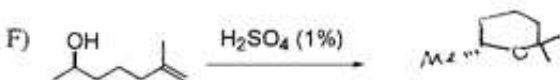
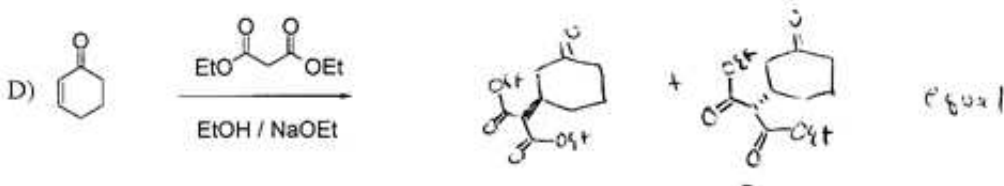
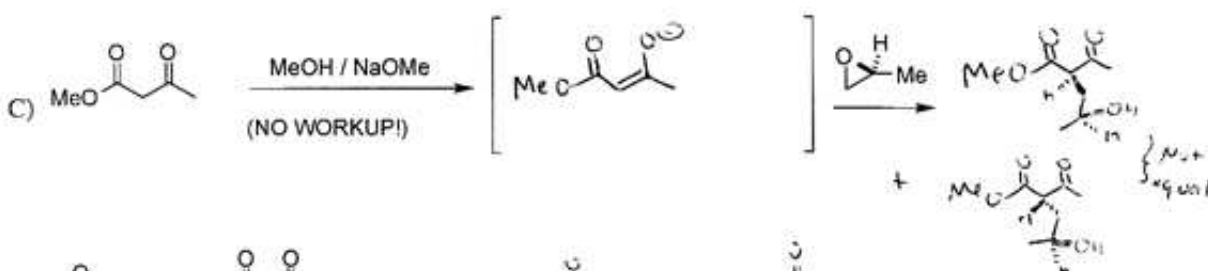
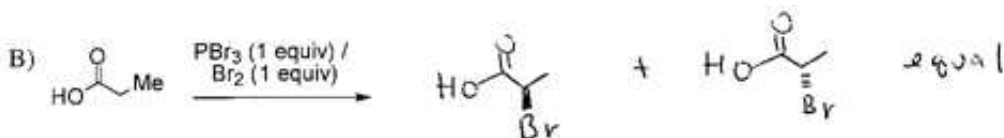
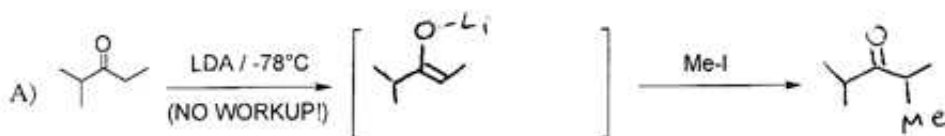
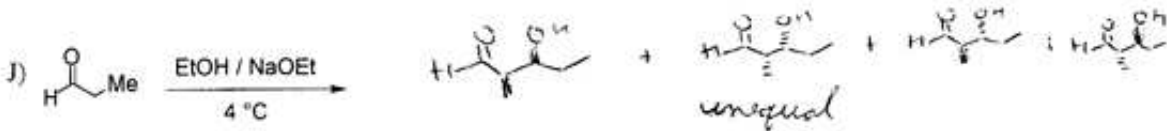
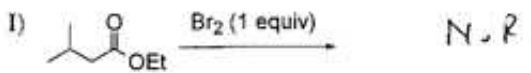
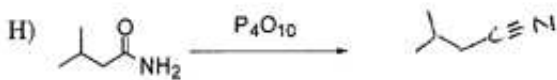
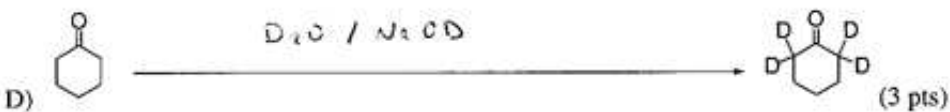
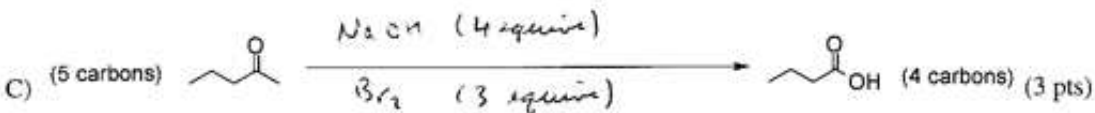
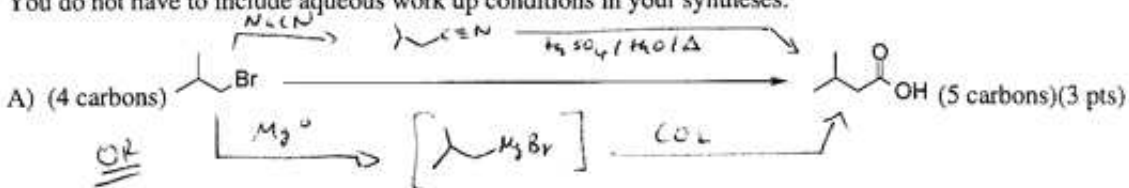


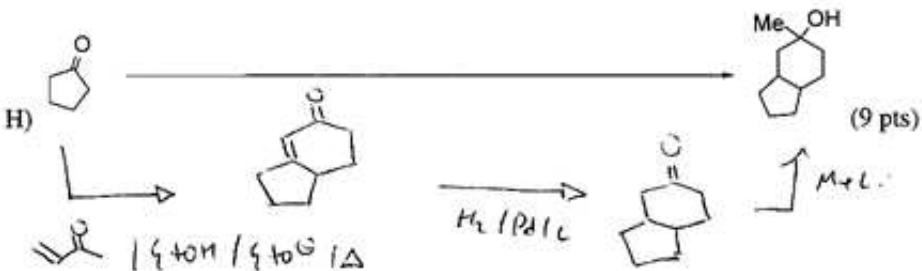
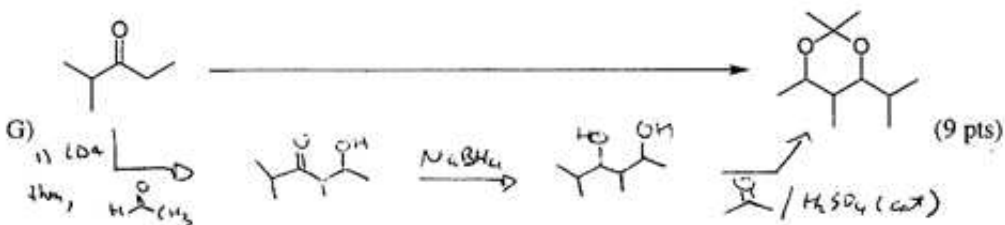
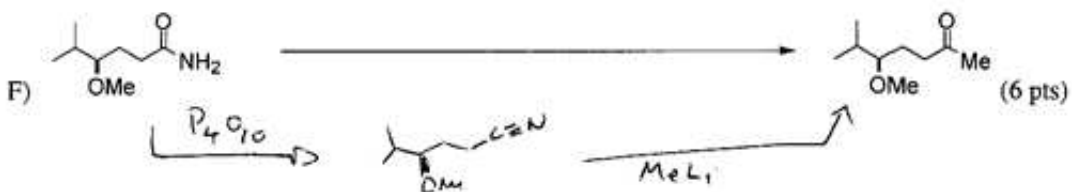
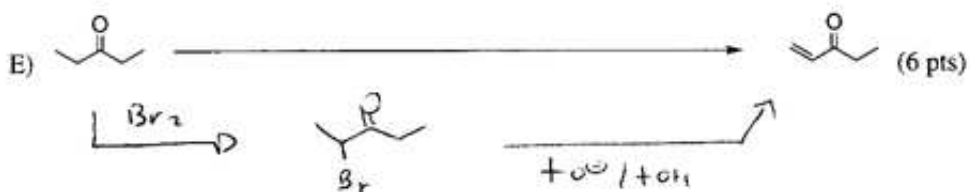
1) Provide the products of the following reactions. If no reaction would occur, then write NR. Draw all possible stereoisomers (i.e., draw dashed and bold lines as needed) and indicate if they would be produced in equal or unequal amounts. There is an appropriate aqueous work up for each reaction **UNLESS OTHERWISE NOTED** (3 points each).





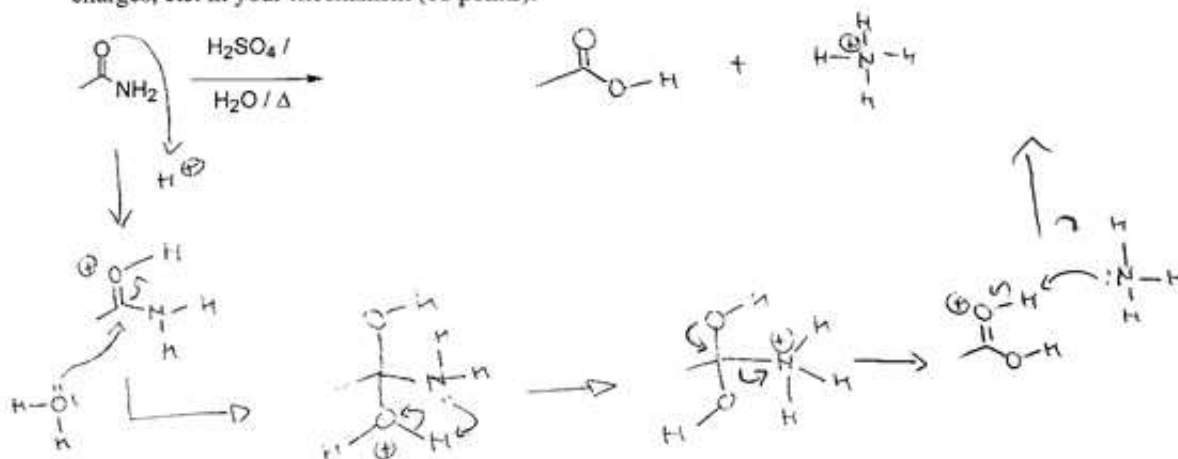
2) Complete the syntheses shown below using organic reagents of 7 carbons or less and any inorganic reagents you wish. If your synthesis requires more than one step, you must write the product of each step. You do not have to include aqueous work up conditions in your syntheses.



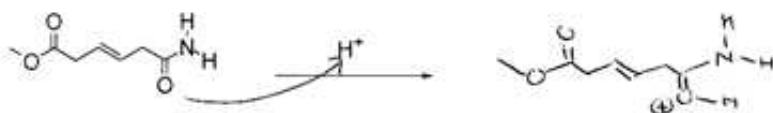


These steps can be run in the opposite order

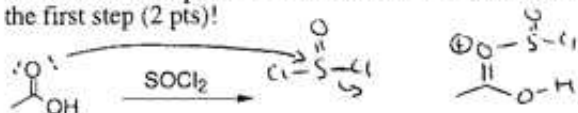
3) Provide the products and mechanism of the reaction shown below (there are two components to the products, show the mechanism of formation of each). Be sure to show all intermediates, arrows, and charges, etc. in your mechanism (18 points).



The molecule shown below can undergo protonation at several sites upon treatment with strong acid. Indicate the most basic site (i.e., draw the product of protonation) 2 pts.



Draw the first step of the mechanism of the reaction shown below. I don't want the whole mechanism, just the first step (2 pts)!



Extra credit: 5 points for up to 100 points total on the exam: Provide a mechanism for the reaction shown below. Be sure to show all intermediates, arrows, and charges, etc. **You must get this entirely right for credit**, there is no partial credit on this, so don't ask!

