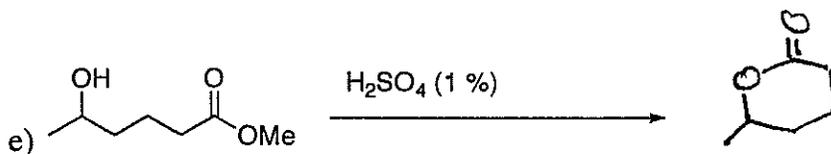
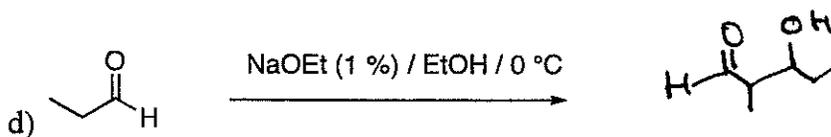
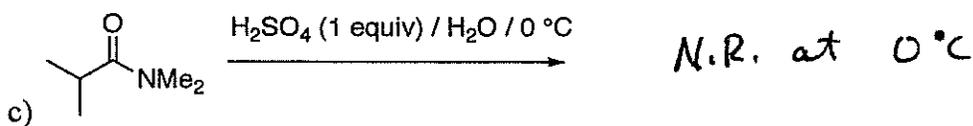
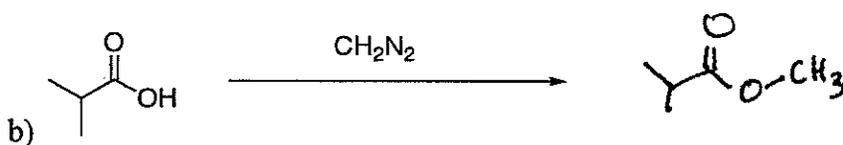
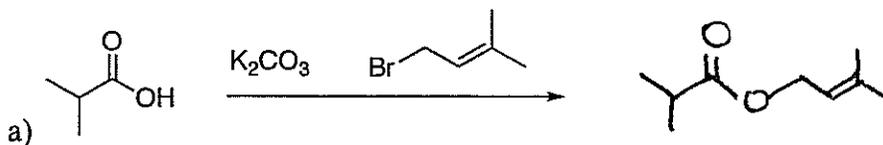
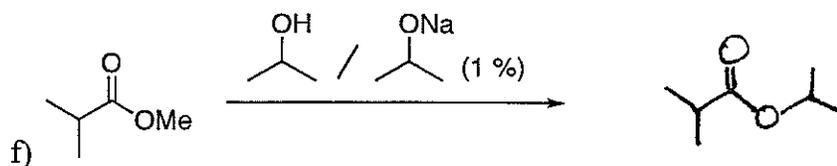
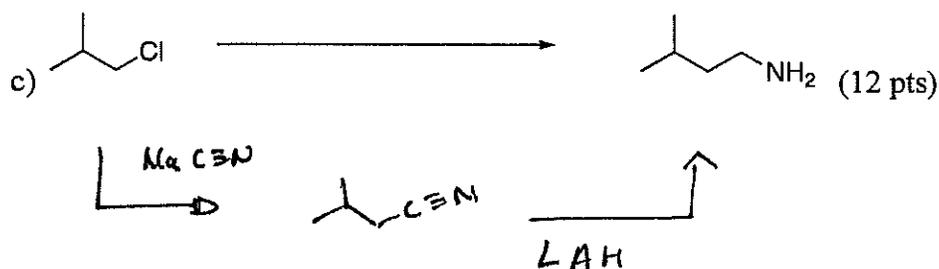
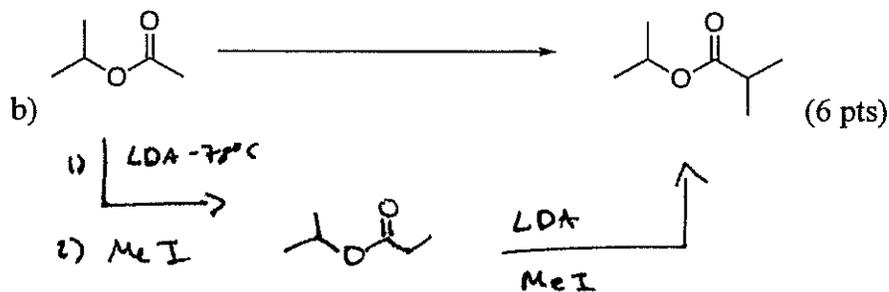
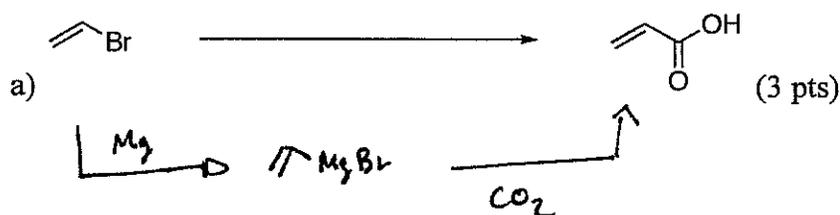


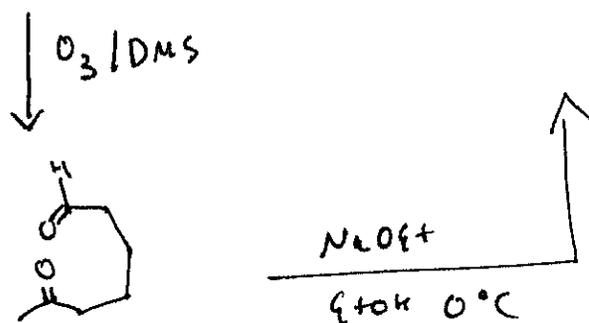
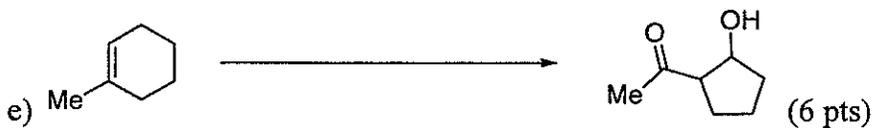
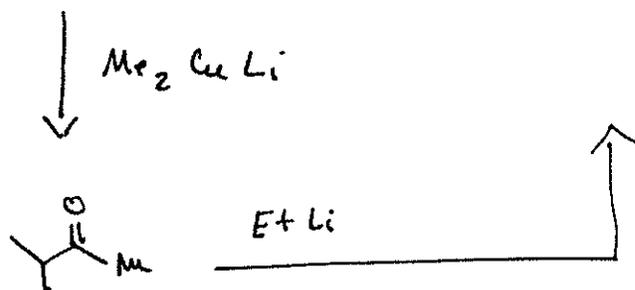
1 Provide the products of the following reactions (all reactions have an appropriate aqueous work up). If no reaction would occur, write NR. **Ignore stereochemistry in the products** (3 pts each).



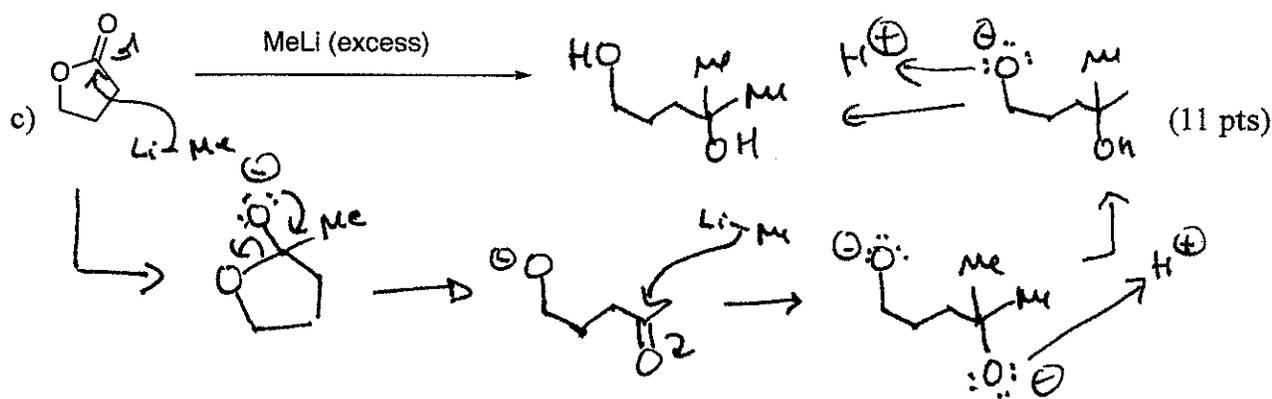
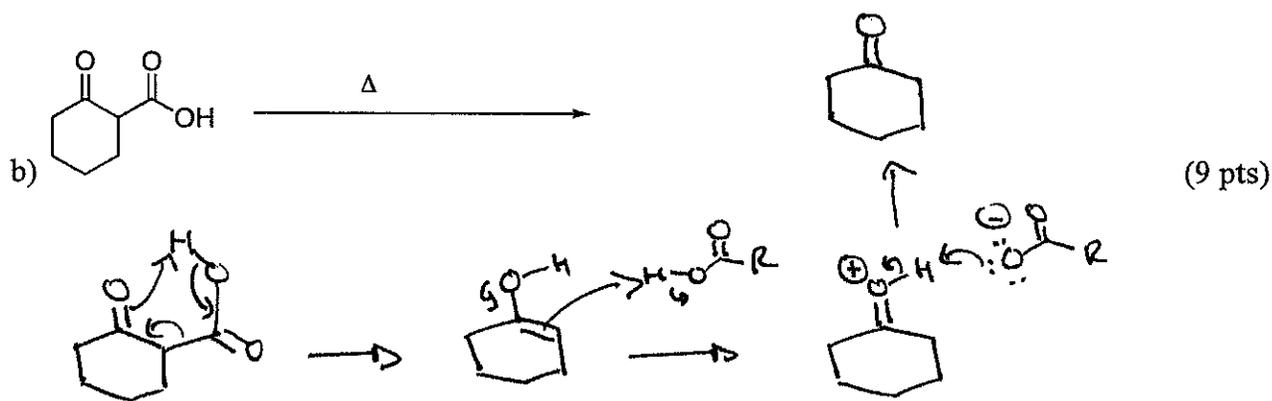
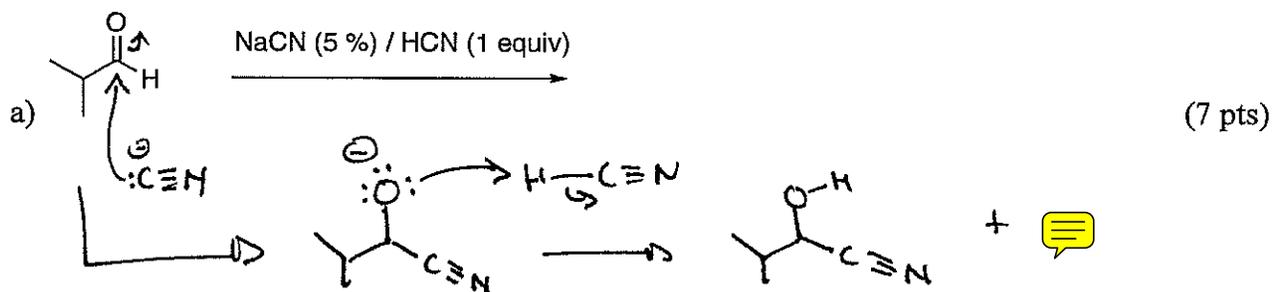


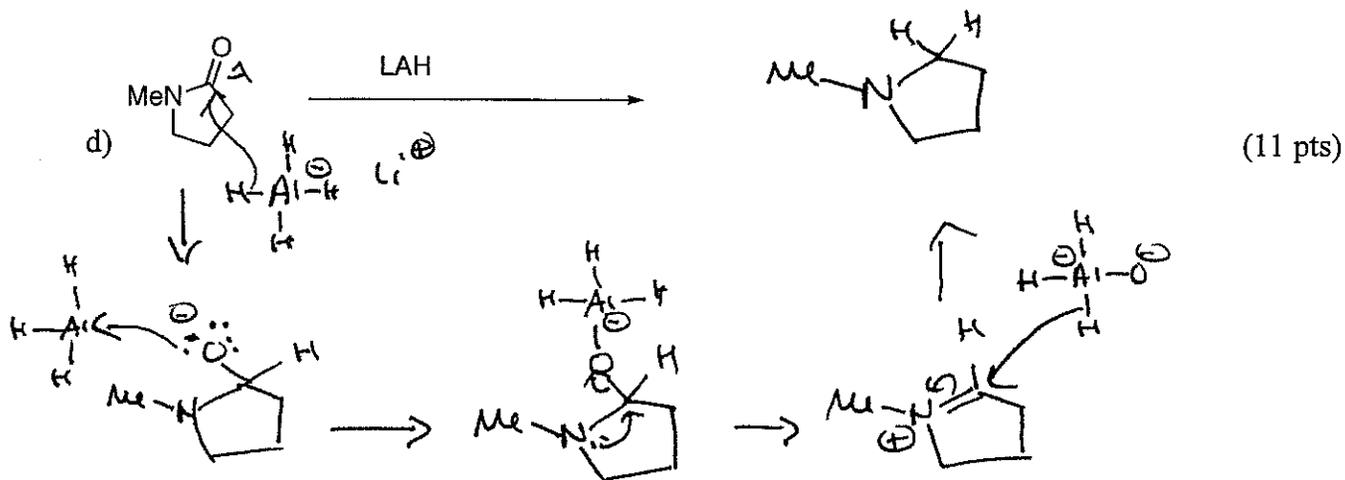
2) Complete the following syntheses using any reagents you need. You do not have to show the synthesis of the reagents you use, but you must use the starting material indicated. If your synthesis requires more than one step, provide the product after each step. All chiral products are racemic mixtures.





3) Provide the products and mechanisms for the following reactions. **All reactions have an appropriate aqueous work up if needed.** Show every intermediate with the proper charges and all the arrows required for each step of the reaction, including the work up steps



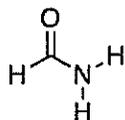


4) Circle true or false (2 pts each)

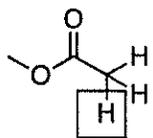
a) Beta lactams are more reactive than ordinary amides because the hybridization of the nitrogen is not sp^2 . T F

b) The nitrogen atom of an amide is typically hybridized sp^2 . T F

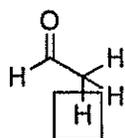
c) The rate of rotation around the amide bond shown below is slower than the rate of rotation of the methyl groups of ethane. T F



5) Provide the pK_a value for the indicated protons shown below – if the value is a range, provide a single number that is within this range (2 pts each)



25



16-18

6) Which is the better electrophile, and ester or an amide? (1 pt)