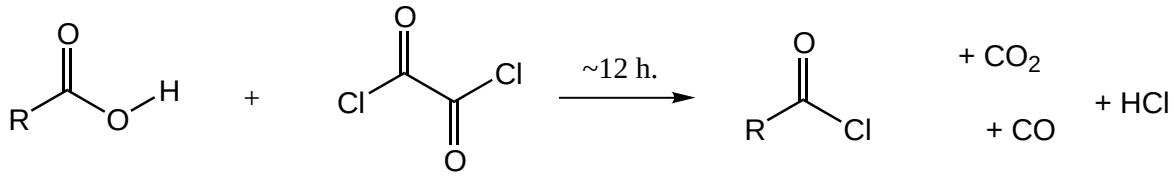
Organic Chemistry c3444y

Problem Set 6 - Carboxylic Acids and Derivatives and β-dicarbonyls

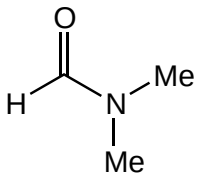
Relevant Reading: 20.2-20.5, 21.1-21.8, 21.11(IR), 22.8, 23.8-23.10 and Chap. 24 up through 24.6.

Relevant Book Problems: 21.40, 21.45, 21.46, 21.56, 21.60, 21.65, 22.26a,b,d, 22.29, 22.30, 22.35, 23.38, 23.43.

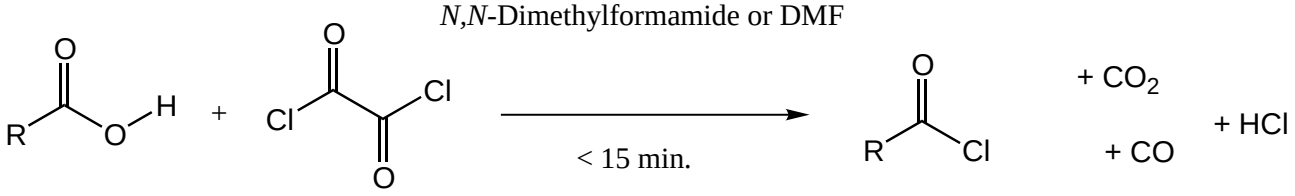
1. We saw in class a way to synthesize acid chlorides from acids. Here is another. Provide a mechanism.



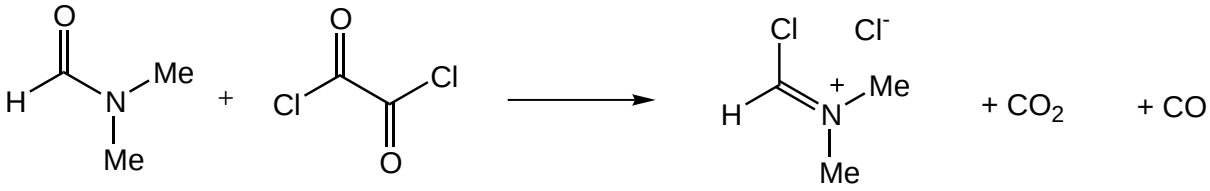
Although this is a nice way to make acid chlorides, the reaction can be rather slow requiring 12 hours or more. It has been found that the addition of a catalytic amount of DMF catalyzes this reaction by several orders of magnitude, such that it will generally be done in less than 15 min.

Catalytic Amount of 

N,*N*-Dimethylformamide or DMF

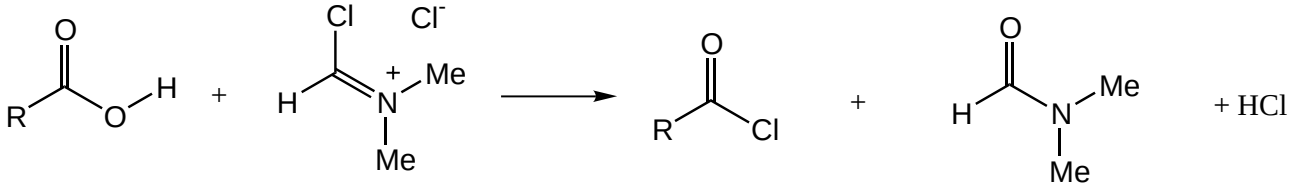


The DMF first reacts with the oxalyl chloride to produce:



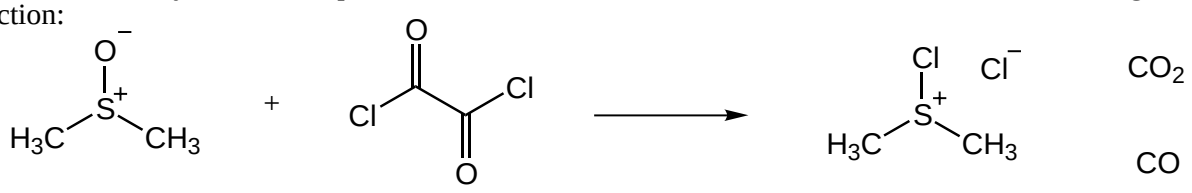
a. Write a plausible mechanism for this transformation.

In the second part of the reaction, the following reaction occurs, and the DMF is regenerated:

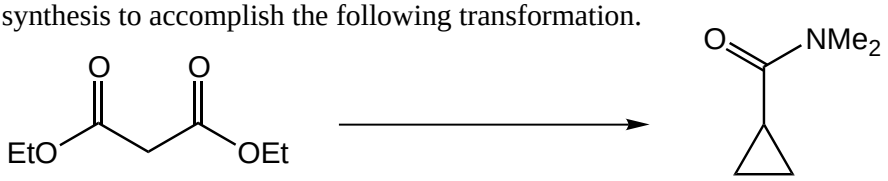


b. Write a plausible mechanism for this transformation.

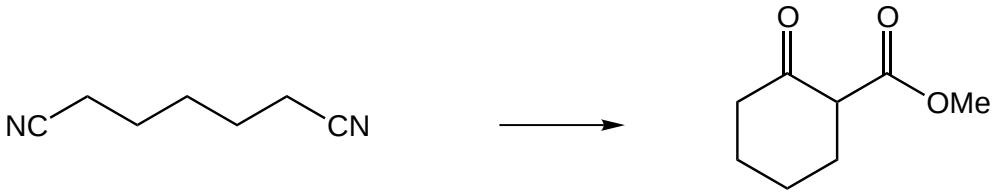
2. You are now ready for the first part of the Swern oxidation. Provide a mechanism for the following reaction:



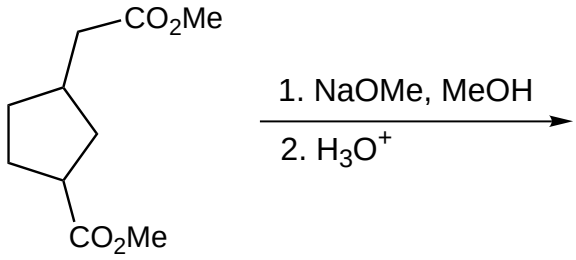
3. Propose a synthesis to accomplish the following transformation.



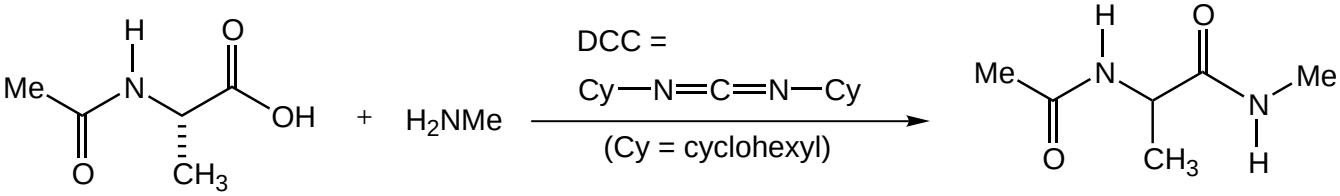
4. Propose a synthesis of the following β-ketoester from the illustrated dinitrile.



5. Predict the major product of the following reaction sequence:



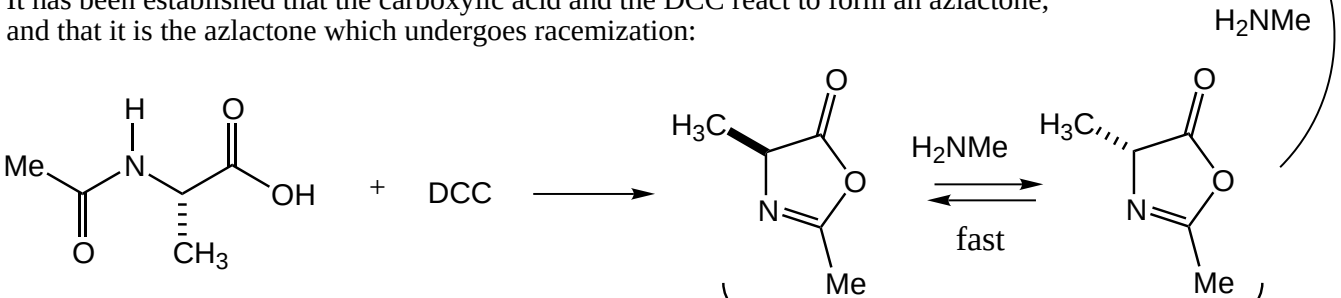
6. It has been observed that the illustrated carboxylic acid can undergo racemization during DCC-mediated amide synthesis:



Enantiomerically pure

Racemic!

It has been established that the carboxylic acid and the DCC react to form an azlactone, and that it is the azlactone which undergoes racemization:



Azlactone

Provide a mechanism for the formation of the azlactone, and then for the reaction of the azlactone with the methylamine to give the final amide product.

For even more fun, write a mechanism for the racemization process (the amine is necessary!), and provide an explanation as to *why* the racemization is so fast with the azlactone.