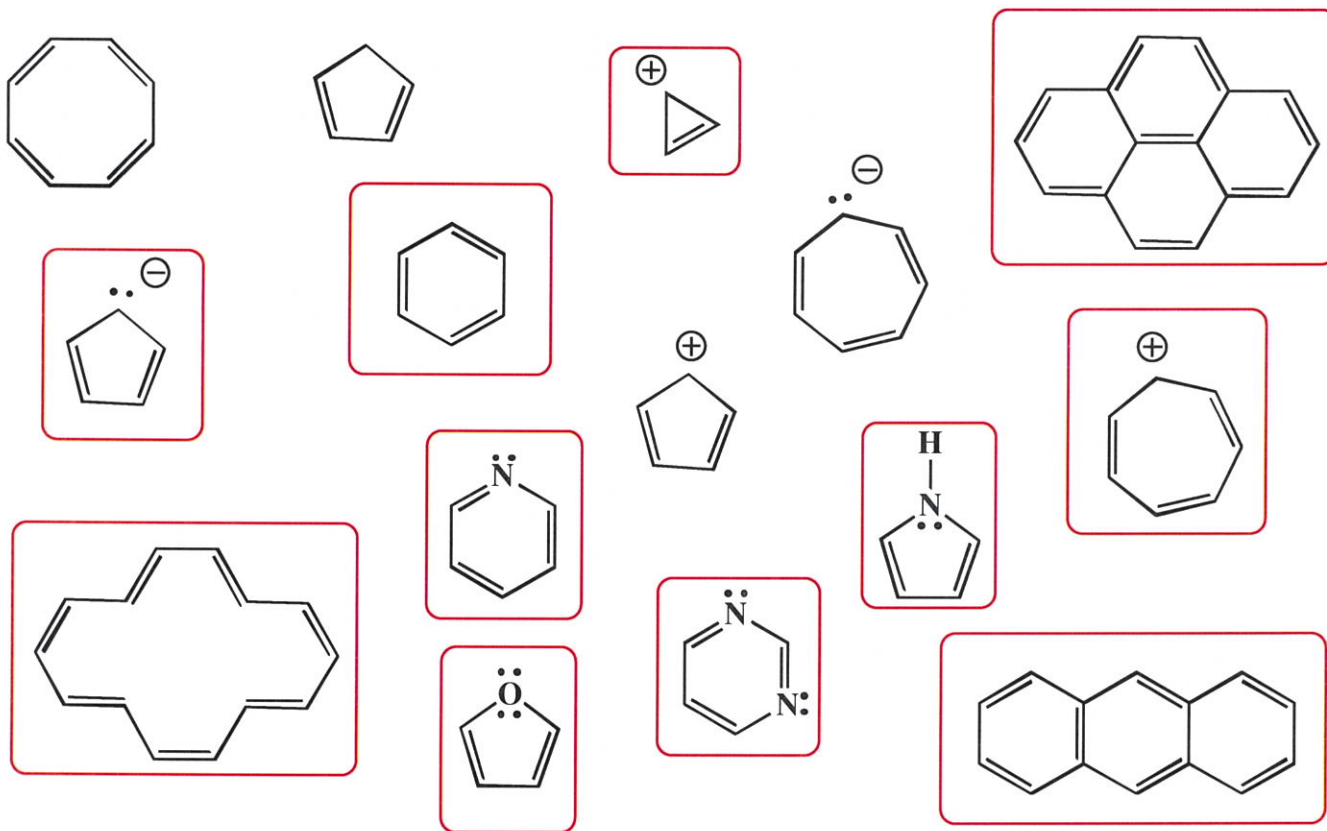
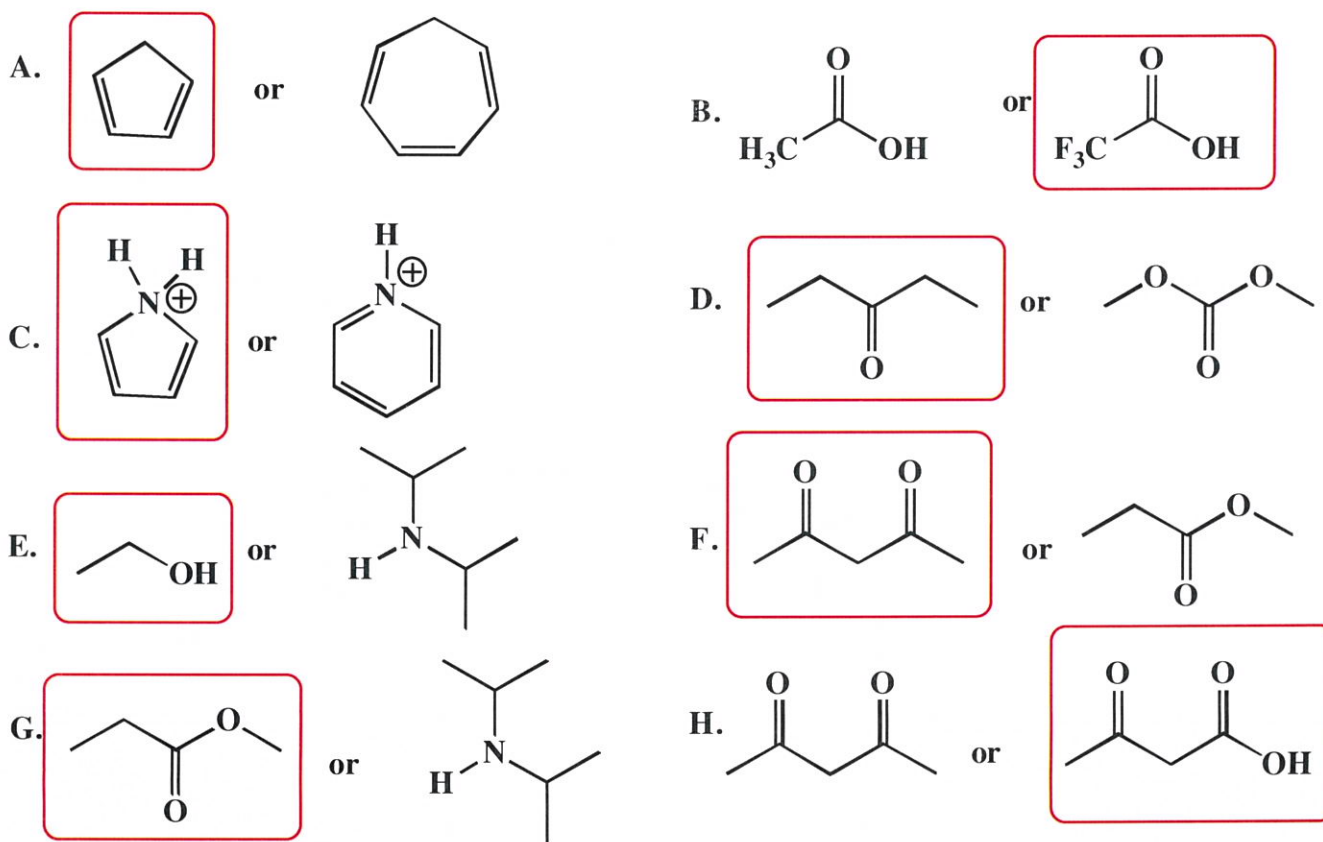


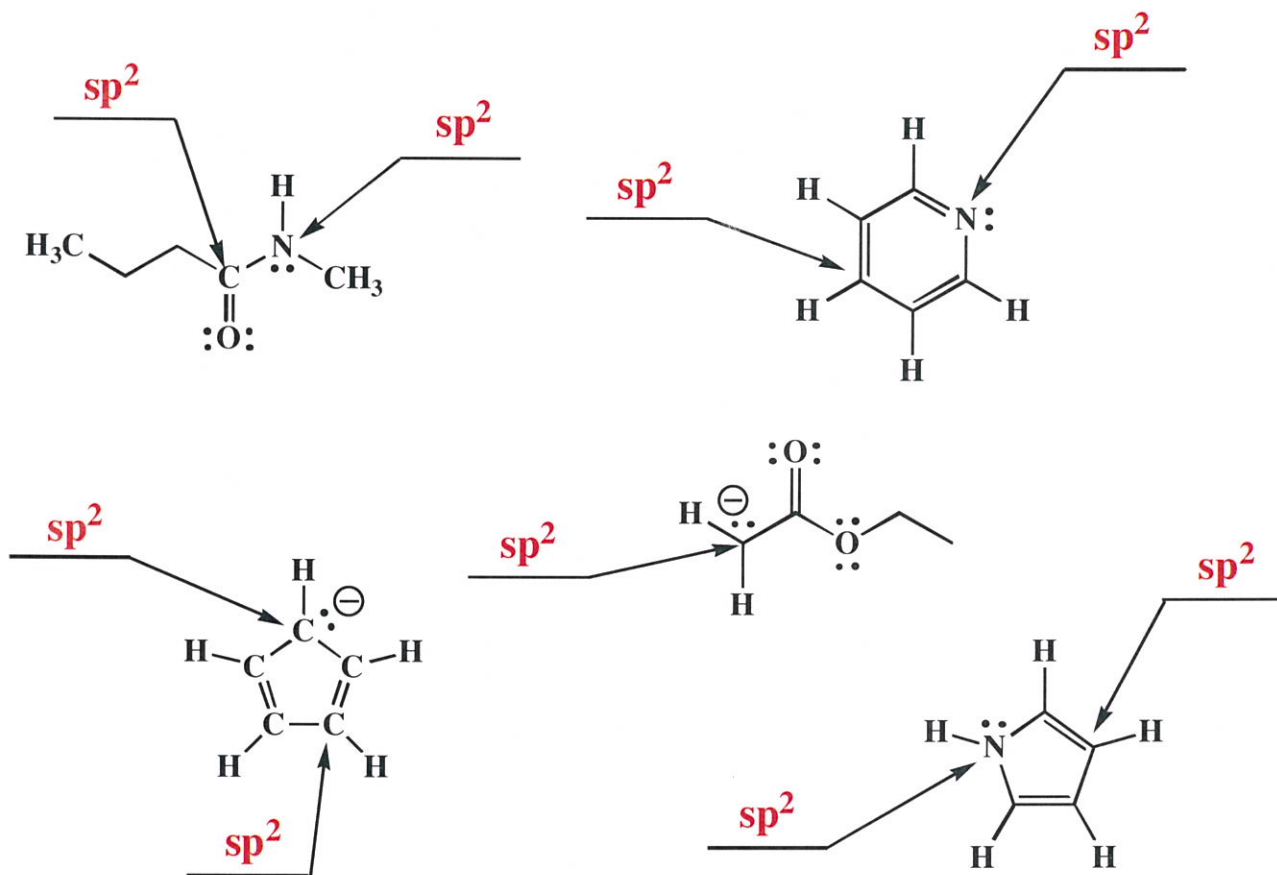
6. (15 points) Draw a circle around all of the molecules below that can be considered aromatic.



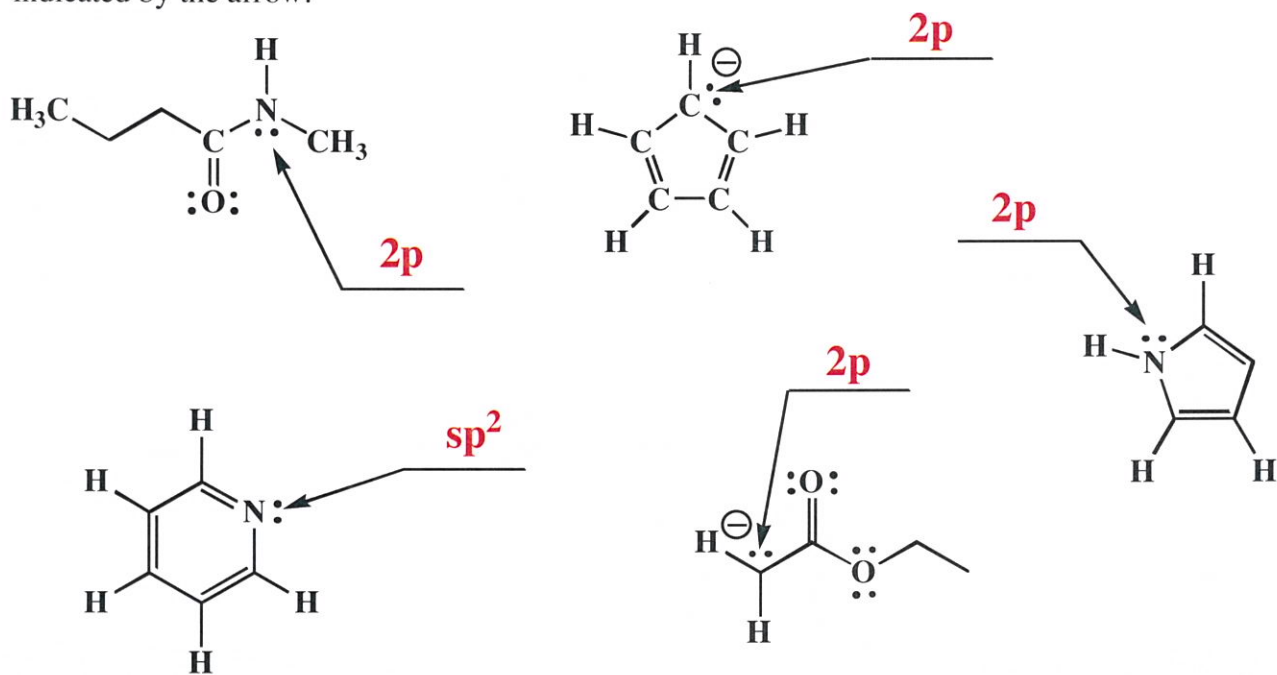
7. (16 points) For each pair of molecules, circle the one that is more acidic.



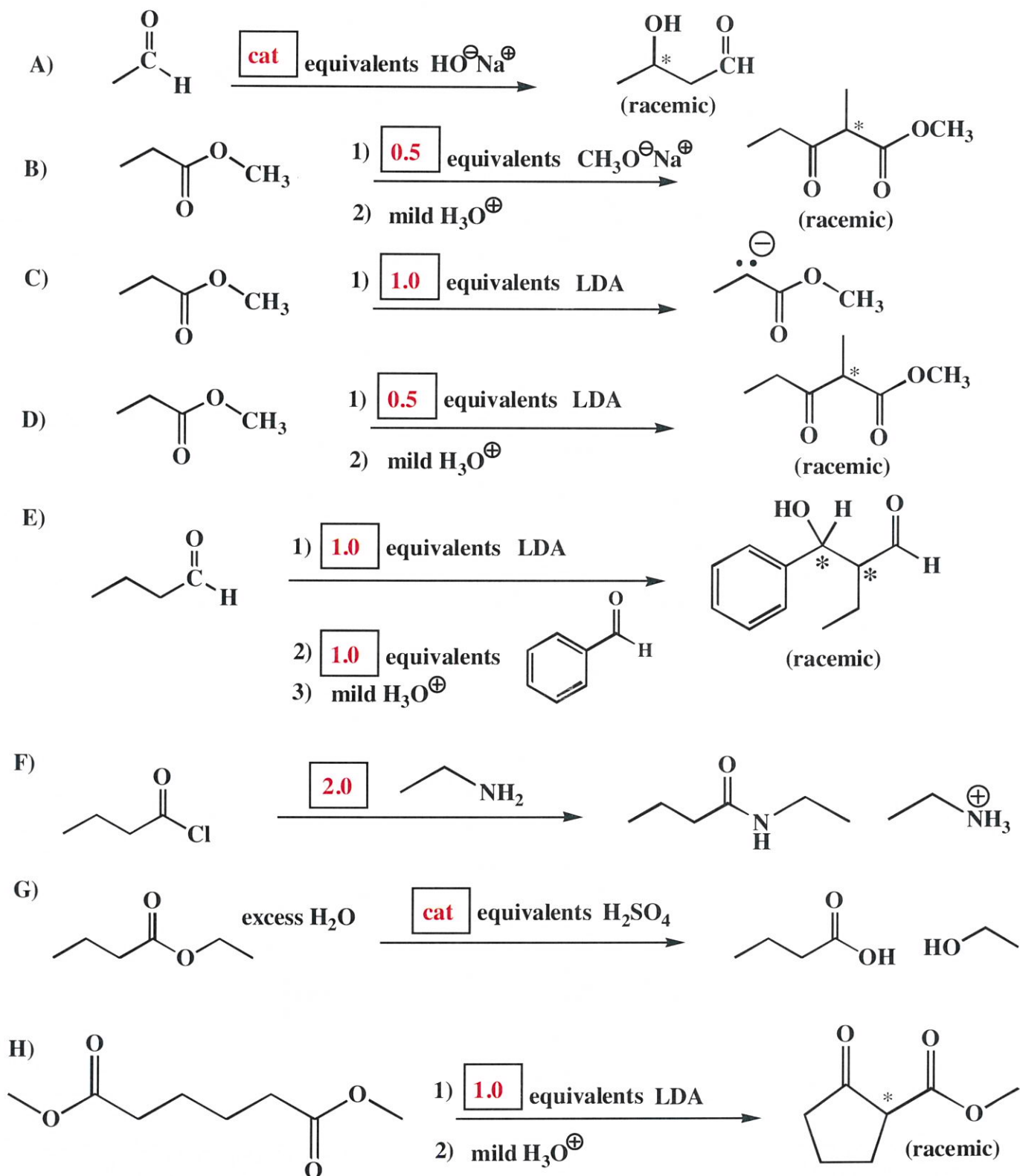
8. (9 points) On the lines provided, state the **hybridization state of the atom** indicated by the arrow.



9. (5 points) On the lines provided, state the **atomic orbital that contains the lone pair** of electrons indicated by the arrow.

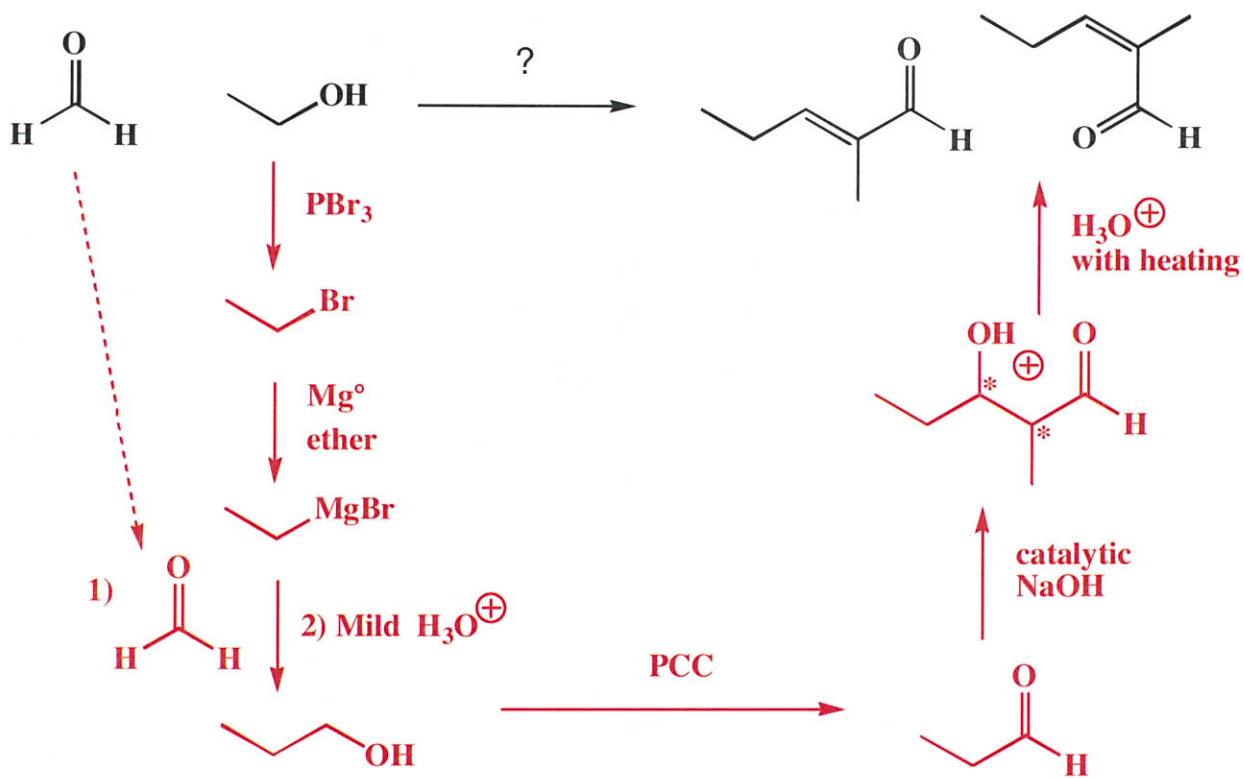


10. (2 pts each) In each of the boxes over an arrow, write the minimum number of equivalents of the specified reagent required to carry out the reaction shown to completion. If only a catalytic amount is needed, write "CAT". Note: You must assume the carbonyl compound starting material is initially present in an amount of 1.0 equivalent.



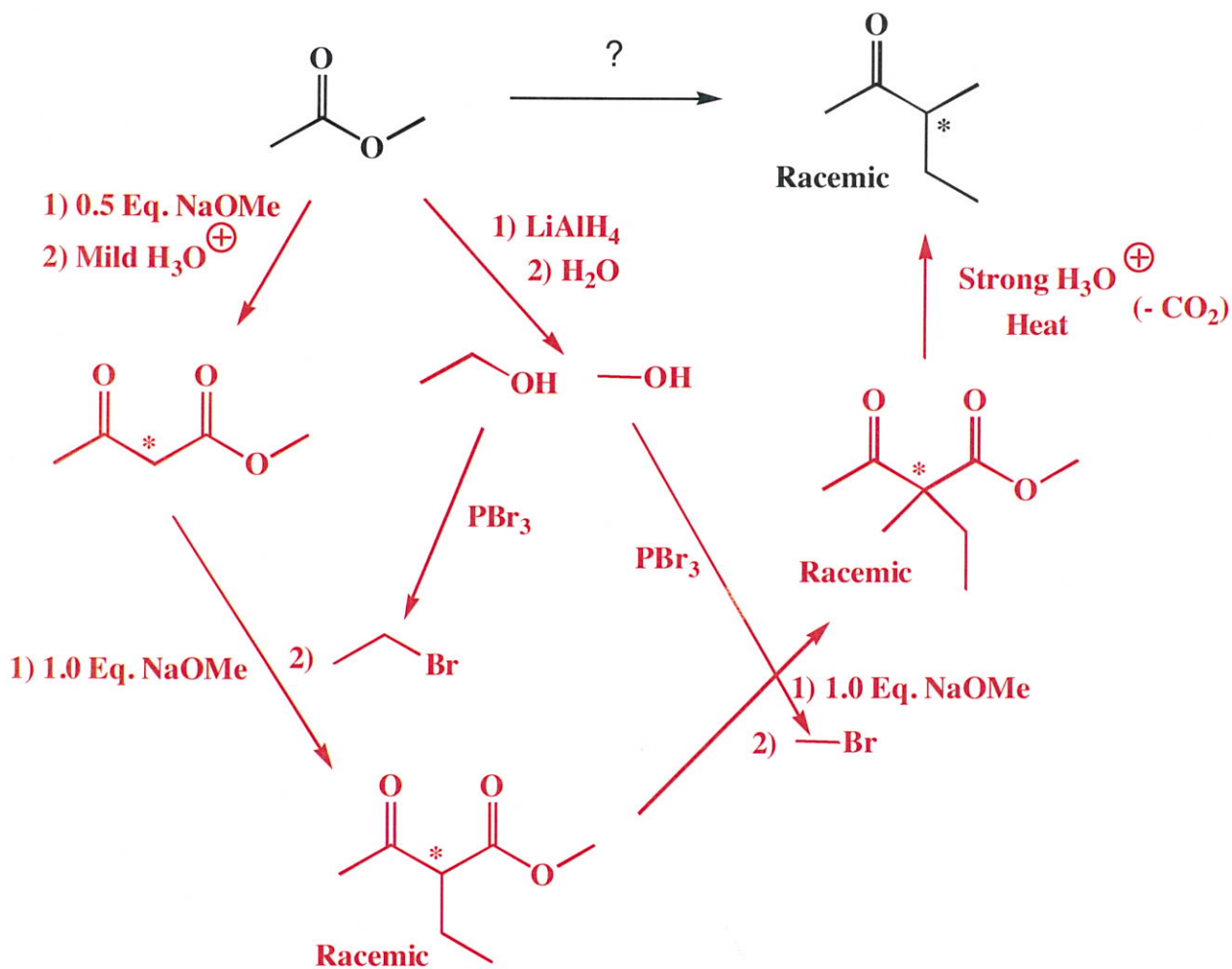
14. (16 pts) Using any reagents turn the starting material into the indicated product. All carbon atoms must come from the starting materials. Draw all molecules synthesized along the way. When in doubt, draw the molecule! Label all chiral centers with an asterisk (*) and make sure to right "Racemic" where appropriate.

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



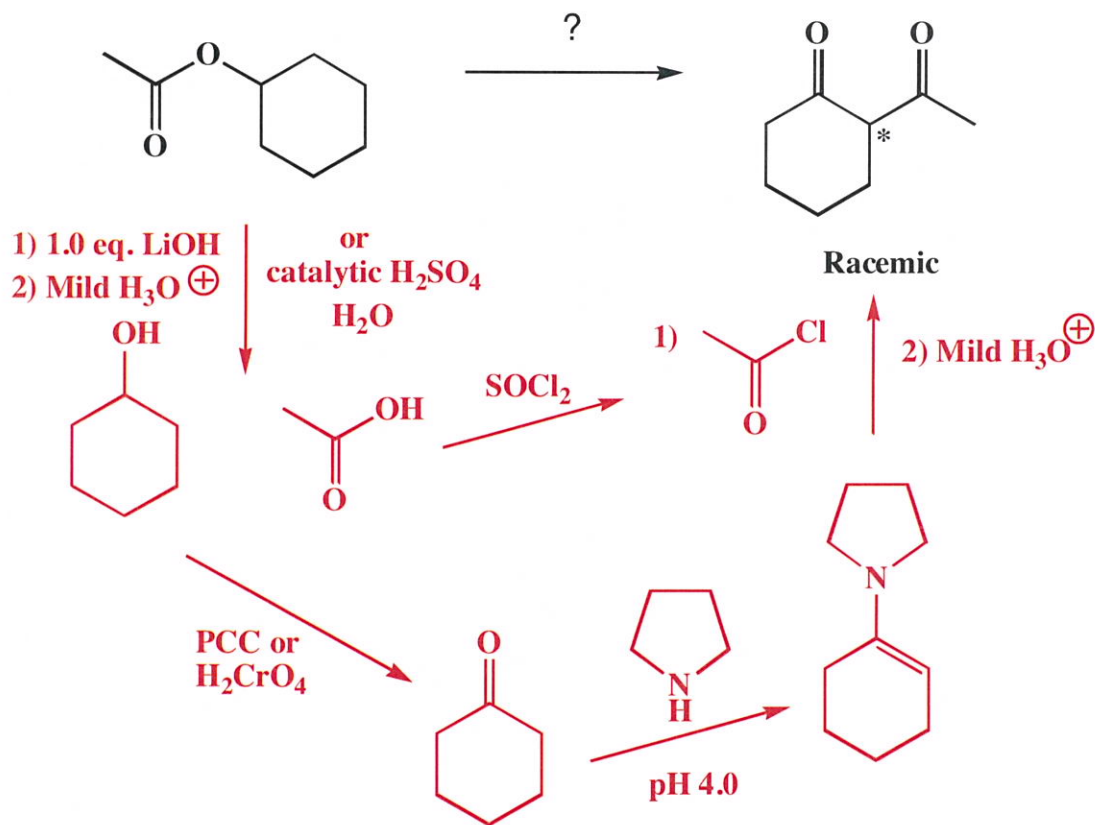
15. (19 pts) Using any reagents turn the starting material into the indicated product. All carbon atoms must come from the starting materials. Draw all molecules synthesized along the way. When in doubt, draw the molecule! Label all chiral centers with an asterisk (*) and make sure to right "Racemic" where appropriate.

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



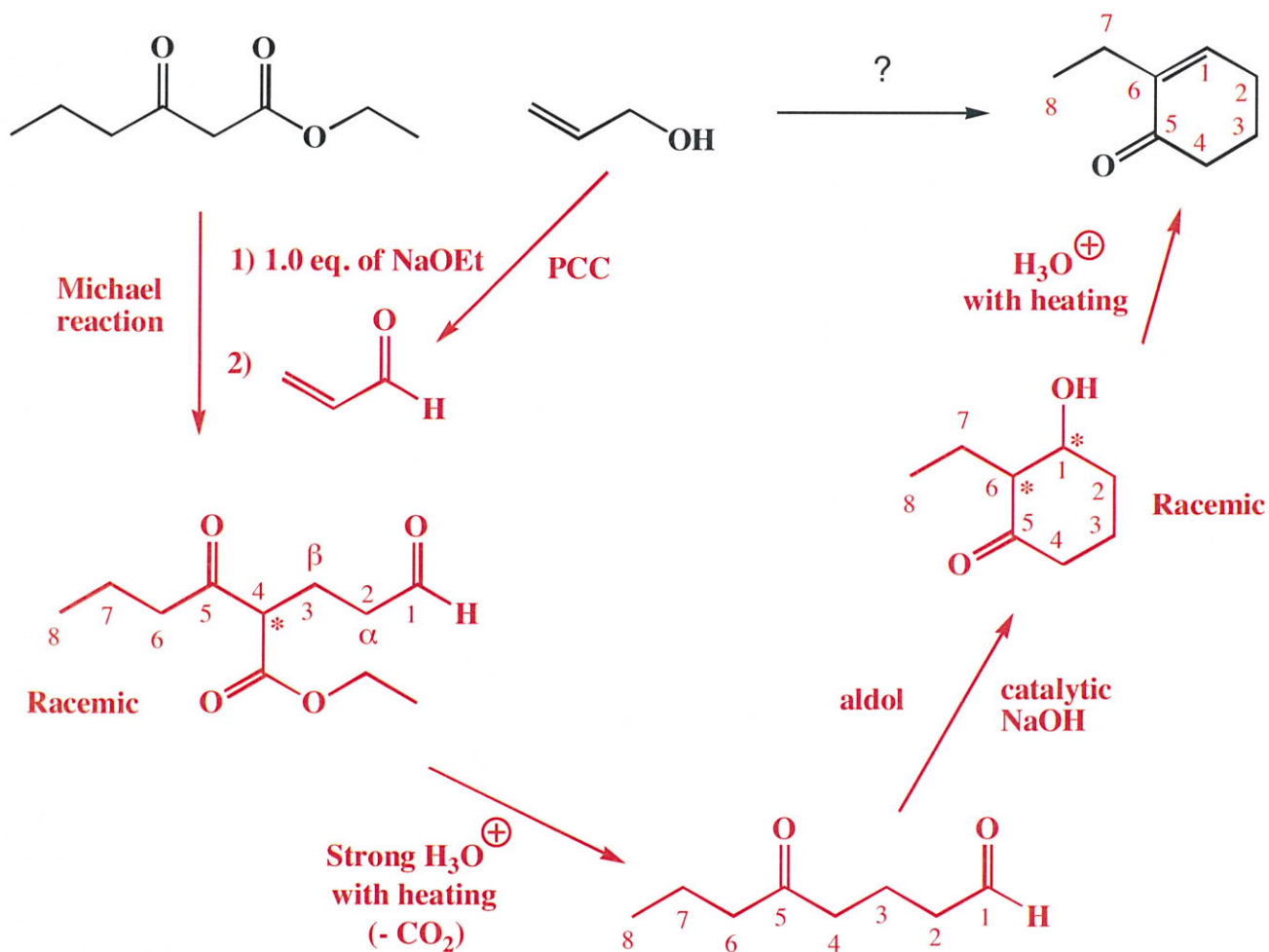
16. (13 pts) Using any reagents turn the starting material into the indicated product. All carbon atoms must come from the starting materials. Draw all molecules synthesized along the way. When in doubt, draw the molecule! Label all chiral centers with an asterisk (*) and make sure to right "Racemic"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

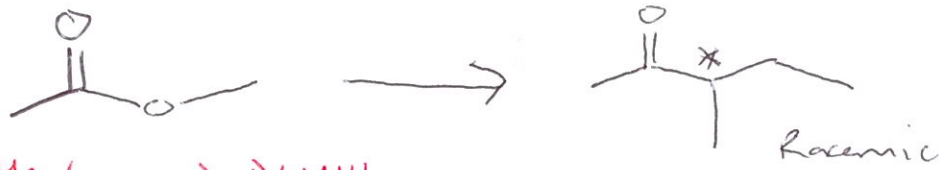
Remember, all of the carbons of the product must come from the given starting materials.



17. (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.

This is the hardest synthesis problem I have ever put on an exam. SAVE IT UNTIL THE END
Remember, all of the carbons of the product must come from the given starting materials.

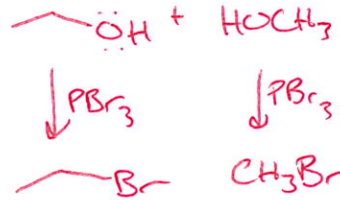




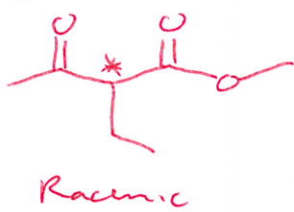
1) 0.5 eq. NaOMe
 2) mild H_3O^+



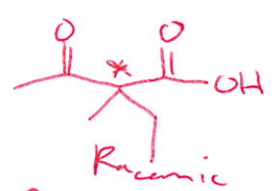
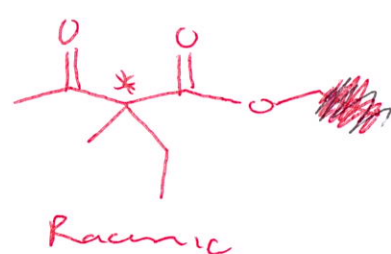
1) $LiAlH_4$
 2) H_2O



1) 1 eq. NaOMe
 2) ~~CH_3Br~~



1) 1 eq. NaOMe
 2) CH_3Br



heat

H_3O^+
 strong

