

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) \_\_\_\_\_

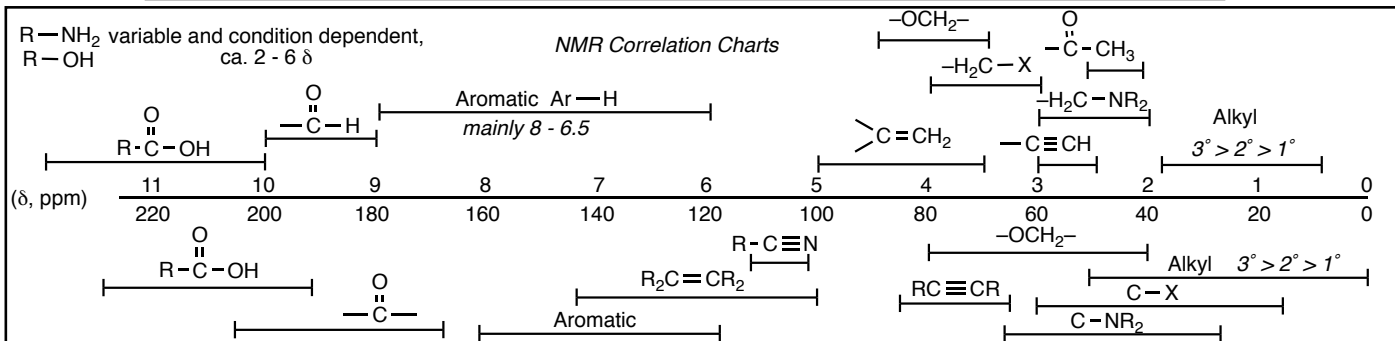
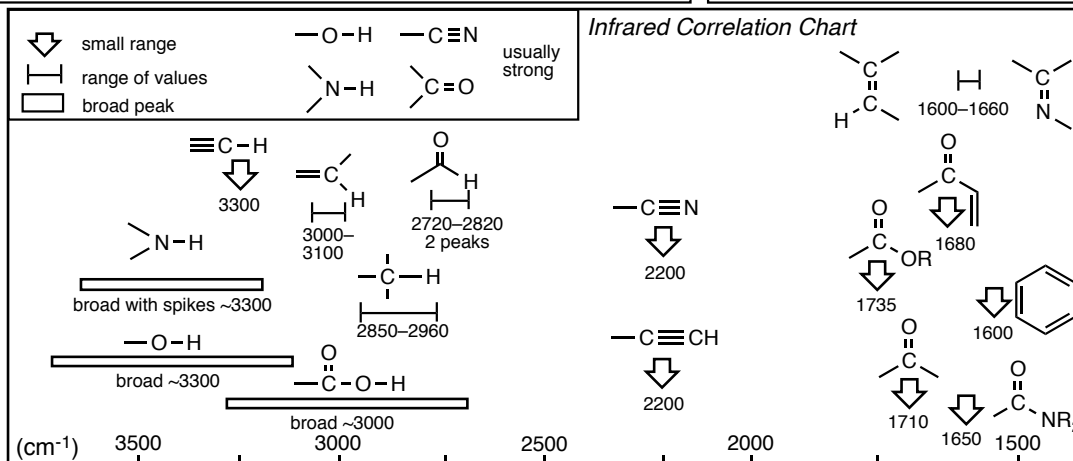
The room where most students will take the test for your class, i.e. LS A-191 for onground and PS H-152 for hybrid) \_\_\_\_\_

**\*\*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* **ANSWER** *PRINTED* **KEY** *ASU ID or*  
**FIRST NAME** \_\_\_\_\_ **LAST NAME** \_\_\_\_\_ *Posting ID* \_\_\_\_\_

**Points by question**

1 \_\_\_\_\_ /13

2 \_\_\_\_\_ /22

3 \_\_\_\_\_ /42

4 \_\_\_\_\_ /40

5 \_\_\_\_\_ /36

6 \_\_\_\_\_ /22

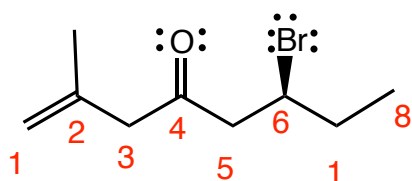
Points Removed for cover errors \_\_\_\_\_/2

Extra Credit \_\_\_\_\_/5

Total (incl Extra) \_\_\_\_\_/175+5

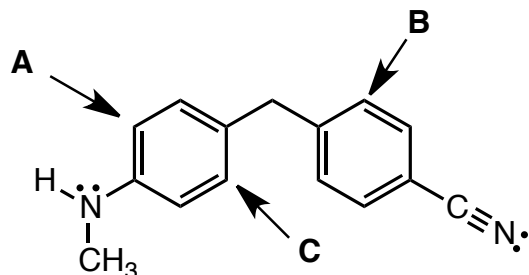
**\*\*YOU ARE NOT ALLOWED TO TAKE SPARE COPIES OF THIS EXAM FROM THE TESTING ROOM\*\***

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.



[6S]-bromo-2-methyloct-1-en-4-one

Question 2 (22 pts). Rank in order of increasing rate of electrophilic aromatic substitution at the carbons indicated by the arrows. Give a BRIEF explanation.



$\frac{B}{\text{slowest}} < \frac{C}{\text{fastest}} < \frac{A}{\text{fastest}}$

Reaction at both A and C is faster than at B, because both are activated by strong (amine) and weak (alkyl) donating groups on the ring. Reaction at A is activated more than at C because the strong donating group stabilizes the intermediate more at this position it is o- and p-directing).

Although B is activated by the weak alkyl donating group, it is deactivated by the by the strongly withdrawing nitrile group, remember, the W groups deactivate at ALL positions, m- is just not as deactivated as o- and p-.

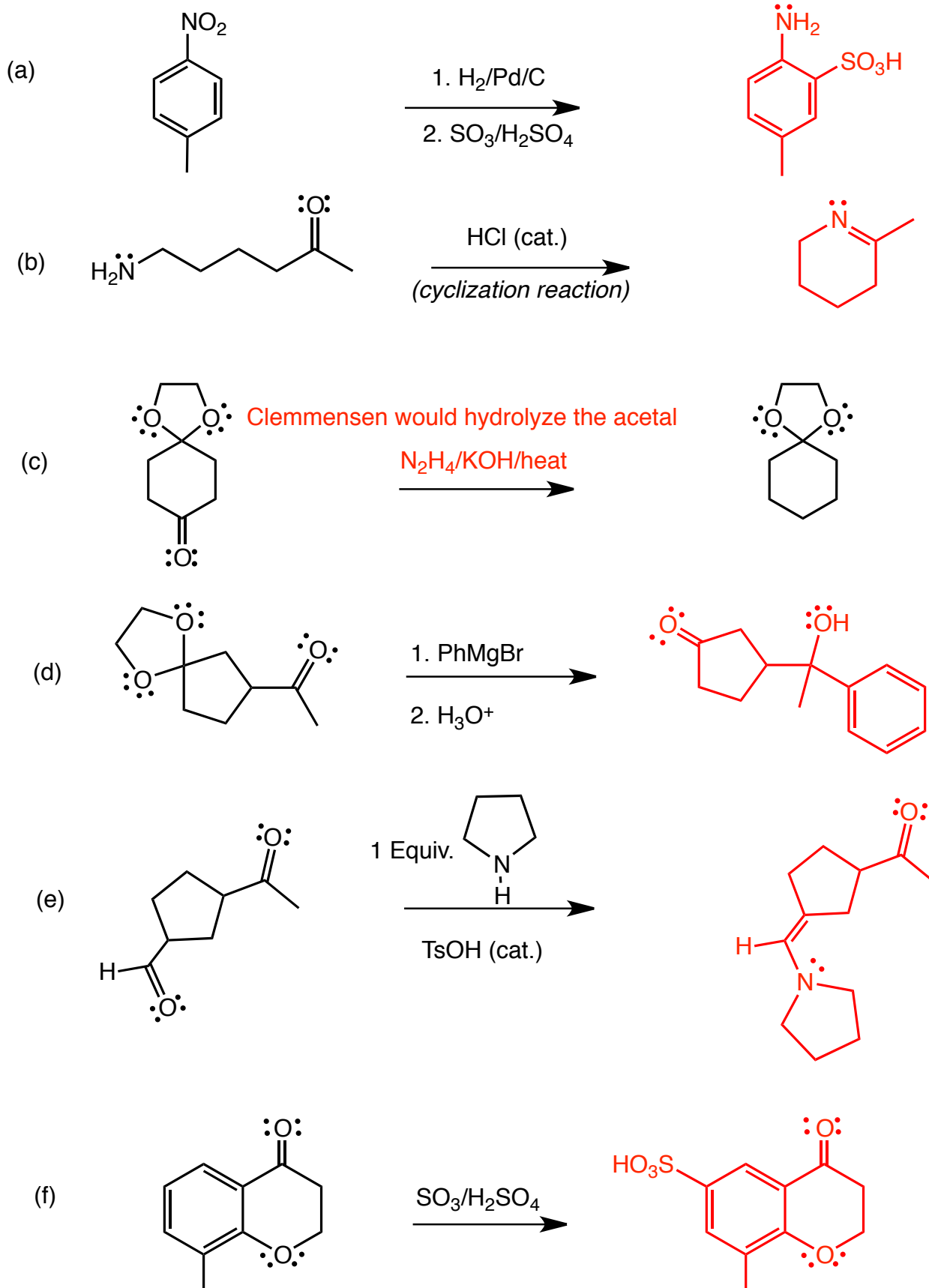
Extra Credit (5 pts). Health problems associated with the use of Agent Orange defoliant in the Vietnam war are thought to be associated with the presence of an impurity produced when Agent Orange was synthesized. This impurity had what kind of chemical structure?

Chlorinated Aldehyde

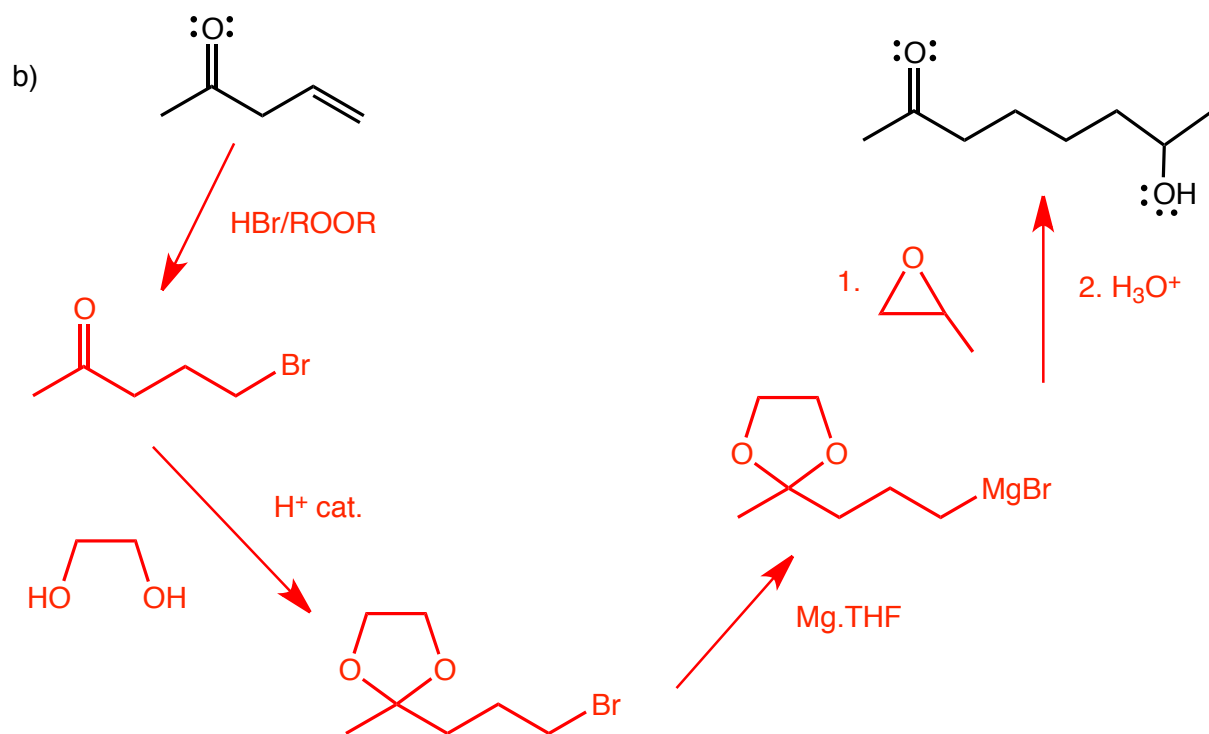
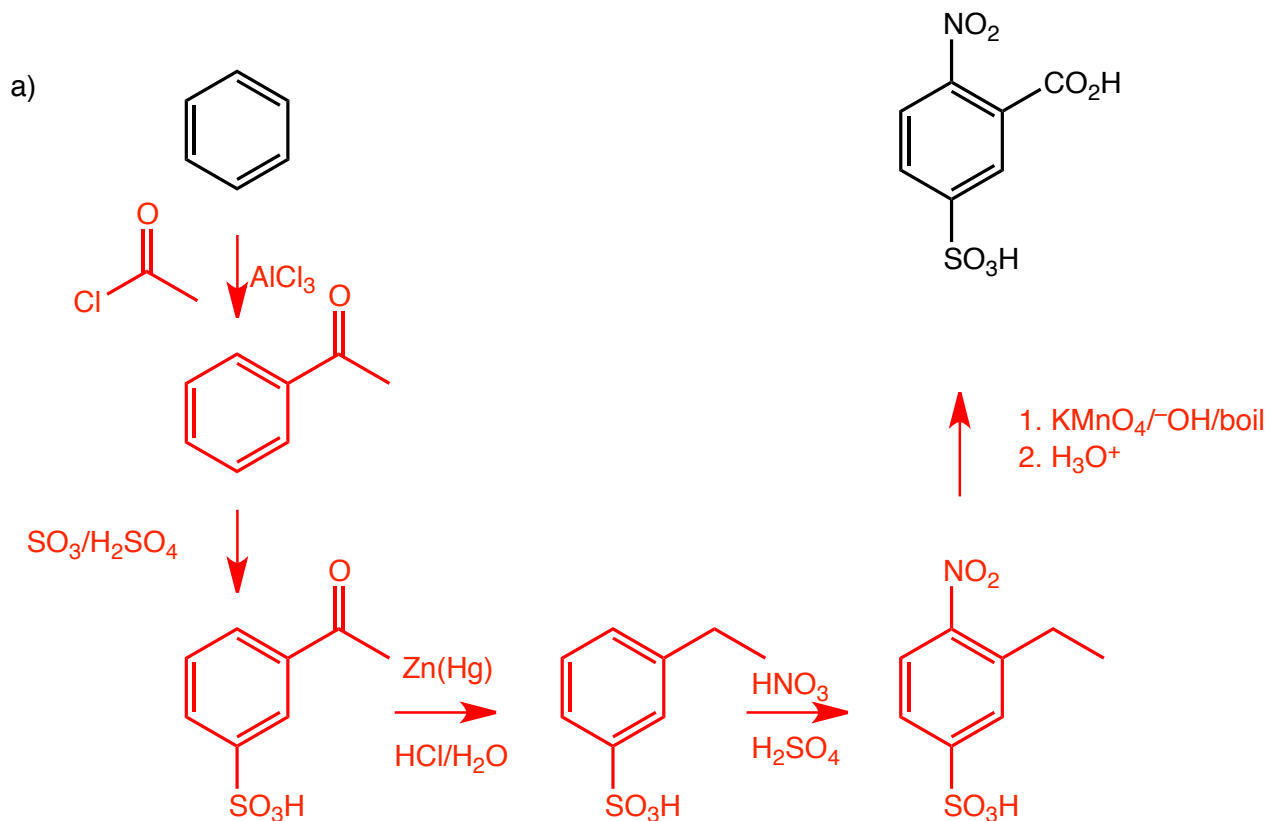
Chlorinated Ketone

Chlorinated Aromatic

Question 3 (42 pts.) Provide the missing major organic products or reagents/conditions as appropriate, you can IGNORE stereochemistry in these problems



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.



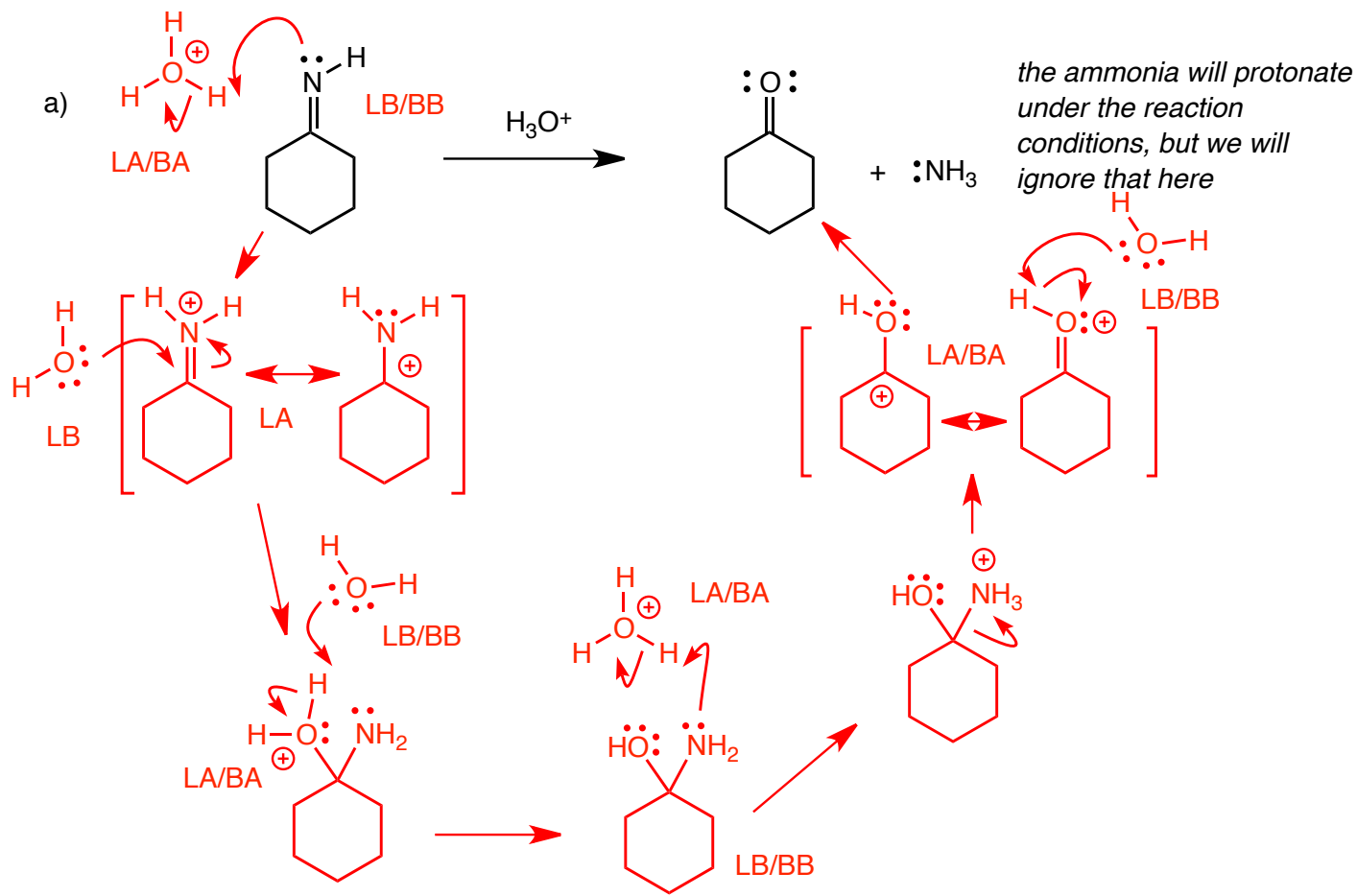
Question 5 (36 pts.) For the following TWO reactions a) and b):

1) Give complete curved arrow-pushing mechanisms

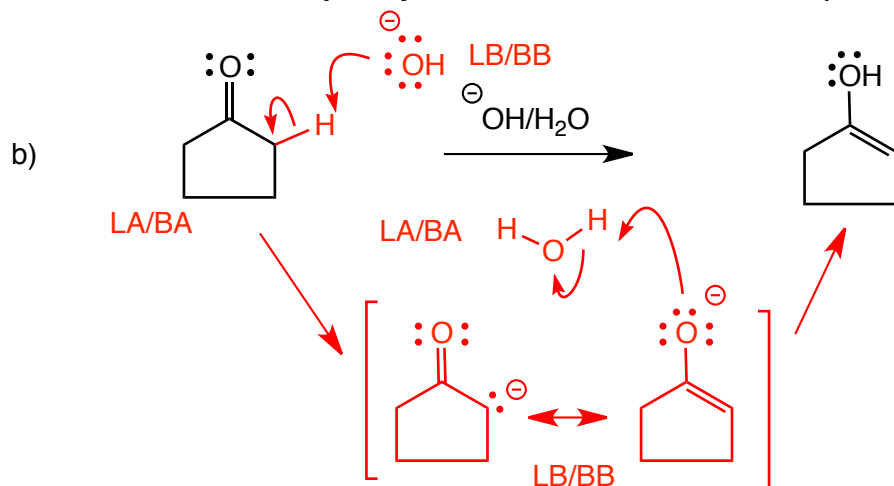
2) Indicate the lewis acid/base for each INTERmolecular step (LB or LA) and whether they are also Brønsted bases/acids (LB/BB or LA/BA)

3) Show where 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 steps in your mechanism for reaction a) 6



Give the number of steps in your mechanism for reaction b) 2

Question 6 (22 pts.) For the following TWO reactions a) and b):

1) Give complete curved 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 where every proton comes from and goes to (i.e., no  $+H^+$  or  $-H^+$ )

4) DRAW ALL RELEVANT RESONANCE CONTRIBUTORS FOR THE INTERMEDIATES

