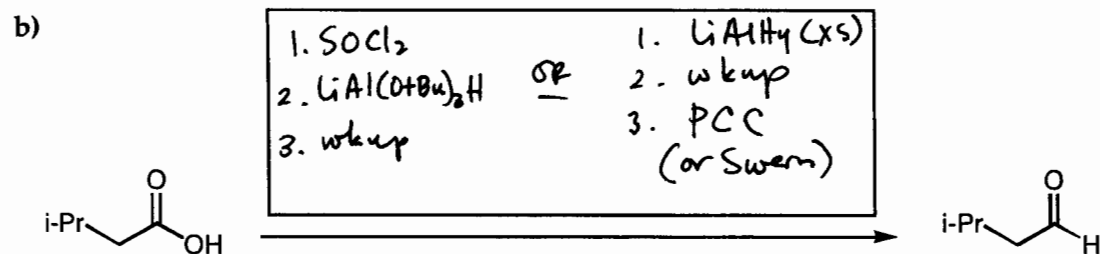
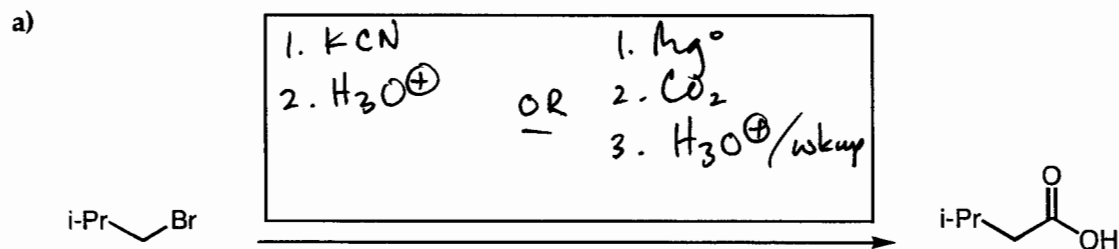
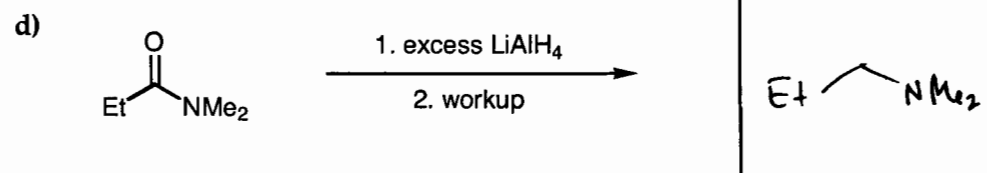
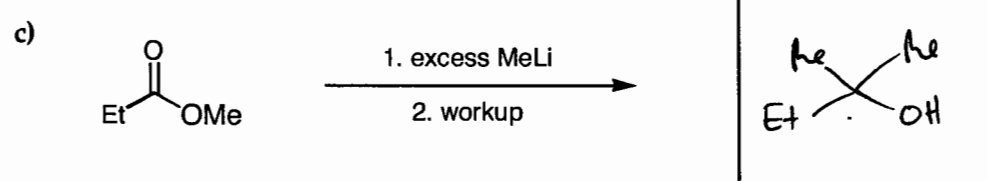
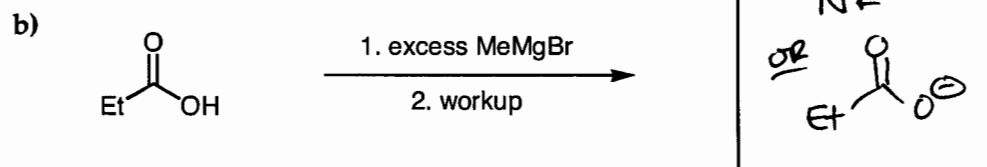
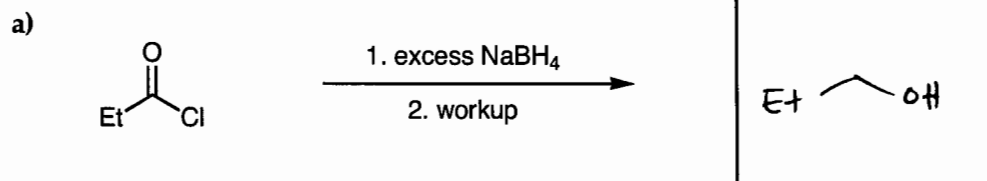


1. (4 points each, 8 points total) In the boxes, please provide the reagents for the illustrated transformations. More than one step may be required.

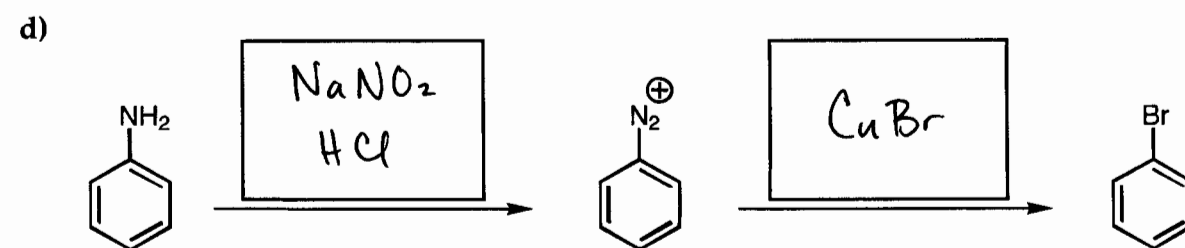
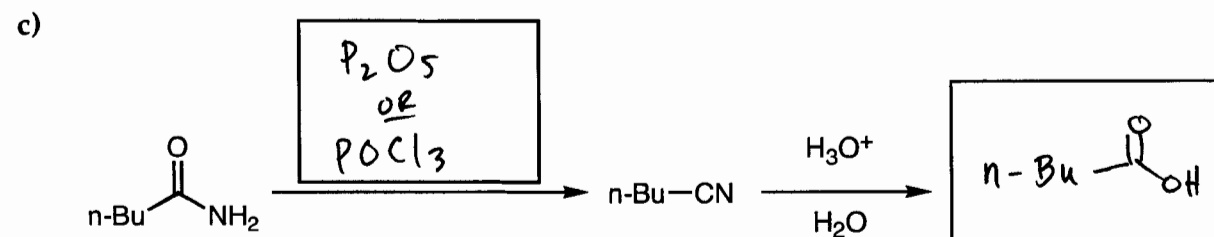
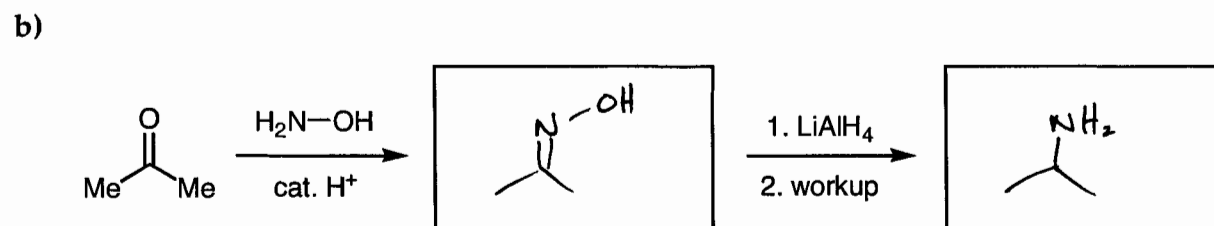
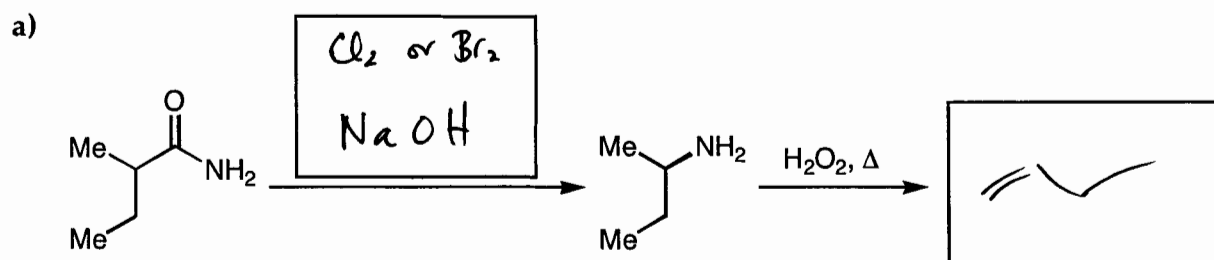


2. (2 points each, 8 points total) Please provide the products of the following reactions. If no reaction is expected, write "NR".



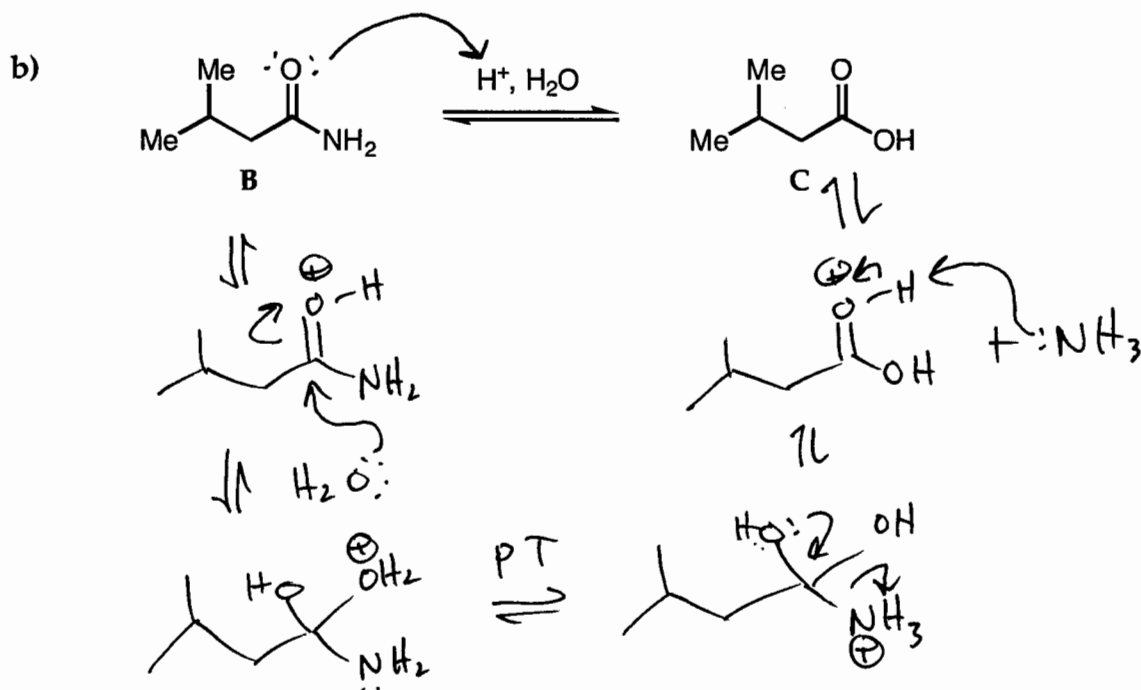
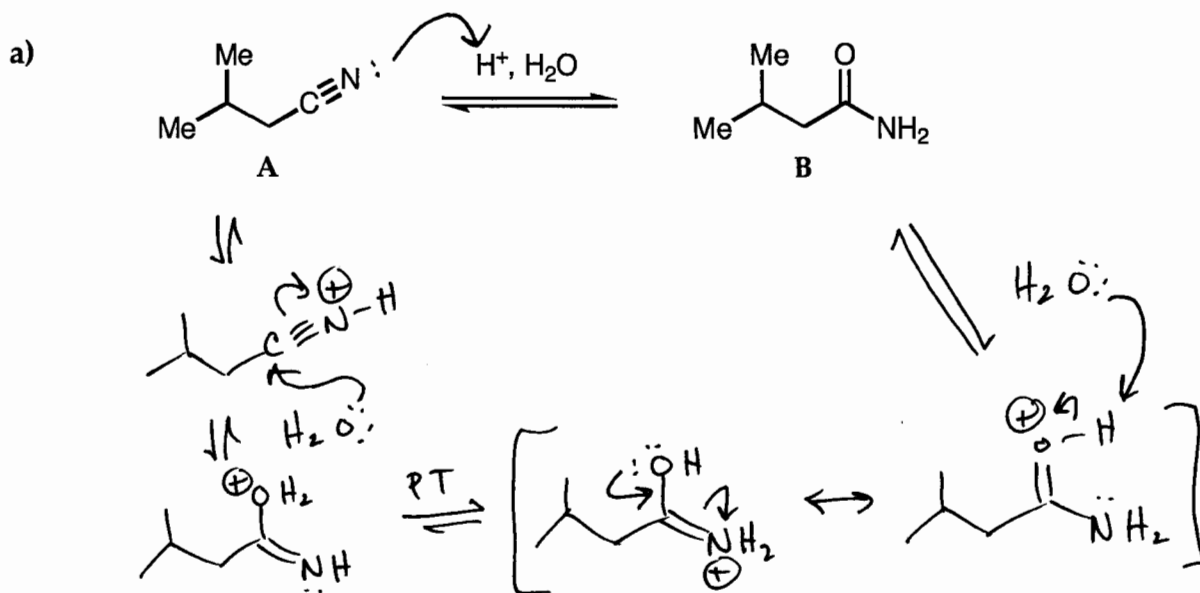
Name Key

3. (2 points each, 16 points total) Please provide the requested products or reagents. If no reaction is expected, write "NR".



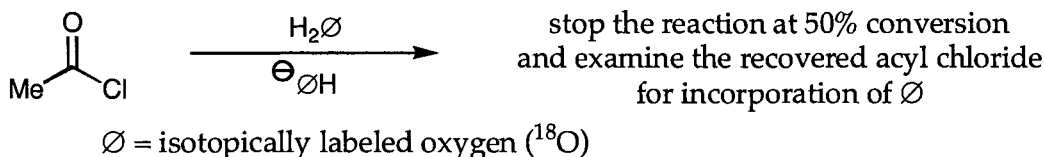
Name Key

4. (12 points) The hydrolysis of a nitrile (A) to a carboxylic acid (C) involves initial formation of a primary amide (B). Provide a detailed mechanism for each the following transformations.

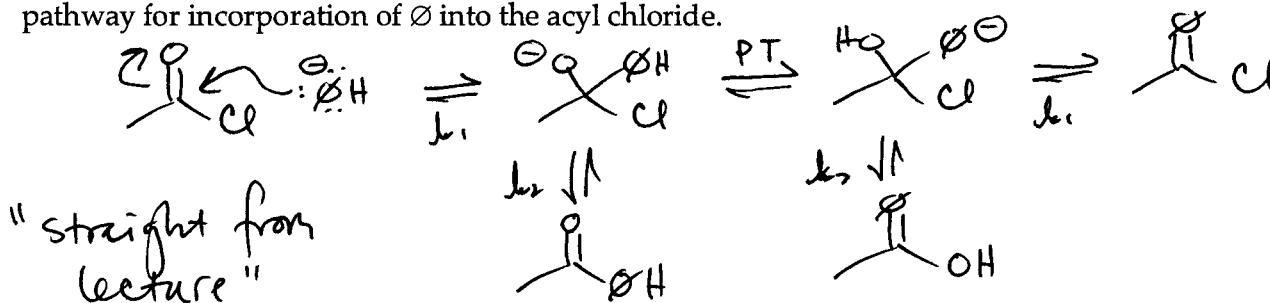


Name Key

5. (12 points) Consider the labeling experiment outlined below:



a) Please provide the mechanism for the hydrolysis reaction shown above, including the pathway for incorporation of O into the acyl chloride.



b) What level of O incorporation ("high" or "low") you would expect to observe in the recovered acyl chloride? Explain briefly.

(do not need to label k_1/k_2)

Incorporation of the label into the acyl chloride would be very low. Cl^- is a much better LG than OH^- , so hydrolysis is much faster than label incorporation.

($k_2 \gg k_1$)

c) Based on your answer to part b, do you think the results of this labeling study definitively prove the mechanism of this reaction? Explain briefly.

No.

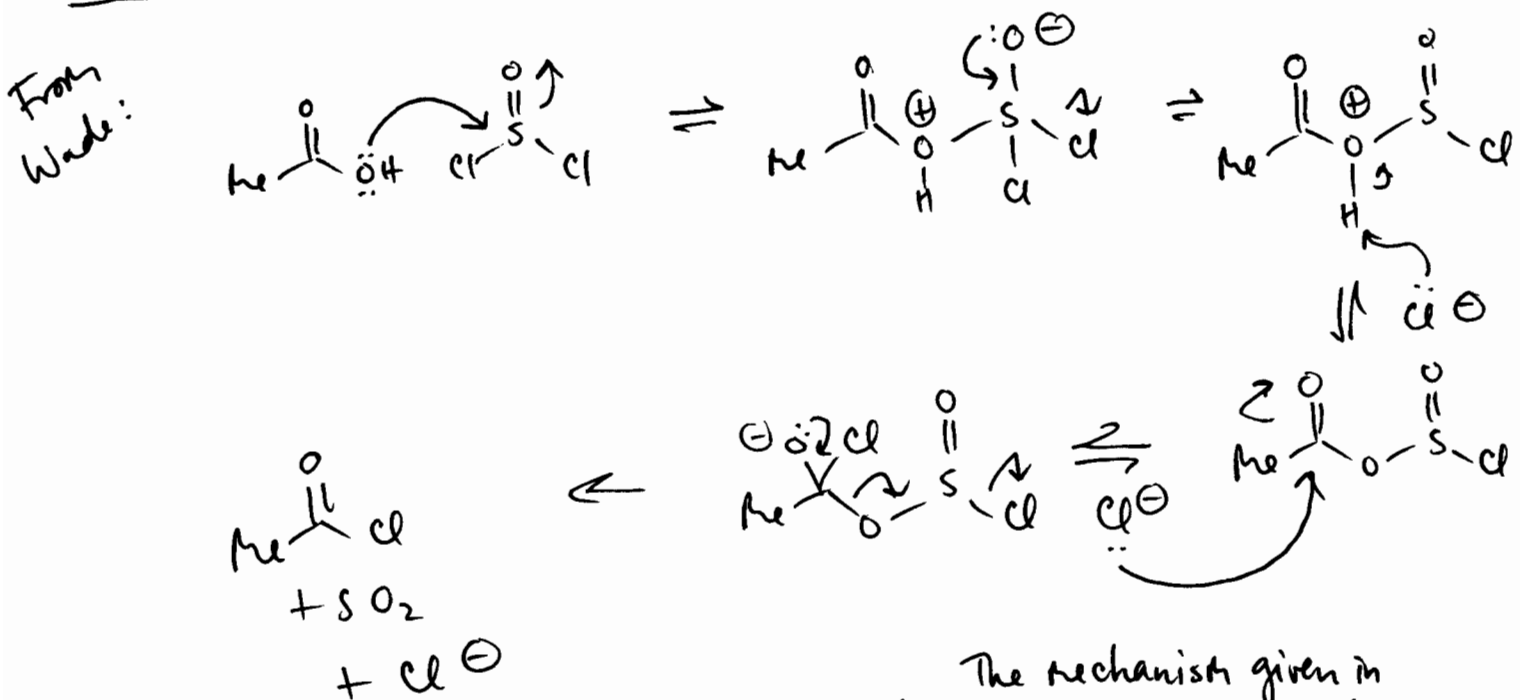
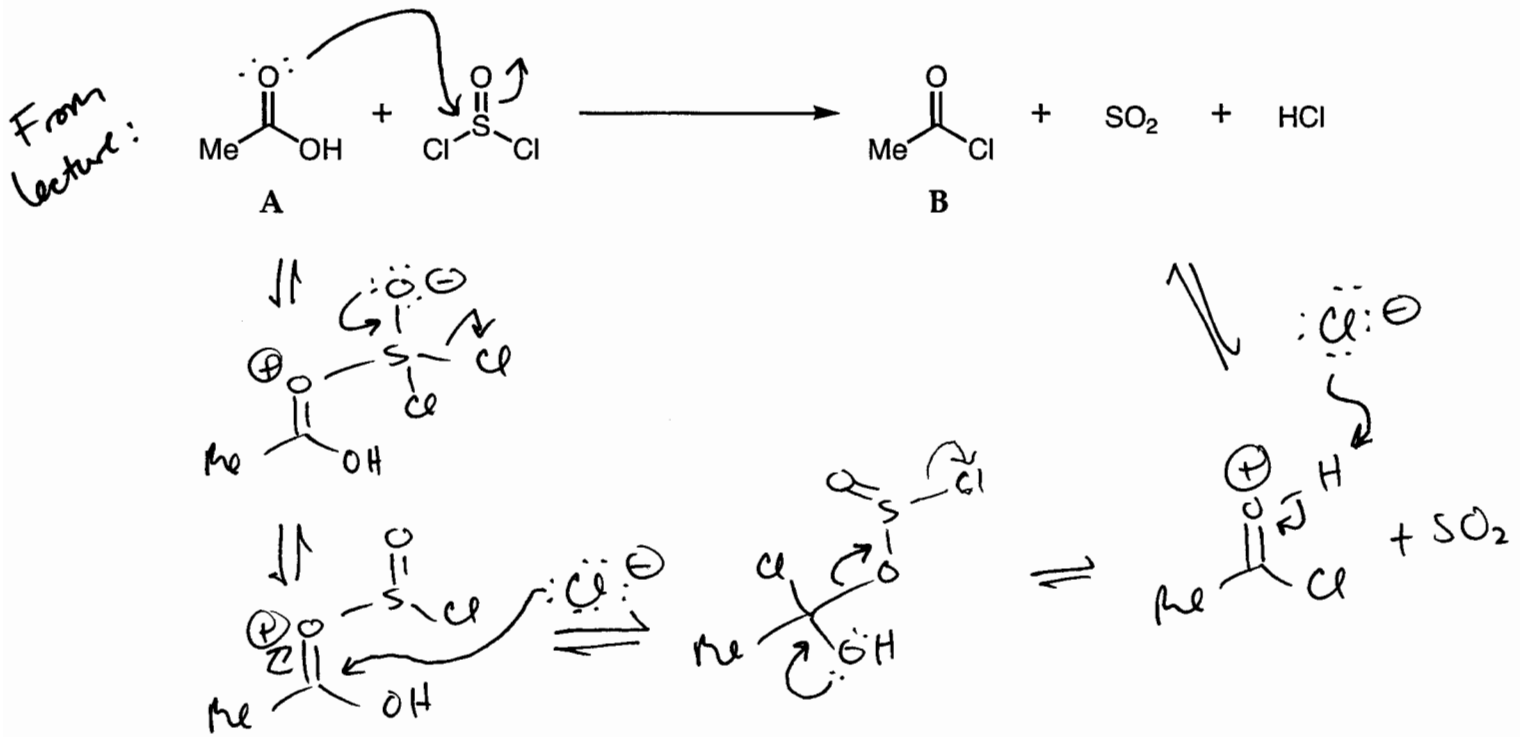
Explanation #1: It is impossible to definitively prove a mechanism!

Explanation #2: No incorporation of label is consistent w/ $\text{S}_\text{N}2$!

add'n/elim.

Name key

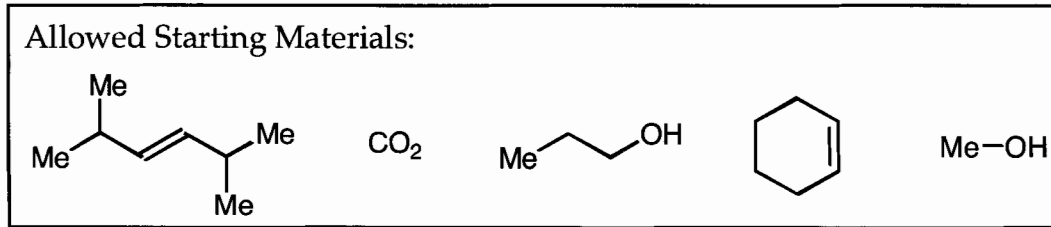
6. (11 points) Provide a detailed mechanism for the illustrated conversion of acetic acid (A) to acetyl chloride (B).



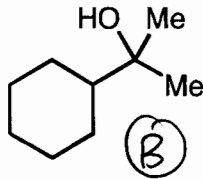
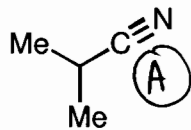
The mechanism given in lecture is more compelling for several reasons, but either one was accepted for full credit.

Name Key

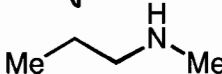
7. (11 points each, 22 points total) Please provide syntheses for **only two of the three** indicated compounds. All of the carbon atoms should be derived from the allowed starting materials. You may use any common reagents.



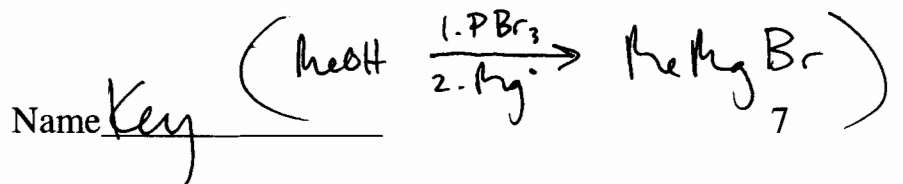
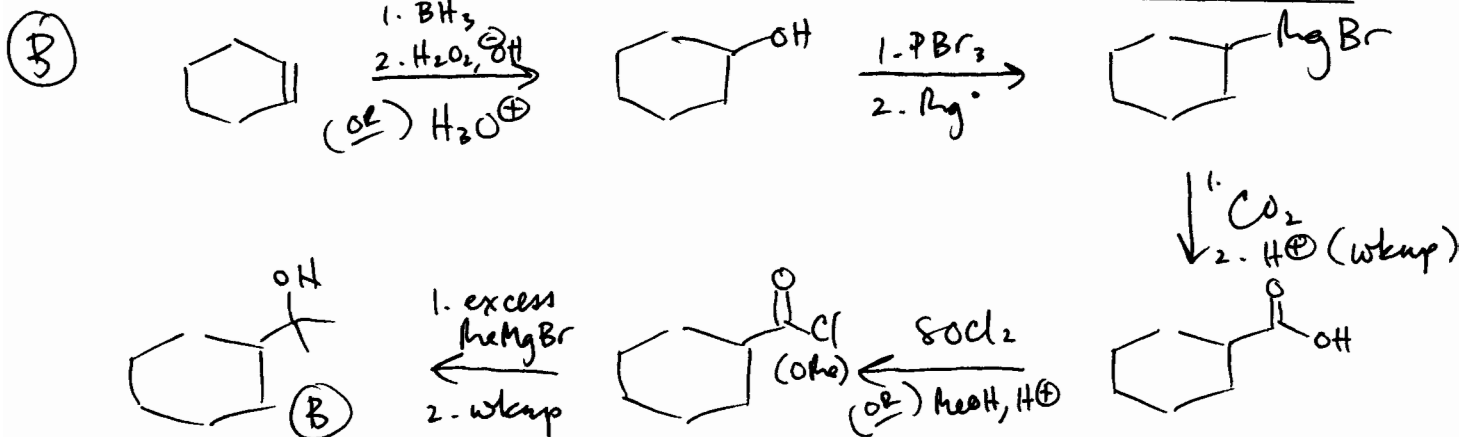
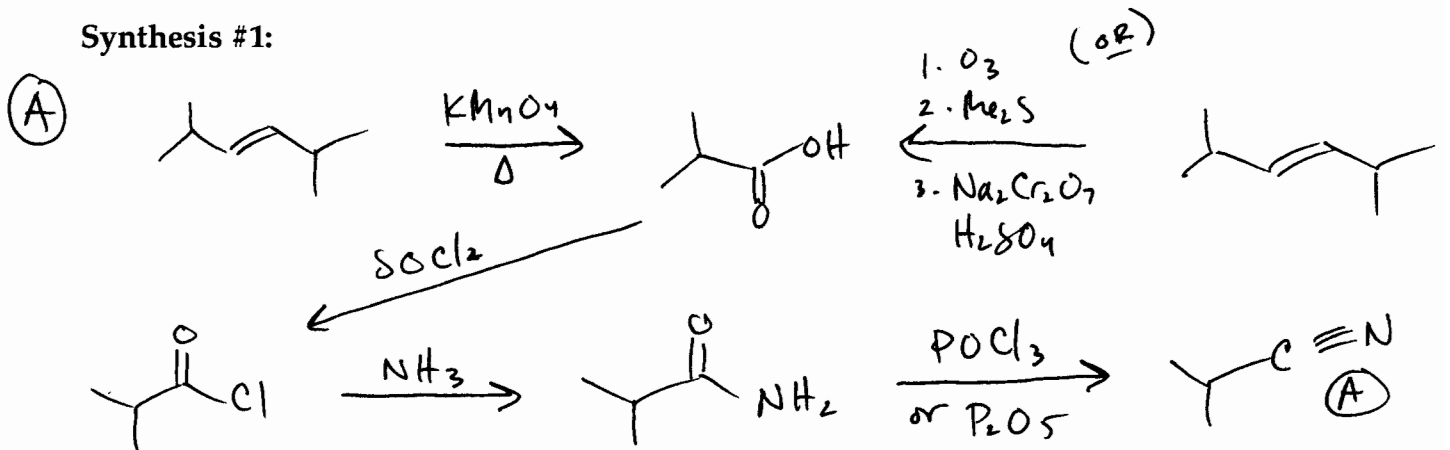
Pick Two:



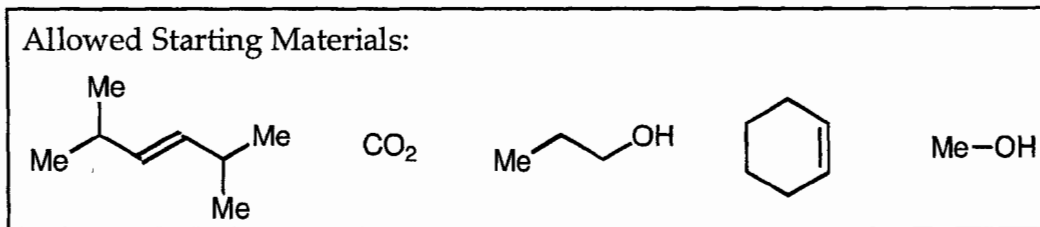
There are other acceptable ways to make all of these molecules.



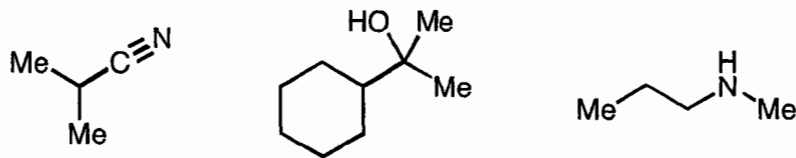
Synthesis #1:



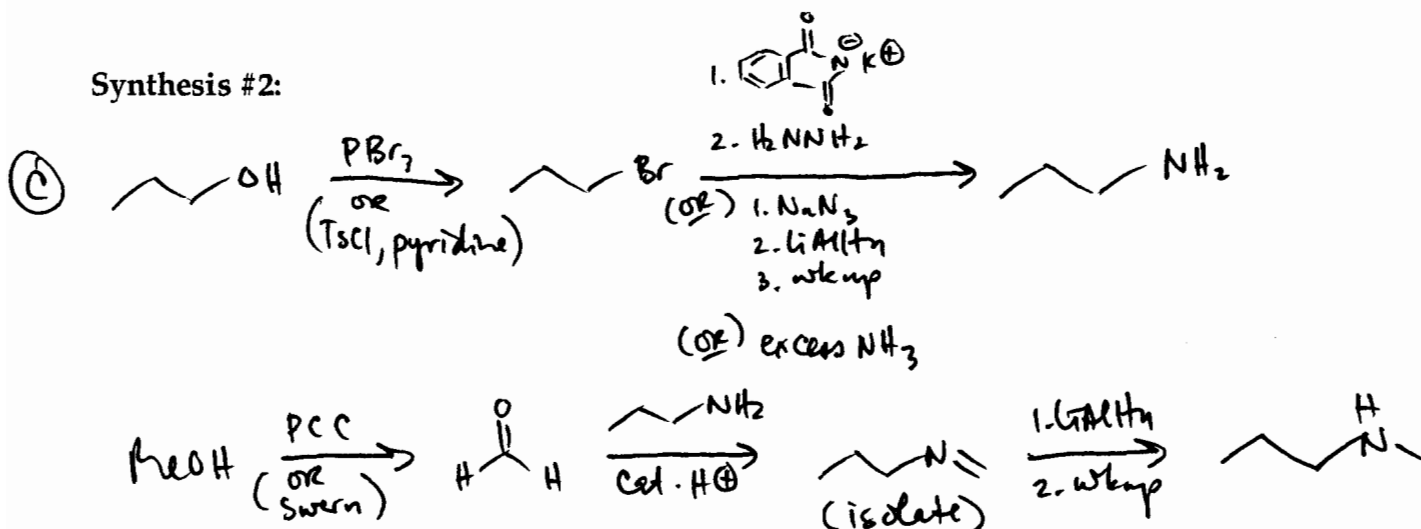
7. (continued)



Pick Two:



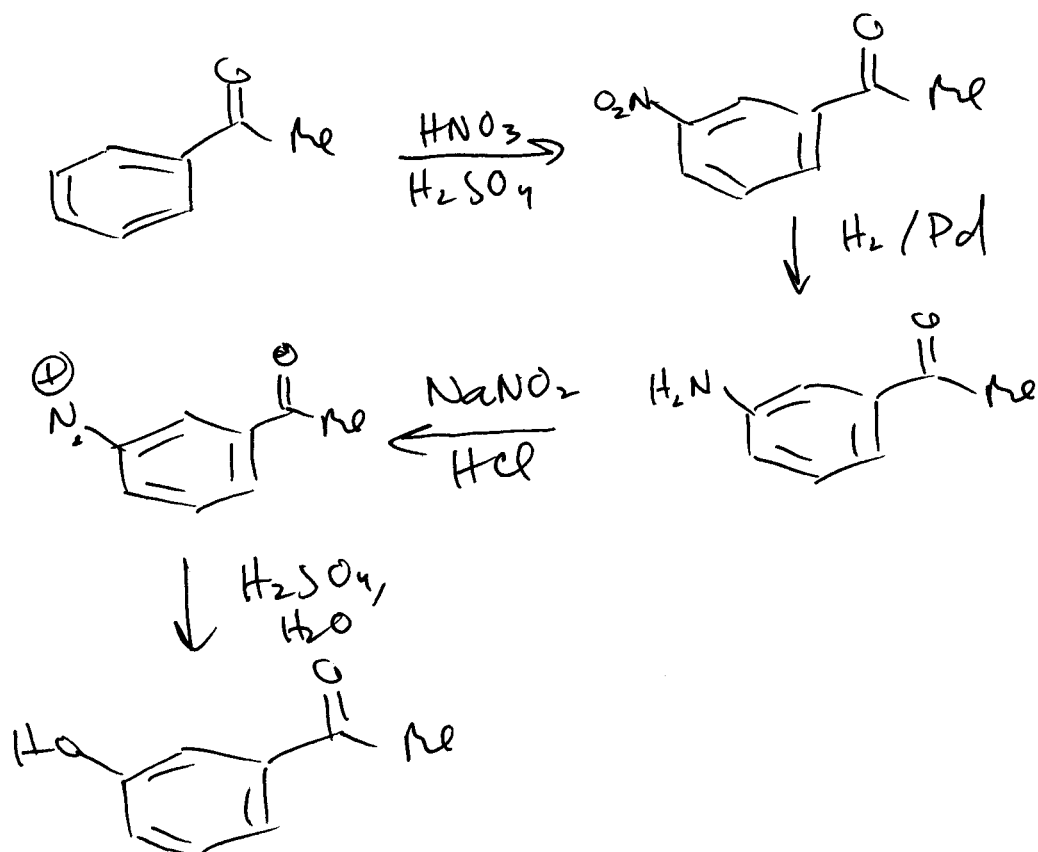
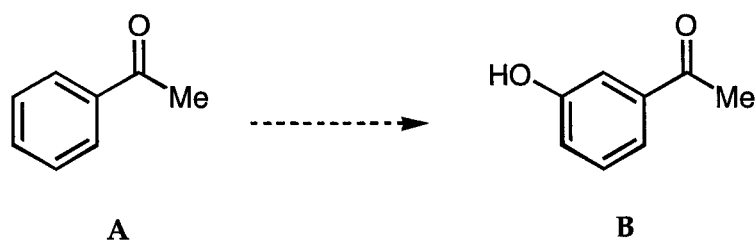
Synthesis #2:



• there are also acceptable routes using acylation/reduction & Hofmann rearrangement.

Name Key

8. (11 points) Provide a synthesis that will *selectively* convert A to B. Show all of the key intermediates and furnish all of the important reagents. This is not a one-step process.



Name Key