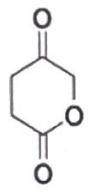
Ester-Enolates: Reactions, Concepts, and Synthesis Practice

Hey, gang! Welcome to the worksheet for the ester-enolates unit. This is the only worksheet for this section, and you know what that means: I'm throwing everything at you.

We'll hit some complete the reaction, concept, mechanism, and synthesis questions aiming to practice all the fun new chemistry from this chapter; however, I'll be sure to weave in some old stuff as well. If you're confused at all, make sure to check out the worksheet solution walkthrough. Otherwise, good luck, you got this, and check out the solutions walkthrough if anything is confusing ☺!

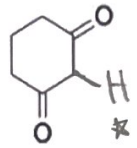
1.) Let's get started with some concept questions, and you know what that means: It's acid-base time!

a.) Given the following three molecules, rank them 1 – 3 with 1 being the **weakest acid** and 3 being the **strongest acid**.



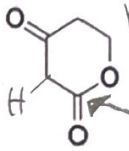
no dicarbonyl, so least acidic

1



dicarbonyl

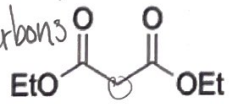
3



dicarbonyl, but ester reduces δ+ on carbonyl carbon

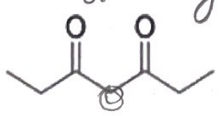
2

b.) Given the following four molecules, rank them 1 – 4 with 1 being the **weakest acid** and 4 being the **strongest acid**.



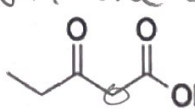
diester, so δ+ on carbonyl carbons is smaller

2



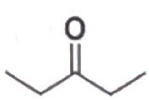
dicarbonyl

4



dicarbonyl but with one ester

3



no dicarbonyl

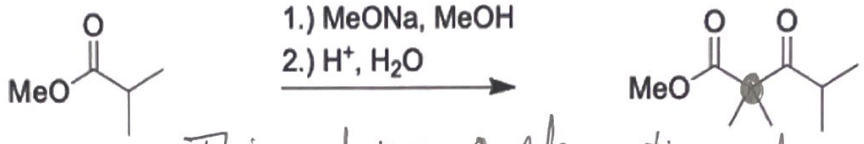
1

c.) Okay, let's shift away from ranking acids.

In this next problem, for each reaction displayed below, you need to:

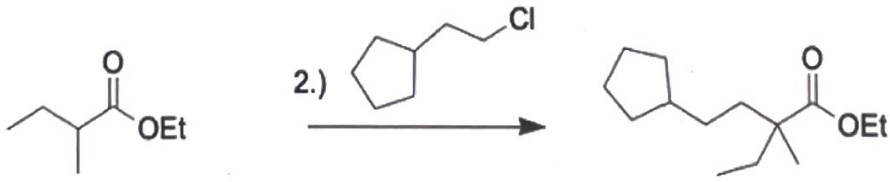
- Decide if the reaction would **actually** happen in real life or if there's an issue with it. Label each reaction by circling either ☑ (aka successful) or ✗ (aka unsuccessful)
- If you mark a reaction with an ✗, provide a brief explanation as to why the reaction is flawed.

☑ ✗



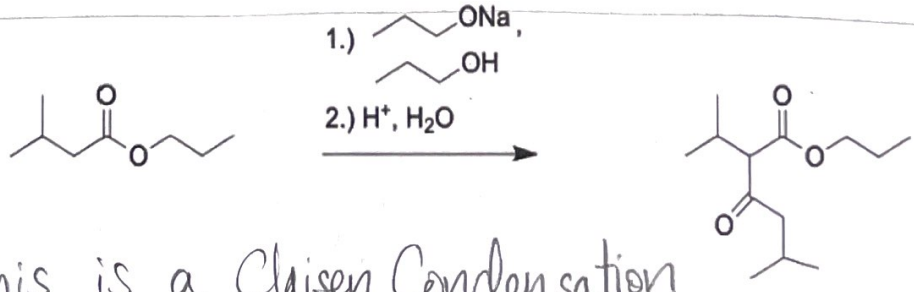
This claisen condensation doesn't occur because the final, necessary acid base rxn can't occur because the • Carbon is quaternary (no H present)

☑ ✗



This is just a straight forward SN2 rxn, alkylation of the α Carbon

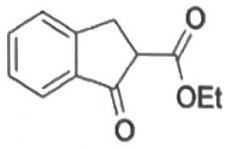
☑ ✗



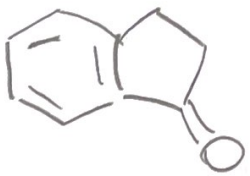
This is a Claisen Condensation

2.) Okay—enough of looking at reactions, let's complete some! For the reactions below, you know the drill: either complete the reaction by predicting the major organic product, providing the reactant(s), or providing the reagent(s).

decarboxylation

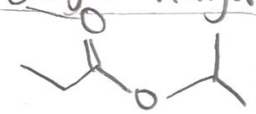


1.) $NaOH$, H_2O
2.) H_3O^+, heat (Δ)

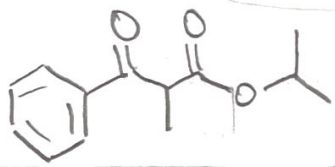


Baeyer-Villiger

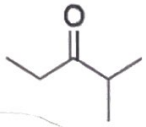
1.)



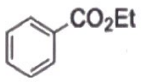
2.)
3.)
4.)



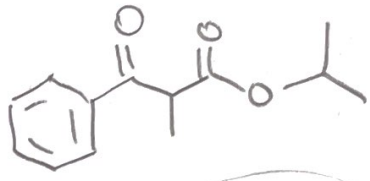
Claisen-Cond.



1.) CH_3CO_3H
2.) EtONa, EtOH
3.)

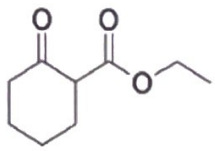


4.) $H+$, H_2O



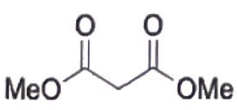
Provide reactant(s)

EtONa, EtOH

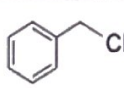


Diekmann Condensation

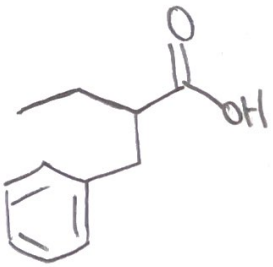
Malonic Ester Synthesis



1.) MeONa, MeOH
2.) EtBr
3.) MeONa, MeOH
4.)

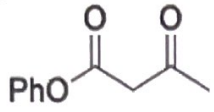


5.) H_3O+, heat (Δ)

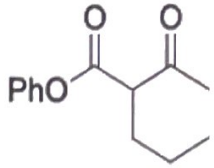


Alkylation of α carbon

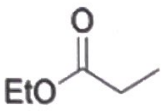
1.) 

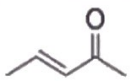


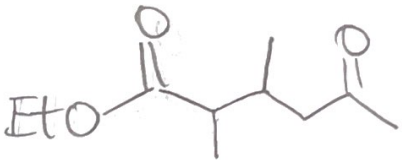
1.) PhOH, PhONa
2.) 
Provide reagents



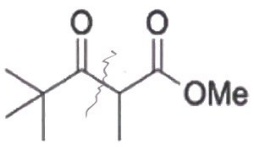
Michael Addition



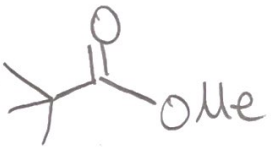
1.) 
2.) 



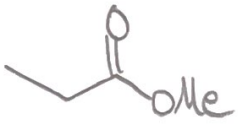
Retro Claisen Condensation



1.) MeONa, MeOH
2.) H^+, H_2O

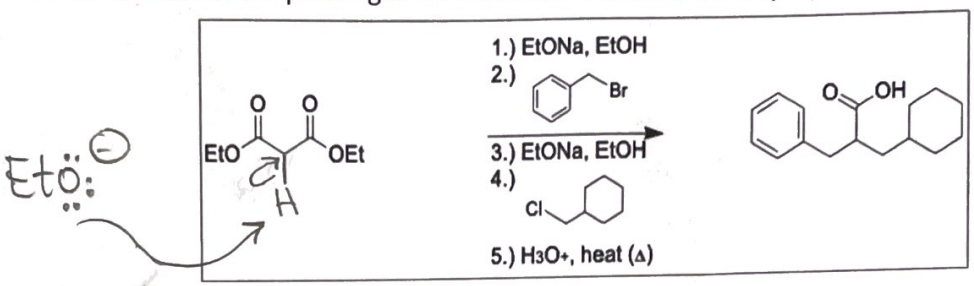


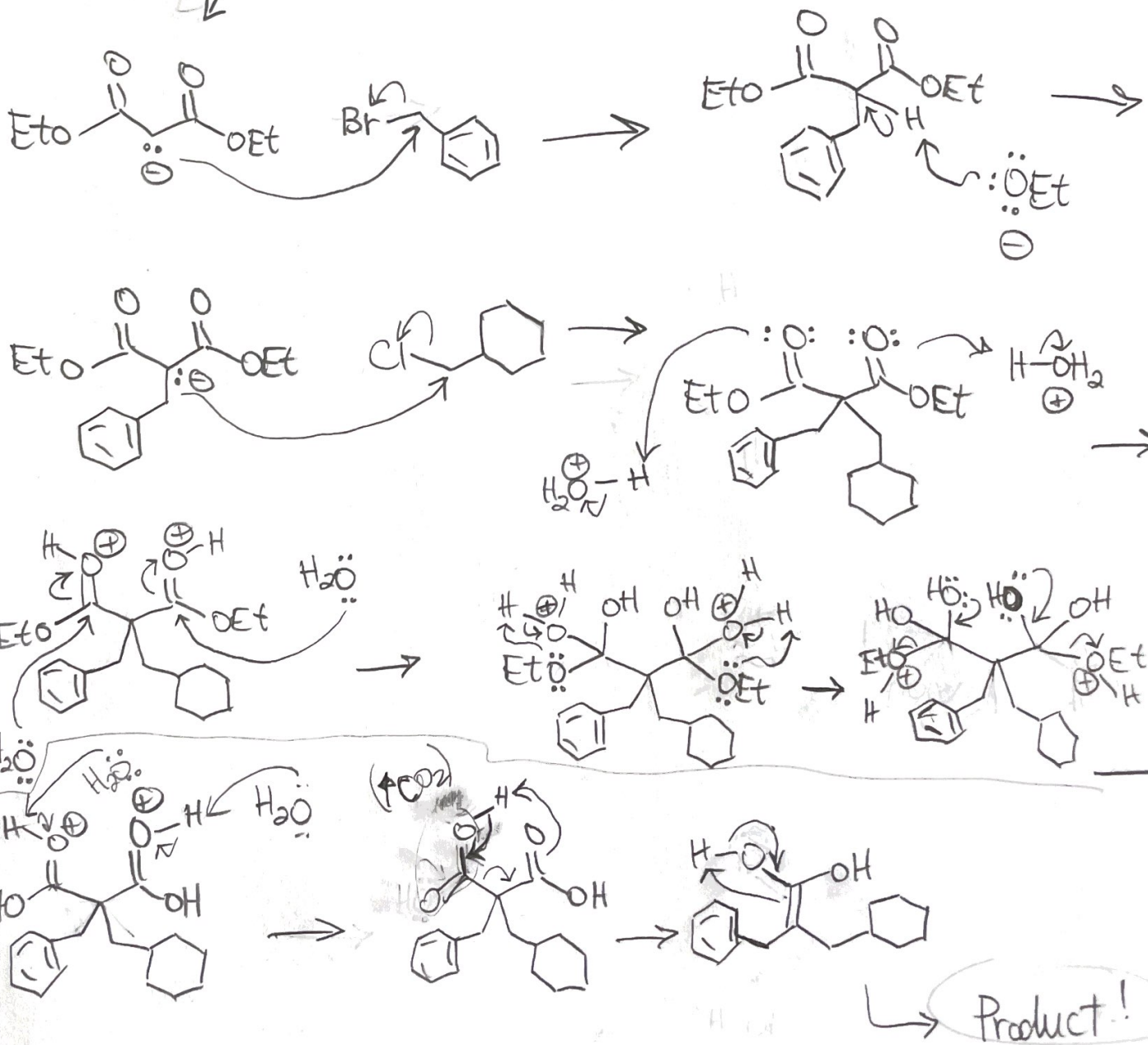
+



3.) Alrighty-roo. Now that we've completed *plenty* of reactions, let's get our mechanism caps on. And I'm going to apologize in advance...it's going to be a malonic ester synthesis mechanism question here.

Draw the full arrow pushing mechanism for the reaction displayed below:





4.) Okay, gang. We've made it past concept, reaction, and mechanism questions. So to close out this worksheet, let's end with a synthesis question ☺. You got this.

Using ethanol as your only carbon source, synthesize 2-petanone.