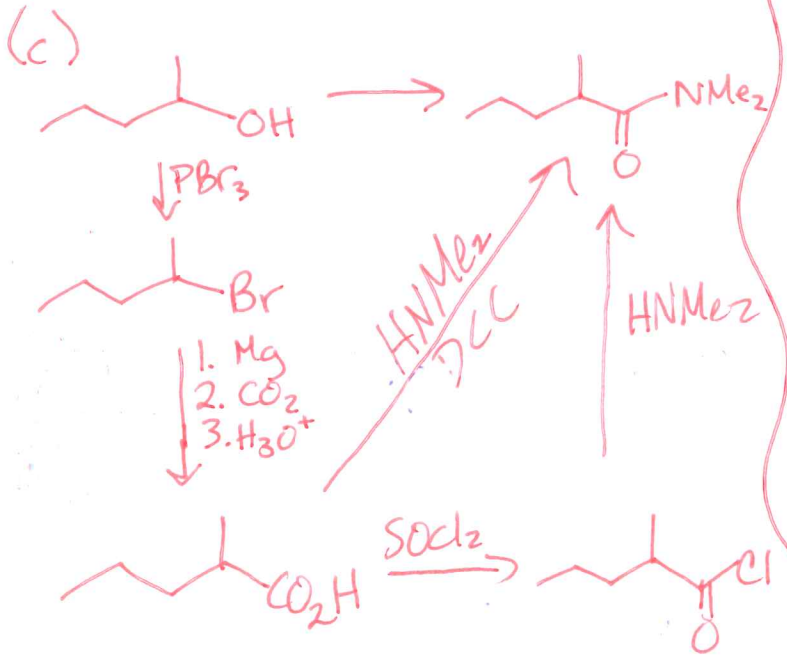
(c) 

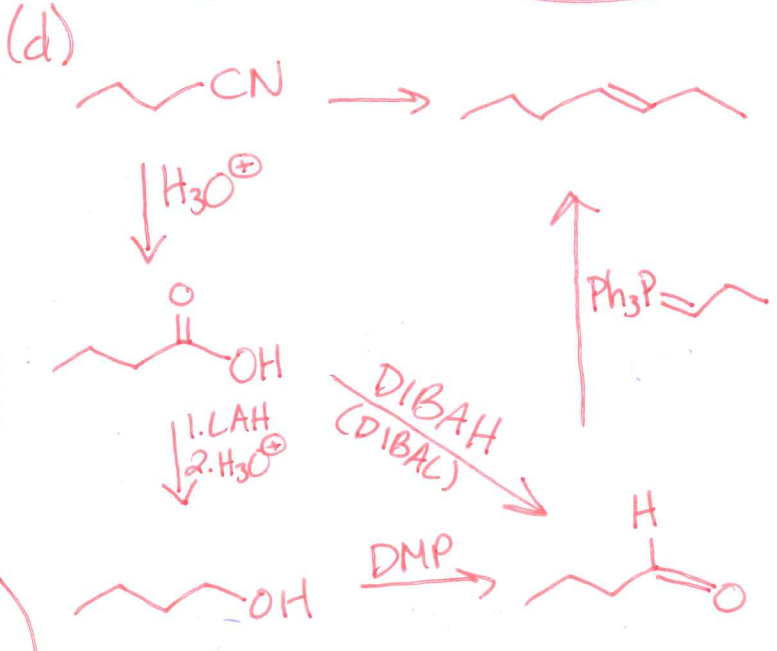
(d) 

PUT A LARGE "X" OVER THE REACTIONS YOU ARE SKIPPING & DO NOT WANT GRADED

(a) 

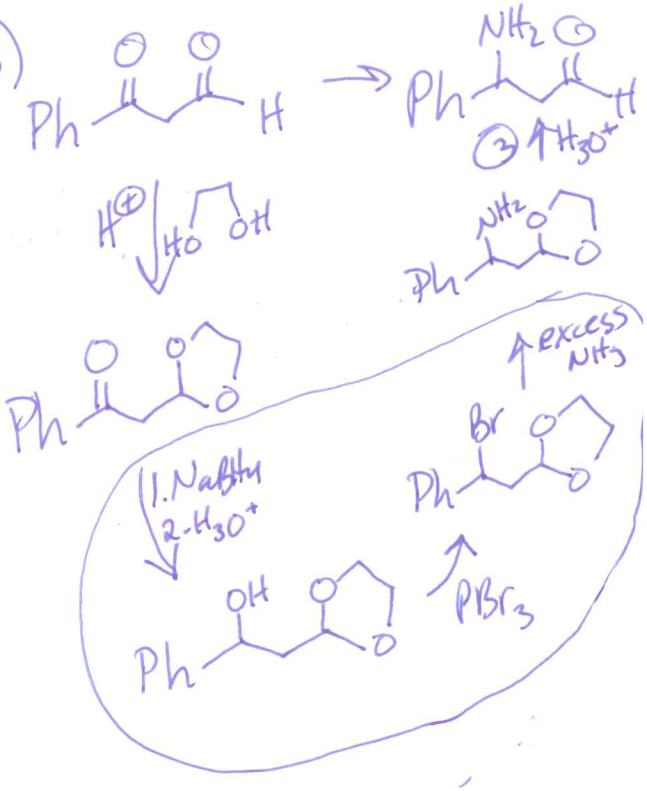
(b) 

(c) 

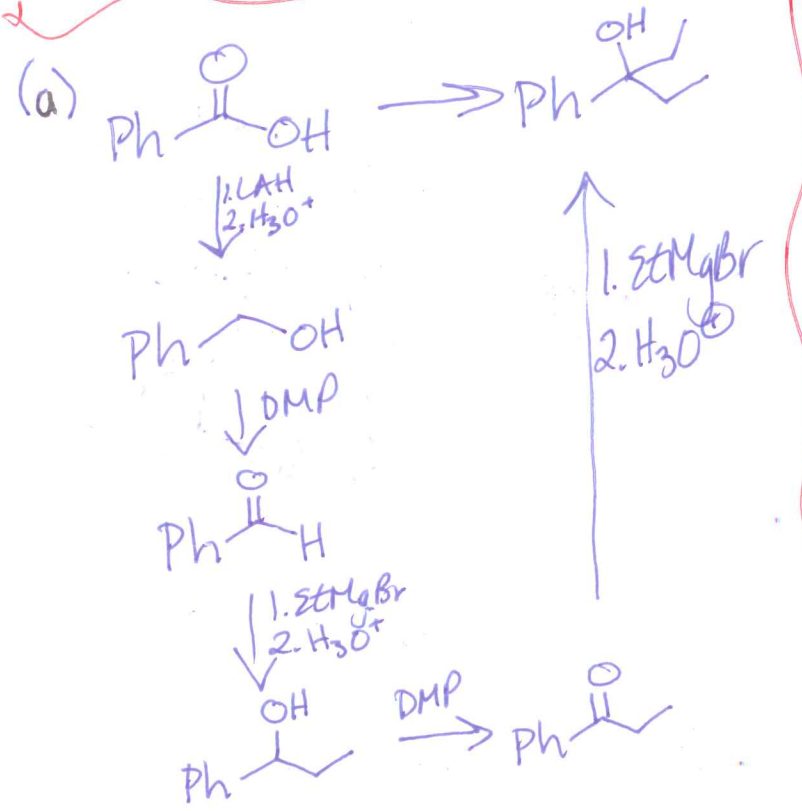
(d) 

Synthesis Alternate Sol'ns

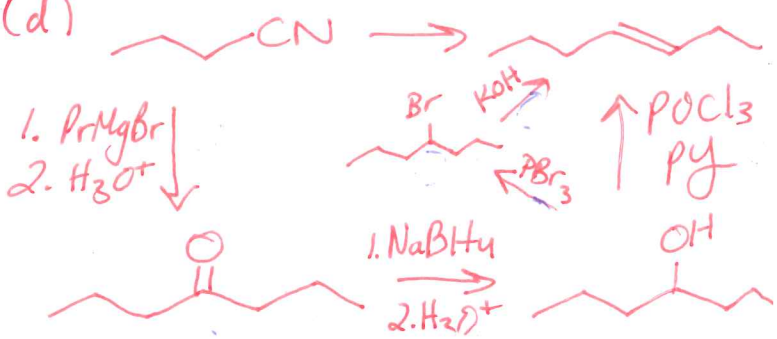
(b)



(a)



(d)



Pre-lab Quiz 5A TLC Name _____

1. Which solvent is more polar? Circle one.

   Hexane Ethyl Acetate

2. Carotenes are hydrocarbons and xanthophylls contain alcohols. Which is more polar? Circle one.

   Carotenes Xanthophylls

Pre-lab Quiz 5A TLC Name _____

1. Which solvent is more polar? Circle one.

   Hexane Ethyl Acetate

2. Carotenes are hydrocarbons and xanthophylls contain alcohols. Which is more polar? Circle one.

   Carotenes Xanthophylls

Pre-lab Quiz 5A TLC Name _____

1. Which solvent is more polar? Circle one.

   Hexane Ethyl Acetate

2. Carotenes are hydrocarbons and xanthophylls contain alcohols. Which is more polar? Circle one.

   Carotenes Xanthophylls

Pre-lab Quiz 5A TLC Name _____

1. Which solvent is more polar? Circle one.

   Hexane Ethyl Acetate

2. Carotenes are hydrocarbons and xanthophylls contain alcohols. Which is more polar? Circle one.

   Carotenes Xanthophylls