Lab Report for Research-Module Scheme 2 Lab Report: Pandemic-Modified

1. You will do theoretical yield, % yield, GC, and NMR analysis on one of the five products **6**. Your specific reaction-analysis assignment is based on the starting letter of your last name:
   Student Last Name Starting Letters:
   - A-B (if your last names starts with an A or a B): Sample **6aa**
   - C-F (if your last names starts with a C, D, E, or F): Sample **6ab**
   - G-K (if your last names starts with a G, H, I, J, or K): Sample **6ac**
   - L-O (if your last names starts with an L, M, N, or O): Sample **6ad**
   - P-Z (if your last names starts with a P or later letter): Sample **6ae**
2. Copy the written procedure for Scheme 1 reaction (**3** → **6**).
3. Insert observations as they occur; or any changes in procedure. (A different font or a different color, so your inserts stand out from copied test, would be nice! ☺)
4. Insert listing of chemicals used; show your mole calculations; identify limiting reactant; and show your theoretical yield calculation. (As per normal report.)
5. Note: make sure your figures are specific to your actual carboxylic acid reactant and actual product 6. (In other words, no generic "R"s are allowed in your pictures! ☺
6. Include final mass and % yield calculation.
7. Make sure that all structures are drawn explicitly.
   - As always for a synthesis style report, you'll want to draw out the reactants and the products. In this case, be sure you draw the **actual** reactant **3a** in your reaction, your actual carboxylic acid reactant, and actual product **6**. (In other words, no generic "R"s are allowed in your pictures! ☺ None of your pictures should have an "R2": you should illustrate each structure with your actual R2 group drawn, whether that's phenyl or 4-methoxyphenyl or whatever.
8. Show all calculations. (Including any mole => mass for reactants, or mass => mole for products)
9. Calculate mass yields, and percent yields, etc., for product **6**.
10. Include your NMR-**6**
    - Be sure to draw your structure, and then provide an abbreviated summary report. This should include a listing of chemical shifts, integrations, and splittings, and a matchup-assignment between signals and hydrogens in the molecule.
    - **Note: you do not need to include impurities/solvents/contaminants in the abbreviated NMR summary report**.
11. Include your GC-MS-**6**, depending on what Dr. Jasperse provides you.
12. Include a results/data/discussion/analysis section. The analysis/discussion section needs to address what the yield information told you, and what the NMR and GC-MS data tells you about both the success and the efficiency of your reaction, and the purity of your product **6**.
13. The results/data/discussion/analysis section should summarize what the mass/yield/NMR/GC-MS data is, and what conclusions can be drawn from them. Just attaching the NMR's and GC-MS's without discussing or showing that you understand them will not be good. What is the summary for the key non-aromatic C-H hydrogens in your NMR? What is your GC-retention time? Between the NMR and the GC, did it look like the product **6** was formed successfully, and does it look reasonably clean? Or is it obviously significantly contaminated?
14. Answer the post-lab questions on the following two pages, and include in your report.

Research Module

Student Last Name Starts with Letters:	Carboxylic Acid Used	Product Produced	Yield of Product	NMR + GC Data URL
A-B	**5a**, p-toluic acid 136 g/mol	**6aa**	3.55 g	http://web.mnstate.edu/jasperse/Chem365/NMR-GC-MS-Toluyl.pdf
C-F	**5b**, Crotonic acid 86.0 g/mol	**6ab**	2.02 g	http://web.mnstate.edu/jasperse/Chem365/NMR-GC-MS-Crotonyl.pdf
G-K	**5c**, Benzoic acid 122 g/mol	**6ac**	3.16 g	http://web.mnstate.edu/jasperse/Chem365/NMR-GC-MS-Benzoyl.pdf
L-O	**5d**, Anisic acid 152 g/mol	**6ad**	3.62 g	http://web.mnstate.edu/jasperse/Chem365/NMR-GC-MS-Methoxy.pdf
P-Z	**5e**, Cinnamic acid 148 g/mol	**6ae**	3.85 g	http://web.mnstate.edu/jasperse/Chem365/NMR-GC-MS-Cinnamoyl.pdf