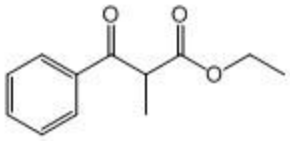
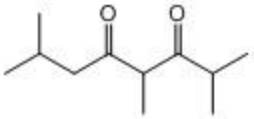
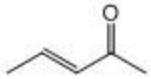
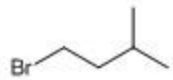
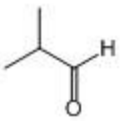
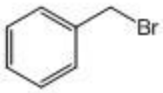
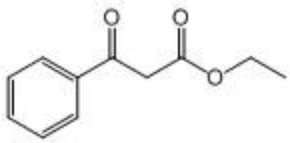
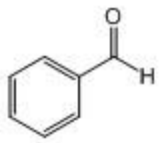
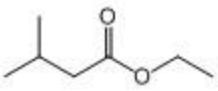
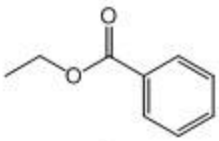
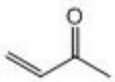
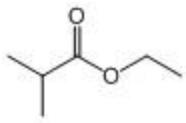
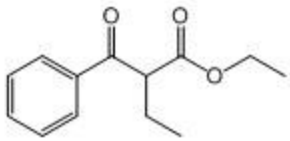
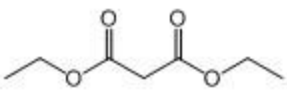
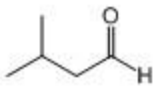
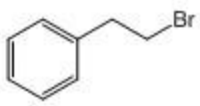
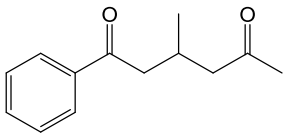
Use retrosynthesis to provide the starting materials and name of reaction for each product. Each letter (A-P) can be used any number of times or not at all.

 A	 B	 C	 D
 E	 F	 G	 H
 I	 J	 K	 L
 M	 N	 O	 P

Possible Reaction Names:

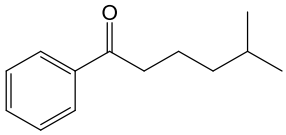
Aldol Condensation (with Dehydration)
Claisen Reaction
Acetoacetate Synthesis
Malonic Ester Synthesis
Michael Addition – Malonic Ester Synth
Michael Addition – Acetoacetate Synth
Robinson Annulation

Use retrosynthesis to provide the starting materials and name of reaction for each product. Each letter (A-P) can be used any number of times or not at all.

i) 

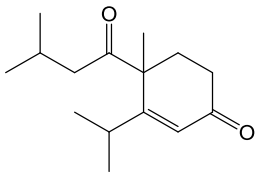
Starting materials: C + G

Reaction Name: Michael Addition – Acetoacetate Synth

ii) 

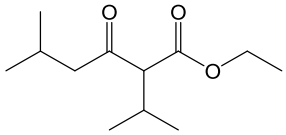
Starting materials: D + G

Reaction Name: Acetoacetate Synthesis

iii) 

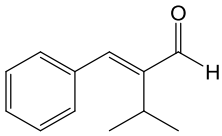
Starting materials: B + K

Reaction Name: Robinson Annulation

iv) 

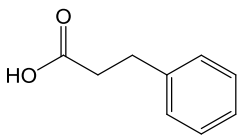
Starting materials: I + I

Reaction Name: Claisen Reaction

v) 

Starting materials: H + O

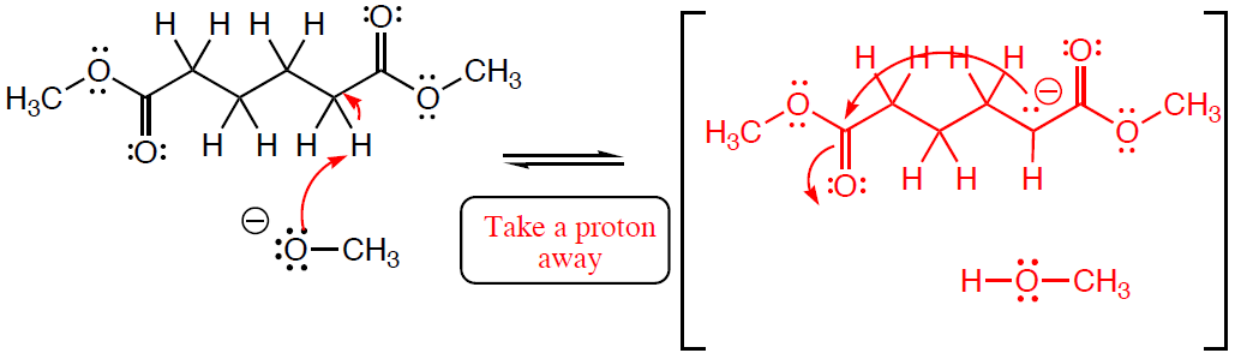
Reaction Name: Aldol Condensation

vi) 

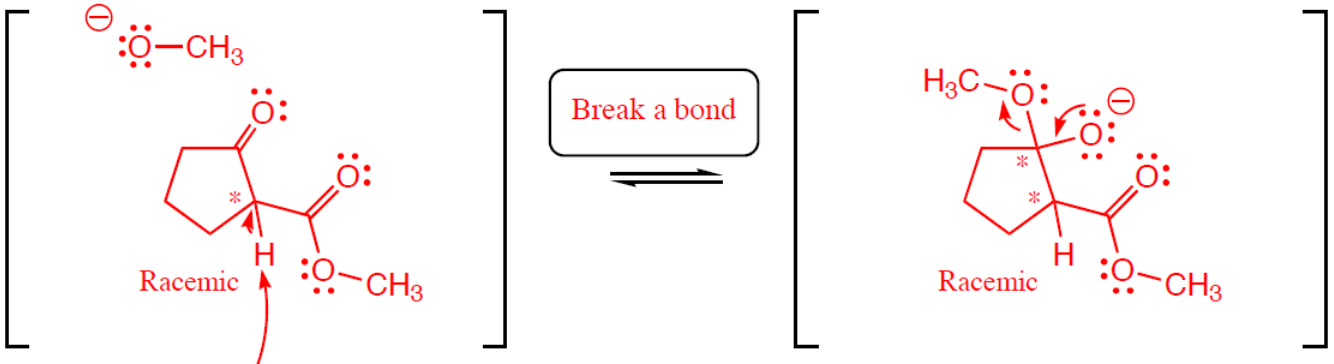
Starting materials: F + N

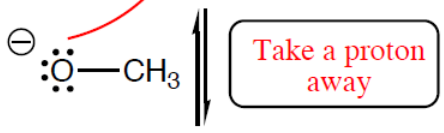
Reaction Name: Malonic Ester Synthesis

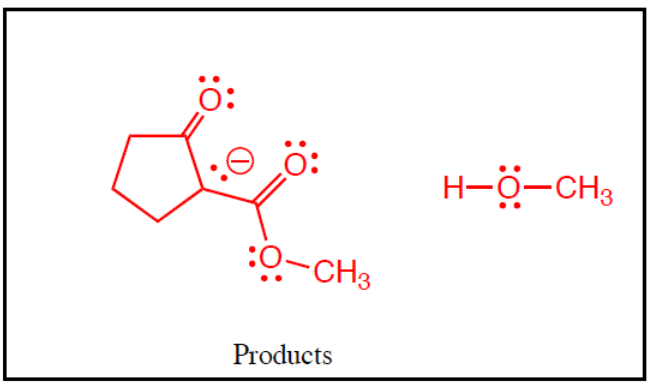
(23 pts) Complete the mechanism for the following Dieckmann reaction. Be sure to show arrows to indicate movement of all electrons, write all lone pairs, all formal charges, and all the products for each step. Remember, I said all the products for each step. IF A NEW CHIRAL CENTER IS CREATED IN AN INTERMEDIATE OR THE PRODUCTS, MARK IT WITH AN ASTERISK AND LABEL AS "RACEMIC" IF RELEVANT. IN THE BOX BY EACH SET OF ARROWS, WRITE WHICH OF THE 4 MECHANISTIC ELEMENTS IS INDICATED IN EACH STEP OF YOUR MECHANISM (For example, "Add a proton").



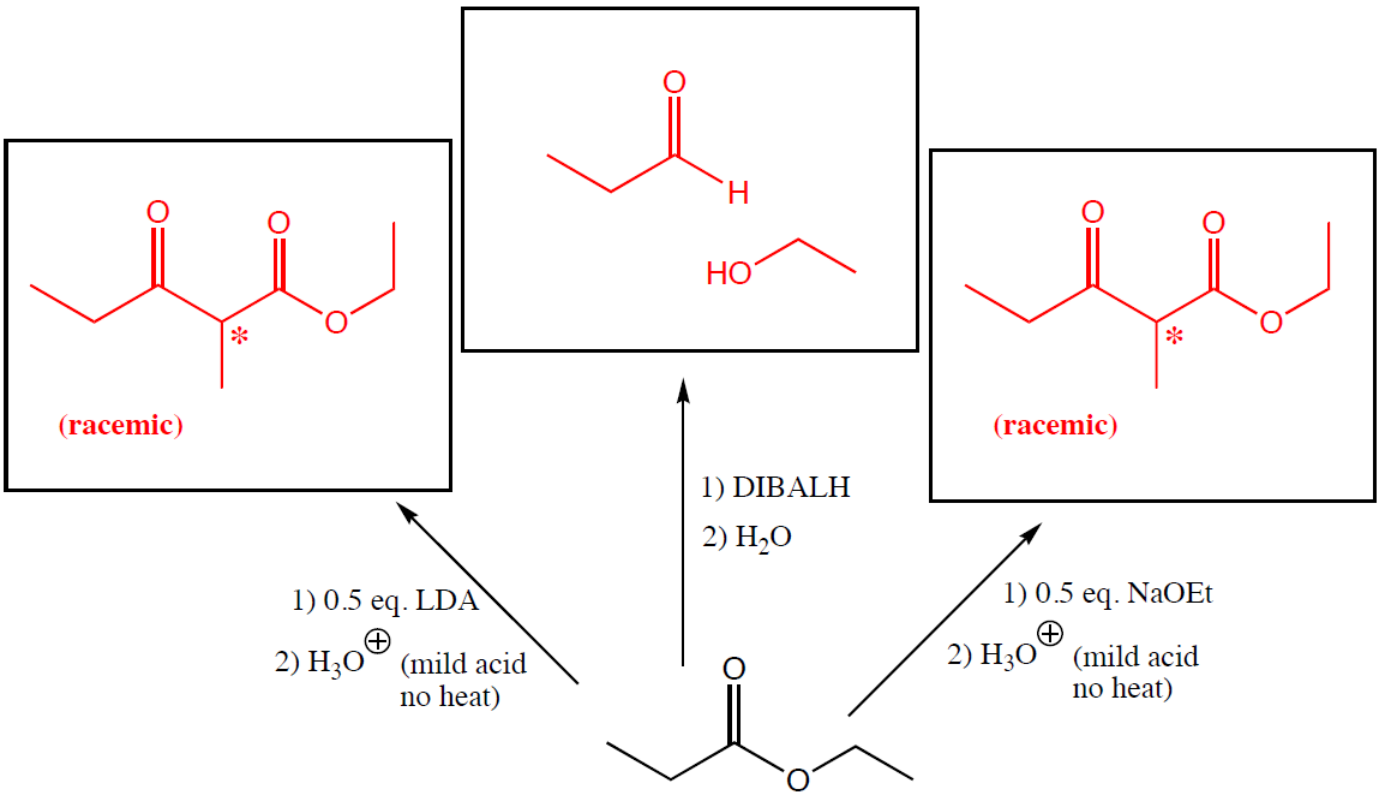
Make a bond

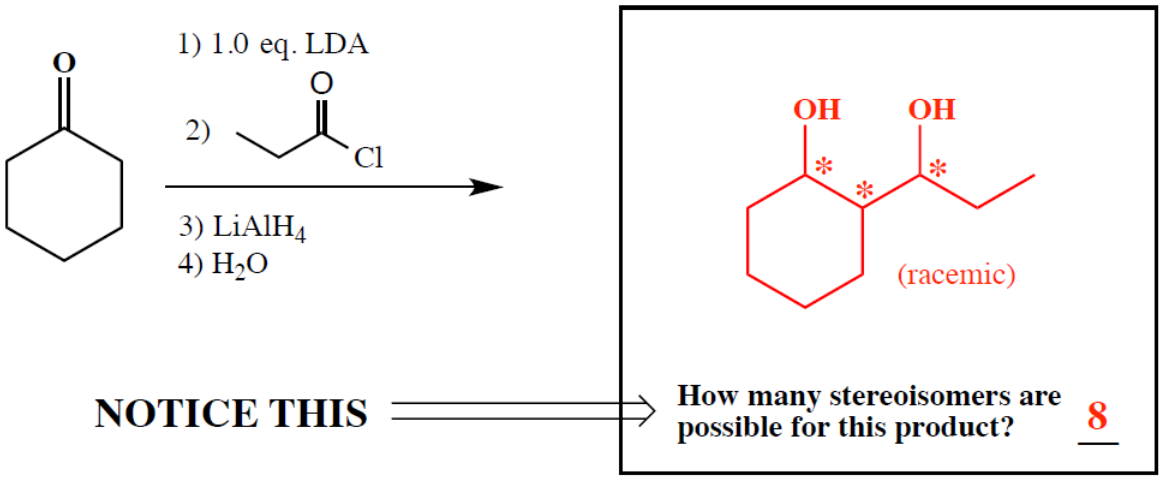






(3 or 5 pts each) For the following reactions, draw the predominant product or products. **When a new chiral center is created, mark it with an asterisk (*) and if a racemic mixture is produced, you must write "racemic" under your structure. If an E,Z mixture is produced as the result of a dehydration step, write "E,Z mixture", but you only have to draw one isomer, not both.** These directions are different than you may have seen before, and are intended to make it easier for you. You should read them again so you know what we want.





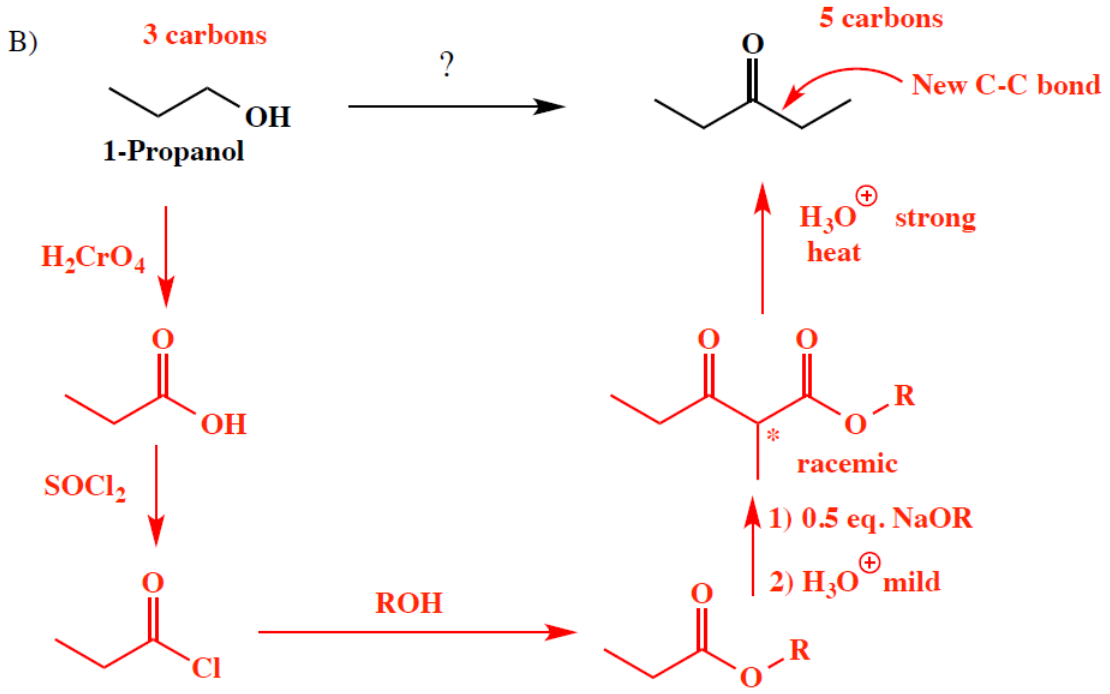
NOTICE THIS ⟹ **How many stereoisomers are possible for this product?** **8**

Using any reagents turn the starting material into the indicated product. All carbon atoms inthe product must come from the starting material. Draw all molecules synthesized along the way. When in doubt, draw the molecule! Label all chiral centers with an asterisk (*) and make sure to right "Racemic" where appropriate. You will notice a theme in these problems in that you will be starting with very simple structures and making more complex products.

Remember, all of the carbons of the product must come from the given starting material.

(13 pts)

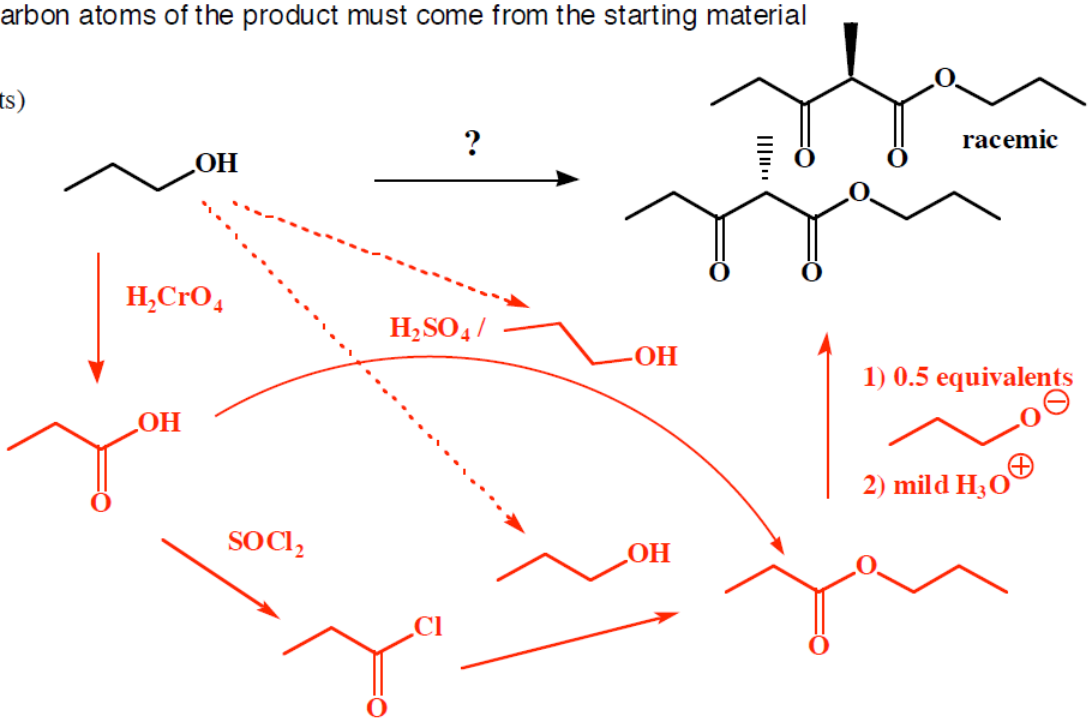
B)



Recognize there are 5 carbons in the product, but 3 carbons in the starting material so, 2 molecules of starting material must be assembled into the product (minus 1 carbon) with the location of the new C-C bond as shown. Losing 1 carbon indicates a decarboxylation. **Recognize** further the final product as a symmetrcial ketone, the KRE of a Claisen reaction followed by ester hydrolysis/decarboxylation. **Recognize** that the Claisen product can be derived from a three carbon ester, that can be made from the three carbon alcohol starting material using chromic acid followed by $SOCl_2$ and reaction with an alcohol. Because the alcohol does not show up in the product, any alcohol can be used and I indicated that by designating the alcohol as ROH.

All the carbon atoms of the product must come from the starting material

(10 pts)



(7 pts)