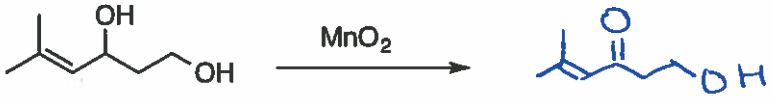
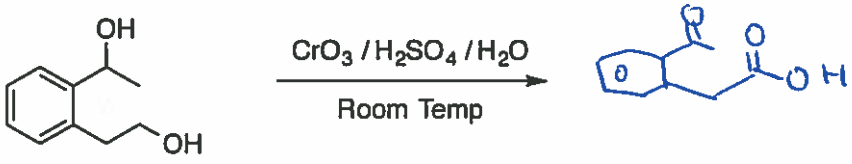
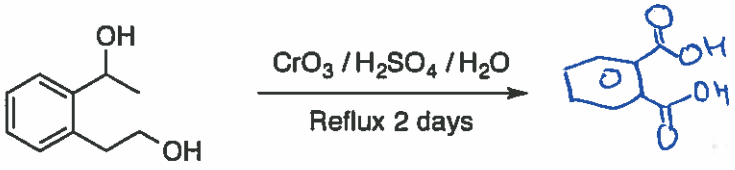
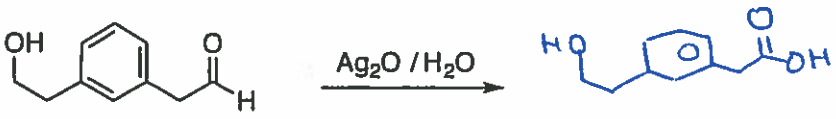
1) Provide the products of the following reactions (all reactions have an appropriate aqueous work up). If no reaction would occur, write NR. If a reaction would produce stereoisomers, draw the isomers and indicate if they will be produced in equal or unequal amounts (3 pts each, except "g" is 4 pts).

a) 

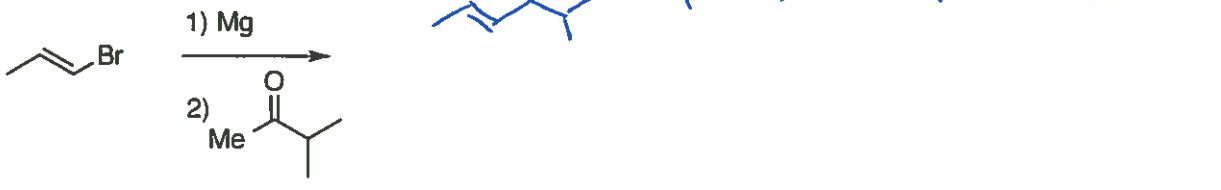
b) 

c) 

d) 

e) 

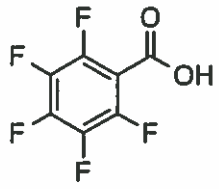
f) 

g) 

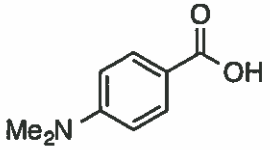
(stereochem, 4 pts total)

h) 

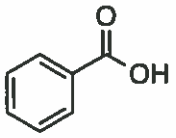
2) Rank the following compounds from most acidic (1) to least acidic (4) (4 pts total).



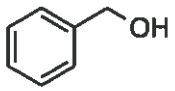
1



3

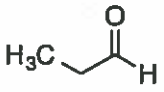


2

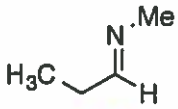


4

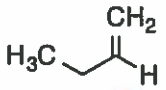
3) Rank the molecules shown below with respect to the energy or π* (lowest energy π* = 1, highest energy π* = 4) (4 pts total).



1

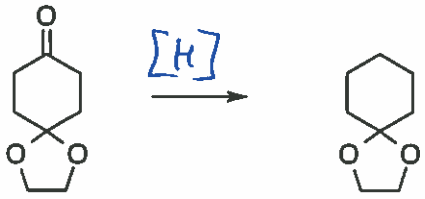


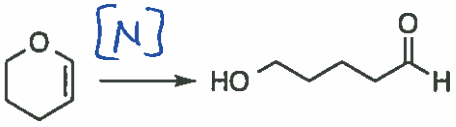
2



3

4) Are the following transformations oxidations, reductions, or neither? (8 pts)

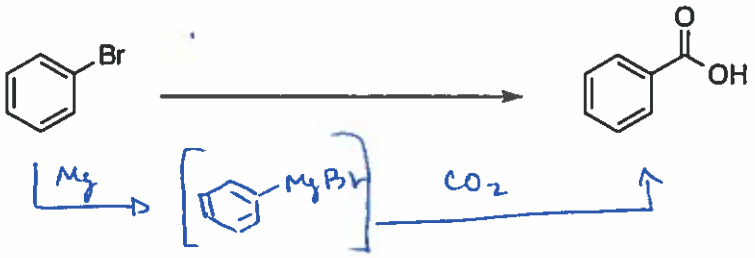




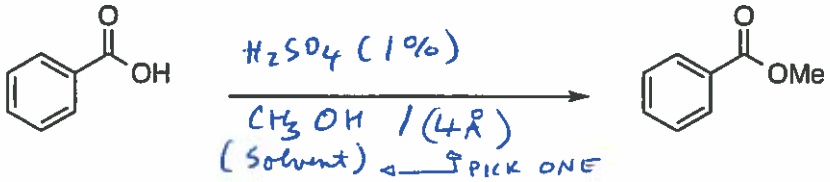
Total pts this page:

5) Complete the following syntheses using any organic molecule of 6 carbons or less, and any inorganic reagents you need. Provide the reagents and any relevant conditions but you do not have to show the synthesis of the 6-carbon or less molecule you use. You may also use triphenyl phosphine (i.e., Ph_3P). If your synthesis requires more than one step, **you must provide the product after each step**. All chiral products are racemic mixtures and you do not need to show mechanisms.

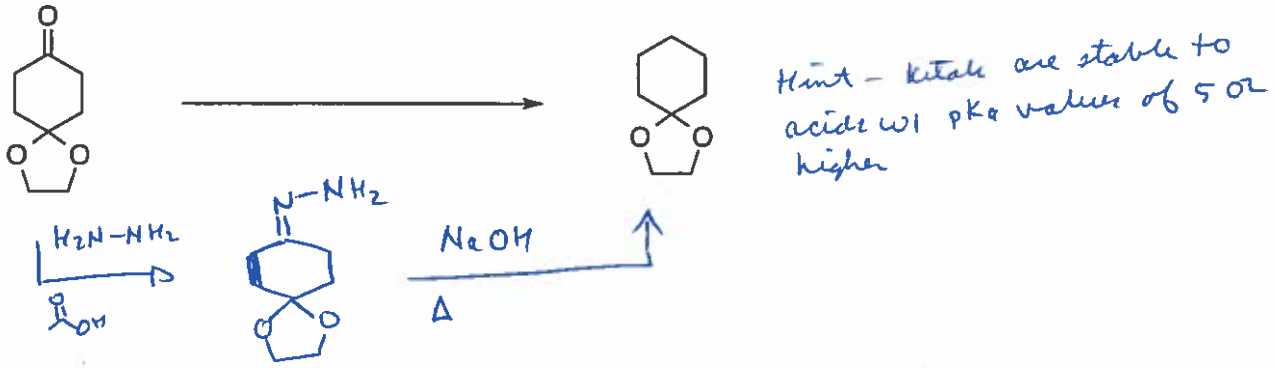
a) (3 pts)



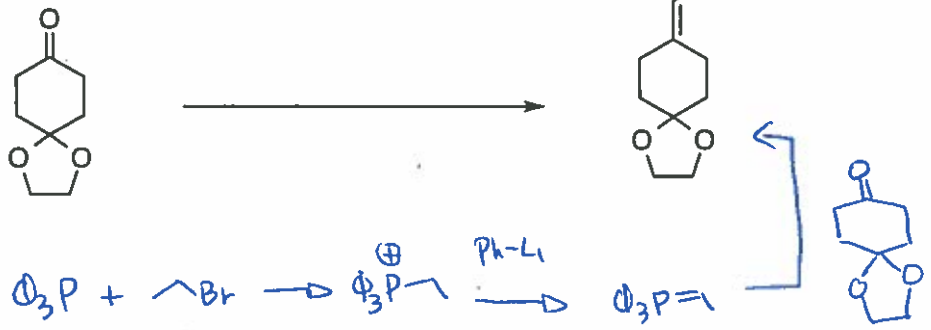
b) (3 pts)



c) (6 pts)



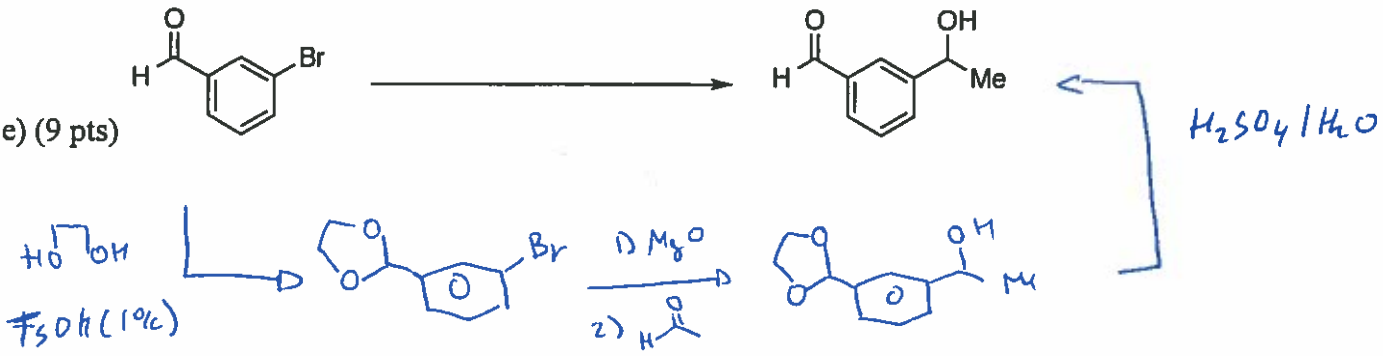
d) (6 pts)



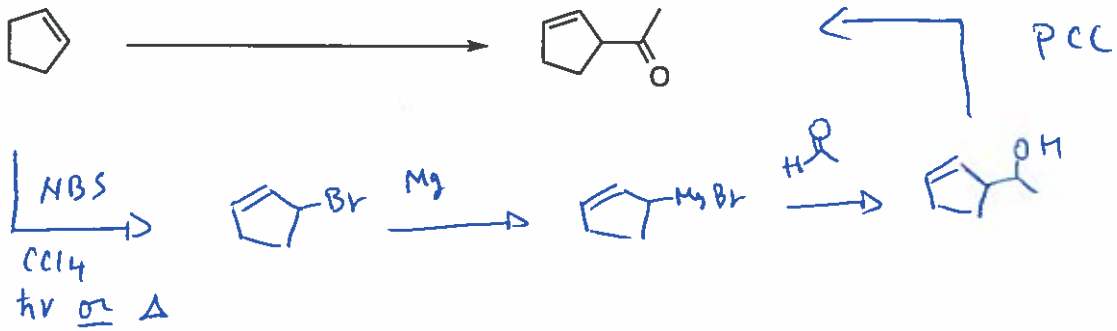
 Total pts this page:

5) continued.

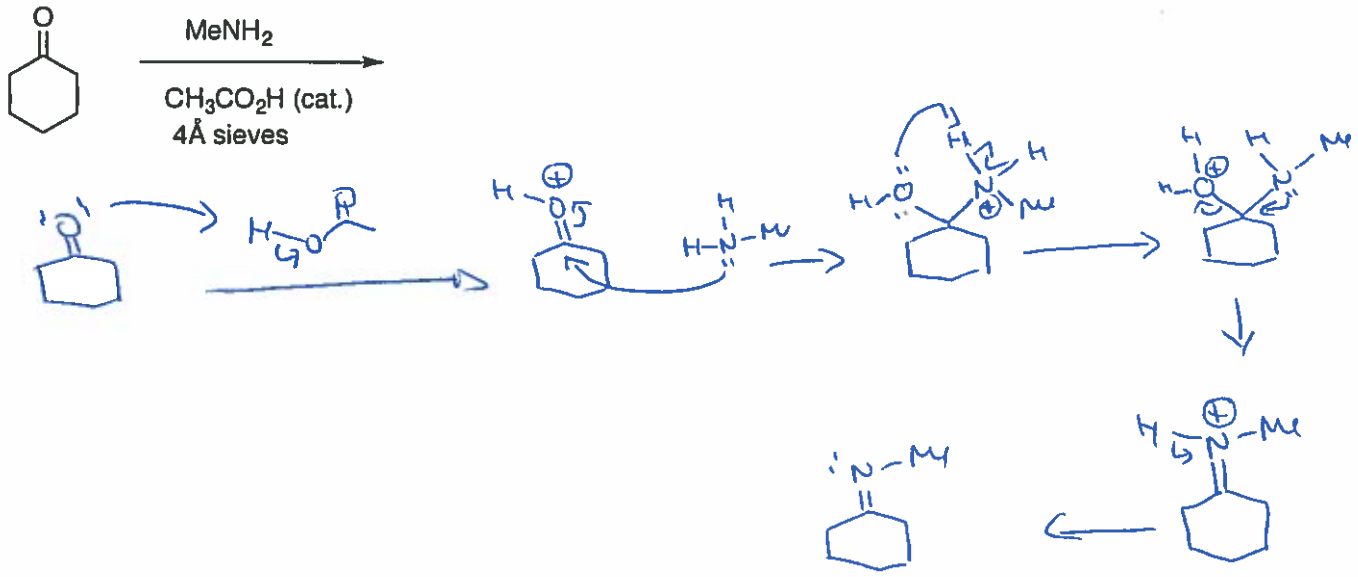
e) (9 pts)



f) (9 pts)



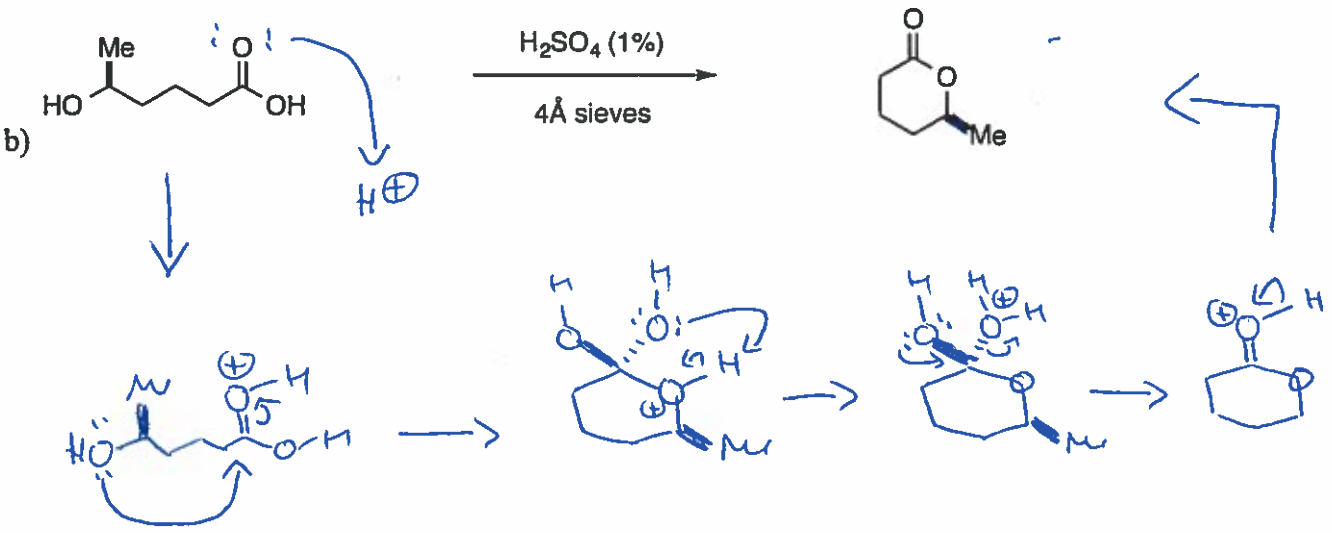
6) Provide the product and mechanism for the reaction shown below. Show every intermediate with the proper charges and all arrows required for each step, including any workup steps (13 pts).



Total pts this page:

7) Provide the mechanism for the reaction shown below. Show every intermediate with the proper charges and all arrows required for each step, including any workup steps (10 pts).

b)



Total pts this page: