Massachusetts Institute of Technology
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5.13, Fall 2006
Organic Chemistry II

EXAM #3 EXTRA PROBLEMS

KEY

What to expect on Exam #3:

1. ~1 Labeling experiment
2. ~2 Mechanisms
3. ~2 Syntheses
4. ~5 transformations – supply missing product
5. ~5 transformations – supply missing reagents
6. ~3 General questions

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.

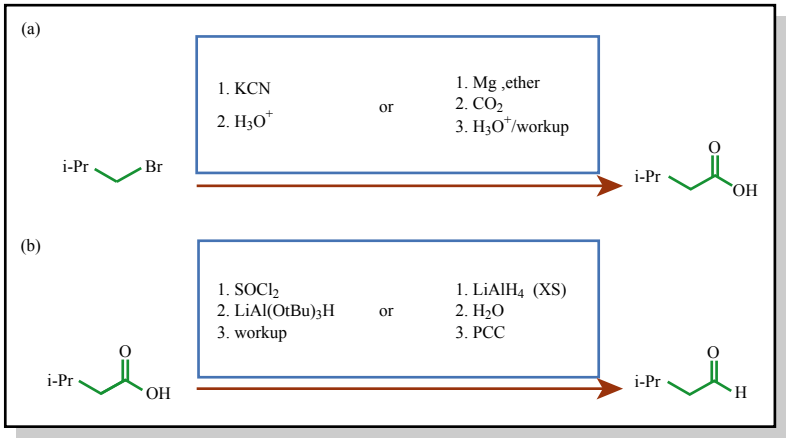

Figure by MIT OCW.

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

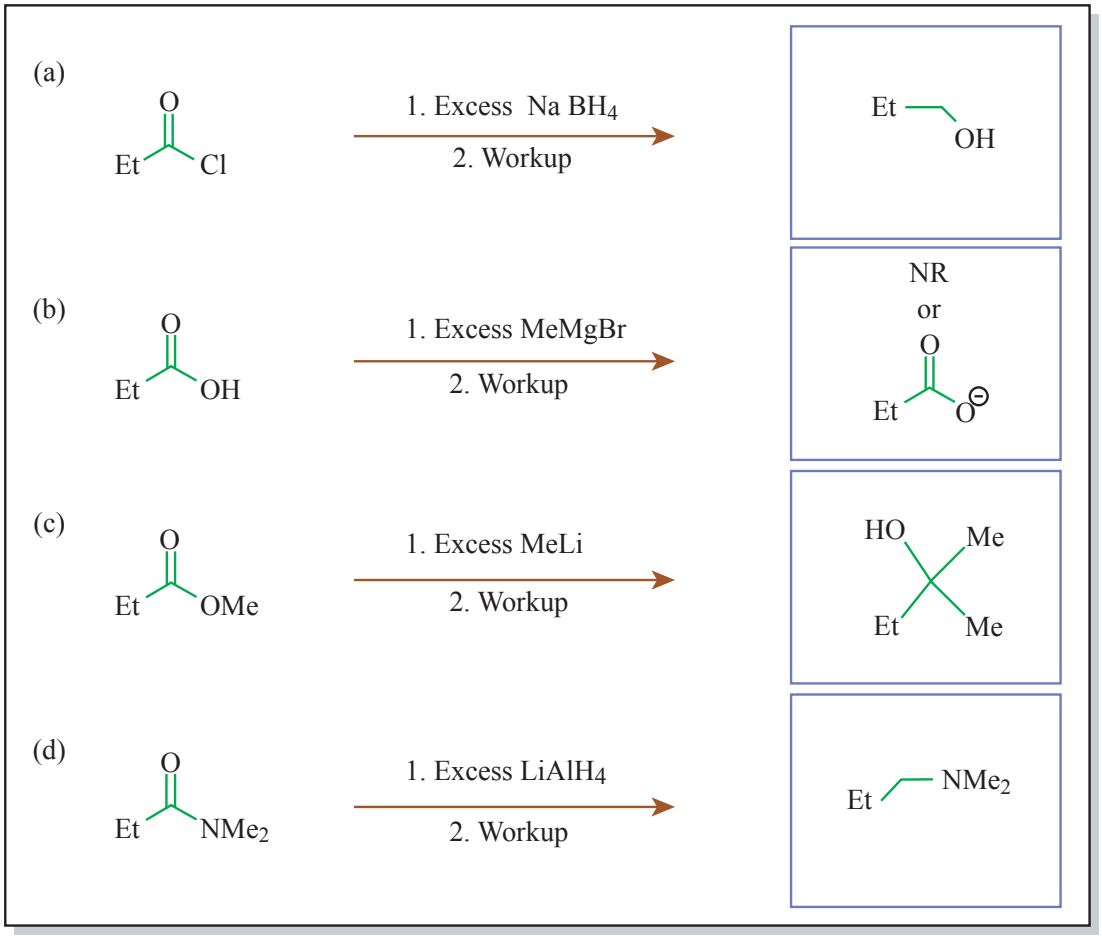

Figure by MIT OCW.

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

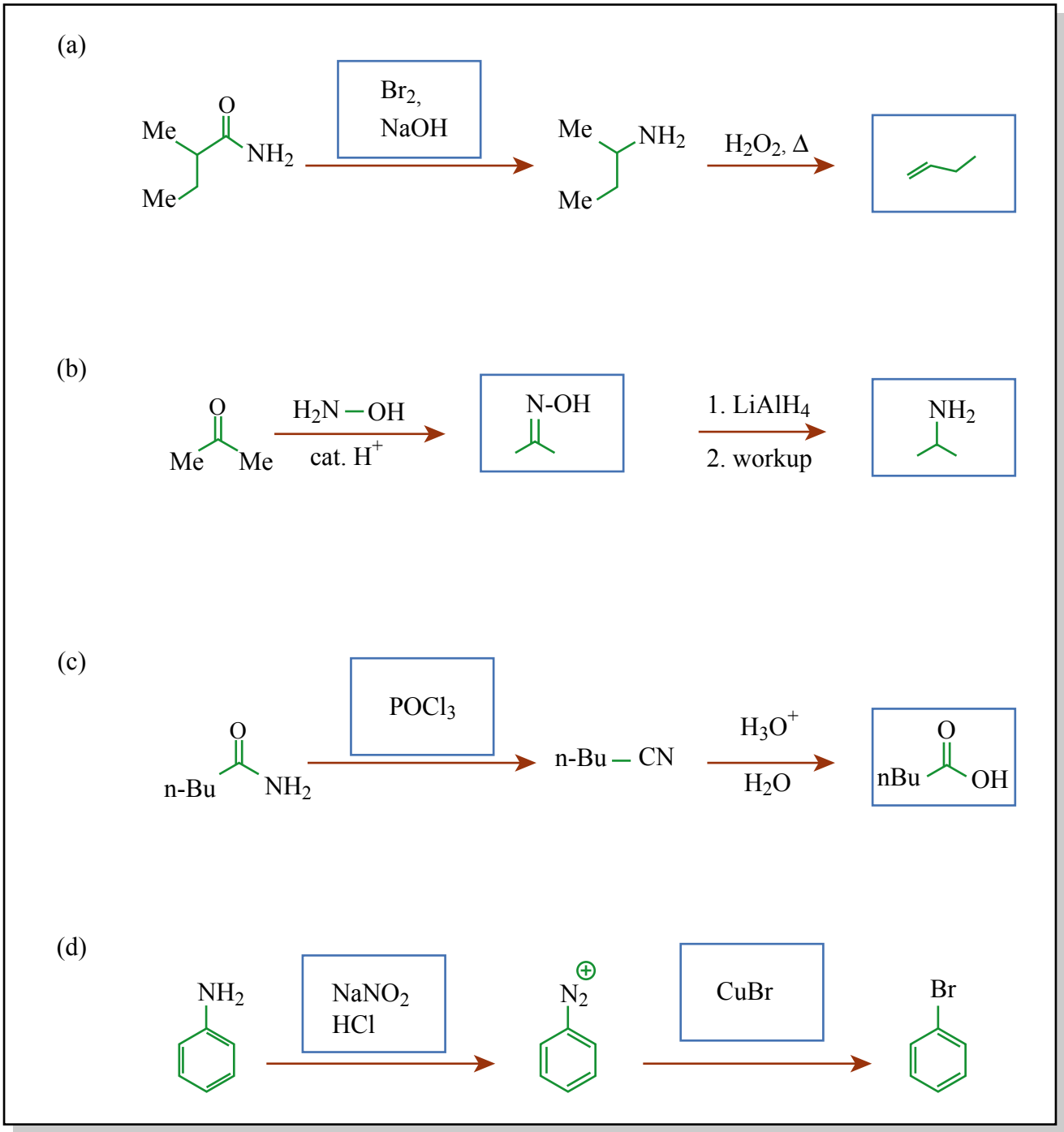

Figure by MIT OCW.

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4. (11 points) Please provide a detailed mechanism for the illustrated conversion of acetic acid (**A**) to acetyl chloride (**B**).

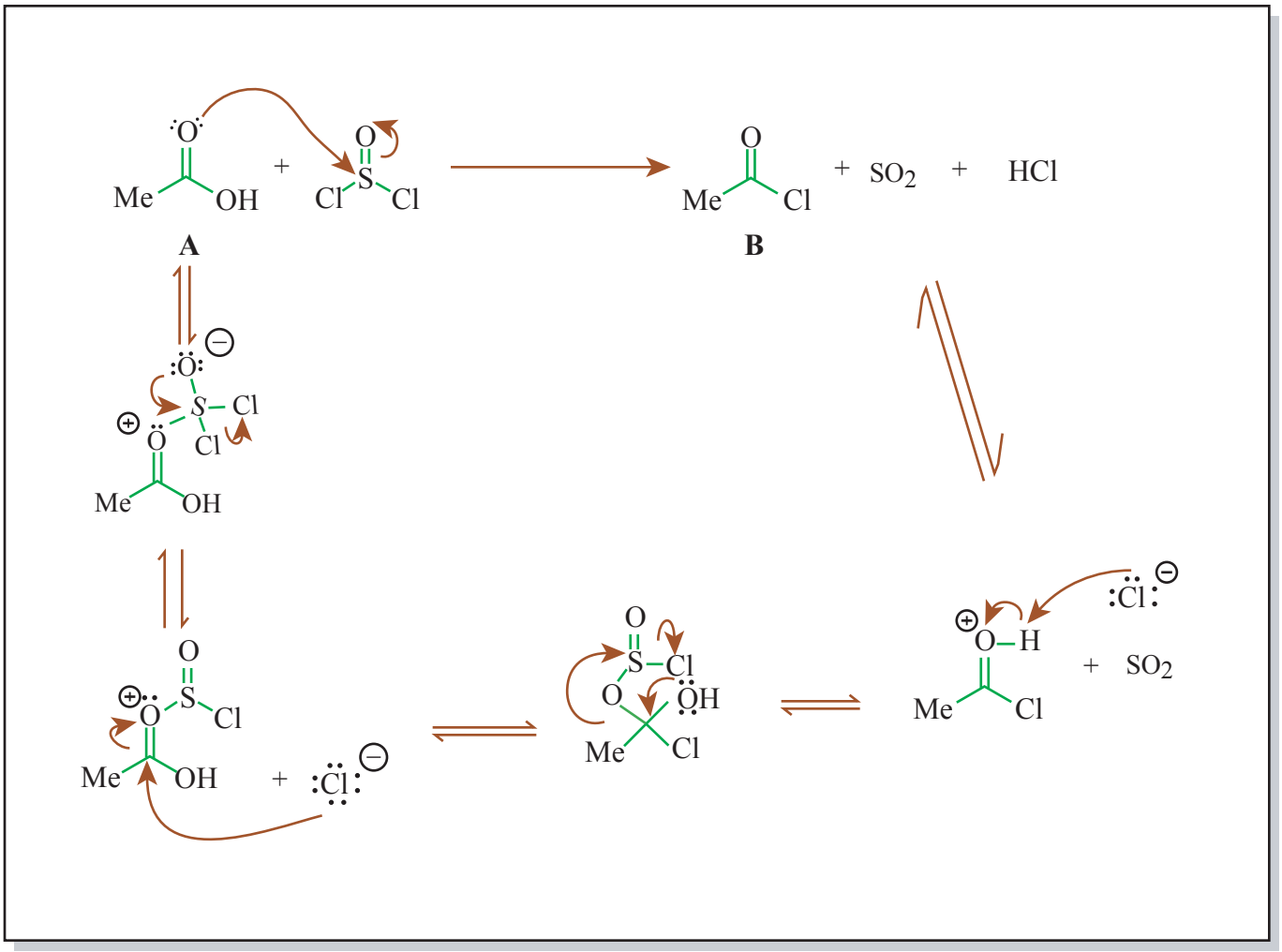

Figure by MIT OCW.

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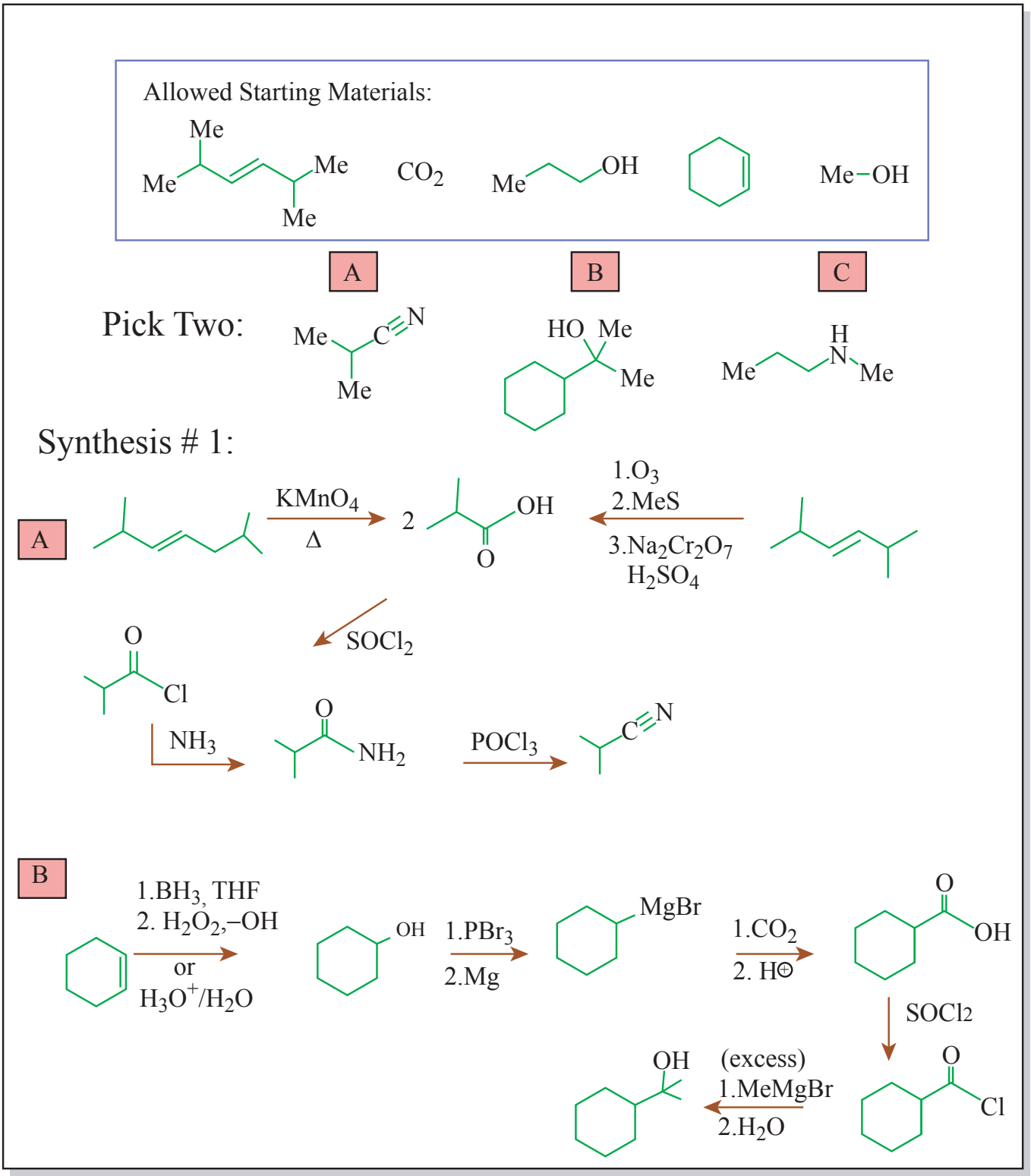
5. (11 points each, 22 points total) Please provide syntheses for **only two of the three** indicated compounds. All the carbon atoms should be derived from the allowed starting materials. You may use any common reagents.



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5. (Continued)

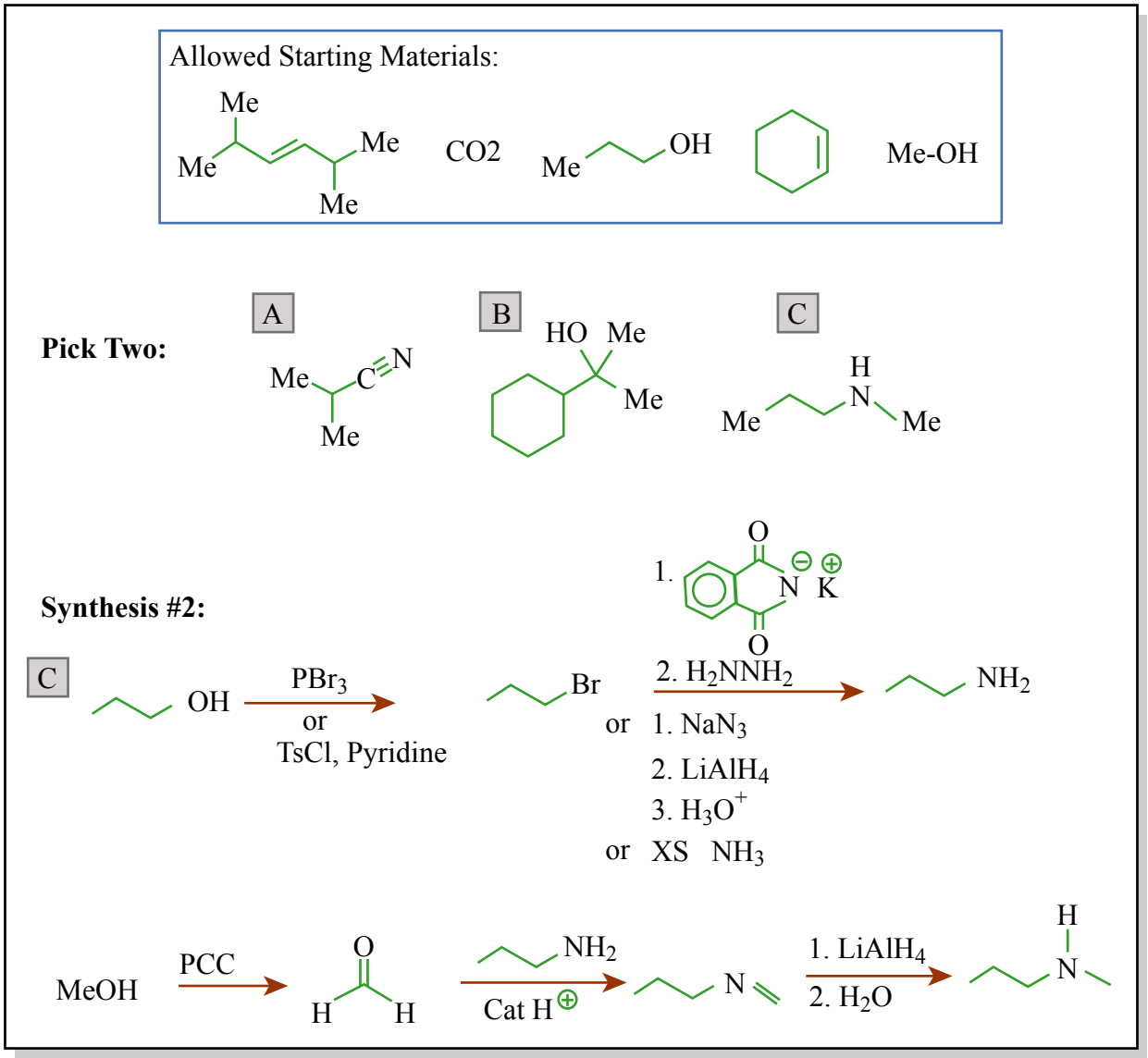

Figure by MIT OCW.

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6. (11 points) Provide a synthesis that will *selectively* convert **A** to **B.** Show all the key intermediates and furnish all the important reagents. This is not a one-step process.

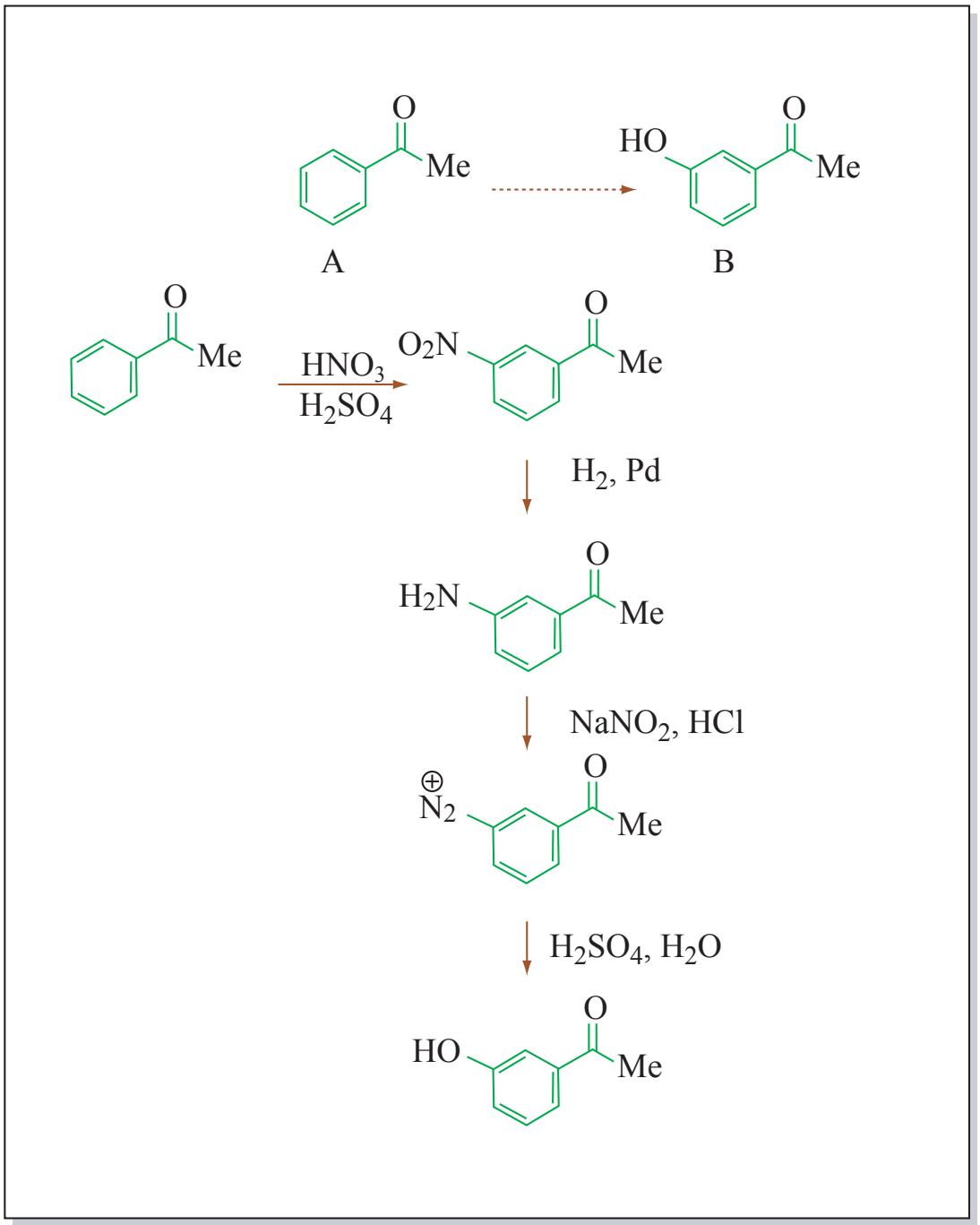

Figure by MIT OCW.

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7. Methyl acetimidate (**A**) is hydrolyzed in aqueous sodium hydroxide to give mainly acetamide and methanol (eq 1). In aqueous acid, **A** hydrolyzes to give primarily methyl acetate and ammonium ion (eq 2).

a) Provide a detailed mechanism for the illustrated process. Please show all arrow pushing.

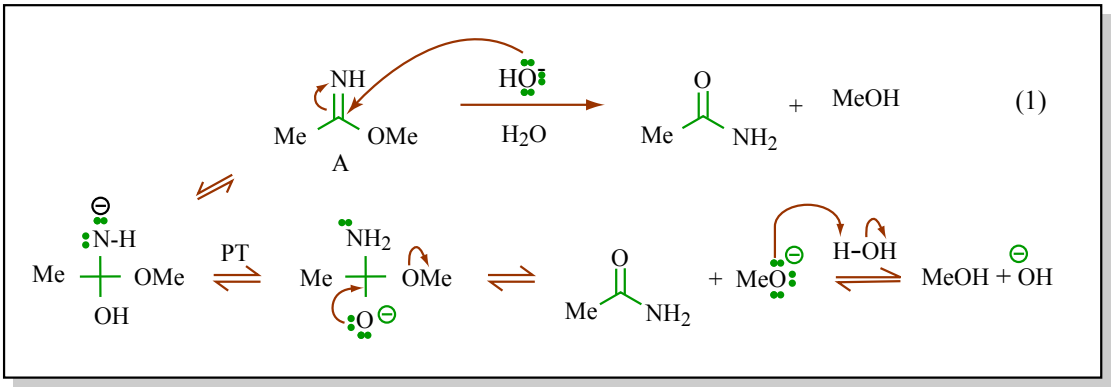

Figure by MIT OCW.

b) Provide a detailed mechanism for the illustrated process. Please show all arrow pushing.

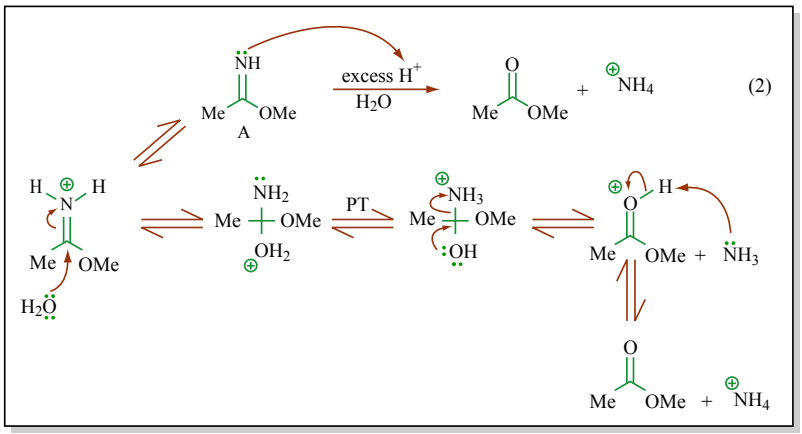

Figure by MIT OCW.

c) Briefly explain why the two reactions provide different products.

Basic conditions: $\ominus NH_2$ worse L.G. than $\ominus OMe$. Elimination favors amide

Acidic conditions: Acid/base equilibrium favors protonation of ntrogen making it a good L.G. Also, $\oplus NH_4$ is not nucleophilic + formation of ester is reversible

Figure by MIT OCW.

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8. Synthesize the indicated compounds from the allowed starting materials shown below. All of the carbons of the target compounds should be derived from the allowed starting materials.

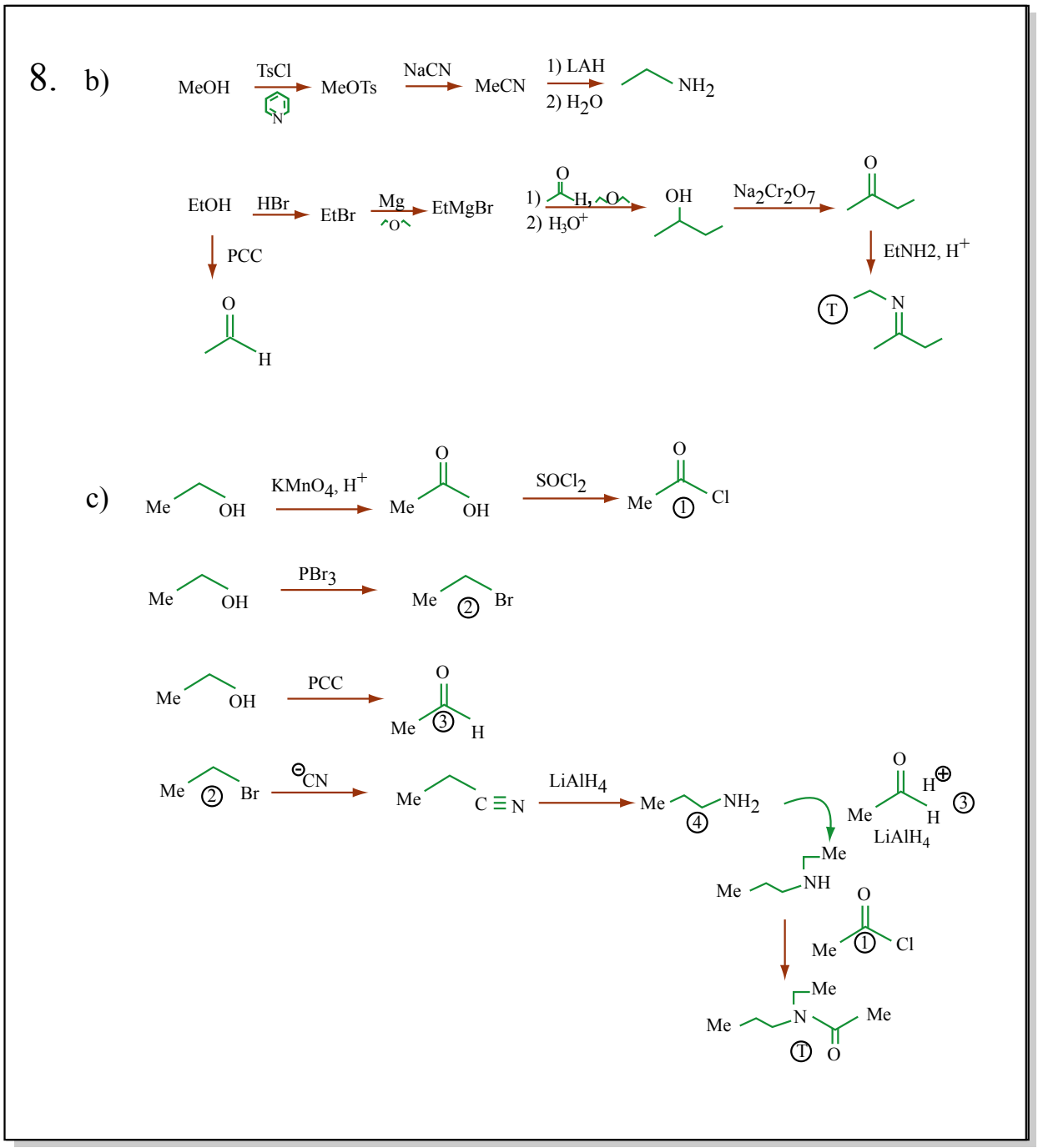

Figure by MIT OCW.

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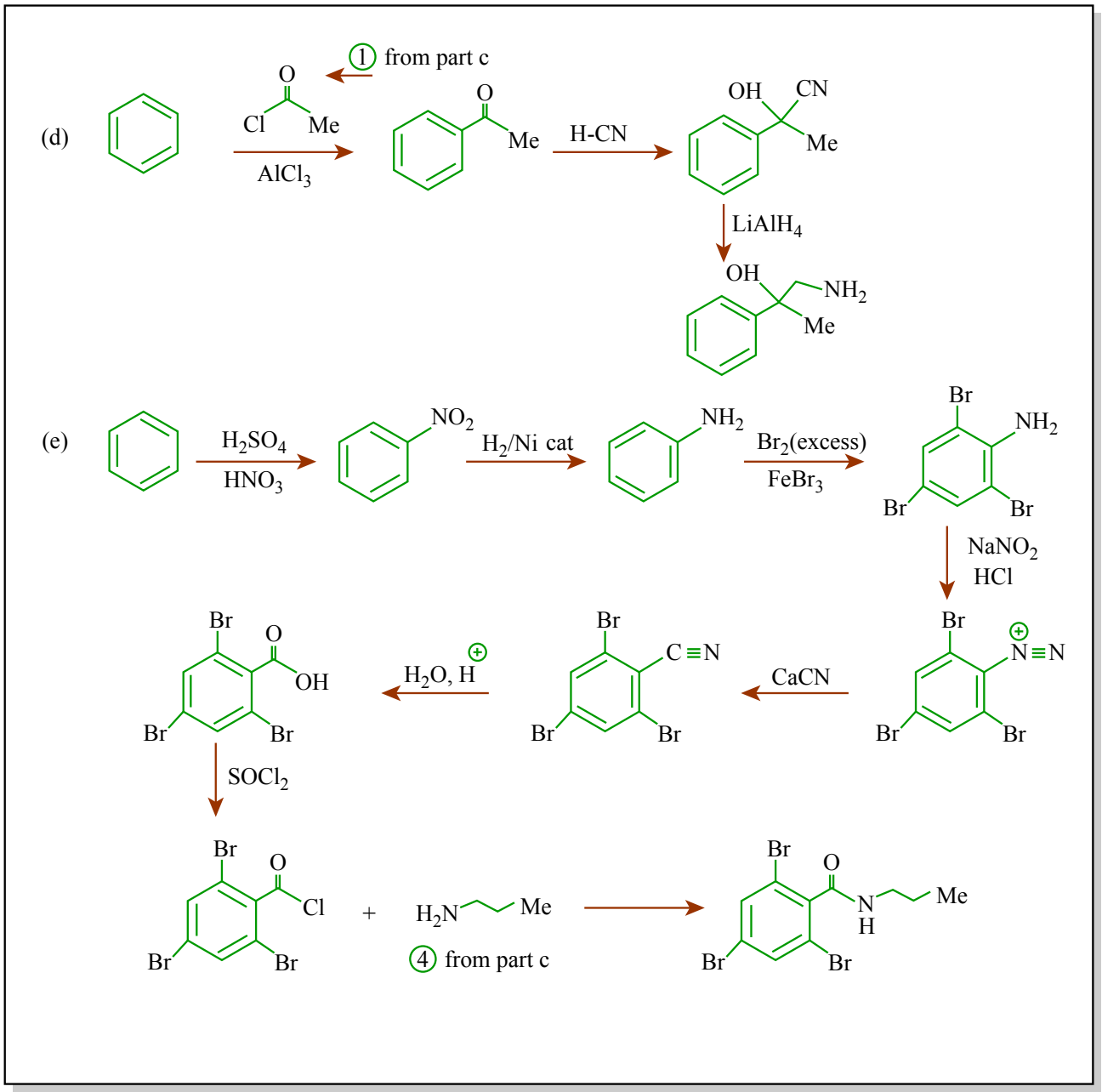

Figure by MIT OCW.

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9. Provide the best stepwise mechanism for the illustrated process. Please show all arrow pushing.

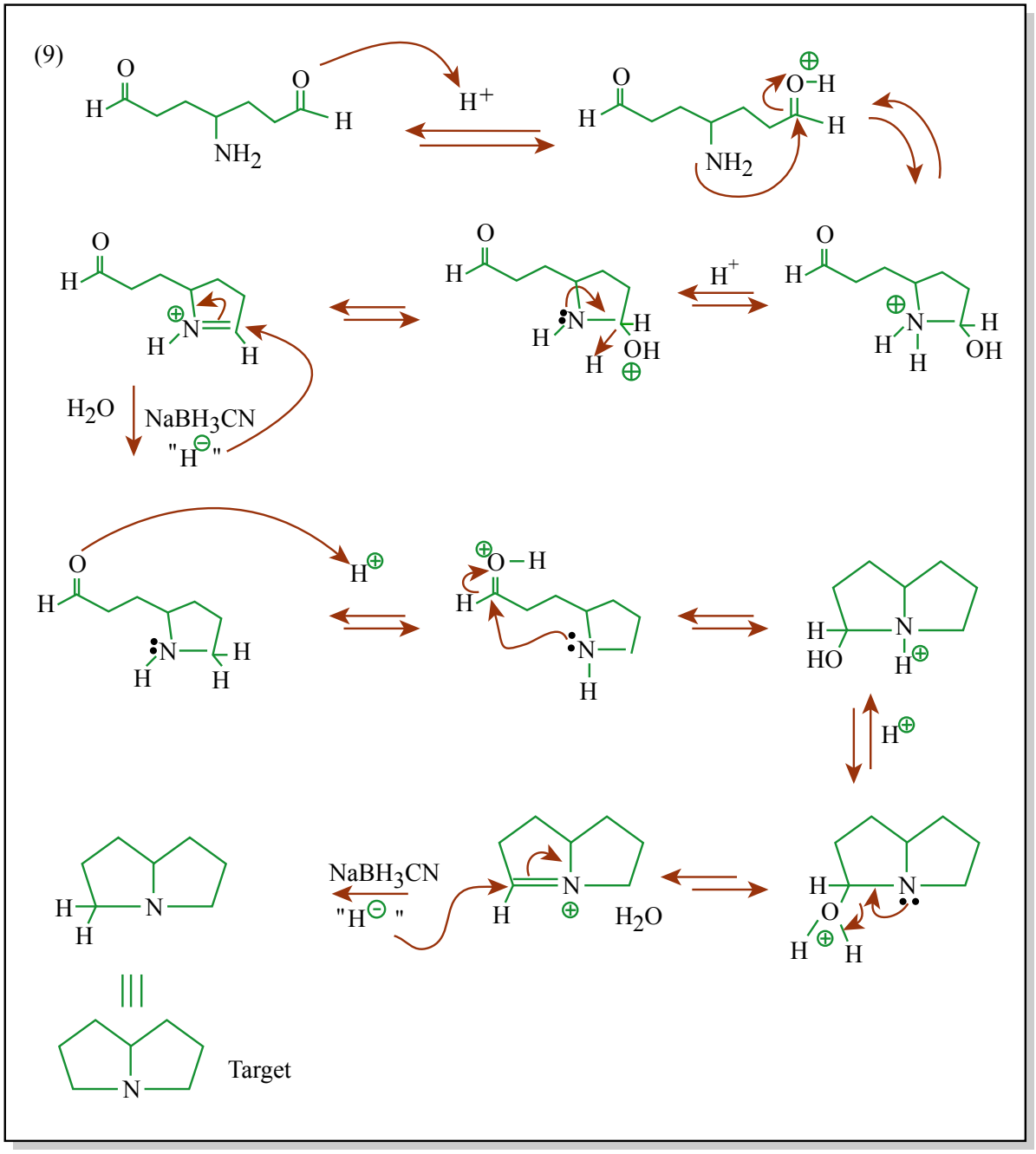

Figure by MIT OCW.

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10. (a) Provide the best mechanism. Please show all arrow pushing.

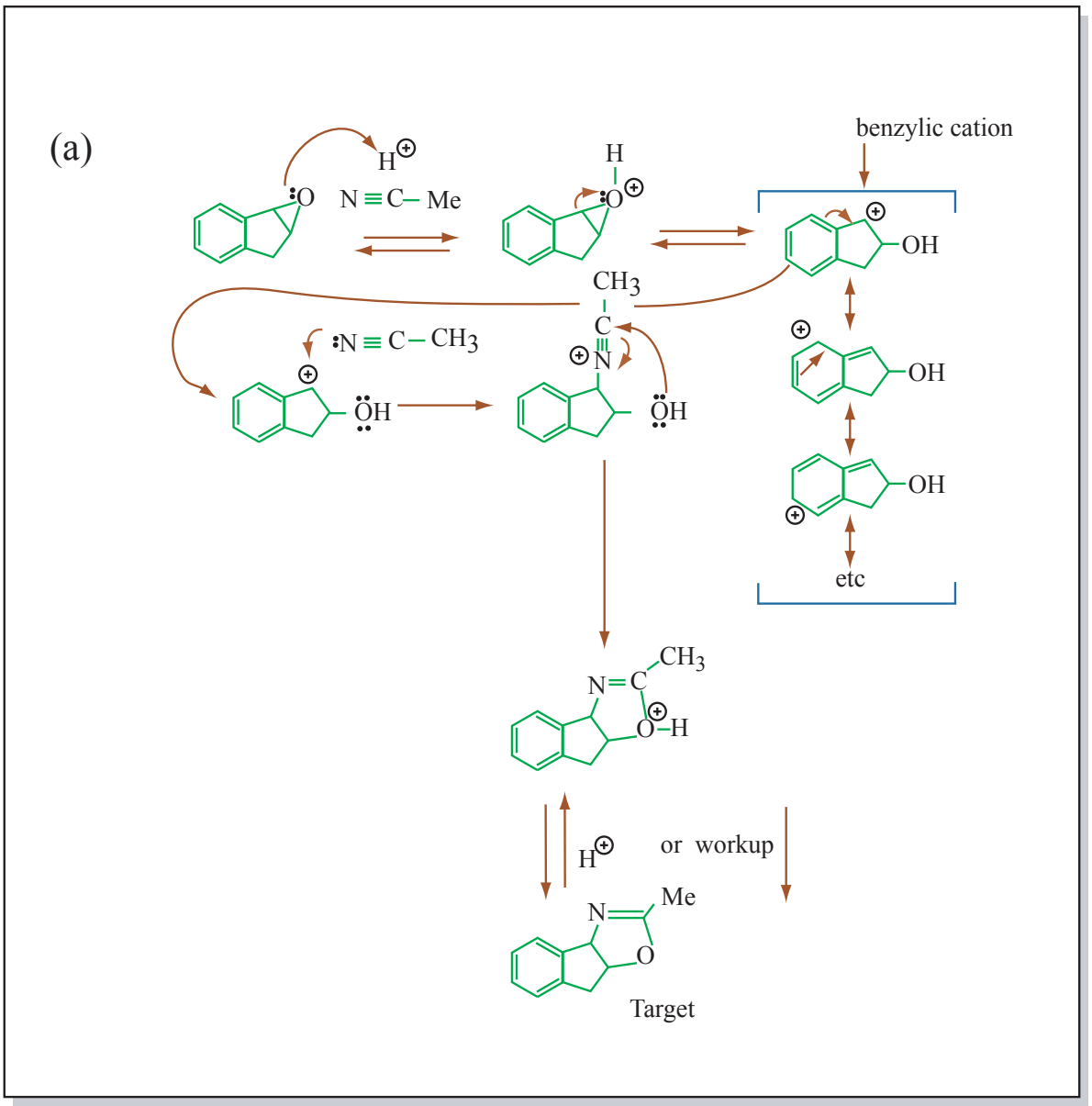

Figure by MIT OCW.

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(b) Provide the best mechanism. Please show all arrow pushing.

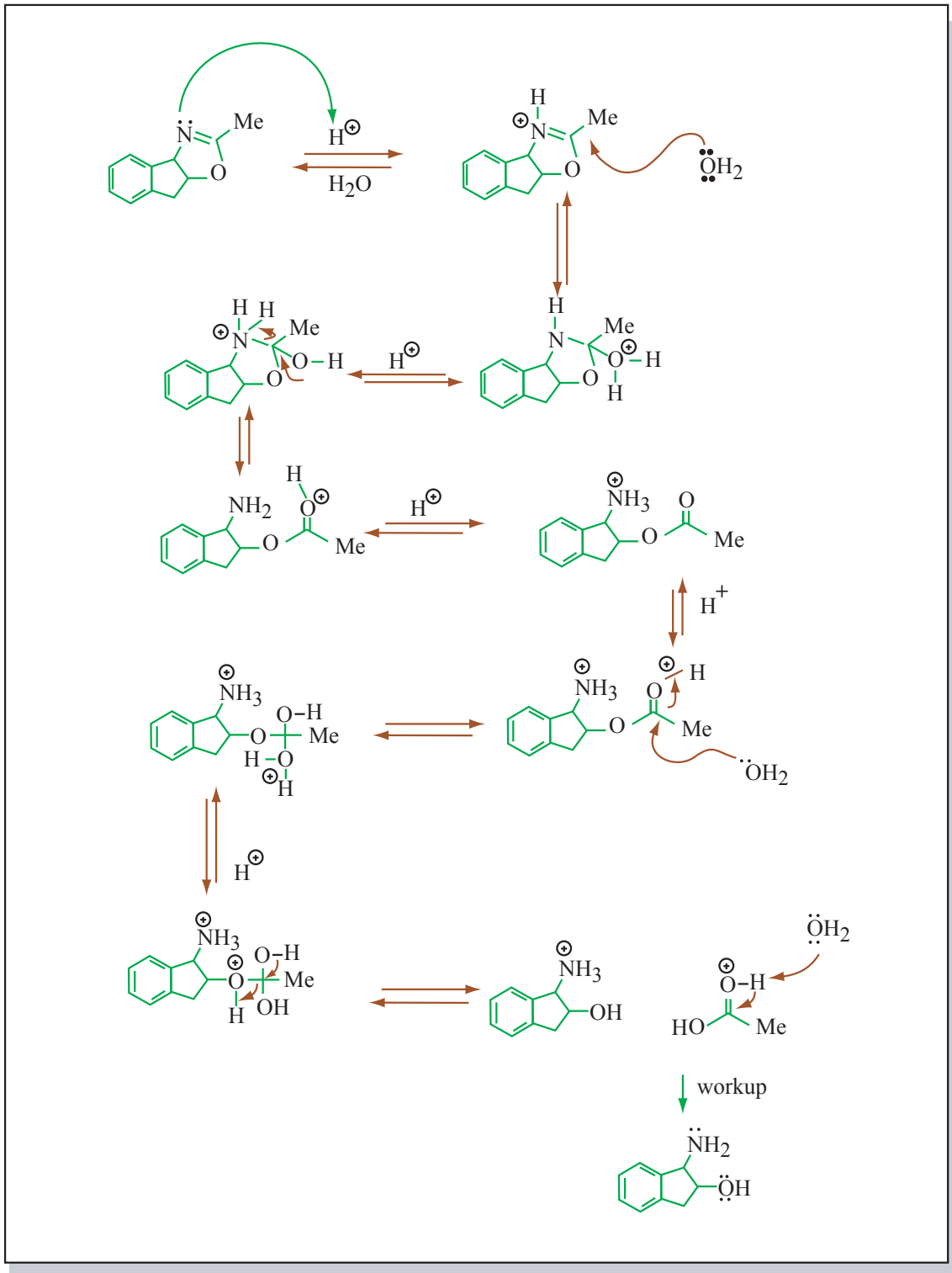

Figure by MIT OCW.

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11. Consider the labeling experiments outlined below:

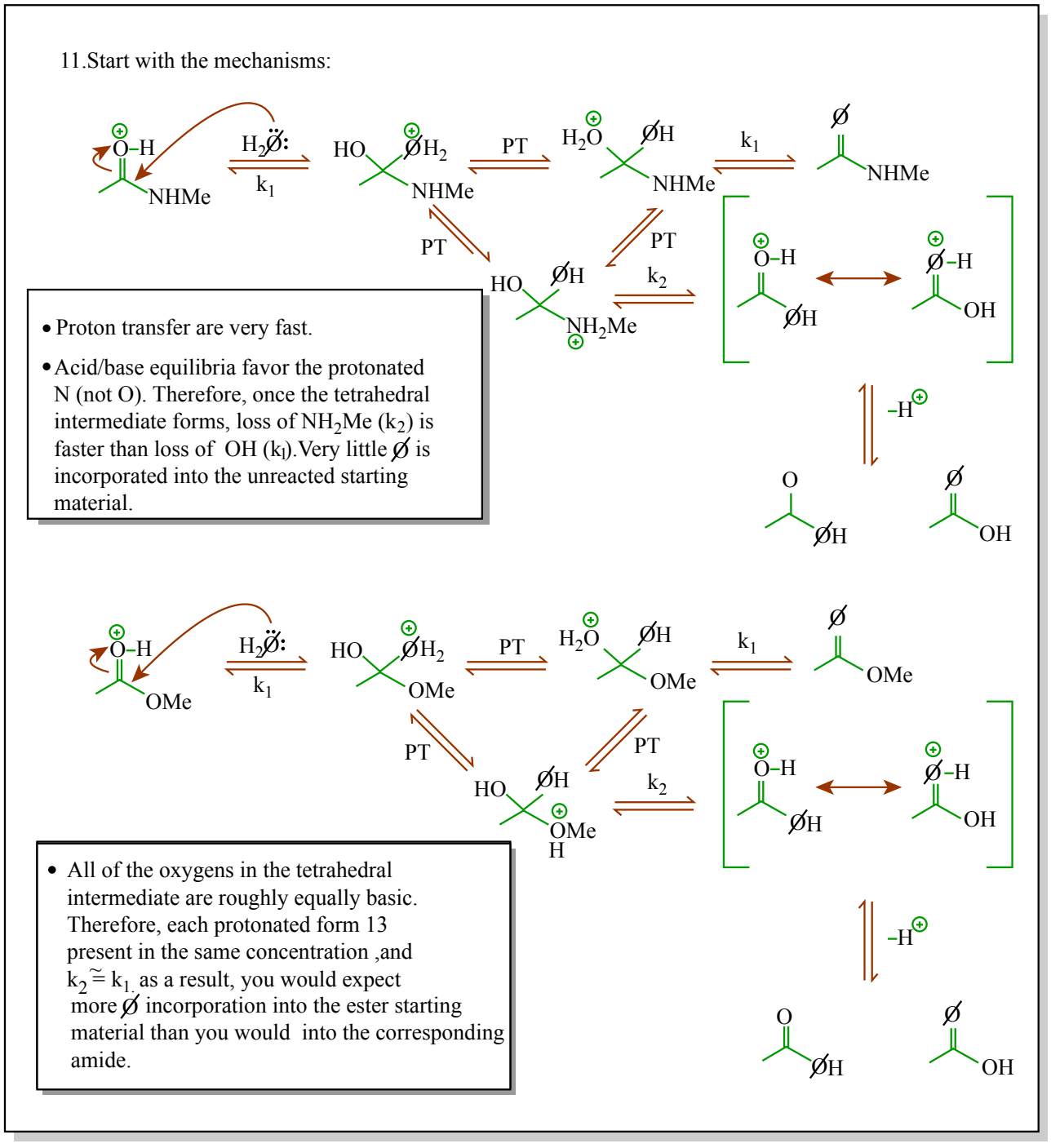

Figure by MIT OCW.

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