CHEM 234, Spring 2010 | Third Midterm | Ian R. Gould

PRINTED **FIRST** NAME ANSWER | *PRINTED* **LAST** NAME KEY | *ASU ID or Posting ID* _____

*Person on your **LEFT** (or **Aisle**)* _____ *Person on your **RIGHT** (or **Aisle**)* _____

- ***PRINT YOUR NAME ON EACH PAGE!***
- ***READ THE DIRECTIONS CAREFULLY!***
- ***USE BLANK PAGES AS SCRATCH PAPER***
  work on blank pages will not be graded...
- ***WRITE CLEARLY!***
- ***MOLECULAR MODELS ARE ALLOWED***
- ***DO NOT USE RED INK***
- ***DON'T CHEAT, USE COMMON SENSE!***

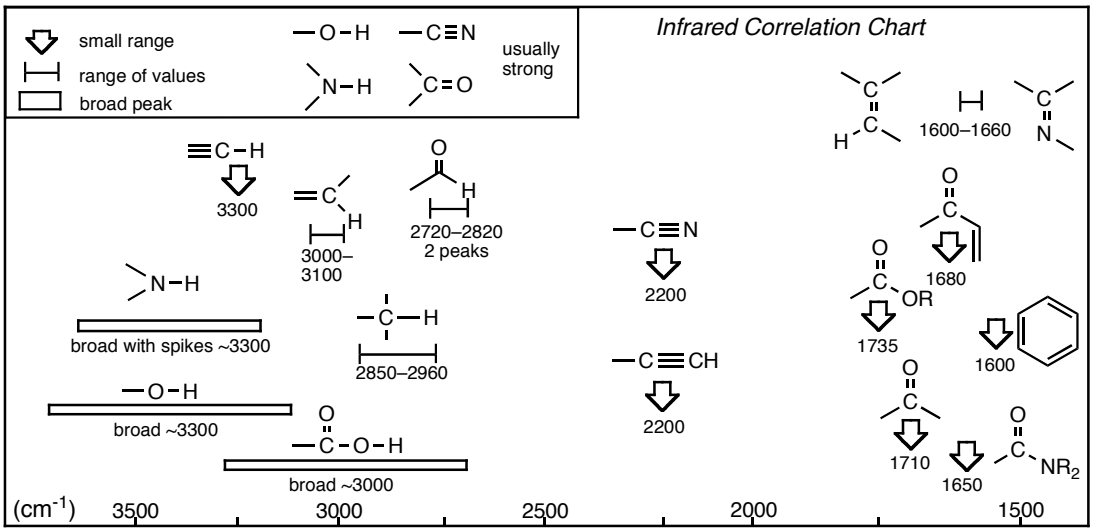
1 EAS /18 .....
2 reactions /32.....
3 retro 1 /40.....
4 retro 2 /20.....
5 mxn 1 /40 .....
6 spect /25.....

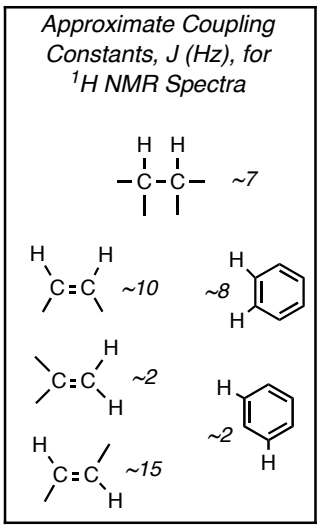
Extra Credit_____/5 **Total (incl Extra)**_____/175+5

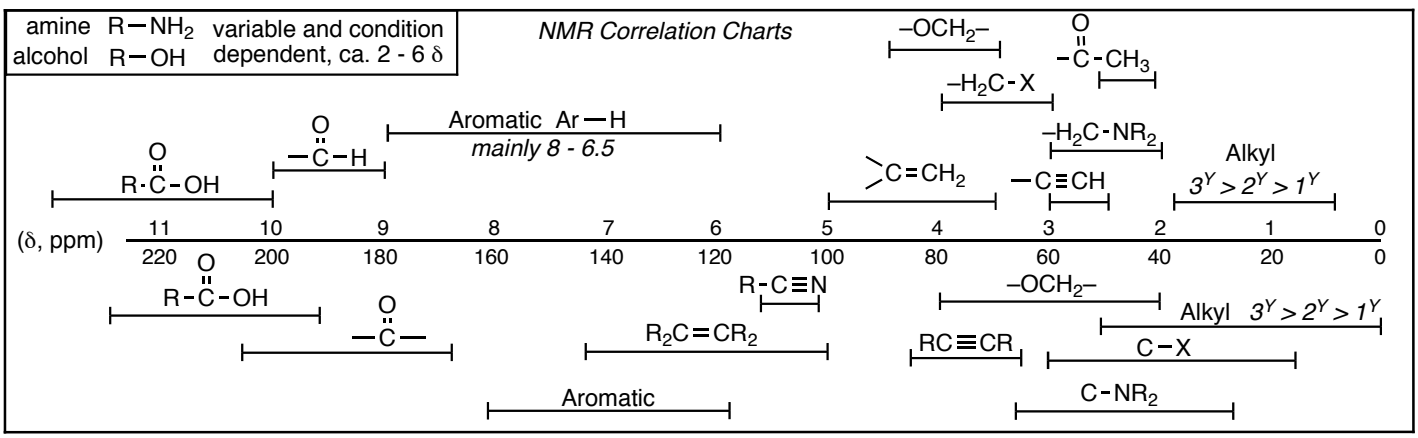
H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn

Interaction Energies, kcal/mol

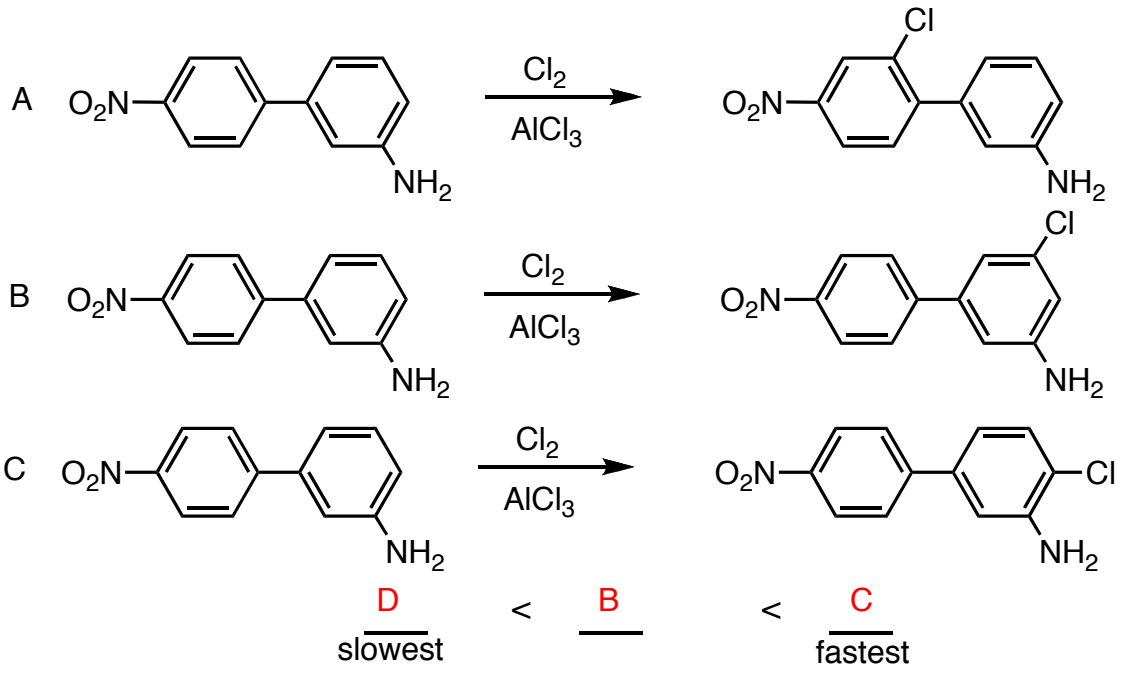
Eclipsing		Gauche	
H/H	~1.0	Me/Me	~0.9
H/Me	~1.4	Et/Me	~0.95
Me/Me	~2.6	i-Pr/Me	~1.1
Me/Et	~2.9	t-Bu/Me	~2.7







Question 1 (18 pts). Rank the following reactions in order of increasing rate. Give a BRIEF explanation that includes discussions of Lewis acidity/basicity, nucleophilicity/ electrophilicity, substitution, addition, elimination or rearrangement as appropriate.



D < B < C

slowest fastest

These are all electrophilic aromatic substitution, reaction at any position on a ring with a withdrawing group is slow because the W-group is deactivating, so reaction A is slower than both reactions B and C. Reaction B, meta with respect to the string donating group is slower than C (ortho-) because the positive charge in the intermediate in C is directly stabilized by the strong donating group whereas it is not in B.

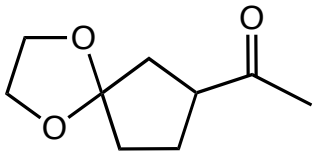
Extra credit question (5 pts). β-carotene is synthesized using which reaction?

Clemmenson Grignard Wittig Aldol

from weekly work #12

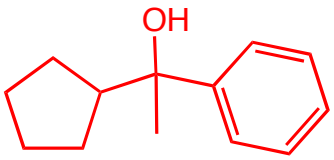
Question 2 (32 pts.) Provide the missing major organic products, you can IGNORE stereochemistry EXCEPT WHERE EXPLICITELY INCLUDED IN THE STARTING STRUCTURE, and you do **NOT** need to state what kinds of reactions these are or whether a solution of the product would be opticaly active.

a)

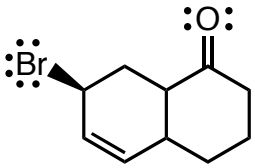


1. PhMgBr

2. $Zn(Hg)/HCl/H_2O$

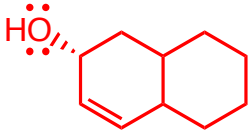


b)

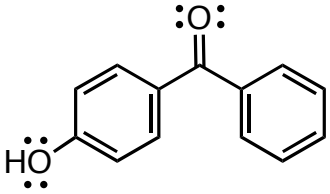


N_2H_4

KOH/heat

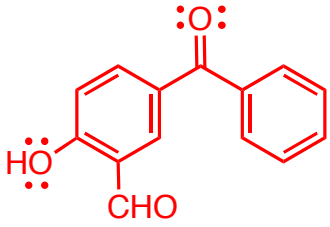


c)

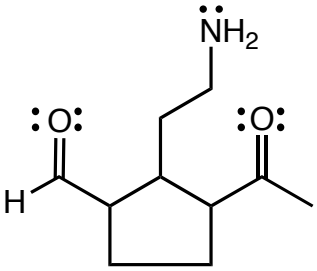


CO/HCl

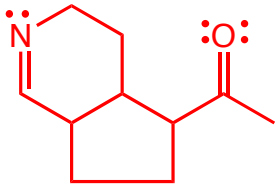
$AlCl_3$



d)



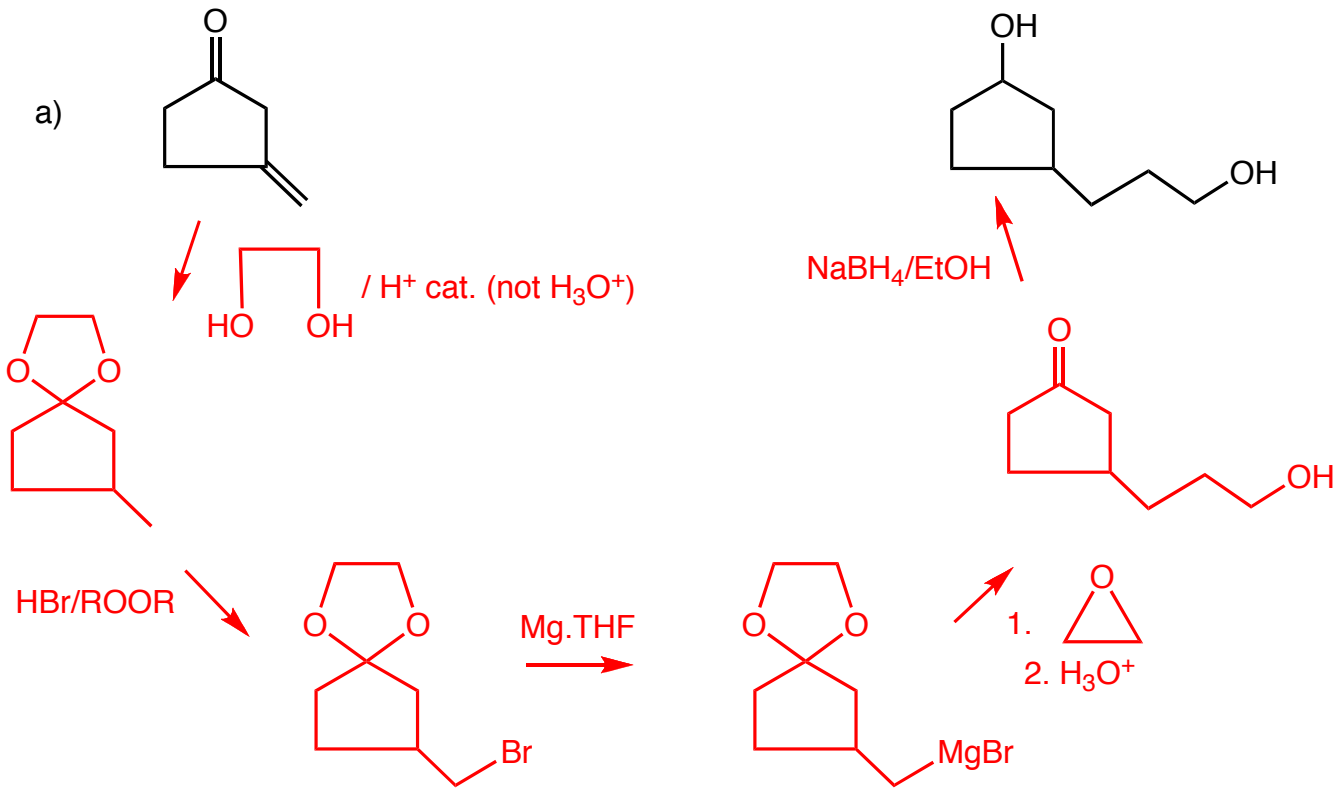
HCl (cat.)



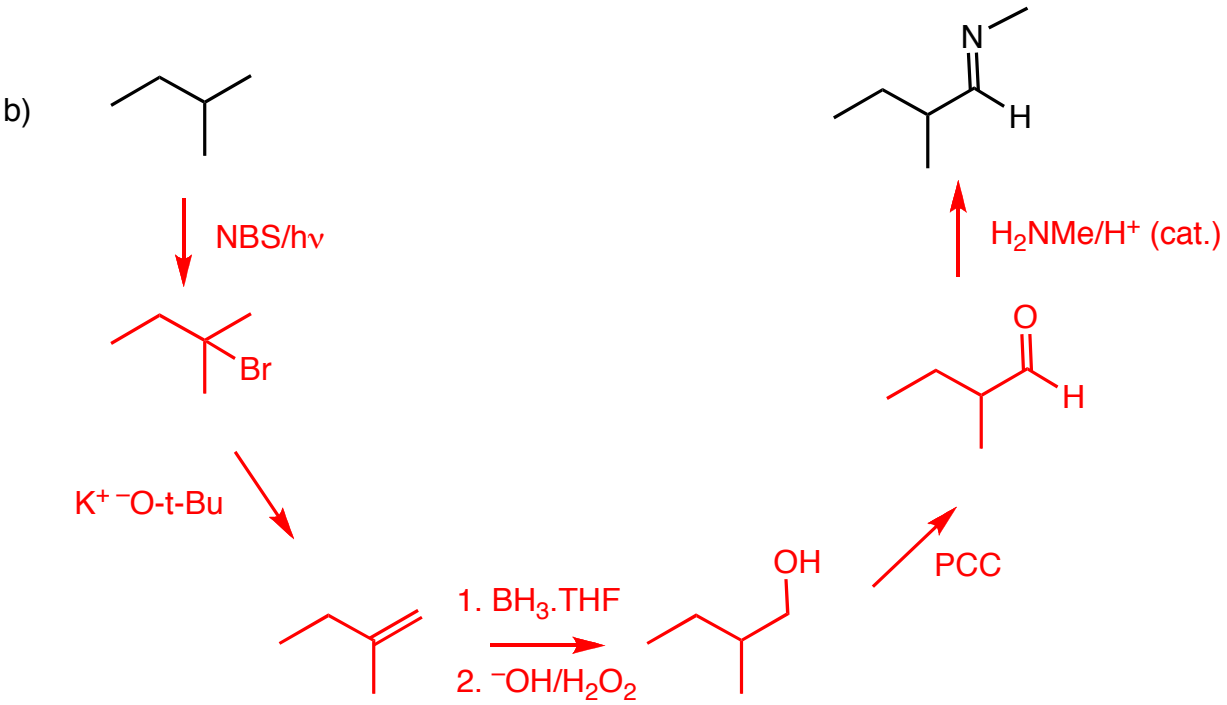
CHEM 234, Spring 2010 MIDTERM #3 NAME _____

Question 3 (40 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.

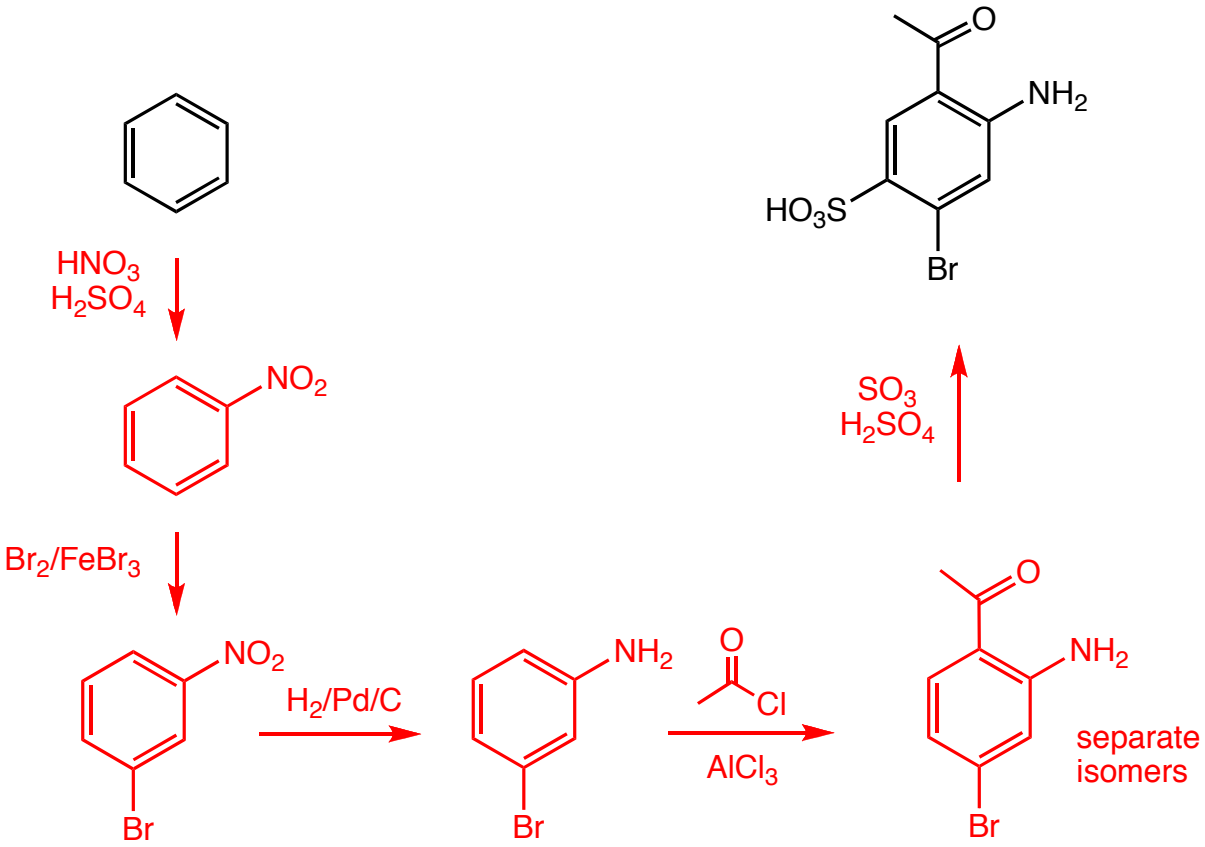
a)



b)



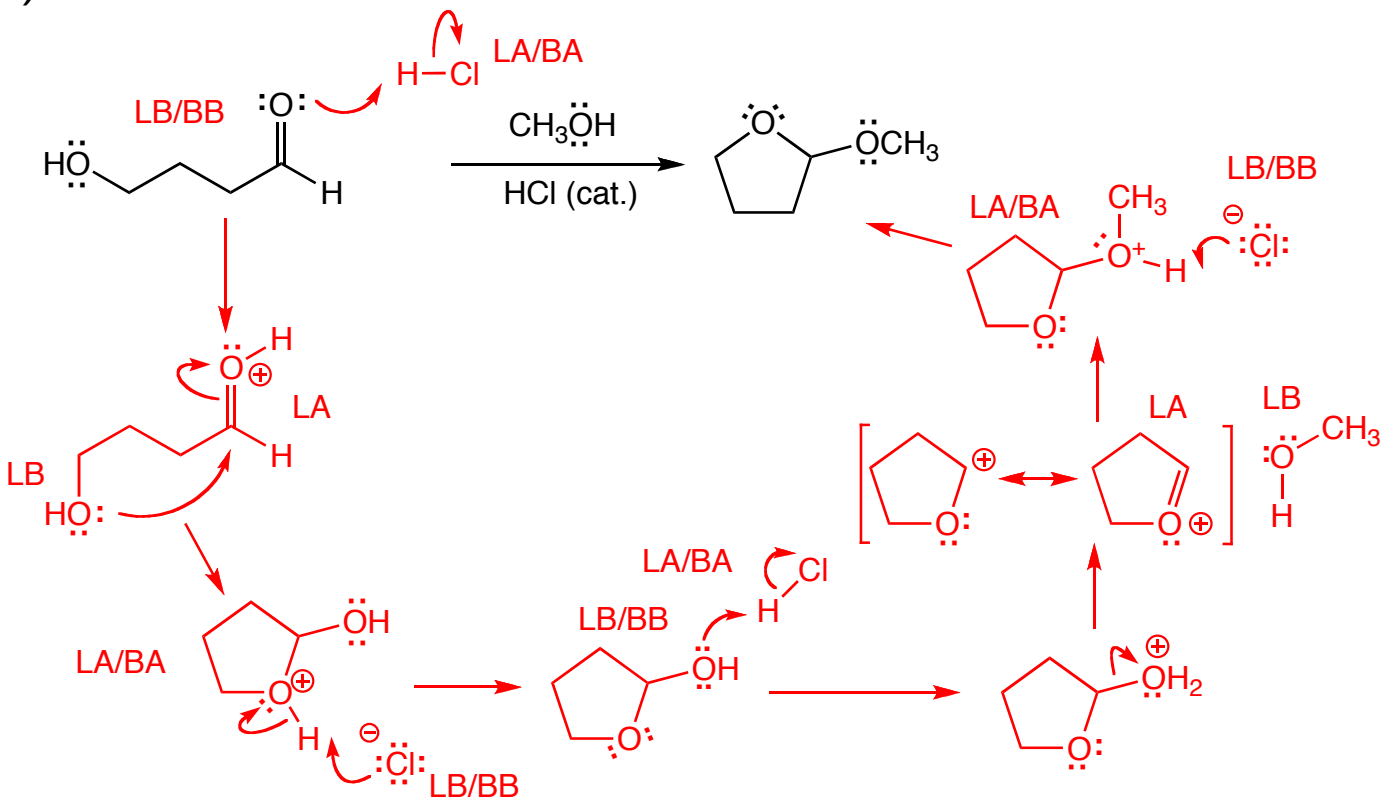
Question 5 (20 pts.) Synthesize the (target) molecule on the right from the starting molecule the left. this can not be done in one reaction. Give reagents and conditions and the intermediate molecules at each step. Do not show any mechanisms or transient intermediates.



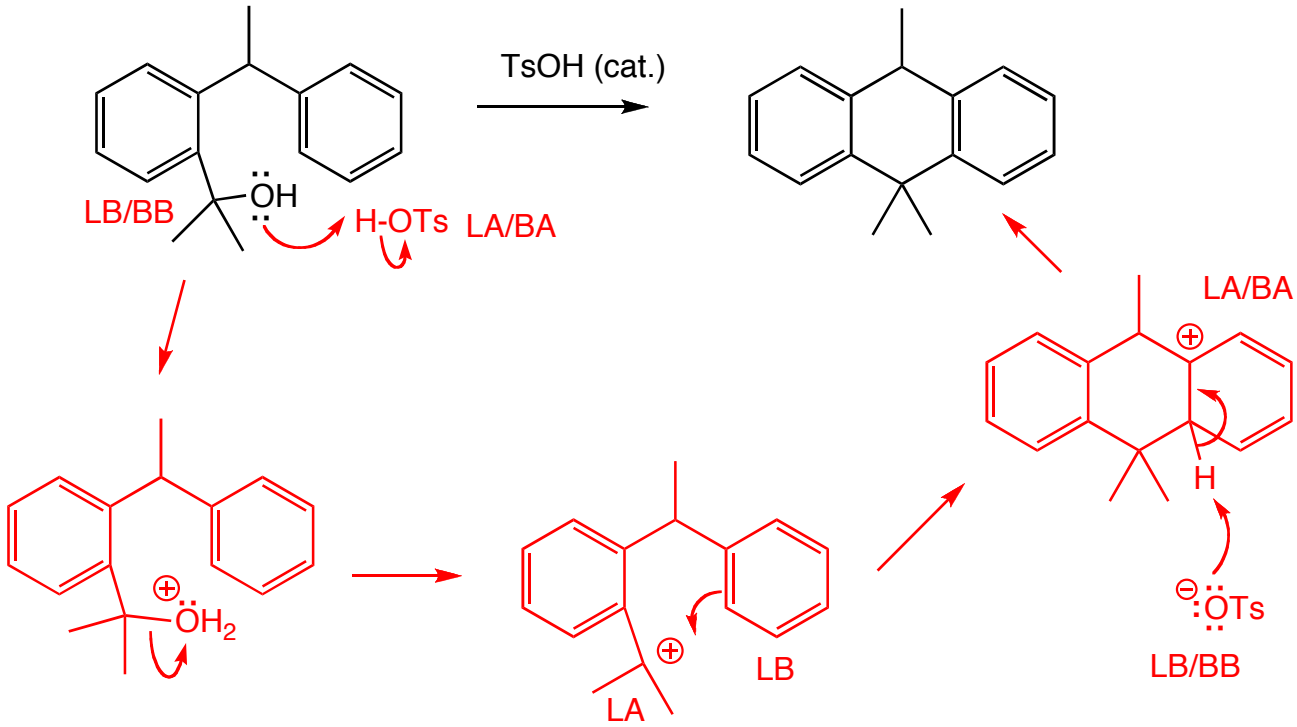
Question 6 (20 pts.) Give a complete arrow-pushing mechanisms for the following reactions.

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)

a) DRAW ALL RELEVANT RESONANCE CONTRIBUTORS OF THE INTERMEDIATES



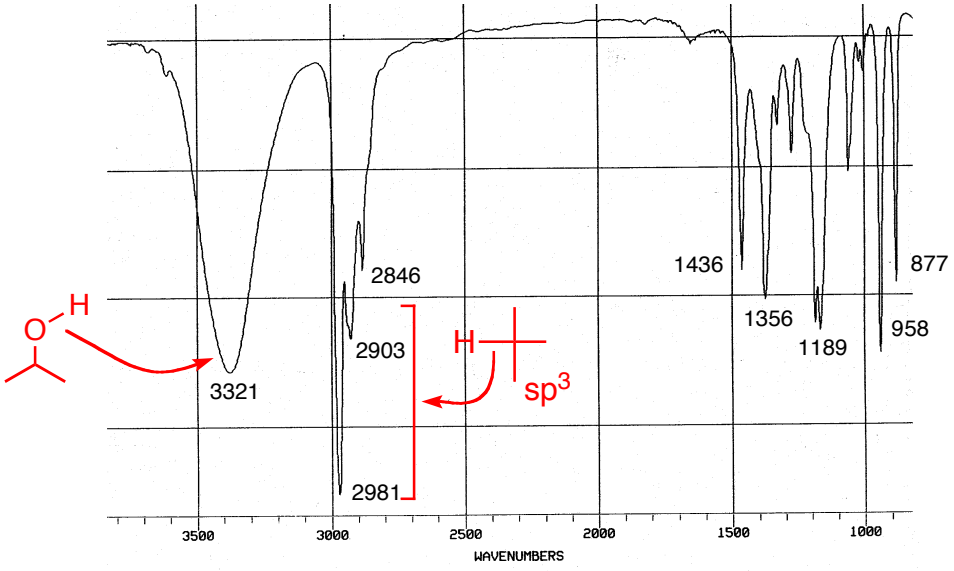
b) DO <u>NOT</u> draw resonance contributors for the intermediates



Question 6 (25pts) Provided are spectra for a compound with molecular formula **$C_6H_{14}O$**

a) Give the degrees of unsaturation 0 degrees of unsaturation

b) On the infrared spectrum, indicate which peaks correspond to which functional groups



c) draw the structure and clearly indicate which hydrogens correspond to which signals **in the proton nmr spectrum (only)**