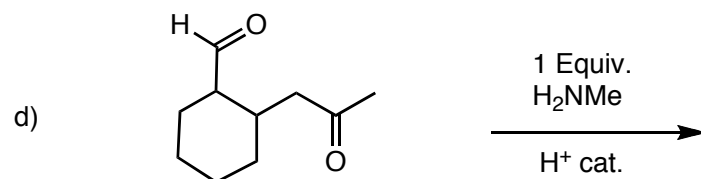
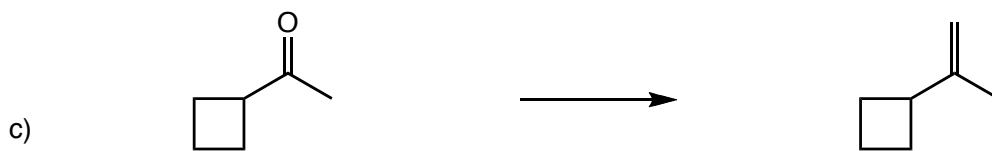
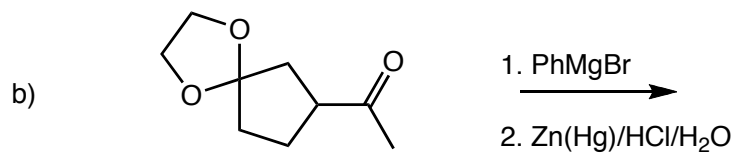
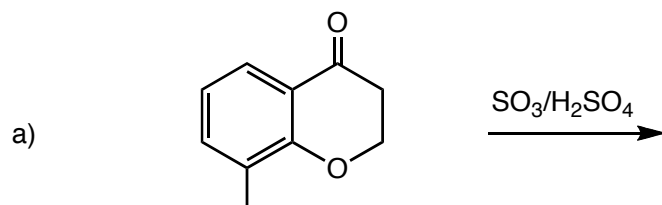




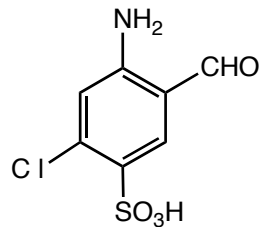
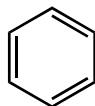


Question 3 (32 pts.) Provide the missing major organic products or reagents/conditions, you can IGNORE stereochemistry in these problems

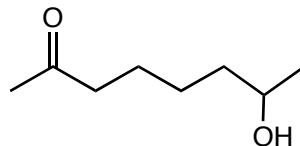
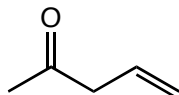


Question 4 (38 pts.) In each case, synthesize the (target) molecules on the right from the starting molecules the left. this can not be done in one reaction. Give reagents and conditions and the intermediate molecules at each step. Do not show any mechanisms or transient intermediates.

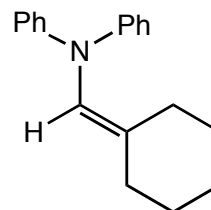
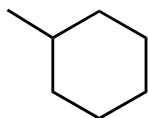
a)



b)



Question 5 (18 pts.) Synthesize the (target) molecule on the right from the starting molecule the left. this can not be done in one reaction. Give reagents and conditions and the intermediate molecules at each step. Do not show any mechanisms or transient intermediates.



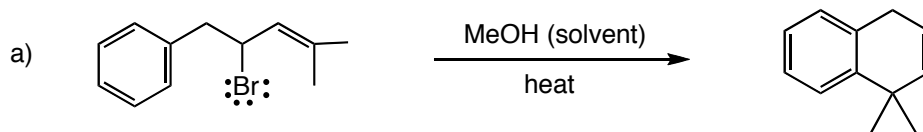
Question 6 (40 pts.) For the following TWO reactions a) and b):

1) Give a complete arrow-pushing mechanisms

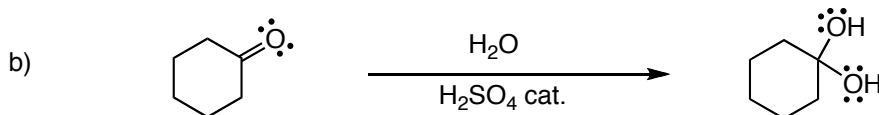
2) Indicate the lewis acid/base for each INTERmolecular step (LB or LA) and whether they are also Brønsted bases/acids (LB/BB or LA/BA)

3) Show wehere every proton comes from and goes to (i.e., no  $+H^+$  or  $-H^+$ )

4) DRAW ALL RELEVANT RESONANCE CONTRIBUTORS FOR THE INTERMEDIATES



Give the number of transition states in your mechanism for reaction a) \_\_\_\_\_



Give the number of transition states in your mechanism for reaction b) \_\_\_\_\_

Question 7 (20 pts.) Give a complete arrow-pushing mechanisms for the following reaction.

**1) You can use the abbreviated  $+H^+$  and  $-H^+$  to indicated protonation and deprotonation**

**2) DRAW ALL RELEVANT RESONANCE CONTRIBUTORS FOR THE INTERMEDIATES**

