Before you begin this exam: First: You are allowed to have a simple model set at your seat. Please put away all other materials. Second: Place your student identification on your desk. A proctor will come around to check everyone’s ID. Third: Read through the entire exam. Your goal, as always, is to score as many points as possible. Do not waste time on problems that you can’t do if there are others that look easy. Fourth: READ EACH QUESTION CAREFULLY. Be sure you answer the question that is asked. Fifth: This exam must be turned in by 12:50 PM SHARP. There will be no extensions, so budget your time carefully.

1. 5 points ____
2. 20 points ____
3. 15 points ____
4. 25 points ____
5. 5 points ____
6. 10 points ____
7. 10 points ____
8. 10 points ____

Total: ____
1. (5 points) Fill in the blank: “Hydrolysis of an ester under basic conditions is called ________________.” (one word)

2. (20 points) In each pair of compounds below, circle the one that is the most reactive electrophile in nucleophilic acyl substitution.

3. (15 points) Indicate the most acidic hydrogens in the following compounds.
4. (25 points) Provide the organic product(s) of the reaction below. If you believe that more than one product will be formed (such as ortho, para regioisomers or E, Z-stereoisomers), show both.

a) 

b) 

c) 

d) 

e)
5. (5 points) Heating the diacid below results in decarboxylation of one, but not both carboxylates. Offer a brief explanation as to why the second decarboxylation (and that particular one) step does not occur easily. One or two sentences, and perhaps a drawing, will be plenty. *Do not exceed the space provided.*

![Diagram](image)

6. (10 points) What reagents would you use to carry out the transformations below? Be aware that you need to select reagents that will only affect the specific functional groups. More than one step may be required - denote separate steps as 1) reagents a; 2) reagents b; etc. Please include workup steps, where needed.

a)

![Diagram](image)

b)

![Diagram](image)
7. (10 points) Draw a detailed, viable, stepwise mechanism for the reaction shown below. *Be careful with your use of mechanism arrows. Show each protonation-deprotonation step (proton transfer) in full detail.*

\[
\text{O} \quad \text{NaOH, H}_2\text{O} \quad \text{O} \\
\text{OH} \quad \text{C}_8\text{H}_{12}\text{O}_2 \quad \text{C}_8\text{H}_{12}\text{O}_2
\]

8. (10 points) Show how diethyl malonate can be converted into the compound shown below. You can use diethyl malonate, inorganic reagents, and any organic reagents of 4 carbons or less.

\[
\text{EtO}_2\text{C}-\text{C}_2\text{H}_4\text{O}_2\text{Et} \quad ?? \quad \text{EtO}_2\text{C}-\text{C}_2\text{H}_4\text{O}_2\text{Et}
\]