CHEM 234, Spring 2018 | Midterm #3 | Ian R. Gould

COMPLETE THIS SECTION : Up to TWO POINTS will be removed for incorrect/missing information!

PRINTED **FIRST** NAME *Answer Key* _____ PRINTED **LAST** NAME _____

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

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

Class you are REGISTERED FOR (onground or hybrid) _____

The room where most students will take the test for your class, i.e. LS A-191 for onground and PS H-152 for hybrid) _____

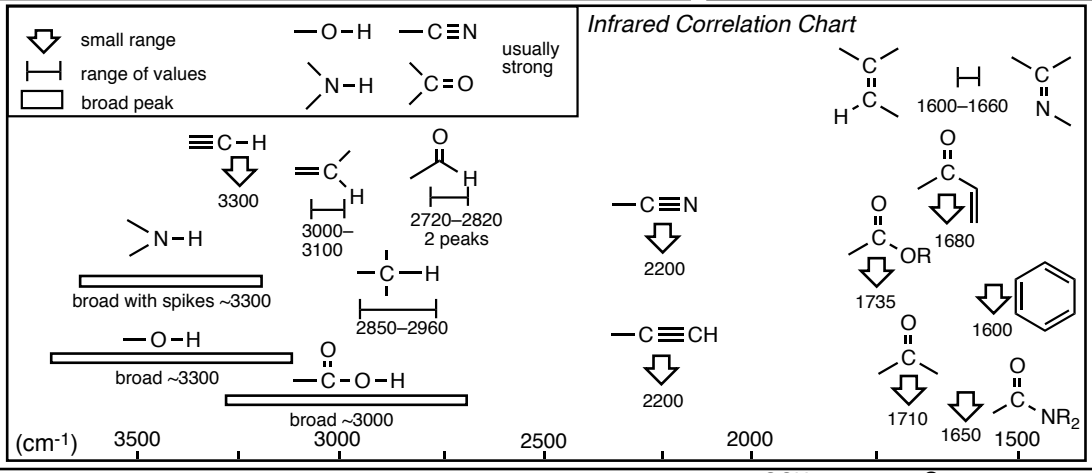
*****YOU ARE NOT ALLOWED TO TAKE SPARE COPIES OF THIS EXAM FROM THE TESTING ROOM*****

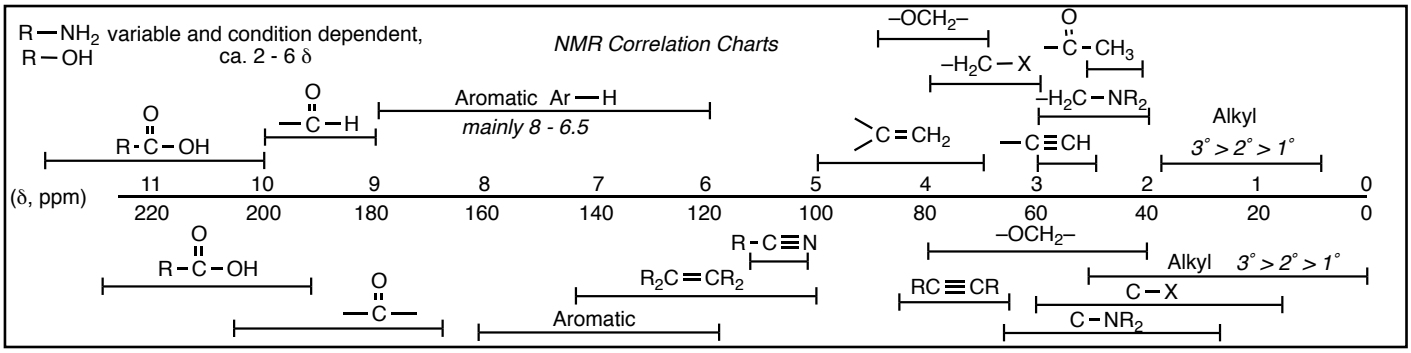
- *PRINT YOUR NAME ON EACH PAGE!*
- *READ THE DIRECTIONS CAREFULLY!*
- *USE BLANK PAGES AS SCRATCH PAPER*
  work on blank pages will not be graded...
- *WRITE CLEARLY!*
- *MOLECULAR MODELS ARE ALLOWED*
- *DO NOT USE RED INK*
- *DON'T CHEAT, USE COMMON SENSE!*

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
Et/Et	~3.1	t-Bu/Me	~2.7





YOU MUST COMPLETE THIS PAGE WITH YOUR NAME
(EVEN THOUGH YOU ALREADY DID THIS ON THE COVER PAGE)
AND ALSO GIVE YOUR ASU OR POSTING ID NUMBER
WE NEED THIS NUMBER BECAUSE YOU WOULDN'T BELIEVE THE NUMBER OF STUDENTS WHOSE NAMES WE CAN'T READ!

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

Points by question

1_____**/13**

2_____**/22**

3_____**/40**

4_____**/40**

5_____**/40**

5_____**/20**

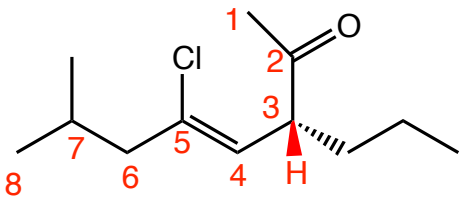
Points Removed for cover errors ____/2

Extra Credit_____/5

Total (incl Extra)_____/175+5

*****YOU ARE NOT ALLOWED TO TAKE SPARE COPIES OF THIS EXAM FROM THE TESTING ROOM*****

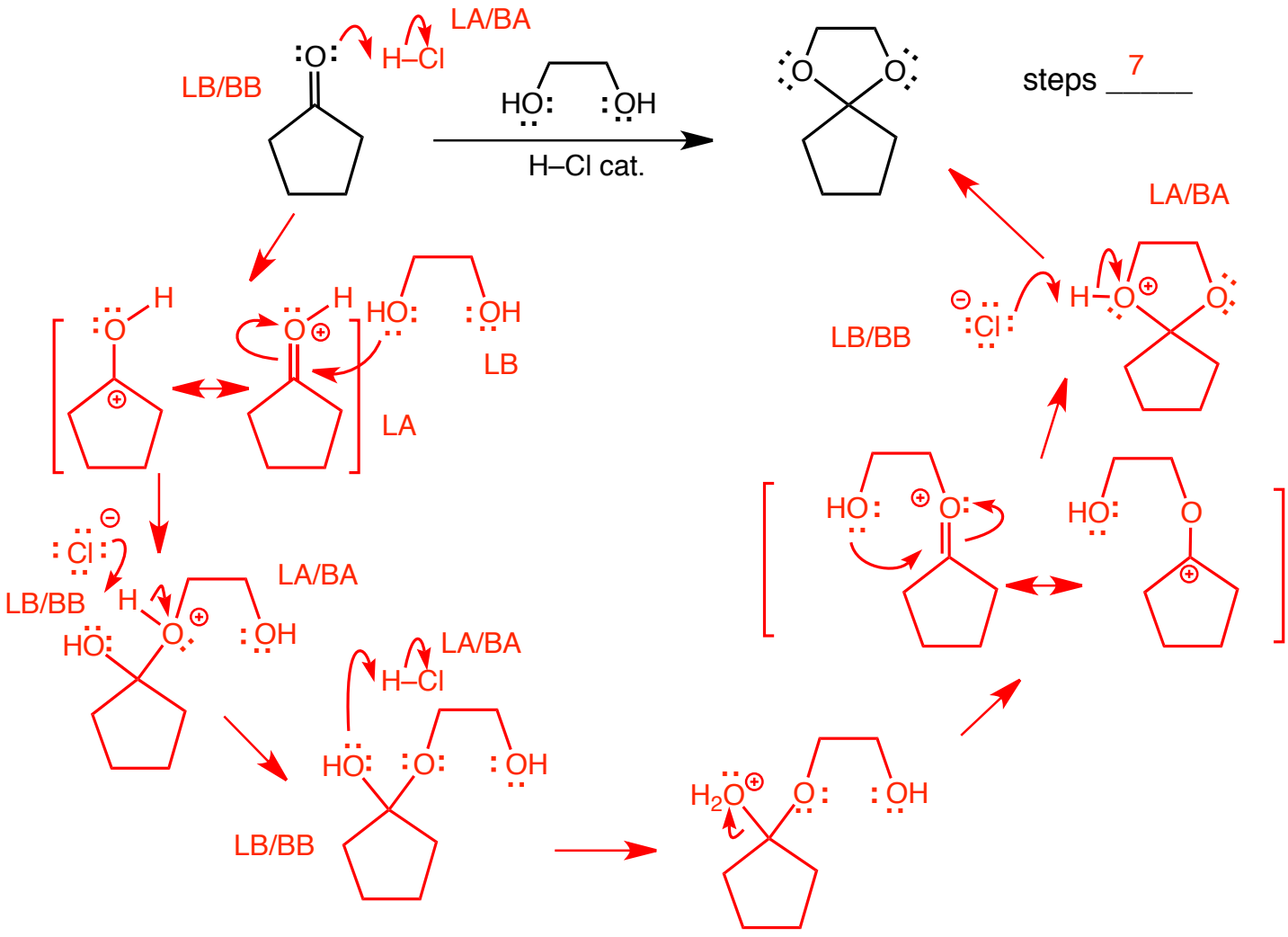
Question 1 (13 pts). Give the IUPAC name for the following compound. Be sure to use cis/trans, E/Z or R/S where appropriate.



5-chloro-7-methyl-(3R)-propyloct-(4Z)-en-2-one

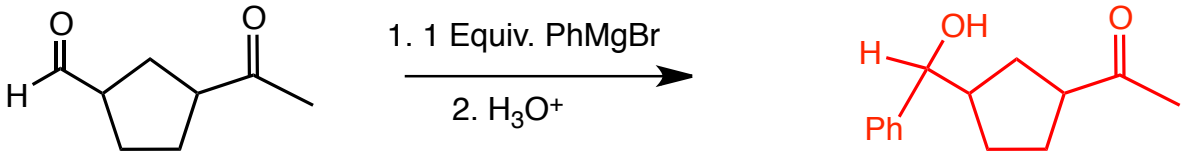
Question 2 (22 pts.) Give a arrow-pushing mechanism for the following reaction, indicate the Lewis and Bronsted acids/bases for each intermoelcular step (LB, LB, BB, BA)

- **Show all resonance contributors for the intermediates**
- **Show where all protons come from and go to (no $+H^+/-H^+$)**
- **Give the number of steps in your mechanism**

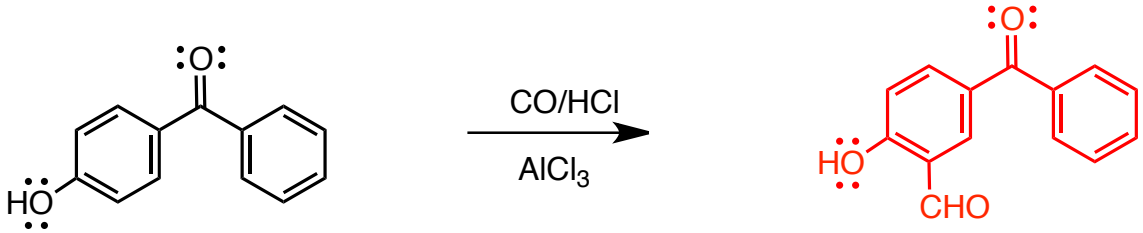


Question 3 (40 pts.) Provide the missing major organic products or reagents/conditions as appropriate, you can IGNORE stereochemistry in these problems

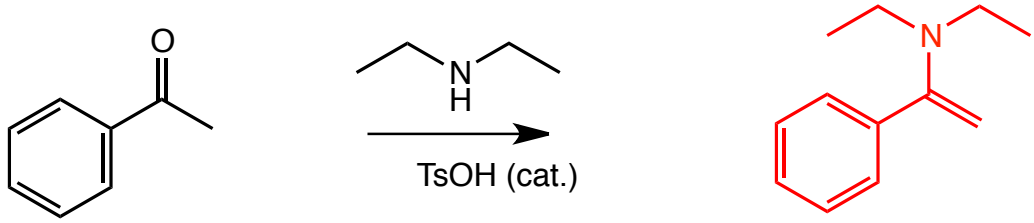
(a)



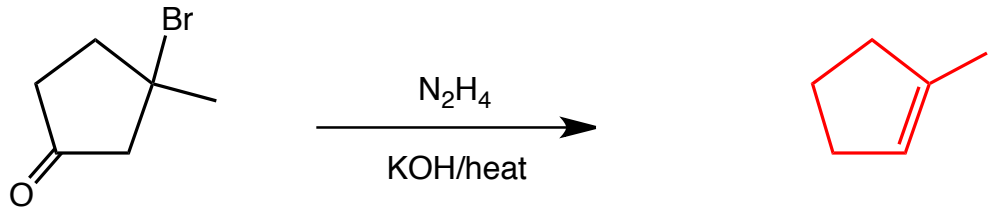
(b)



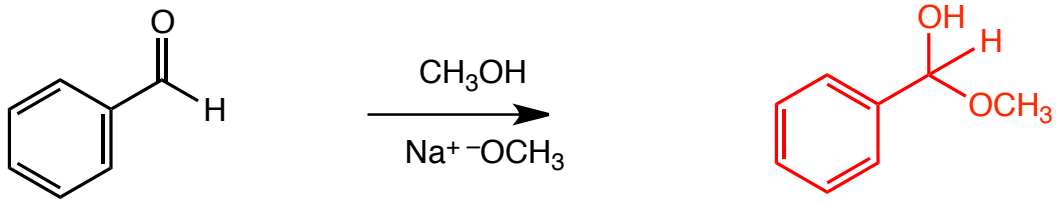
(c)



(d)



(e)

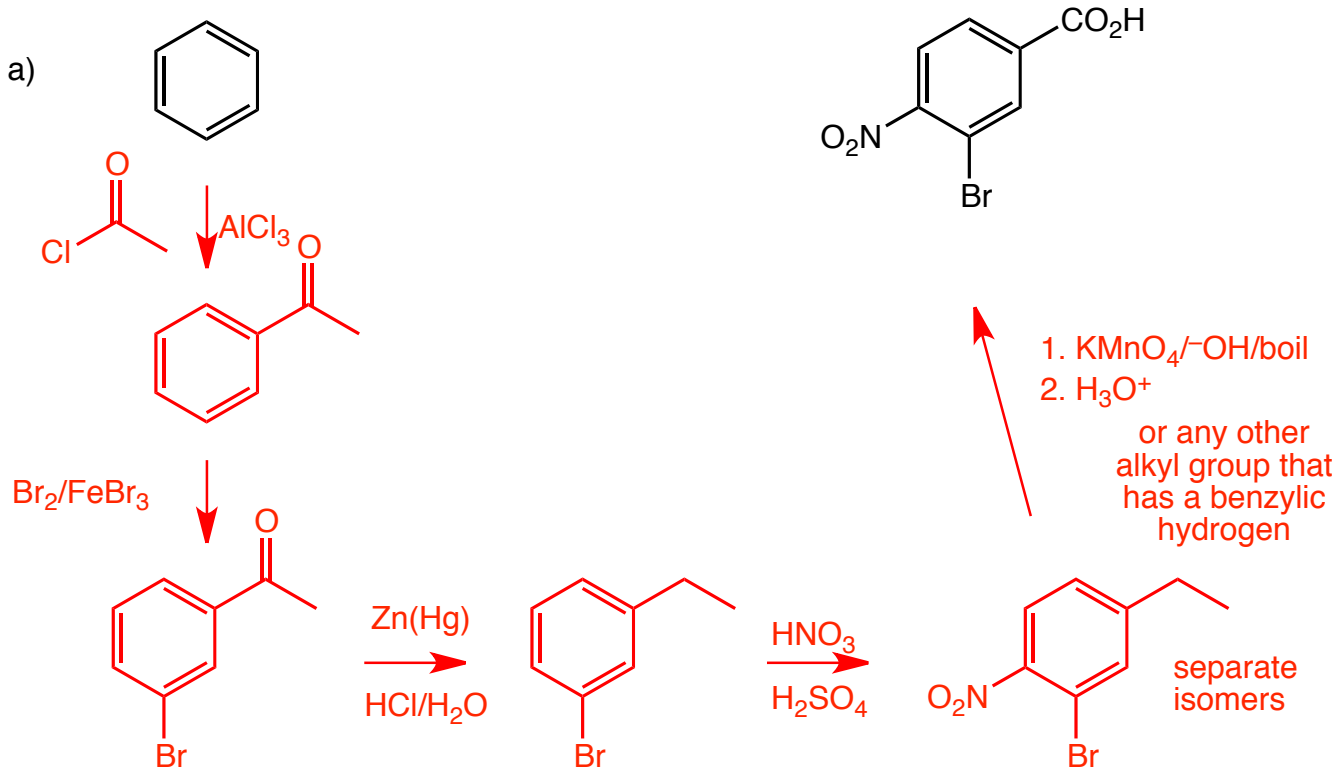


Extra credit question (5 pts). β-carotene is synthesized using which reaction?

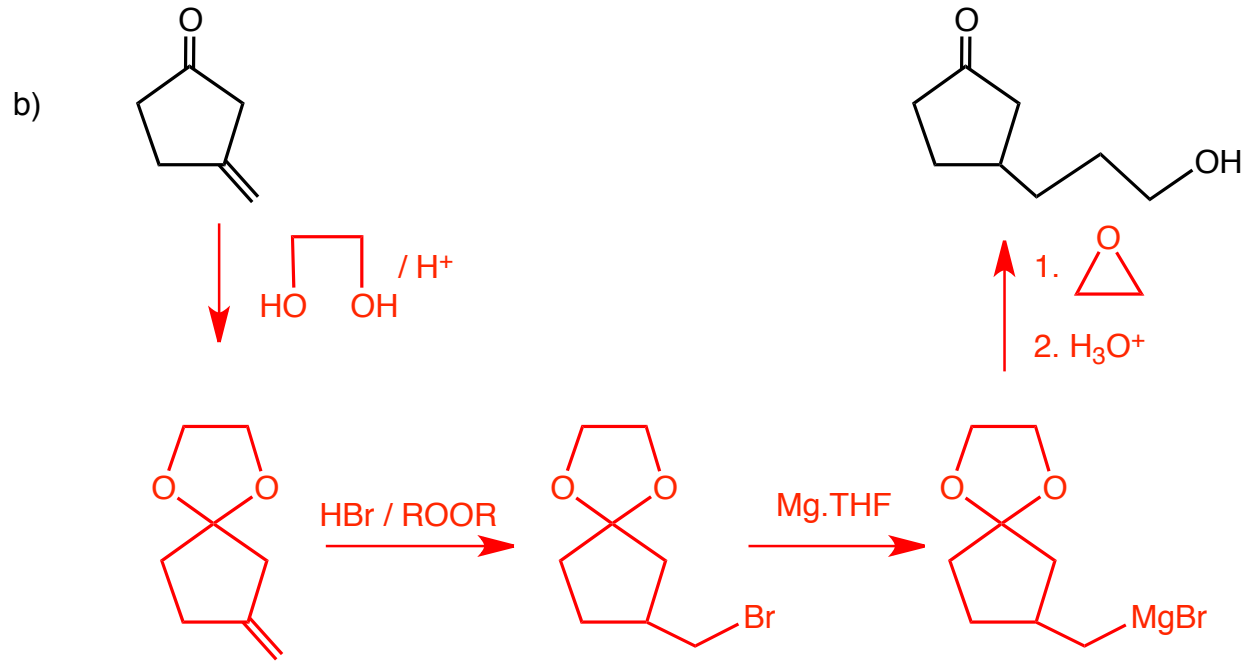
Clemmenson Grignard Wittig Aldol

Question 4 (40 pts.) 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. If other isomers are formed at any step then you need to indicate this but you do not need to draw their structures.

a)

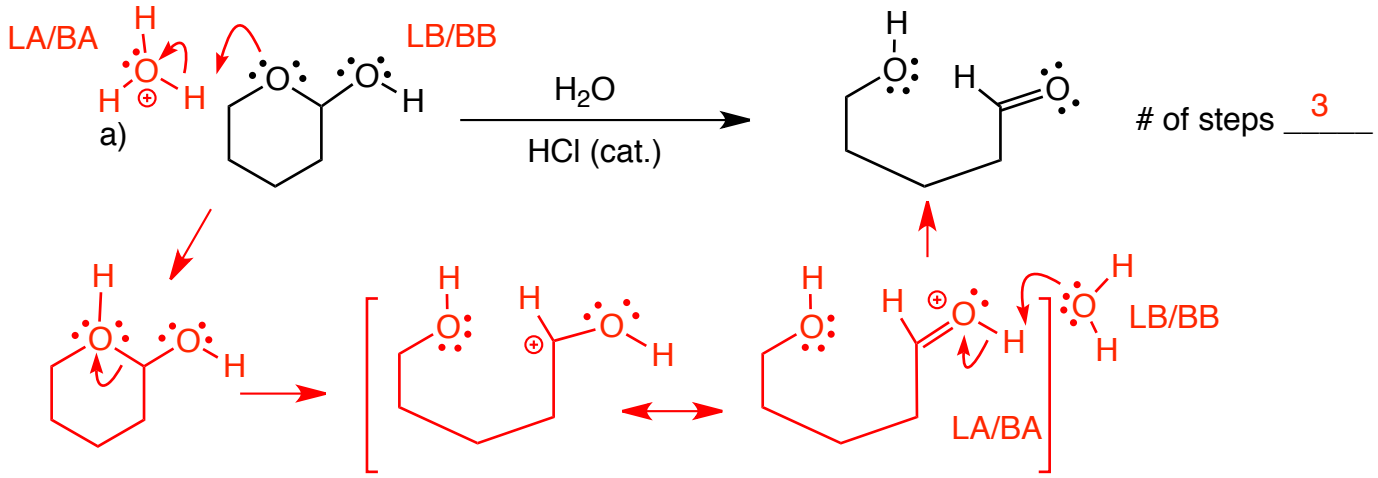


b)

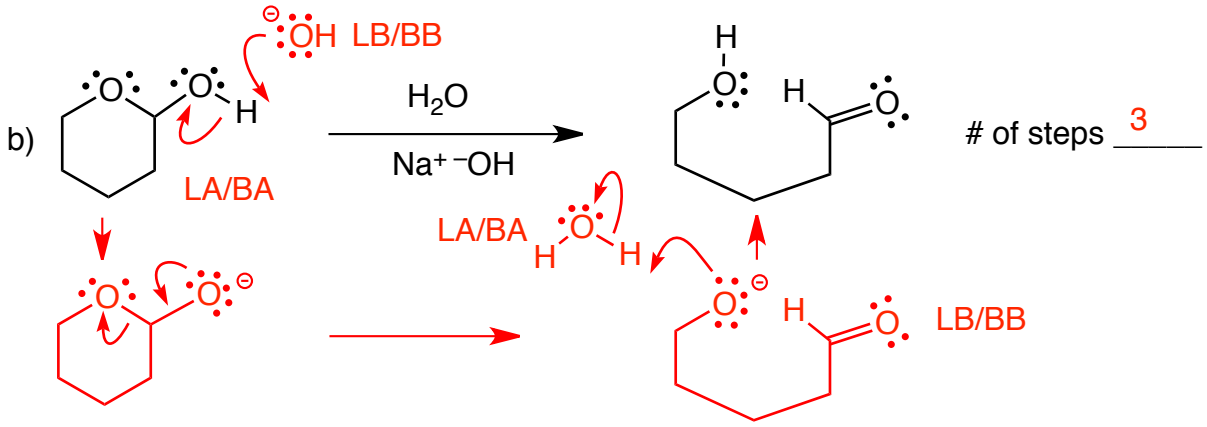


Question 5 (40 pts.) Give a complete arrow-pushing mechanism for the following reactions, indicate the Lewis and Bronsted acids/bases for each intermolecular step (LB, LB, BB, BA)

- **Show all resonance contributors for the intermediates**
- **Show where all protons come from and go to (no $+H^+/-H^+$)**
- **Give the number of steps in your mechanism**

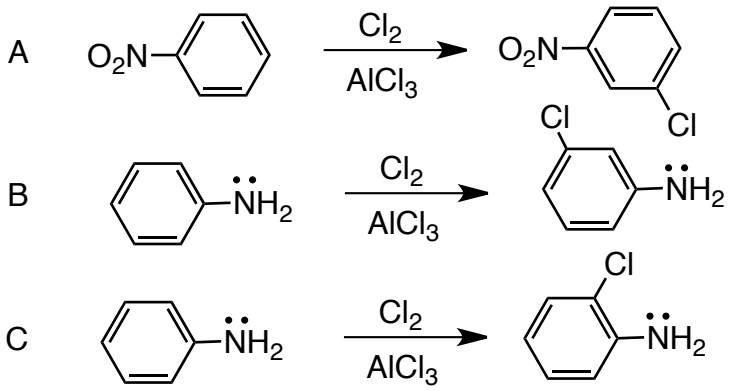


# of steps 3



# of steps 3

Question 6 (20 pts). Rank the following reactions in order of increasing rate. Give a BRIEF explanation that includes the terms Lewis acidity/basicity **OR** nucleophilicity/electrophilicity (almost all points for the explanation, not getting the order correct)



A (slowest) < B < C (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 strong 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.