Massachusetts Institute of Technology
Dr. Kimberly L. Berkowski

5.13, Fall 2006
Organic Chemistry II

PRACTICE EXAM #3

Hour exam #3 will be held on Wednesday, November 15, from 12:05-12:55.

Location:
If your last name begins with A-L, report to 54-100.
If your last name begins with M-Z, report to 2-190.
A 10 point deduction for reporting to the wrong room.

Books, notes, and calculators **will not** be allowed during the exam.

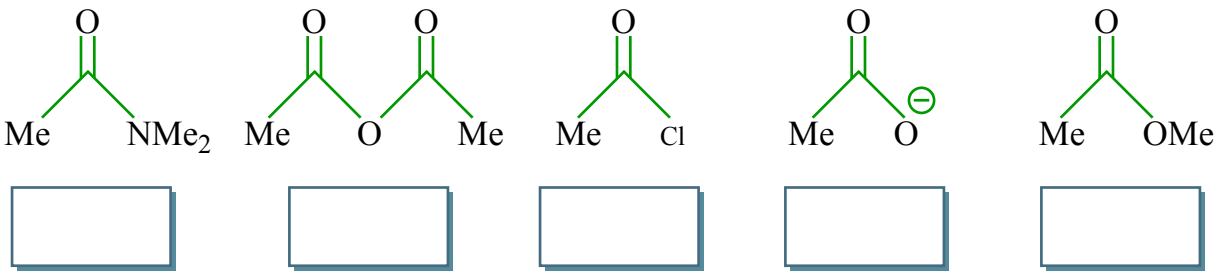
Molecular model kits **will** be allowed during the exam. You will be given a periodic table and blank pages.

Material Covered on Exam #3:

- Everything presented in lecture related to Amines, Carboxylic Acids, and Carboxylic Acid Derivatives
- Recitation and Drill Problems
- Problem Sets 5 and 6
- McMurry Chapters 20, 21, 24
- All 5.12 material.

The answer key will be posted on Monday

1. Rank the following acyl derivatives based on their reactivity as electrophiles toward hydroxide ion (1 = most reactive, 5 = least reactive).



2. In the boxes, please provide the reagents for the illustrated transformations. More than one step may be required

(a)

(b)

Figure by MIT OCW.

3. Please provide the requested products. If no reaction is expected, write "NR".

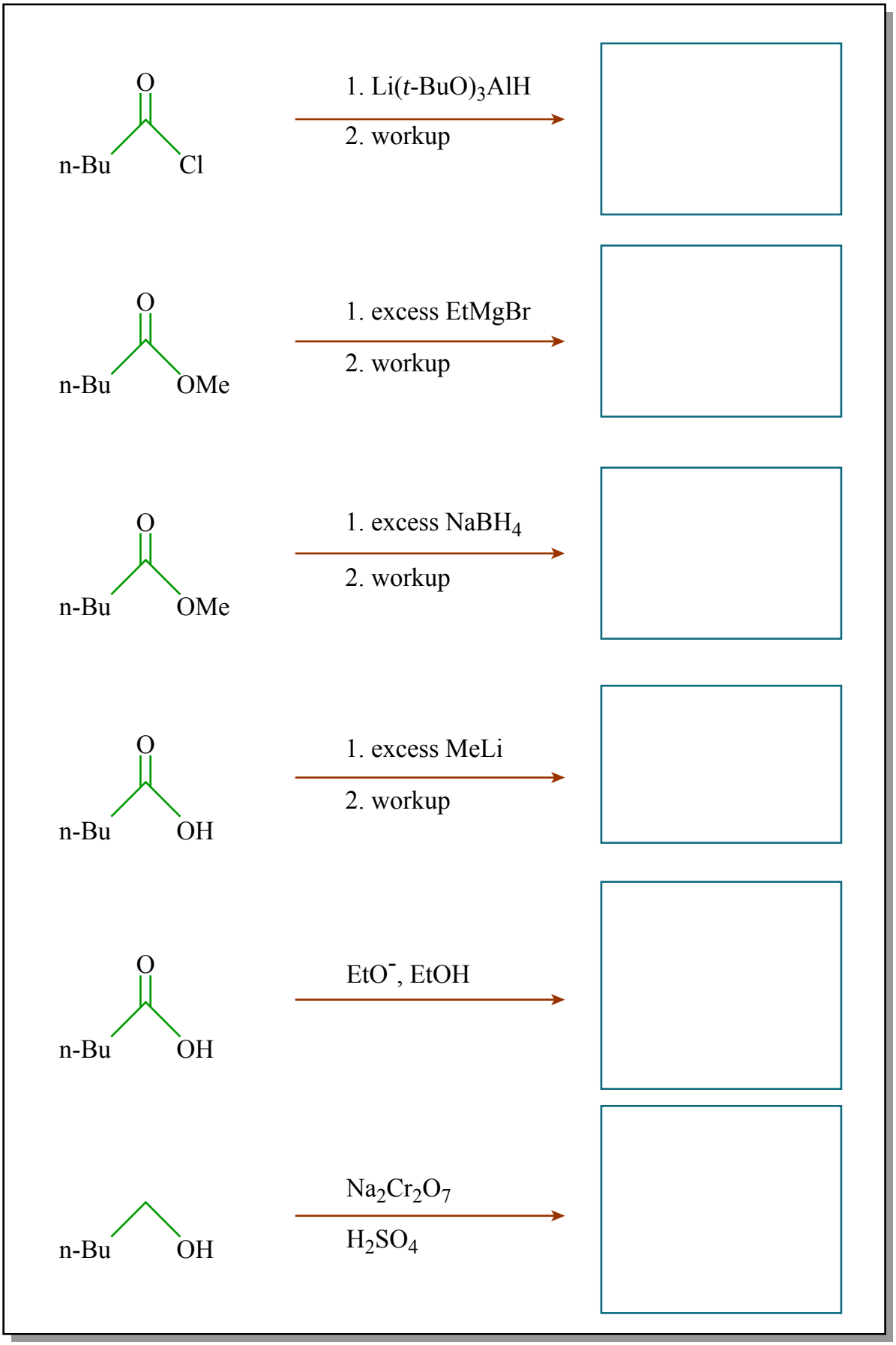


Figure by MIT OCW.

4. Please provide the requested reagents.

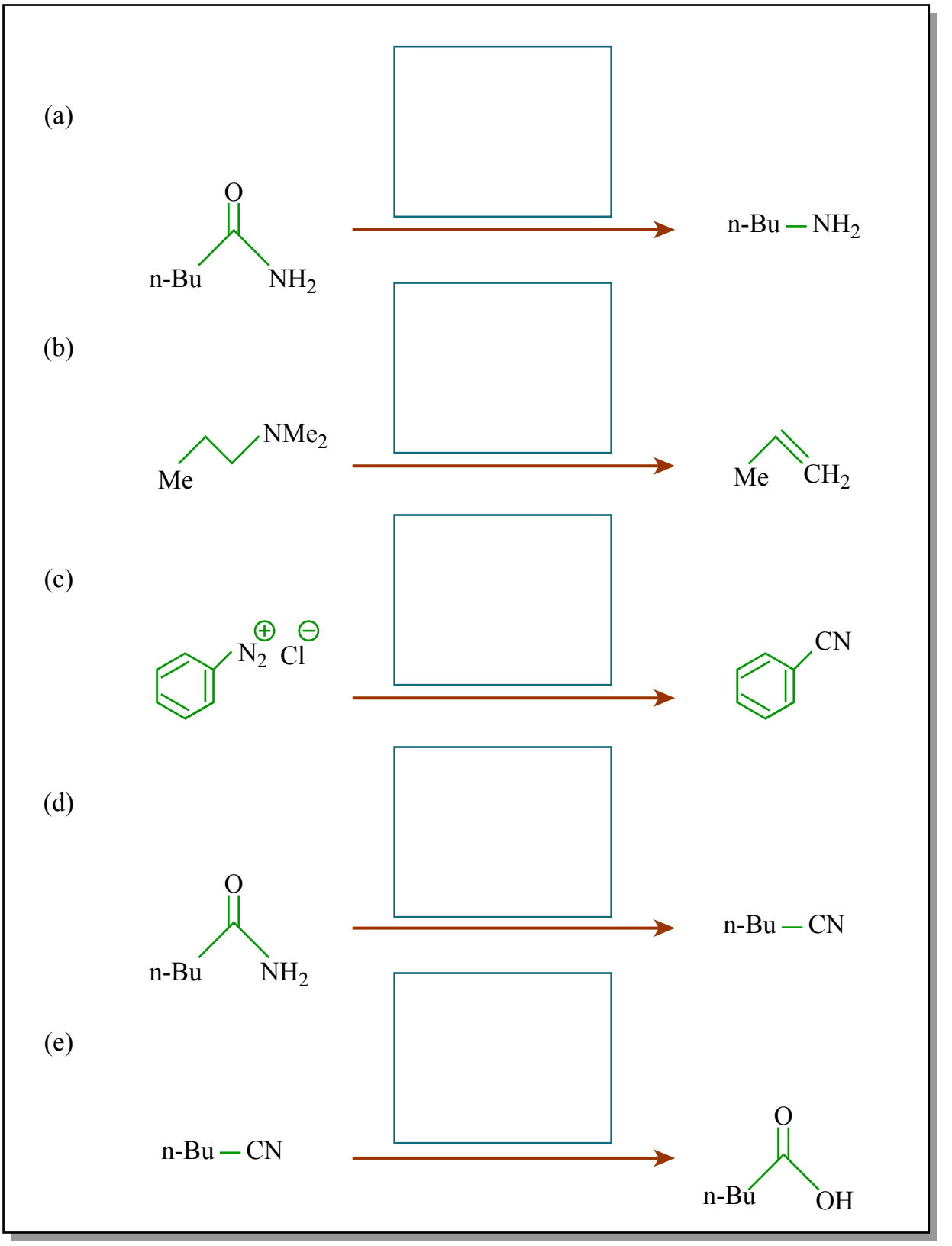


Figure by MIT OCW.

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

Stop the reaction at 50% conversion and examine the recovered acyl chloride for incorporation of Ø

Ø = isotopically labeled oxygen (^{18}O)

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

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

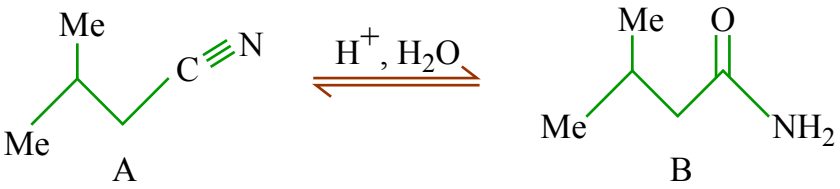
(c) Based on your answer to part b, do you think the results of this labeling study definitively prove the mechanism of this reaction? Explain briefly.

Figure by MIT OCW.

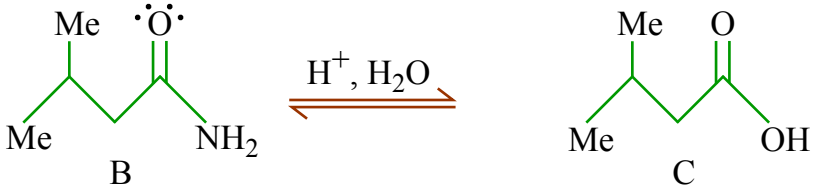
Name_____

6. (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.by MIT OCW.

(a)



(b)



Name_____

Figure by MIT OCW.

7. Provide a mechanism for the Hofmann elimination. Please show all arrow pushing.

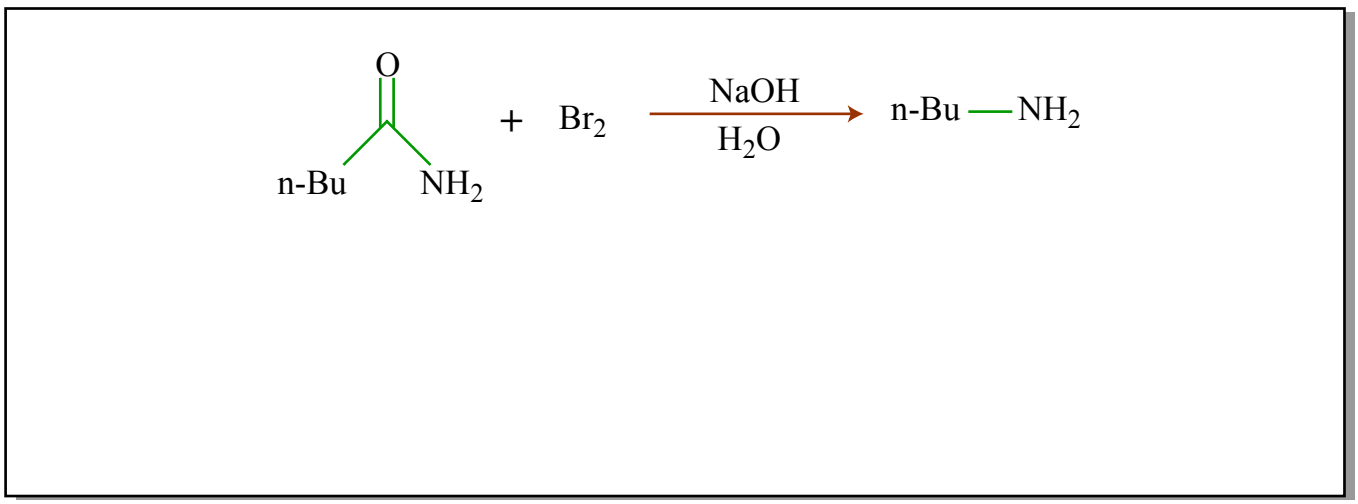


Figure by MIT OCW.

8. Provide a synthesis that will *selectively* convert **A** to **B**. Show all the key intermediates, and furnish all of the important reagents.

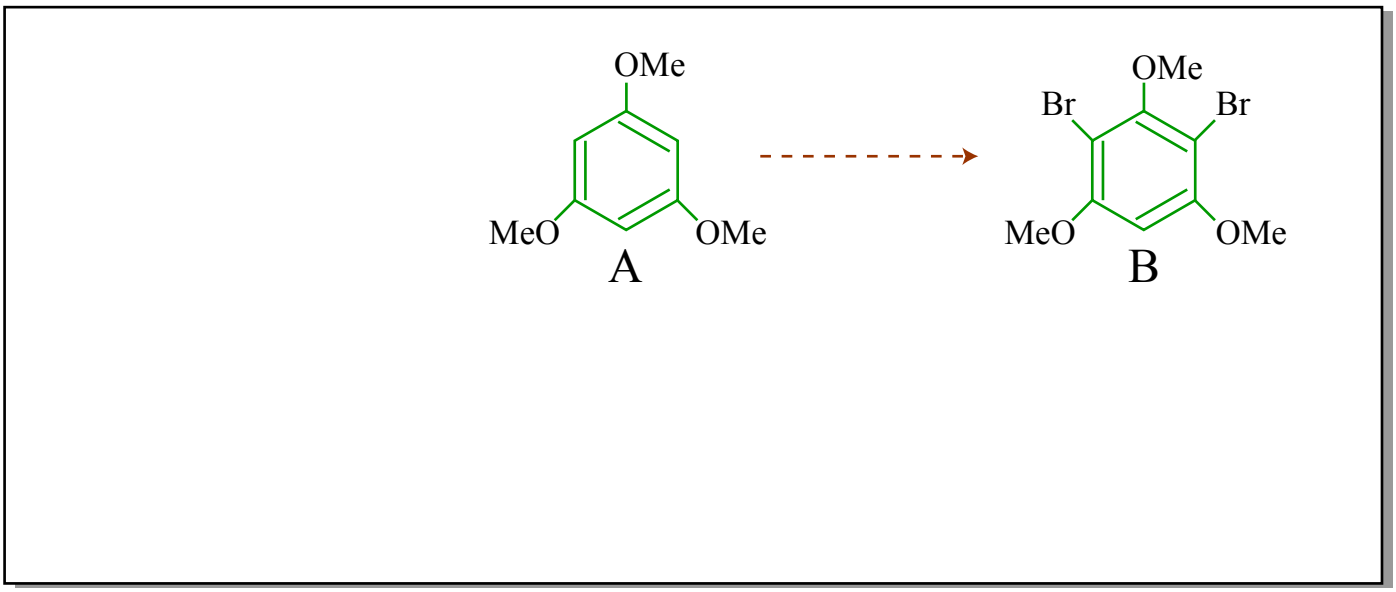
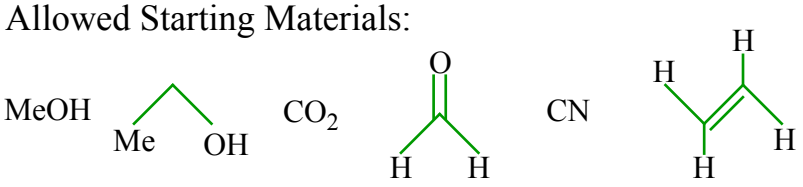


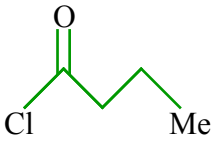
Figure by MIT OCW.

9. Provide synthesis for the following compounds. All of the carbons in the target molecules should be derived from the allowed starting materials. You may use any common reagents.

Allowed Starting Materials:



(a)



(b)

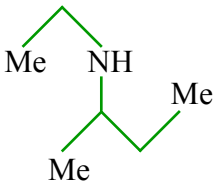


Figure by MIT OCW.