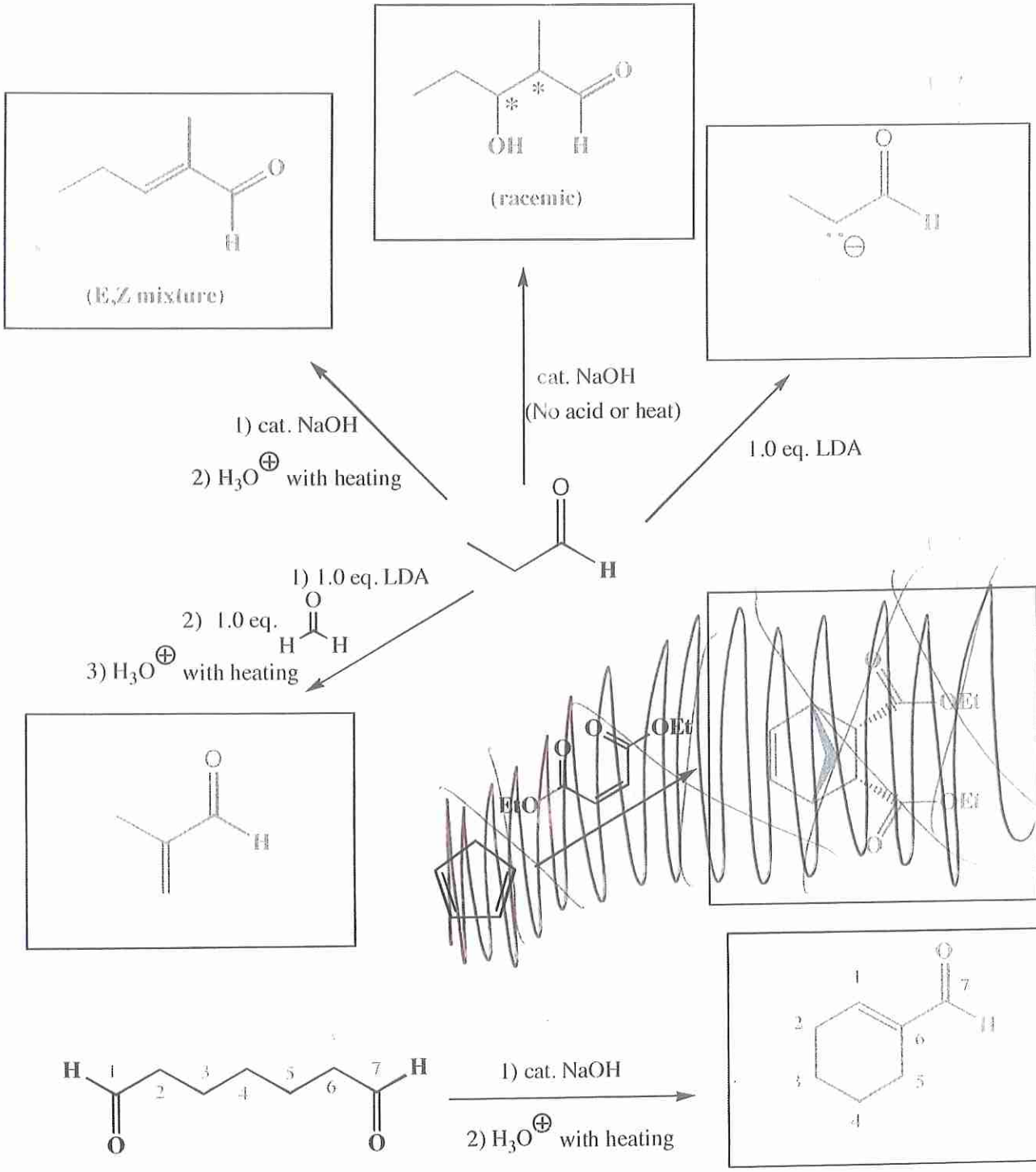
13. (3 or 5 pts each) For the following reactions, draw the predominant product or products. **When a new chiral center is created, mark it with an asterisk (*) and if a racemic mixture is produced, you must write "racemic" under your structure. If an E,Z mixture is produced as the result of a dehydration 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.



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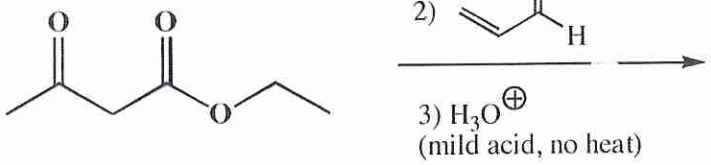
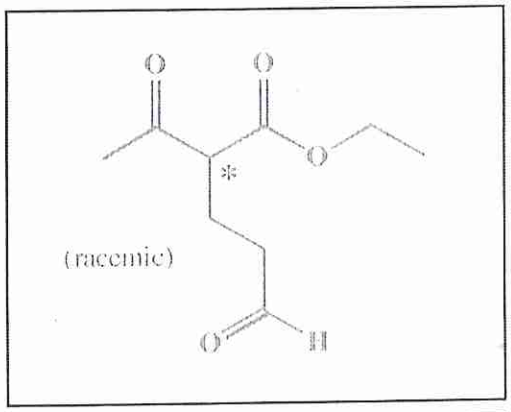
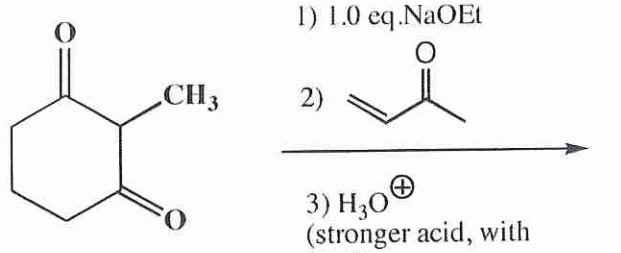
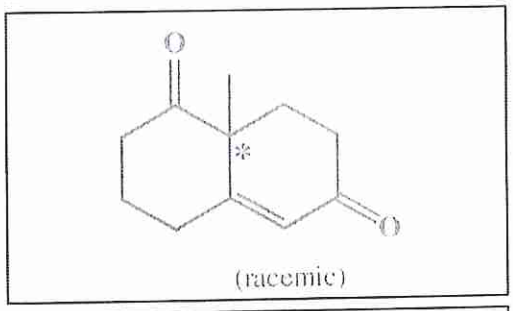
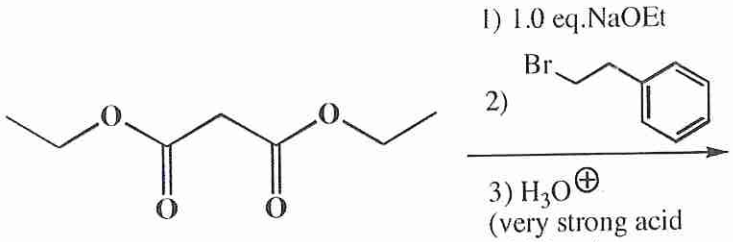
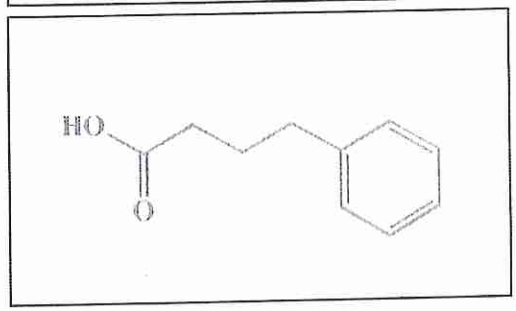


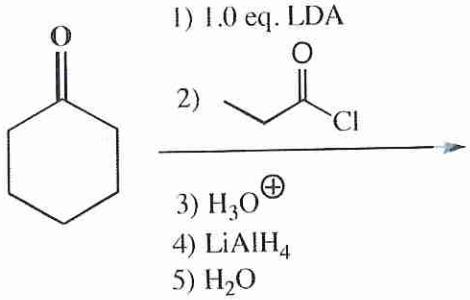


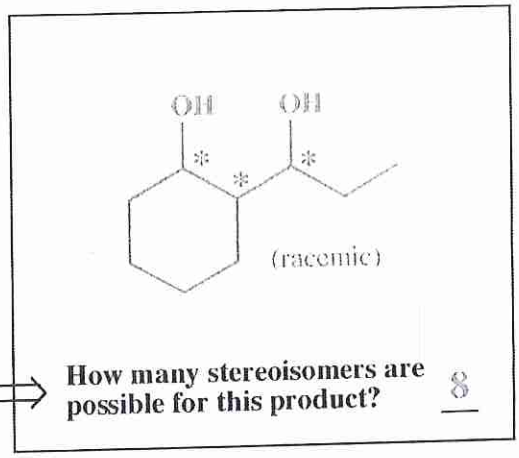








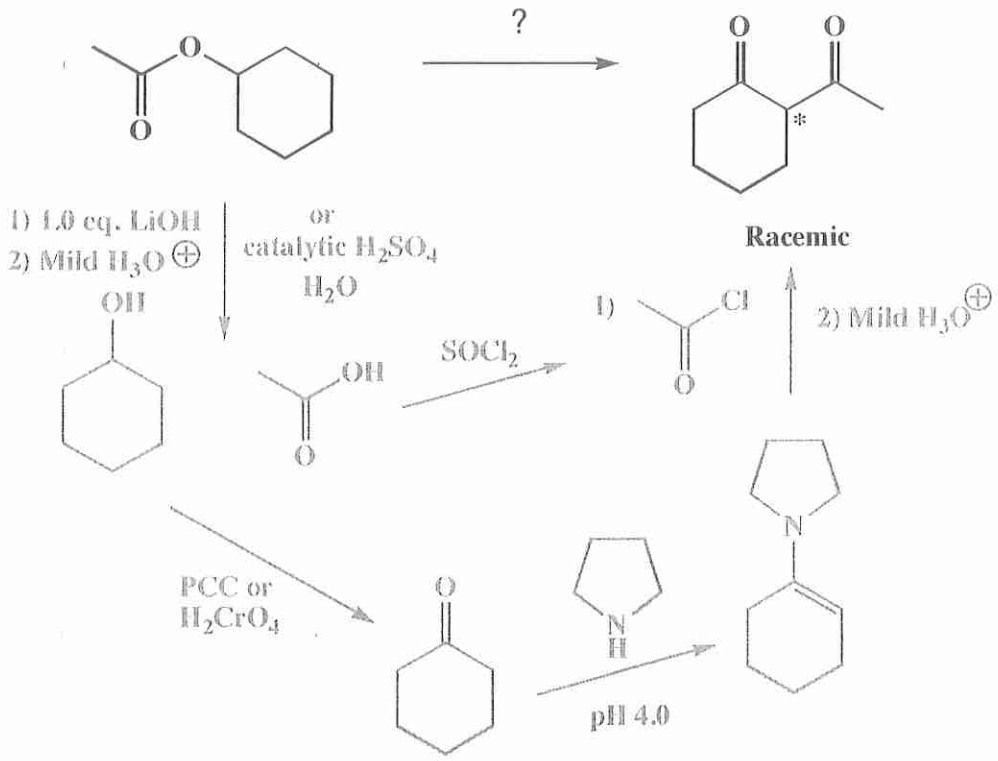




NOTICE THIS ⟹

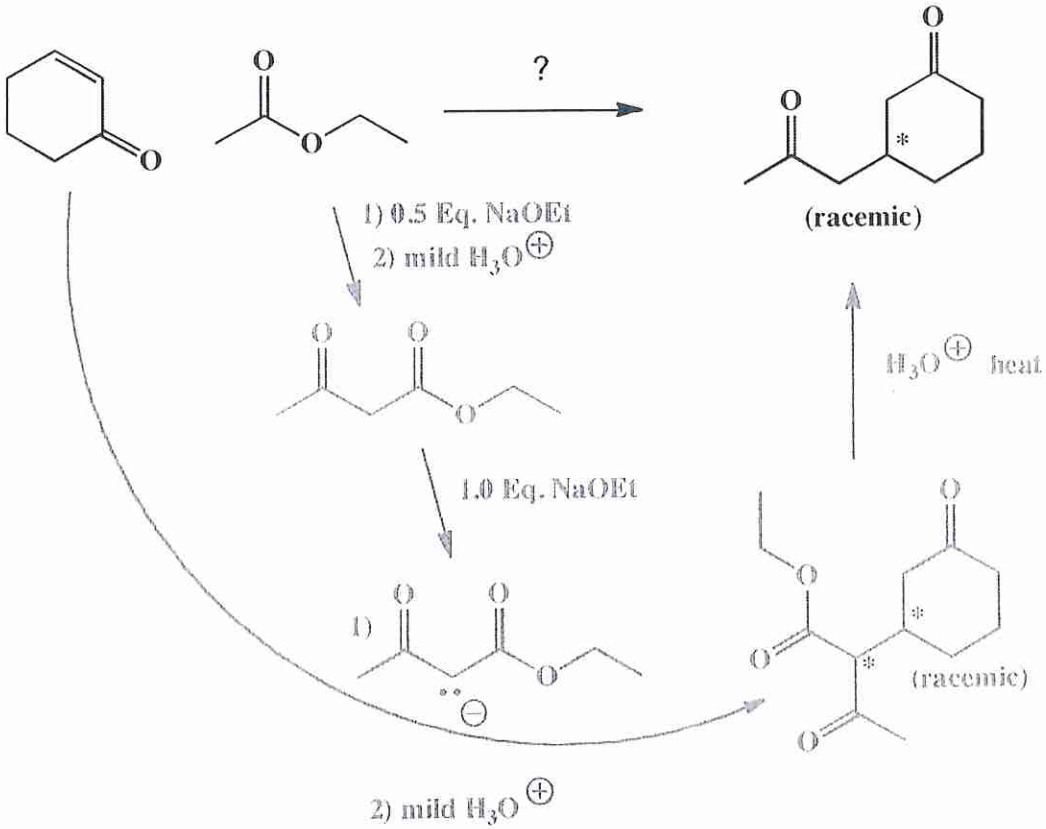
16. (13 pts) Using any reagents turn the starting material into the indicated product. All carbon atoms must come from the starting materials. Draw all molecules synthesized along the way. When in doubt, draw the molecule! Label all chiral centers with an asterisk (*) and make sure to right "Racemic" where appropriate.

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



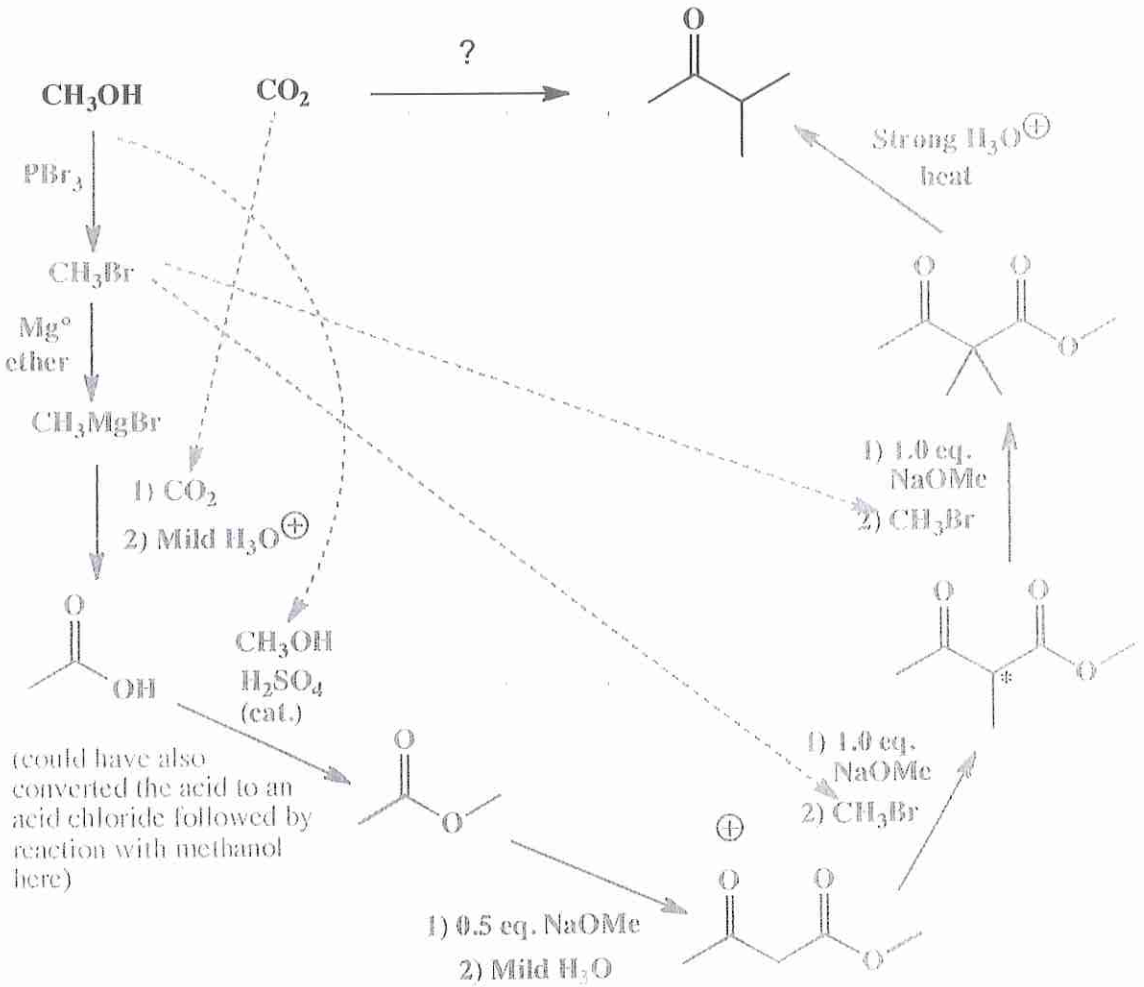
14. (9 pts) Using any reagents turn the starting material into the indicated product. All carbon atoms must come from the starting material. Draw all molecules synthesized along the way. When in doubt, draw the molecule! Label all chiral centers with an asterisk (*) and make sure to right "Racemic" where appropriate.

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



14. (cont. 22 pts) Using any reagents turn the starting material into the indicated product. All carbon atoms 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.

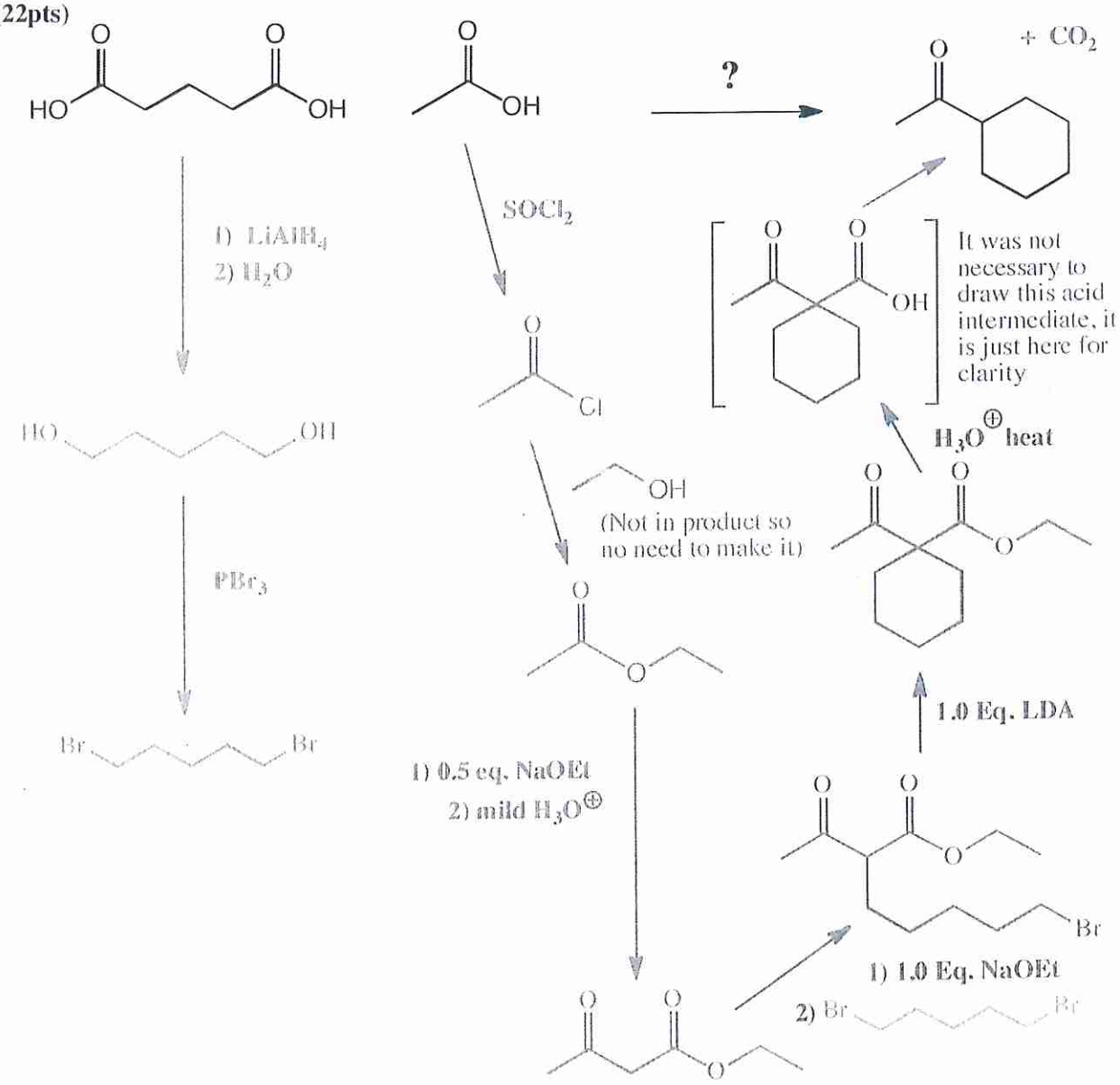
Remember, all of the carbons of the product must come from the given starting material.



I consider this to be a difficult problem because of how many pieces from one carbon units (starting materials) need to be assembled to get to the product. Recognize the product as a methyl ketone derivative, the KRE for the acetoester synthesis. The required β-ketoacid derivative is acetoester that has been alkylated twice using methyl bromide, which is available from the starting methanol following reaction with PBr_3. Recognize that acetoester comes from the Claisen reaction of methyl acetate. Recognize further that methyl acetate comes from esterification of acetic acid. The required acetic acid can be made from the Grignard reagent derived from methyl bromide added to CO_2.

17. Using any reagents turn the starting material into the indicated product. All the carbons in the product must come from the given starting materials, but you may use any carbon containing reagent along the way as long as its carbons do not end up in the product. Draw all molecules synthesized along the way. When it doubt, draw the molecule!

(22pts)



Recognize the product as coming from an acetoester synthesis (methyl ketone is the KRE). The tricky part of this one is recognizing that the ring comes from alkylation of ethyl acetoacetate in two sequential steps by 1,5-dibromopentane. Recognize that the ethyl acetoacetate comes from the Claisen reaction of ethyl acetate, which in turn comes from ethanol and acetyl chloride, the latter of which comes from reaction of the staring acetic acid with $SOCl_2$. Fischer esterification would have worked to make the ester as well. Recognize that the dibromopentane can be derived from the corresponding 1,5 pentanediol, which is the product of reduction of the starting diacid with $LiAlH_4$.