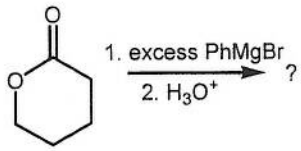
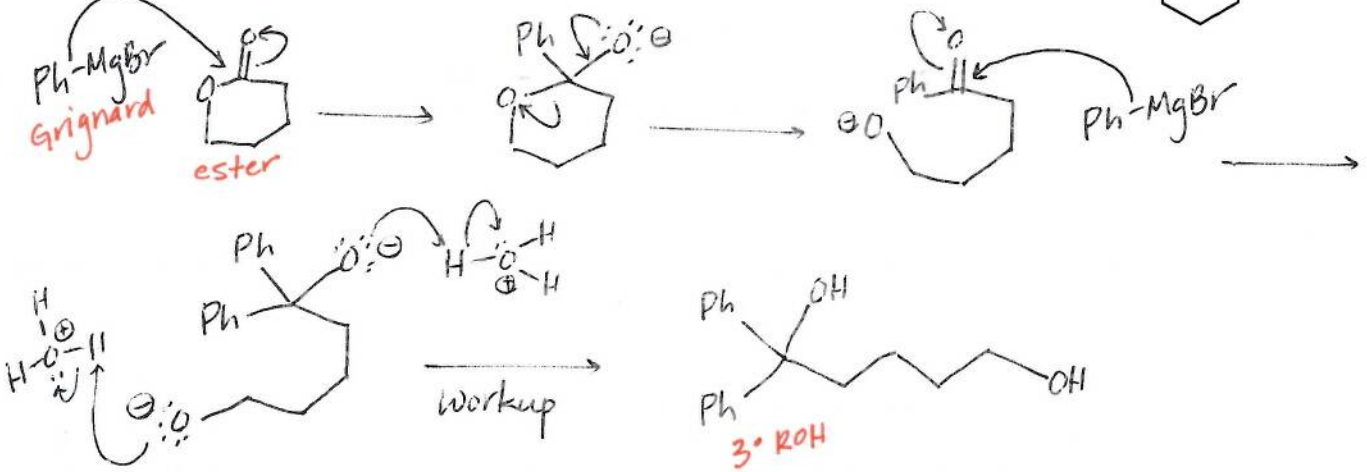
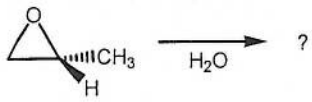
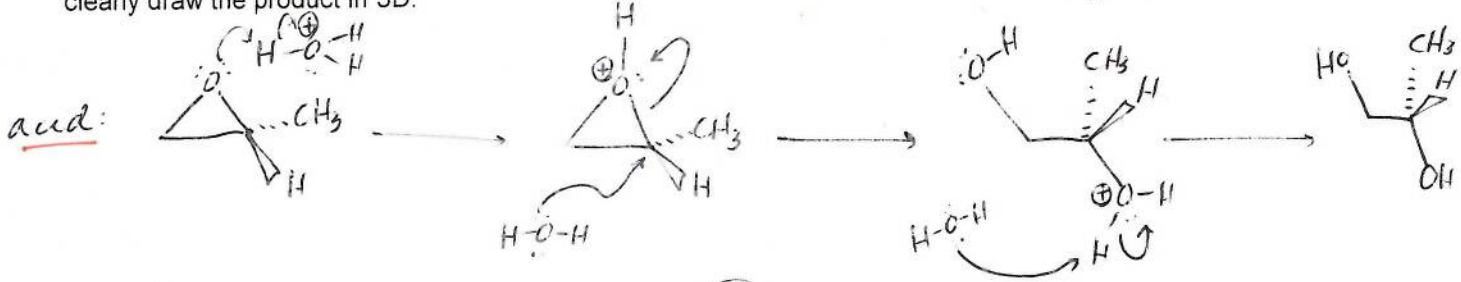
1. (12 pts) Using curved arrow notation, write a complete mechanism for the reaction at right and predict the structure of the product. If an intermediate is resonance stabilized, it is not necessary to draw all its resonance structures.

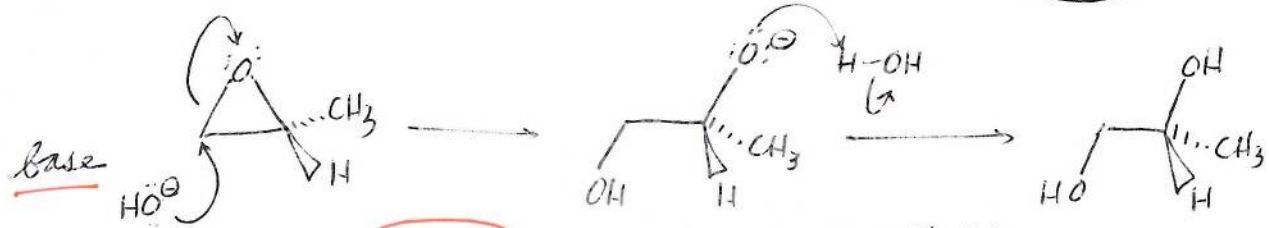




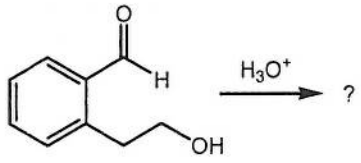
2. (12 pts) Hydrolysis of (*R*)-propylene oxide (at right) produces a chiral molecule. Write a complete mechanism for the H_3O^+ catalyzed reaction. Write a complete mechanism for the HO^- catalyzed reaction. In each case, clearly draw the product in 3D.

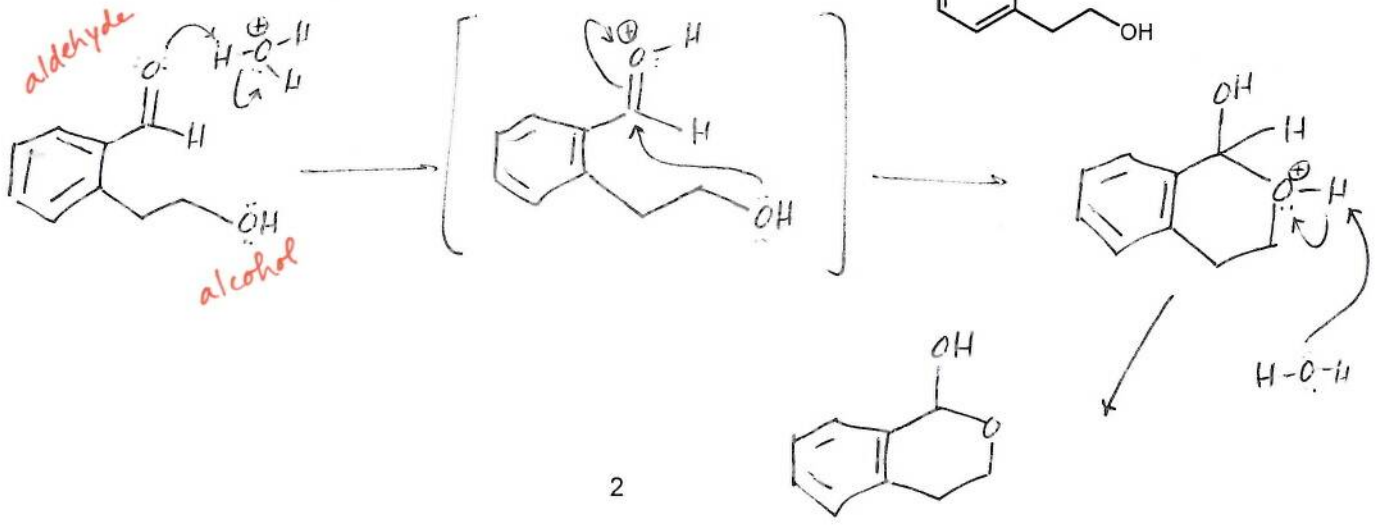




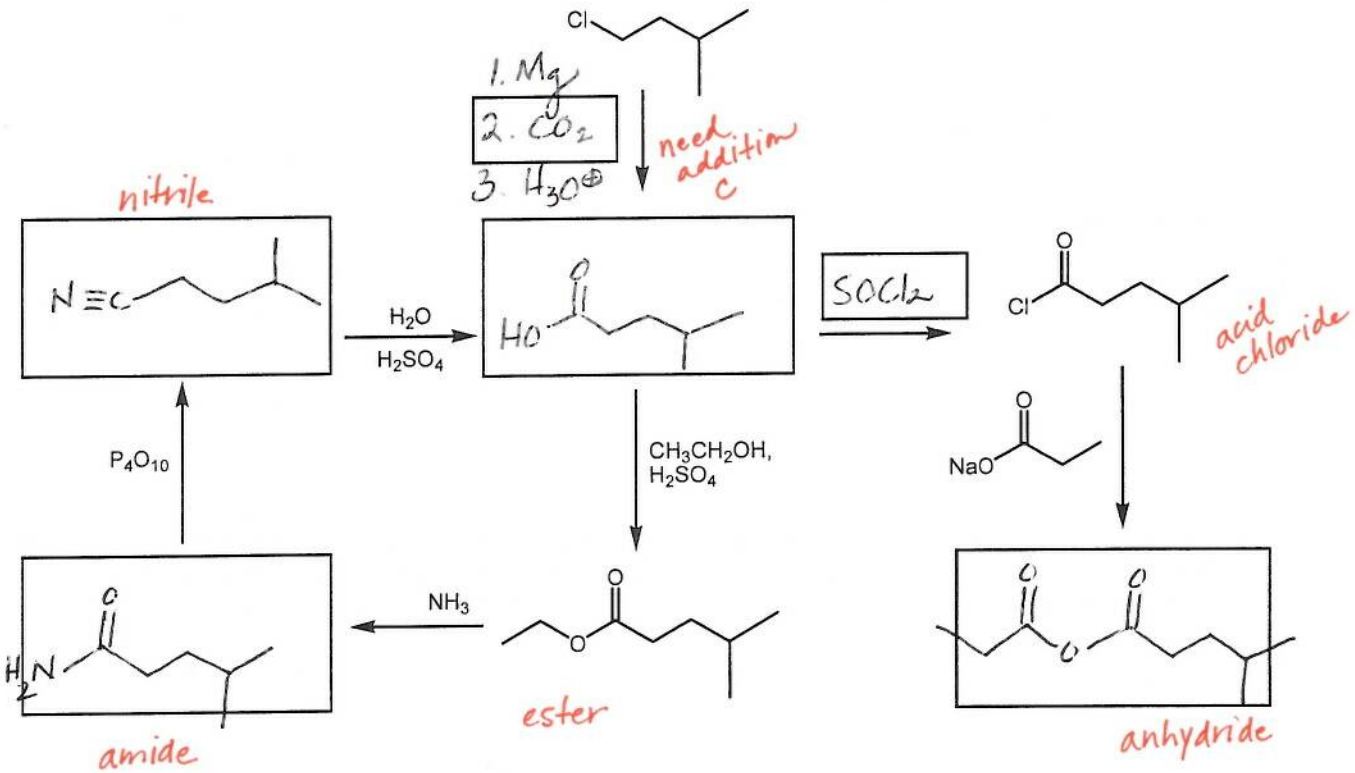


3. (8 pts) Intramolecular hemiacetal formation can be catalyzed by H_3O^+. Using curved arrow notation, write a complete mechanism for the reaction at right and predict the structure of the product. If an intermediate is resonance stabilized, it is not necessary to draw all its resonance structures.

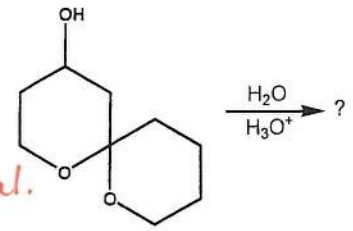


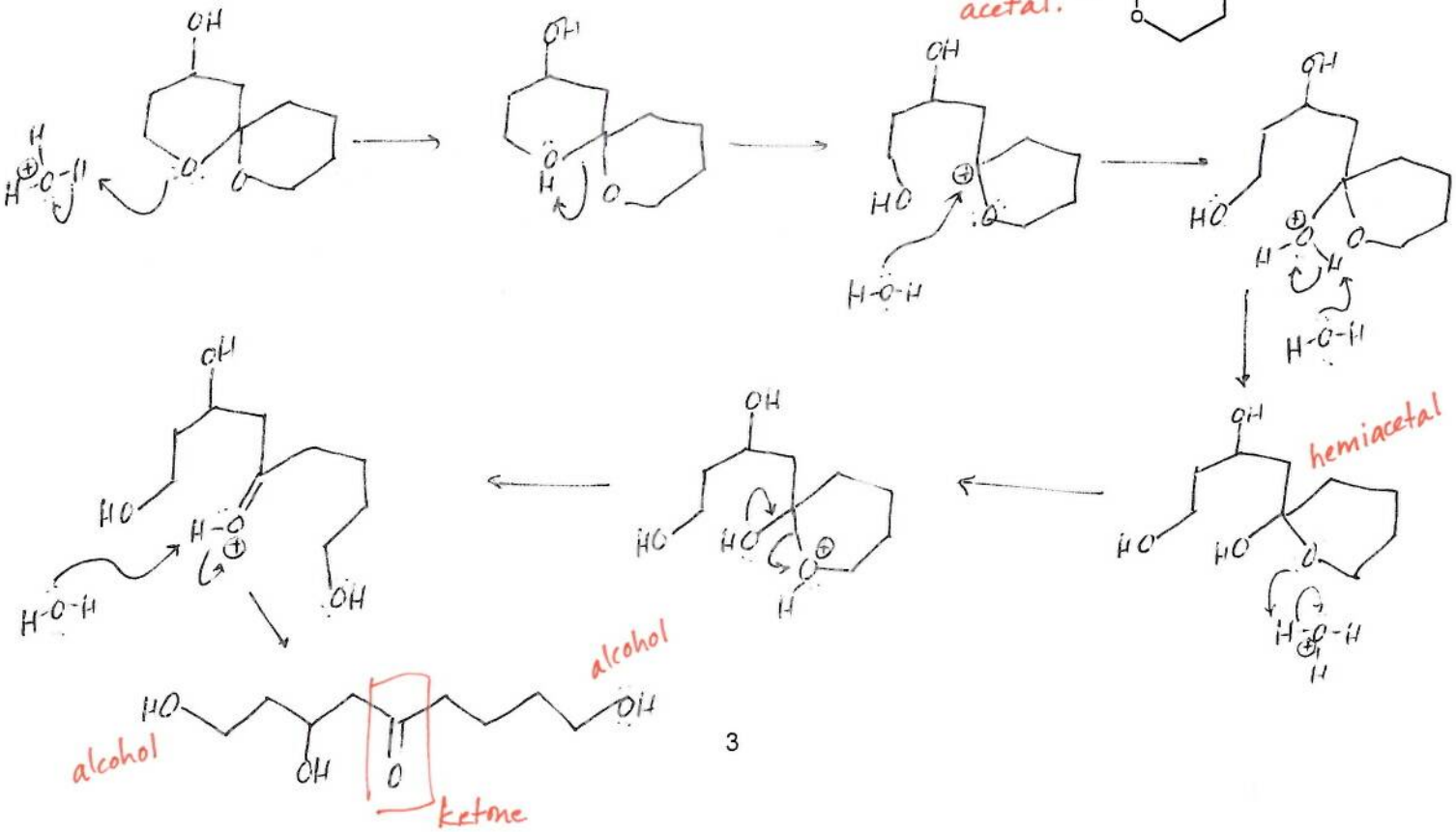


4. (18 pts) Fill in the missing reagents/reactants/products in the scheme below.

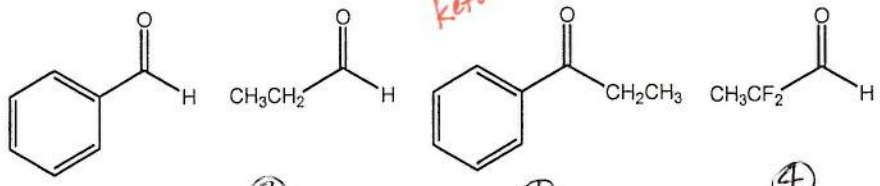


5. (12 pts) Recently researchers have synthesized (4*S*,6*S*)-4-hydroxy-1,7-dioxaspiro-[5.5]undecane, a pheromone of the olive fly. Show a curved arrow mechanism for the complete acid-catalyzed hydrolysis of this molecule.





6. (10 pts) Arrange the following compounds in order of increasing reactivity with a nucleophile (1 = least reactive). Clearly explain the order.



ketone

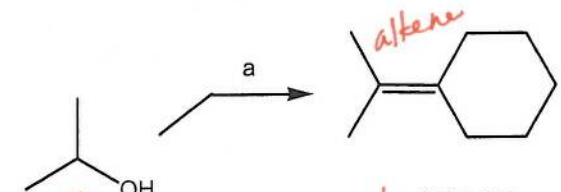
② ③ both aldehydes, but Ph has more sterics & is better at stabilizing C=O.

① 2 R groups stabilize δ+ C of C=O & destabilize sp3 product b/c of sterics

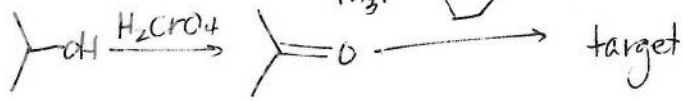
④ e⁻ withdrawing inductive effect of F destabilizes aldehyde by enhancing δ+ of C=O

7. (28 pts) Indicate what reagents you would use to complete the following syntheses, assuming all necessary reagents are available.

6 pts

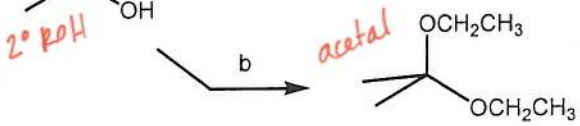


alkene

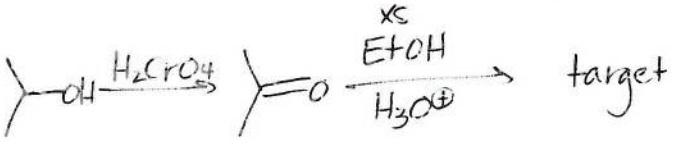


6 pts

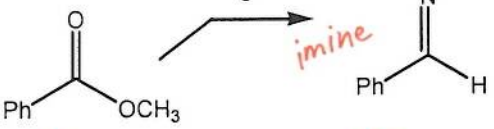
2° ROH



acetal

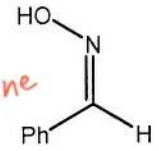


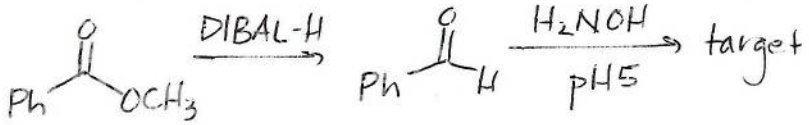
6 pts



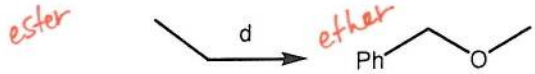
ester

imine

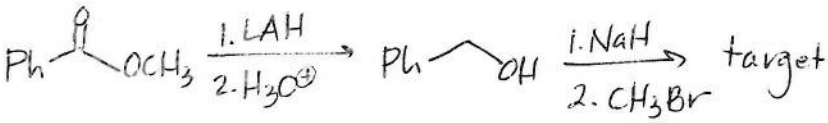




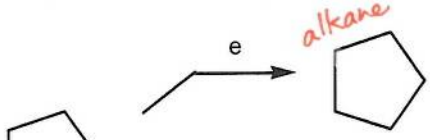
3 pts + bonus



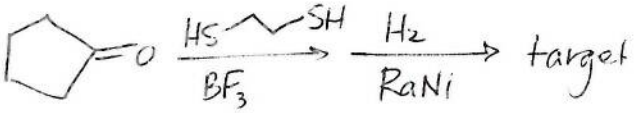
ether



3 pts

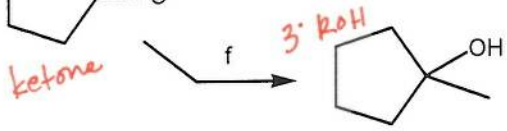


alkane



4 pts

ketone



3° ROH