Full First and Last Name_____

DO NOT WRITE YOUR NAME UNTIL TOLD TO START!

CHEM 8B Organic Chemistry II
EXAM 2, Winter 2017 (*200 points*)

In each of the following problems, use your knowledge of organic chemistry conventions to answer the questions in the proper manner. **Be sure to read all questions & instructions carefully, paying special attention to directions to skip parts of problems (pgs 1, 2, & 6).** *Choose which problems to skip rather than doing every problem, otherwise you may run out of time*. ***Make sure it is crystal clear which problems should and should not be graded by circling and X'ing out those problems, respectively.*** Write your last name and first initial on the top of pages 1-7.

You will have the entire class period to complete this exam (1 hour, 35 minutes), but hopefully you won't need it! You are welcome to use pre-built models.

Keep your eyes on your own paper. Electronic devices of any kind are not allowed, including cell phones and calculators. Any student found using any of said devices, or found examining another student's exam, will be promptly removed from the exam room and at minimum will receive a zero on this exam. Such an incident may also be considered a form of academic dishonesty and reported to the UCSC Judiciary Affairs Committee.

1 (30)	
2 (30)	
3 (40)	
4 (30)	
5 (40)	
6 (30)	
Total	/ 200
	%

Functional Group	**Suffix**
Acid chloride	-oyl chloride
Acid Anhydride	-oic anhyride
Carboxylic Acid	-oic acid
Esters	-oate
Amides	-amide

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.

(i) 2,4-Dimethylpentanenitrile

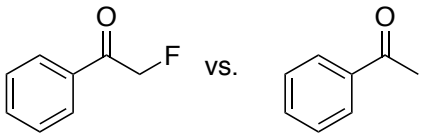
(ii) Acetyl chloride (ethanoyl chloride)

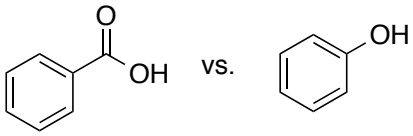
(iii) Propyl benzoate

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

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

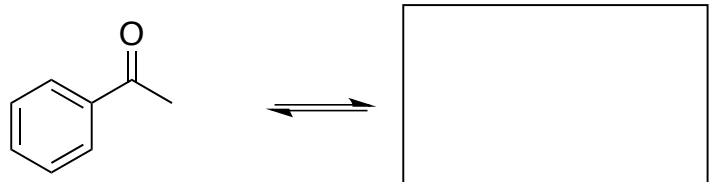
(c) (*6 points*) **Circle the more acidic compoun**d in each pair and **provide the approximate pKa** of each on the line provided (less than, greater than, or equal to one of the memorized pKa standards).





Approximate pKa _____ _____ _____ _____

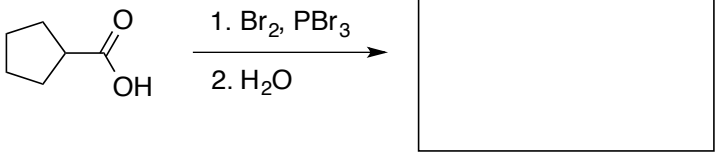
(d) (*5 points*) Draw the enol tautomer of acetophenone.



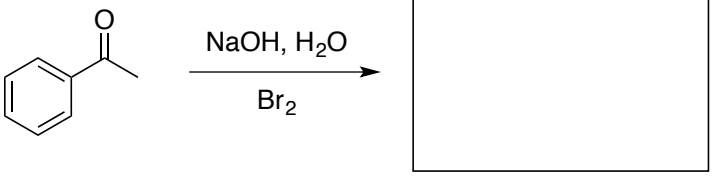
acetophenone (keto form) **enol form**

2. (*30 points*) **Single Step Reactions –** Fill in the box with the reactant, reagent(s), or product. **Choose any four (skip one by drawing an X over the box), otherwise (a) – (d) are graded.**

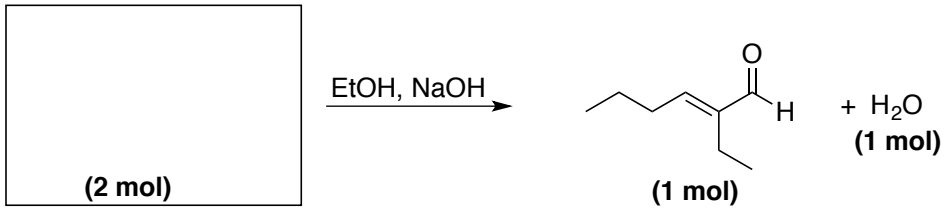
(a)



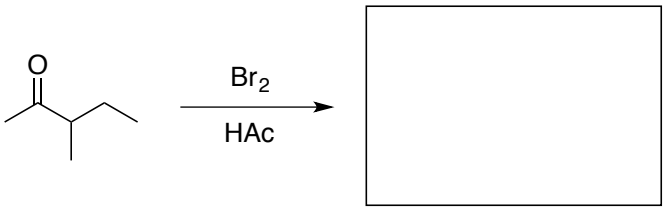
(b)



(c)

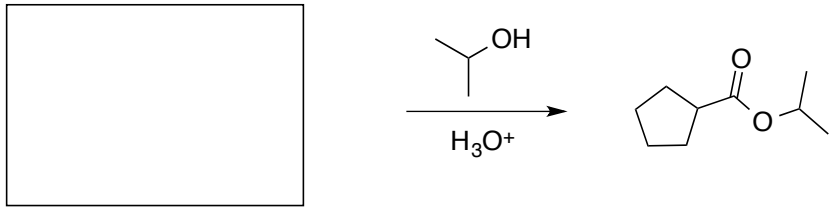


(d)



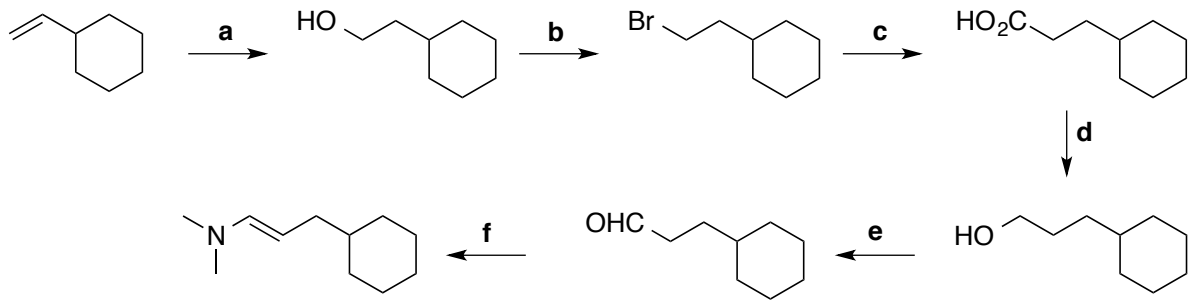
major (more stable) product

(e)



3. Reaction Puzzles – Complete both puzzles.

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

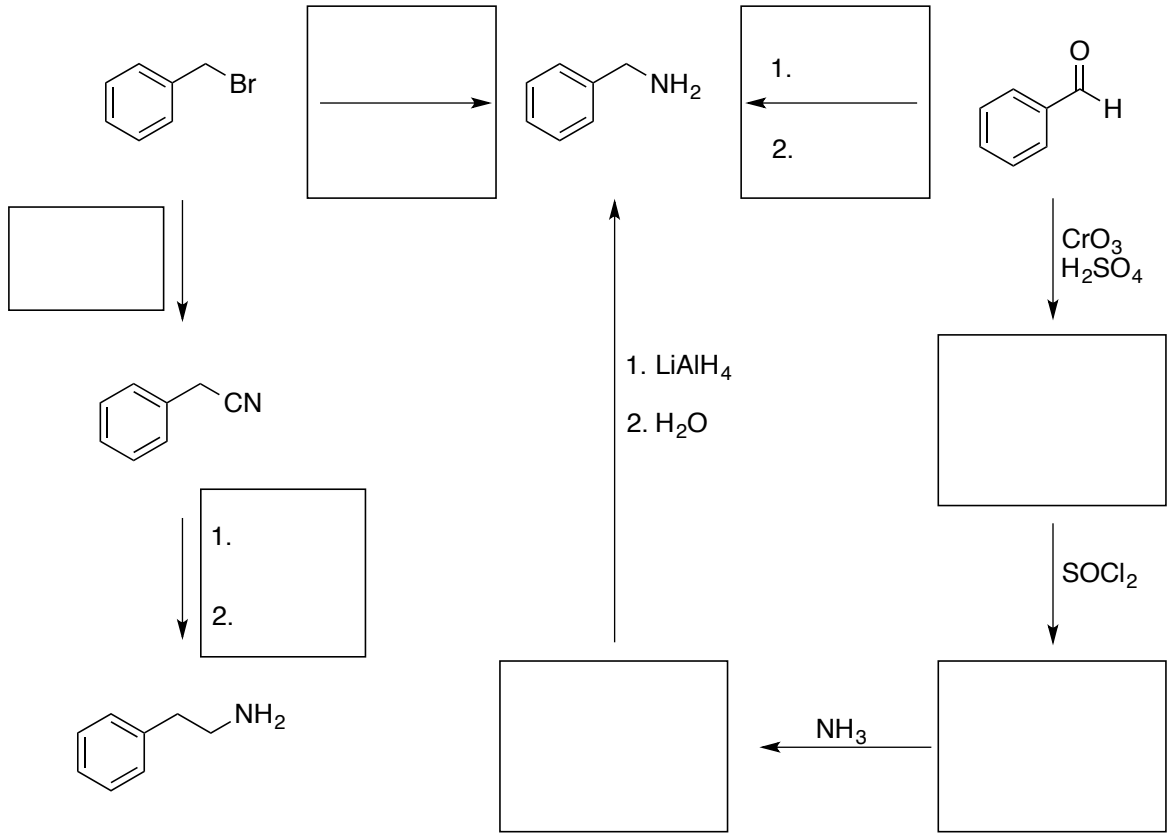


(a) 1. _____ 2. _____ **(b)** _____

(c) 1. _____ 2. _____ 3. _____ **(d)** 1. _____ 2. _____

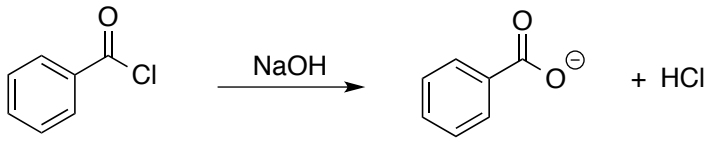
(e) _____ **(f)** _____

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

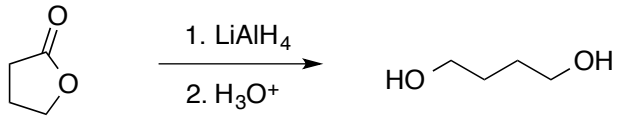


4. Basic Mechanisms – Draw the **arrow-pushing mechanism for both reactions** below, including all arrows for proton transfers. Include all intermediates with proper charges circled for each step.

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

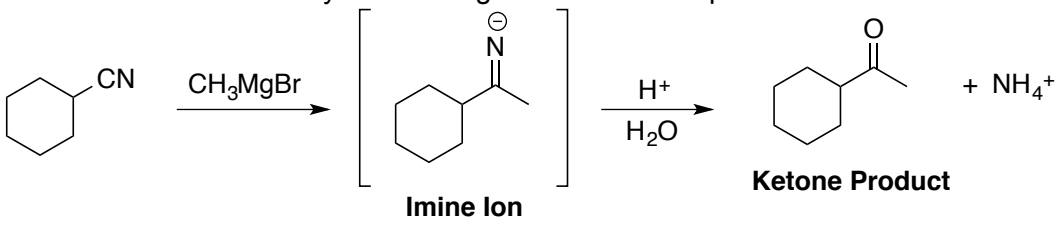


(b) (*20 points*) Draw the mechanism for the reduction of the lactone (cyclic ester) with lithium aluminum hydride, followed by quenching with acid.

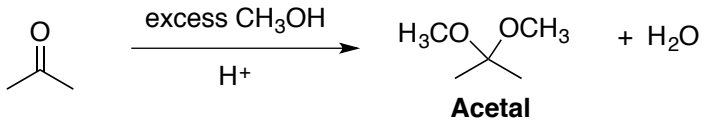


5. Acidic Mechanisms - Draw the **arrow-pushing mechanism for both reactions** below, including all arrows for proton transfers. Include all intermediates with proper charges circled for each step.

(a) (*20 points*) 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 mechanism from the imine ion to the ketone product** in the space below. No mechanism necessary for the Grignard addition step.



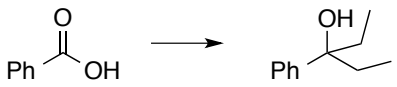
(b) (*20 points*) **Draw the mechanism** for the acid-catalyzed reaction of acetone with methanol to give the acetal product below.



6. (*30 points*) **Multi-Step Synthesis -** Carry out **any two** 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.

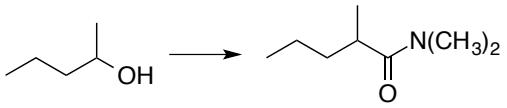
CHOOSE ANY TWO

(a)

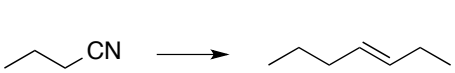


(b)

(c)



(d)



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

For five extra points, write my old wifi password I told you in lecture on February 16th.

Only the students in lecture that day can give this response, otherwise no one will get points. I know how many students were present that day - don't ruin it for everyone!